Fans | Air Handling Units | Air Distribution Products | Fire Safety | Air Curtains and Heating Products | Tunnel Fans

Product Catalog

Edition IV

systemair

Welcome to Systemair! High-performance and reliable ventilation technology is our goal – your trust our drive. To make sure you can look to the future with confidence, we work daily on new, highly efficient and advanced solutions. With these pages you will get to know what we've come up with: fresh ideas and product innovations for the most varying of challenges in the area of ventilation technology.

Innovative. Intelligent. Inspiring.

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Systemair has been taking care of Indoor Air Quality (IAQ) as an essential resource since 1974. Today Systemair is one of the leading ventilation companies worldwide. A success story, which started in Skinnskatteberg, Sweden with the invention of the inline duct fan. This invention revolutionised the ventilation world. Since then the company has continuously advanced and now offers a comprehensive range of products for all ventilation requirements.

The experts at Systemair have the required knowledge and understanding in finding solutions when considering the ventilation of shopping centres, domestic ventilation of a family home to the complex ventilation of tunnels and metro stations. More than 3100 employees and in excess of 60 subsidiaries in 44 countries are available to our customers.

Detailed product information can be found on our website www.systemair.net

Systemair

The straight way

The straight way was our first production idea and led to the circular duct fan. Today "the straight path" represents our ambition to simplify the life of our customers. High product quality, correct technical data and fast deliveries are always in focus.

Systemair

Systemair was established in Sweden in 1974 and is today the parent company in an international group with 60 subsidiaries and approximately 3100 employees. The group's head office and largest production plant is located in Skinnskatteberg with some 400 employees and a floor area of 538.000 ft^2 (50.000 m^2).

Production

We are proud of our production plants. The aim has been to have both effective production of bulk products and, at the same time, an efficient and flexible approach to producing small volumes. This has steered our choice of machinery and how we plan our production, with focus on the working environment. Our premises are light and pleasant and we invest in tools that facilitate work and provide our employees with a safe and efficient workplace. The Group manufactures products in 15 production facilities in Europe, North America and Asia, with a total manufacturing floor space of 2.000.000 ft^2 (190.000 m^2)

Technical data

Systemair puts significant assets toward development of energy efficient, environment friendly and user friendly ventilation products. We have five development centers located in Sweden, Germany, Canada, Slovakia and the United States at our disposal. More than 80 engineers from 13 development teams on three continents work on product development.

With our broad geographic reach, we can carefully follow current trends in various parts of the world. We also actively influence future trends by taking part in the specification of new international and national standards.

Quality and environment

Nine of our production facilities have ISO 9001 certification and two of them earned ISO 14001 environmental certification, Our quality system allows us to continuously improve our products and our customer service. Certification means that we have undertaken measures to minimise our environmental impact. We always take the environment into consideration when we choose sub-suppliers, materials, production methods, etc. An important factor is that we continuously work to reduce our energy consumption and reduce waste. Through increased recovery and heightened awareness we have been able to reduce our waste by 90%.

Dal, Eidsvoll, Norway

In Eidsvoll, Norway we manufacture air handling units for the Norwegian market. The Norwegian warehouse for fans is also located here.

Bouctouche, Canada

Our largest Canadian facility is located in Bouctouche, New Brunswick, where we produce energy and heat recovery ventilators. The Bouctouche facility is also home to our Canadian center of development.

Aylmer, Canada

Aylmer is home to our school classroom ventilation equipment, where we develop, engineer, service and manufacture the Change'Air product family.

Lenexa, USA

Our ISO certified manufacturing and distribution center for residential and commercial ventilation products for the North and South American markets is located in Lenexa, Kansas.

Production in Skinnskatteberg is virtually fully automated with modern machinery featuring advanced computer support. Also located here is the company's most advanced test installation for measuring technical data.

Detailed product information can be found on our website **www.systemair.net**

Skinnskatteberg, Sweden

Main plant

Here is home to our worldwide headquarters, our largest production facility, as well as our principal distribution center. This heavily automated production plant features ultra-modern machinery and advanced computer technology.

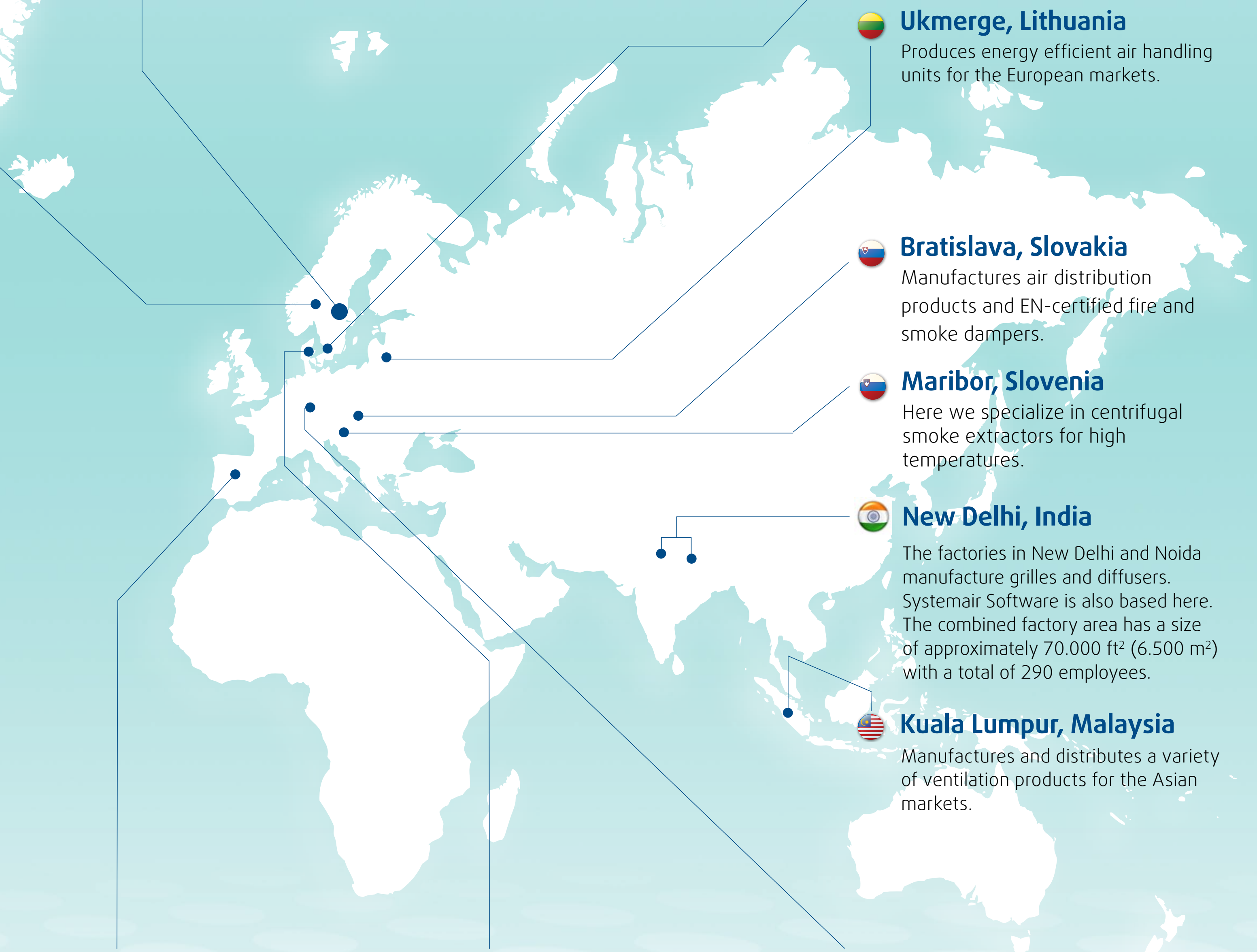
Klockargården

Systemair's air handling units for European market are made at Klockargården in Skinnskatteberg. Frico’s central warehouse of approximately 86.000 ft² (8.000 m²) is also located here.

Hässleholm, Sweden

VEAB

VEAB is the leading European manufacturer of duct heaters - producing heating and cooling coils for both electric- and water-based applications.



Ukmerge, Lithuania

Produces energy efficient air handling units for the European markets.

Bratislava, Slovakia

Manufactures air distribution products and EN-certified fire and smoke dampers.

Maribor, Slovenia

Here we specialize in centrifugal smoke extractors for high temperatures.

New Delhi, India

The factories in New Delhi and Noida manufacture grilles and diffusers. Systemair Software is also based here. The combined factory area has a size of approximately 70.000 ft² (6.500 m²) with a total of 290 employees.

Kuala Lumpur, Malaysia

Manufactures and distributes a variety of ventilation products for the Asian markets.

Madrid, Spain

Producing air handling units for South European markets and Northern Africa.

Hasselager, Denmark

The factory in Hasselager, Denmark manufactures large air handling units. All production here is order based.

Windischbuch, Germany

This facility produces fans, modular air handling units and engineered products for such uses as tunnel, jet fans for underground parking lots.

Product Overview

Systemair has a wide range of ventilation products for use in various applications from small office premises to larger industrial applications. Common to all items in the range is that components have been developed to satisfy stringent demands for low energy consumption. The products have all undergone extensive testing, both in the laboratory and out in the field, in order to comply with current and future demands for low energy consumption.

All products are also manufactured to comply with environmental requirements.

Topvex FR - False ceiling energy recovery units up to 1600 cfm

Compact and easy to maintain air handling unit with sensible and latent recovery and control system. Mounted in a false ceiling or in the attic.

Technical data. 14-21

Topvex TR - Vertical energy recovery units up to 2000 cfm

A broad range of vertical air handling units with sensible and latent recovery. Useable everywhere from minor premises to schools, stores and larger offices.

Technical data. 22-33

ERV RT-EC - Energy recovery units up to 4600 cfm

These units are exclusively engineered to meet today's latest energy requirements by using the most efficient impeller design and a state of the art rotating heat exchanger.

Technical data. 34-41

MUB - Commercial inline fans up to 6000 cfm

Systemair's square inline fans have been developed for use in compact exhaust and supply air systems. This range is available in a wide performance spectrum.

Technical data. 42-49

K EC - Inline fans up to 800 cfm

Systemair offers K-range fans for systems with higher pressure losses.

Technical data. 50-55

DVC - Roof exhaust fans up to 7600 cfm

Systemair roof fans with square connection are available for vertical discharge.

Technical data. 56-65

Air distribution products

Systemair's range also includes a wide selection of air distribution products suitable for a variety of applications and requirements.

Technical data. 66-85

A good indoor climate is important

We often take natural resources such as fresh air for granted. We must however remain frugal with this essential resource and mindful of maintaining a responsible balance between the design of good ventilation systems and considering energy consumption and well thought out material usage and production methods.

Our strategy for many years has been to develop energy-efficient products with integral energy recovery and EC technology-based fans in order to be able to offer a product portfolio fully satisfying current and future requirements. Systemair's low energy consumption EC-products carry the **Green Ventilation** registered trademark.

Green Ventilation®

Energy recovery

In areas of the country that experience moderate to severe weather conditions, Systemair ventilation systems employ effective energy recovery that returns energy from the exhaust air to the supply air. A good rotating energy exchanger can recover up to 90% of the total energy present.

Energy-efficient fans

Today, a new generation of fan motors contributes to a dramatic reduction in energy consumption, as much as 50% in some cases. The new EC motors are better suited for speed control functions, which is where considerable energy savings can be made. A bonus of this is also quieter operation.

Pressure

The design of the duct system and the unit has an impact on the required system pressure. There is often a lot of energy to be saved here.

Free cooling

Free cooling is used to save energy by using the cold outdoor air to cool down the building during the night.

Quality-certified products

How can you choose the right solution and product when there are so many alternatives?
Nowadays, most major suppliers are ISO9001-certified and have AHRI-marked products, but is that enough?

Systemair's most modern development centre in Canada

At Systemair we have gone one step further and work hard to ensure that our products maintain a high standard and are approved by various bodies. For units, this may mean Eurovent certification or other local certification for the country in question. To achieve this, you need resources and expertise.

Our North American Research centre is now equipped with our largest environmental chamber with the capability of reaching temperatures ranging from -40°F to +104°F (-40°C to +40°C). It offers designers the opportunity to test out new concepts and validate designs in house. We all know that equipment alone doesn't make products and it takes good people and teamwork to make everything run smoothly.

As with all business, it is crucial find better ways to meet client demand and change is inevitable. But with change comes opportunity and this why these times are so exciting for Systemair.

As well as the test centre in Bouctouche, there are also test facilities in Sweden, Germany, Denmark, Slovakia and the United States.

Planning tools

We have developed this product overview to make it easier for you to get an idea of which product best suits your specific needs.

More detailed analysis or planning usually requires additional information, which is where the following tools come in.

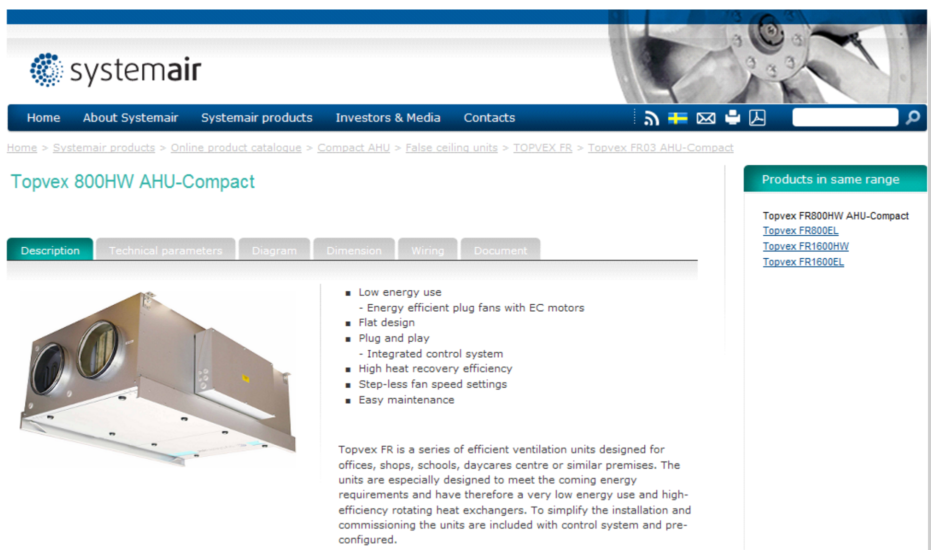
PRODUCT CATALOGUE AND SPECIFICATION DATA

More detailed technical information, sufficient to carry out complete planning, is available in separate catalogues and specification data.

These describe all incorporated functions, available accessories, and additional technical data.

ONLINE CATALOGUE

For those who prefer to work online, it is possible to select most products using Systemair's online catalogue.



PERSONAL SUPPORT

Systemair aims to have local expertise close to the customer. We do our utmost to ensure that we have our own representatives in the markets where we operate.

You can find up-to-date information and contact details on our website **www.systemair.net**

PRODUCT KEY

TOPVEX FR1600EL-208-3-CAV

- Family Name
- Duct connection size
- Airflow at 0.4 in.wg (ESP)
- Post-heater type (Electical/Hot Water)
- Supply voltage
- Phase
- Type of fan control

MUB 16-120-1

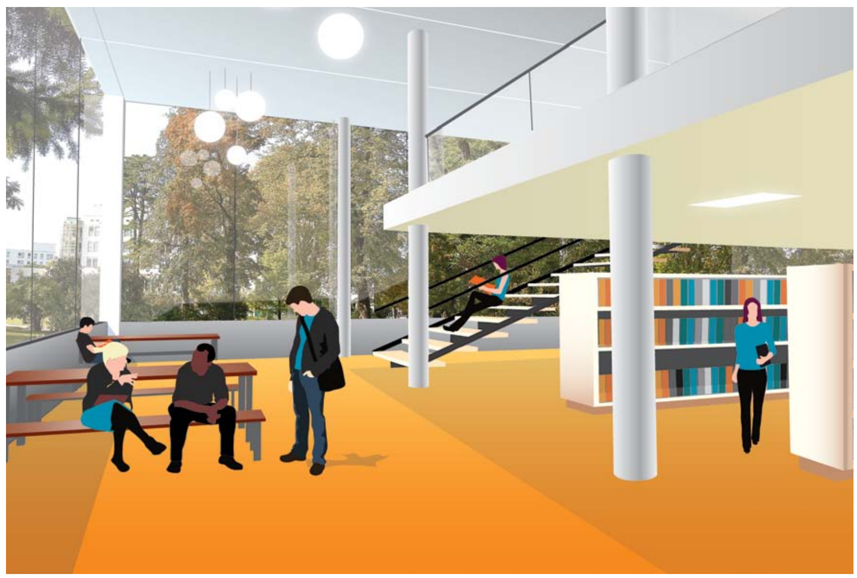
*208-3-CAV - This part of the model name does not appear in the print catalogue, however it is available online

OFFICES

Office buildings generally require good ventilation during the day as well as heat recovery and conditioning of supply air depending on external conditions. Ventilation systems with demand control should be considered for offices where staffing levels vary. As a rule, offices develop an excess of heat produced by people, lighting, solar radiation, computer equipment, etc. If the office is in a city environment, a higher filtration class should be used. In an office environment, there is also considerable need to reduce the noise generated by the ventilation system.

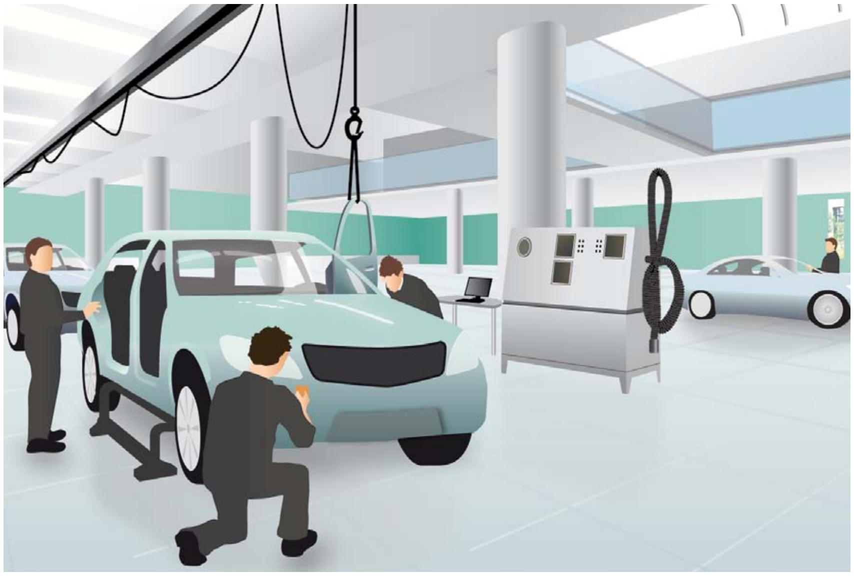
SCHOOLS/DAY NURSERIES

A school environment means a lot of people present at certain times of the day, and generally there are relatively large variations. This means that it should be possible to use demand control for the ventilation system. Normally, heat recovery is warranted.



SHOPS

As a rule, the number of people in a shop changes constantly throughout the day, making a control-on-demand ventilation system the sensible option. Recirculating air in combination with carbon dioxide control (CO_2) and heat recovery can be one optimised solution for these types of premises. When there are few people present, CO_2 levels will be low and an increased amount of return air can be mixed into the system. As the number of people present increases, the amount of return air is reduced and replaced with fresh outdoor air.



INDUSTRY

Industrial premises will often have high airflows if the work carried out there generates high levels of air pollution. If the pollutants are also aggressive, there may be requirements that affect the choice of material used. Systemair offers products for different environmental classes that can cope with tough environments. Filtration of processed air can be adapted to suit specific demands.

HOTELS

The requirements for ventilation in hotels are characterised by demands relating to fire protection, demand control and low noise levels. The choice of air handling unit will be affected by these demands. What is important here is good functions for speed control and quiet operation.

In addition to quiet air handling units with demand control, Systemair can also supply fans and dampers for fire protection.

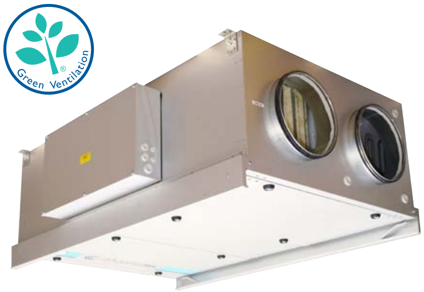
HEALTHCARE PREMISES

Healthcare premises can encompass numerous activities, everything from operating rooms to overnight wards. The activity determines the requirements. Operating rooms will have stringent demands for cleanliness and ventilation. Wards require low noise levels. If several areas are served by the same system, the unit must have demand control and possibly even sub-systems.

Systemair's range of air handling units can satisfy most requirements relating to healthcare premises, whether these have to do with air cleanliness, noise levels or demand control.


Lauge
base
base
Säure
acid
acide
LAUGEN
SÄUREN
Systemair


NEOLAB



Topvex FR

- Airflows 300 - 1600 cfm
- Low overall height
- Integrated control system
  - pre-programmed controller
  - BMS compatible
- Constant airflow- (CAV) or duct pressure- (VAV) controlling
- Galvalume sheet metal

Topvex FR is a range of energy recovery ventilators with a low overall height and double rotating heat exchangers. The units are especially designed for maximum energy transfer at the lowest operating costs.

Topvex FR800-1600 is a series of efficient ventilation units designed for offices, shops, schools, daycare centres or similar premises. The units are designed for very low energy use and high efficiency. Drain pans are not required, making the unit very flexible to install.

It could not be simpler!

The units are supplied preprogrammed, tested and ready to install. Connect the duct system, any external components, the power supply, and set the timer and fan speed. Installation is now complete.

ELECTRICAL ACCESSORIES

Pre-heater
p. 92

RVAZ4..24
p. 92

TG-UH
p. 91

CO2RT
p. 91

IR24-P
p. 92

E-OR
p. 91

E-Bacnet
p. 91

Low overall height

The unique design with double rotating heat exchangers makes it possible to produce the units with a low overall height. Using the enclosed suspension device, the unit can be installed in a false ceiling. To further simplify the use when mounted in a false ceiling, the hinges can be split, and the panels opened as doors.

EC fan motors

Unlike motors with frequency converters, EC motors ensure excellent efficiency even at low speeds. This contributes to low operating costs. EC motors are also very quiet when running at high and low speeds.

Pre-heater

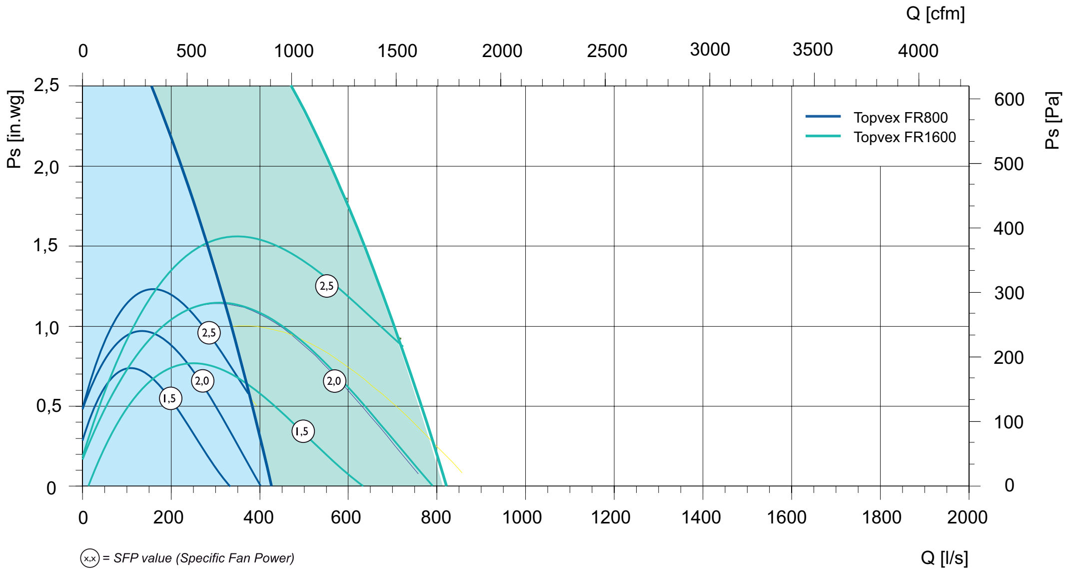
The pre-heater enables the system to perform in extremely cold climates to preserve performance and ensure a continuous supply of air. It does this by warming the outdoor air before it enters the energy recovery wheel.

The preheater is designed to keep the temperature above the frost threshold while remaining within the temperature range of the system.

SPECIFICATION DATA

		FR800EL	FR800HW	FR1600EL	FR1600HW
Voltage/Frequency	60Hz	208V	208V	208V	208V
Phase	~	3	3	3	3
Current (with Pre-heater)	A	13 (20)	7 (14)	20 (36)	7 (23)
Power rating, motors	W	2x477	2x477	2x941	2x941
Power rating, Post-heater	W	4500	-	9000	-
Power rating, Pre-heater	W	4500		9000	
MCA (w/Pre-heater)	A	16 (25)	8 (17)	24 (44)	9 (28)
MOP (w/Pre-heater)	A	20 (25)	15 (20)	25 (45)	15 (30)
Operational temperature	°F (°C)	-13...104 (-25...40)		-13...104 (-25...40)	
Weight	lbs (kg)	395 (179)	395 (179)	565 (256)	565 (256)
Filter, supply/extract air	MERV	13/9	13/9	13/9	13/9

WORKING RANGE



VENTILATION ACCESSORIES


EFD + AF24
p. 89


ZTR/ZTV
p. 93


LD
p. 88


FC
p. 90


BFT
p. 91

ACCESSORIES

FUNCTION	DESCRIPTION	MODEL NAME
Shut-off damper	1 for exhaust air and 1 for outdoor air	EFD
Water heater control	Valve and valve actuator	ZTV/ZTR and RVAZ4 24A
Room control	Room sensor without set point dial	TG-R5/PT1000

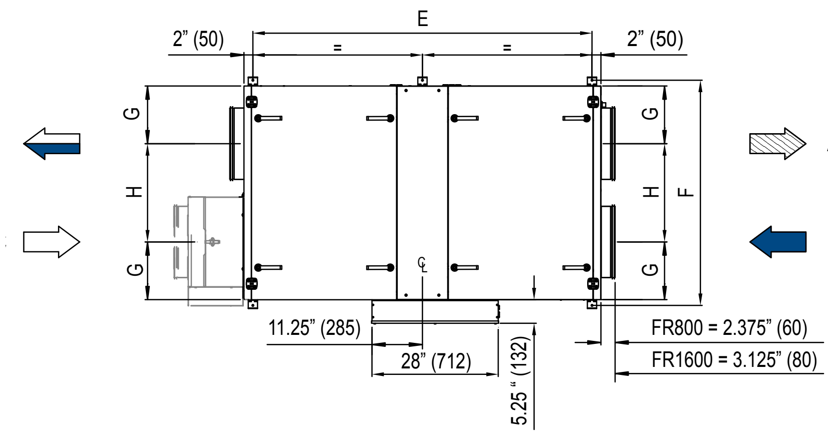
ACCESSORIES	Topvex FR800	Topvex FR1600
Shut-off damper	EFD 12	EFD 16
Valve actuator	RVAZ4 24A	RVAZ4 24A
Valve, 2-way	ZTV 15-1.0	ZTV 15-1.0
Valve, 3-way	ZTR 15-1.0	ZTR 15-1.6
Room temperature sensor, witout set point dial	TG-R5/PT1000	TG-R5/PT1000
Baffle silencer	LD 12	LD 16
Filter MERV 9 (exhaust air)	BFT FR800	BFT FR1600
Filter MERV 13 (supply air)	BFT FR800	BFT FR1600

DIMENSIONS

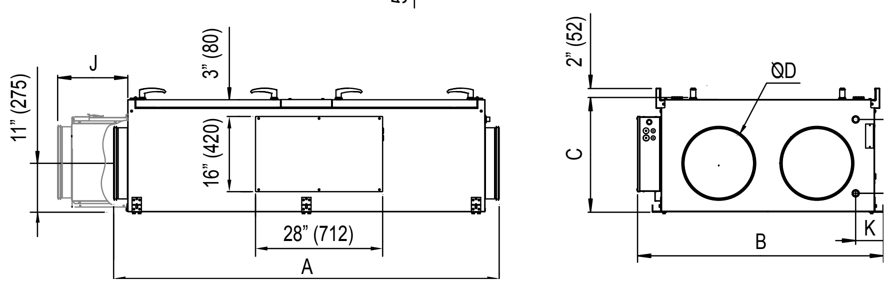
	A	B	C	øD	E	F	G	H
FR800	68 (1722)	46 (1178)	21 (545)	12 (300)	59 (1502)	42 (1062)	10.75 (273)	17.72 (450)
FR1600	85 (2161)	54 (1378)	25 (645)	16 (400)	75 (1902)	50 (1261)	12.66 (322)	21.65 (550)

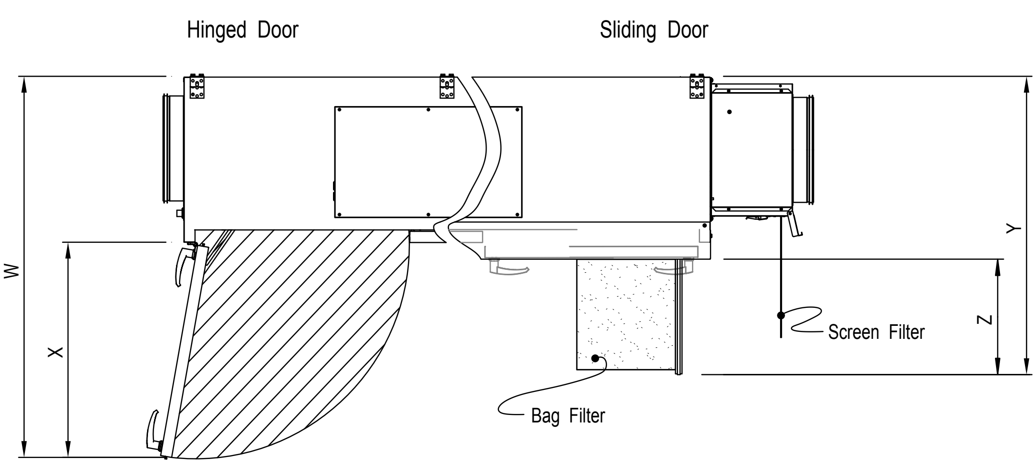
	J	K	L	M	W	X	Y	Z
FR800	14.68 (373)	4.7 (119)	2.75 (70)	13.31 (338)	45 (1148)	24 (618)	38 (978)	15 (380)
FR1600	15.25 (388)	6.1 (156)	4.21 (107)	18.86 (479)	57 (1448)	32 (818)	45 (1134)	18 (440)

Dimensions are in inches (mm)



A Supply room air
B Exhaust air
C Outdoor Air
D Extract air



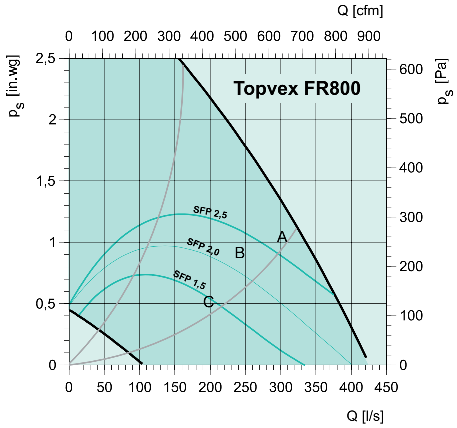


*X - required minimal space corresponds to the free area for filter service and maintenance.
Z - required minimal space corresponds to the free area for filter service and maintenance when installing sliding door option.

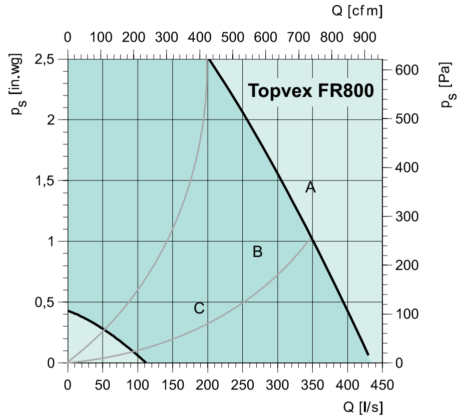
PERFORMANCE

FR 800

SUPPLY AIR



EXTRACT AIR



THERMAL EFFECTIVENESS

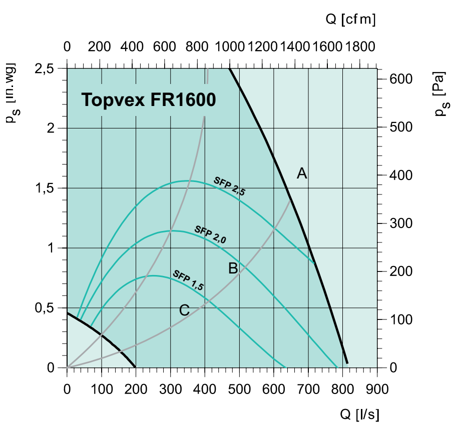
Ratings at 0” pressure differential	Sens. %	Lat. %	Tot. %
100% airflow, heating	71	66	70
75% airflow, heating	76	72	75
100% airflow, cooling	71	65	67
75% airflow, cooling	76	73	74

OCTAVE BAND (mid-frequency, Hz)

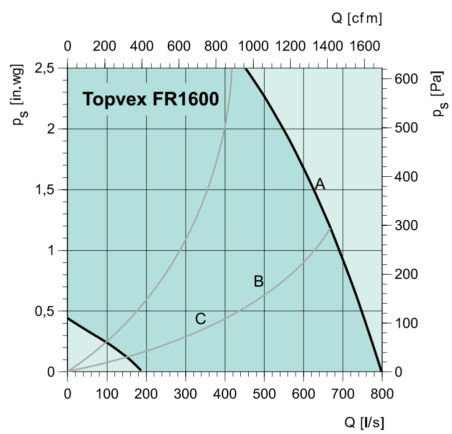
	Tot			63			125			250			500			1000			2000			4000			8000		
L_{WA} dB(A)	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Supply air	86	78	71	62	58	54	71	70	64	84	74	64	76	70	62	77	71	64	76	69	62	70	63	55	61	53	44
Exhaust air	73	68	63	62	57	53	66	64	62	71	65	57	56	51	41	55	48	41	47	41	34	39	32	24	30	22	20
Surrounding	65	59	52	44	40	36	56	53	50	64	56	48	52	46	38	46	39	33	42	35	28	40	33	25	31	23	18

FR 1600

SUPPLY AIR



EXTRACT AIR



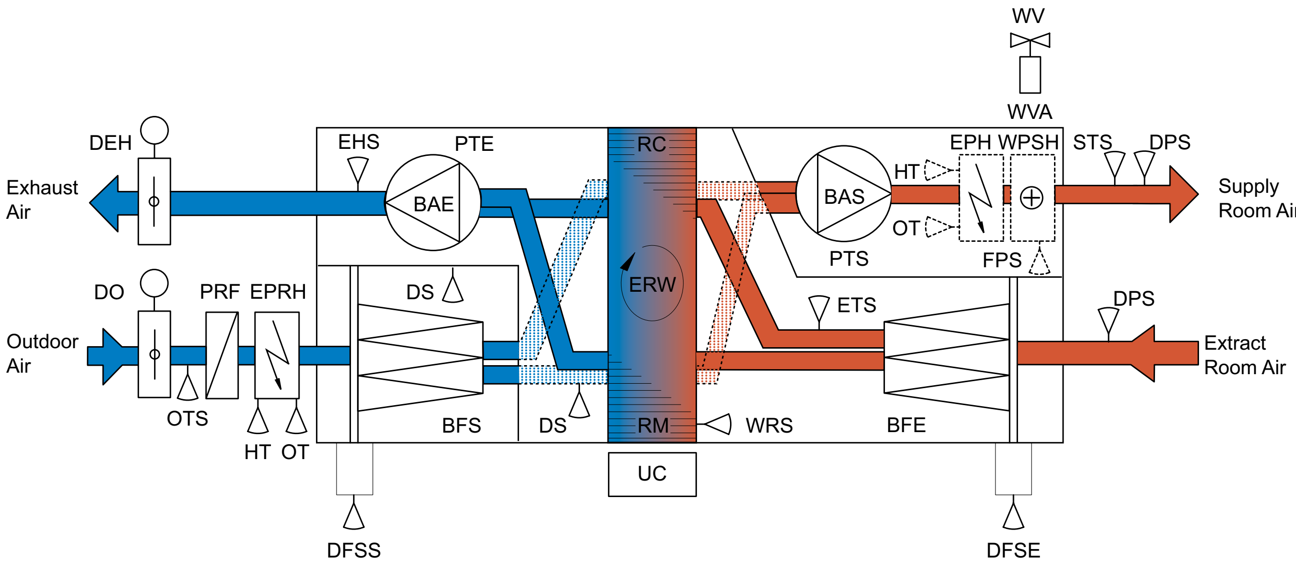
THERMAL EFFECTIVENESS

Ratings at 0” pressure differential	Sens. %	Lat. %	Tot. %
100% airflow, heating	67	61	65
75% airflow, heating	72	67	70
100% airflow, cooling	67	57	61
75% airflow, cooling	72	66	68

OCTAVE BAND (mid-frequency, Hz)

	Tot			63			125			250			500			1000			2000			4000			8000		
L_{WA} dB(A)	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Supply air	87	84	73	64	57	50	67	64	69	83	83	64	78	70	61	81	73	68	80	73	65	75	67	57	68	58	49
Exhaust air	71	68	60	60	54	47	64	58	58	68	68	55	61	52	43	57	50	42	53	46	39	43	36	29	35	26	22
Surrounding	64	63	54	44	37	31	50	48	52	62	63	47	57	48	40	54	47	40	52	45	38	46	38	30	39	29	23

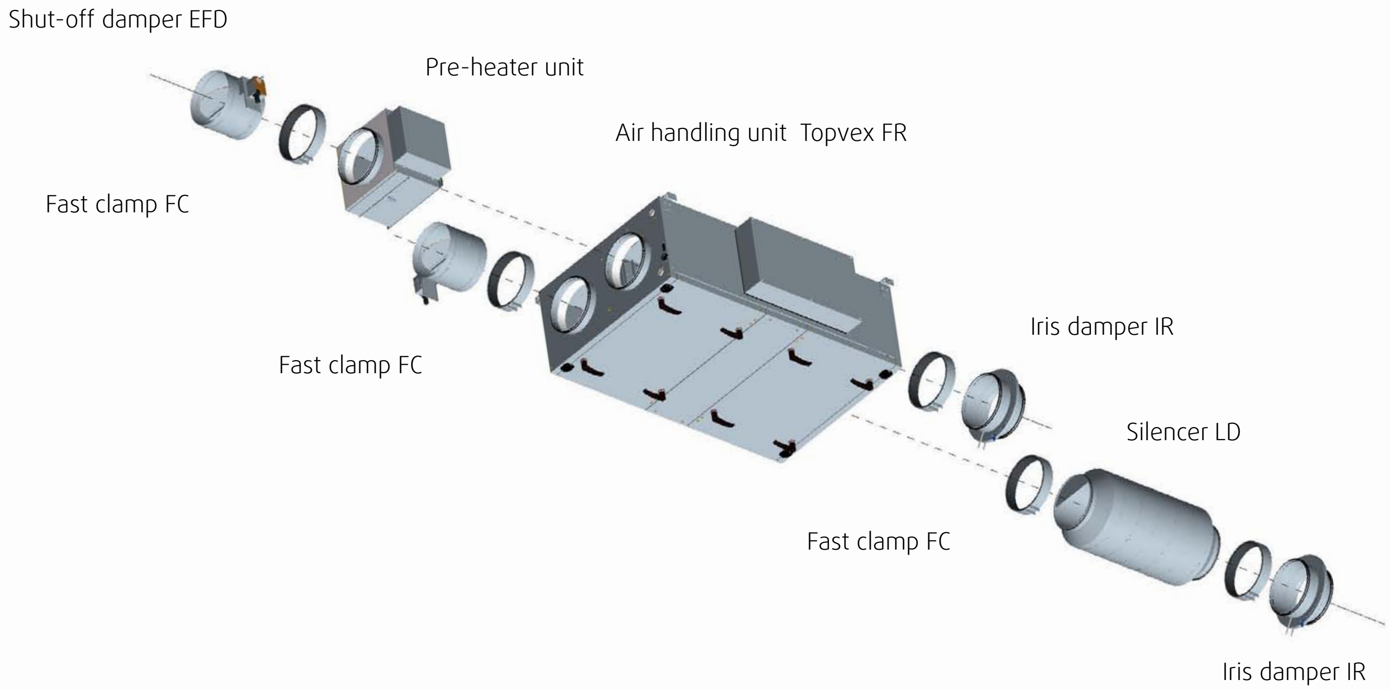
OPERATION DIAGRAM



BAE	Blower Assembly Exhaust	EPH	Electric Post-Heater	RC	Rotation Control
BAS	Blower Assembly Supply	EPRH*	Electric PRe-Heater	PRF*	PRe-Filter
BFE	Bag Filter Extract	ERW	Energy Recovery Wheel	PTE[1]	Pressure Transmitter Exhaust
BFS	Bag Filter Supply	EHS	Exhaust Temperature Sensor	PTS[1]	Pressure Transmitter Supply
DEH*	Damper Exhaust Air, motorized	ETS	Extract Temperature Sensor	STS	Supply Temperature Sensor
DO*	Damper Outdoor Air, motorized	FPS	Frost Protection Sensor	UC	Unit Control
DFSE	Dirty Filter Sensor Extract	HT	Heater Thermostat	WPSH	Water PoSt-Heater
DFSS	Dirty Filter Sensor Supply	OT	Overheating Thermostat	WRS	Wheel Rotation Sensor
DPS[2]	Duct Pressure Sensor	OTS	Outdoor Temperature Sensor	WV*	Water Valve
DS	Defrost Sensor	RM	Rotating Motor	WVA*	Water Valve Actuator

* an additional accessory
[1] an option for CAV Version
[2] an option for VAV Version

INSTALLATION EXAMPLE WITH ACCESSORIES



Air handling unit
Topvex FR800 or Topvex FR1600

APPLICATIONS

The Topvex FR solution is a system application for public buildings such as schools, daycares and libraries consisting of several rooms where good indoor air quality enhances learning and concentration quite considerably. Since the indoor climate varies based on the number of people present, the load caused by occupants varies substantially as the day progresses. This normally requires complicated solutions to maintain the correct airflow and temperature for every time period in each individual room.

The application is based on having the Topvex FR unit supply the rooms with preheated air at a constant supply air temperature of 61-66°F (16-19°C). The pressure in the supply duct is kept constant and the airflow to the extract fan is slave controlled so that the supply air and extract air will be kept in balance. The extract air from each room leaves via extract diffusers, doors or other openings and is then evacuated at a central location. At room level the Corrigo control system controls temperatures and airflow in response to signals from wall temperature sensors or CO_2-sensors, or presence detectors. This intelligent solution holds in check a demand controlled and substantially energy-saving ventilation system.


EFD Shut-off damper
Topvex FR Air handling unit
FC Fast clamps
IR-F Iris damper
TG-UH Temperature sensor

Topvex TR800, TR1300, TR1800

- Airflows 300 - 2.000 cfm
- Integral automatic control system for heating/cooling ventilation
- Integrated control system
  - pre-programmed controller
  - BMS compatible
- Constant airflow- (CAV) or duct pressure- (VAV) controlling
- Low sound level

Topvex TR is a range of air handling units capable of providing all tempered ventilation for the building. Common applications include offices, shops, banks, daycares and similar facilities.

It could not be simpler!

The units are supplied preprogrammed, tested and ready to install. Connect the the duct system, any external components, the power supply, and set the timer and fan speed. Installation is now complete.

Easy to inspect

To make inspections and maintenance even easier both fans and rotating heat exchangers are easy to remove. All electrical cables are fitted with quick connectors so the fans can be released quickly and easily.

ELECTRICAL ACCESSORIES

RVAZ4..24
p. 92

TG-UH
p. 91

E-OR
p. 91

E-Bacnet
p. 91

Space-saving top connection

With Topvex TR the ducts are connected on the top of the unit. These units take up little space and are easy to install in existing premises.

Compared with roof-mounted units

Topvex TR is easier to install, as you don't need to hire cranes for lifting the unit into place or cut holes in the roof. With one unit placed inside the building, service and maintenance are also simplified.

EC fan motors

Unlike motors with frequency converters, EC motors ensure excellent efficiency even at low speeds. This contributes to low operating costs. EC motors are also very quiet when running at high and low speeds.

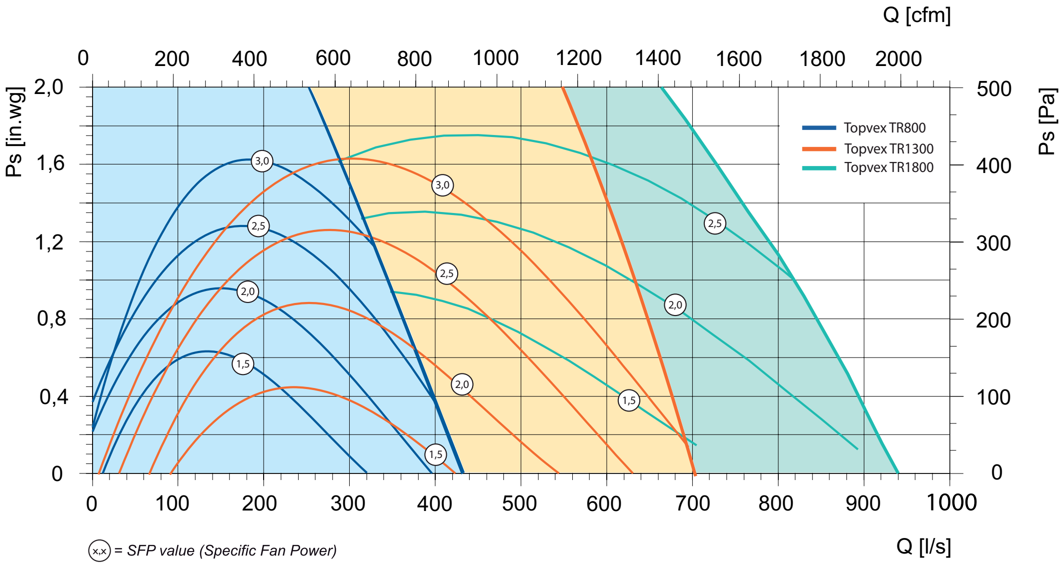
Pre-heater

The pre-heater enables the system to perform in extremely cold climates to preserve performance and ensure a continuous supply of air. It does this by warming the outdoor air before it enters the energy recovery wheel. The preheater is designed to keep the temperature above the frost threshold while remaining within the temperature range of the system.

SPECIFICATION DATA

		TR800EL	TR800HW	TR1300EL	TR1300HW	TR1800EL	TR1800HW
Voltage/Frequency	60Hz	208V	208V	208V	208V	208V	208V
Phase	~	3	3	3	3	3	3
Current (with Pre-heater)	A	16 (26.8)	5.2 (16)	25.3 (41.9)	6.1 (22.7)	33.5 (55.9)	6.2 (28.6)
Power rating, motors	W	2x505	2x505	2x769	2x769	2x1005	2x1005
Power rating, Post-heater	W	4500	-	6900	-	9000	-
Power rating, Pre-heater	W	4500	4500	6900	6900	9000	9000
MCA (w/Pre-heater)	A	18.1 (28.9)	5.2 (18.1)	29.5 (46.1)	6.2 (26.3)	39.7 (62.1)	6.3 (33.6)
MOP (w/Pre-heater)	A	30 (40)	15 (30)	50 (70)	15 (45)	70 (90)	15 (60)
Operational temperature	°F (°C)	-13/104 (-25/40)		-13/104 (-25/40)		-13/104 (-25/40)	
Weight	lb (kg)	485 (220)	485 (220)	618 (280)	618 (220)	772 (350)	772 (350)
Filter, supply/extract air	MERV	13/9	13/9	13/9	13/9	13/9	13/9

WORKING RANGE



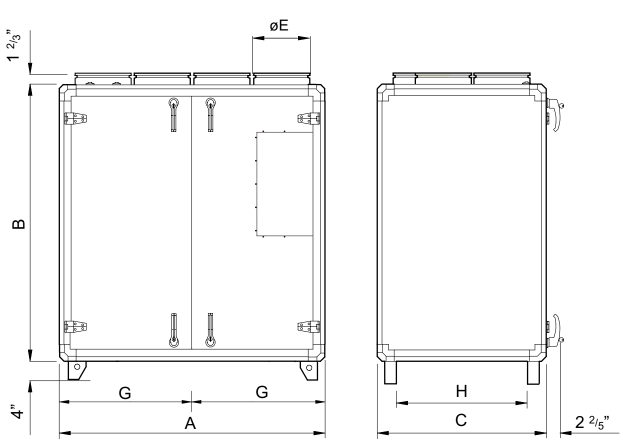
DIMENSIONS

	A	B	C	E	G	H
Topvex TR800	48 (1180)	49 (1230)	30 (750)	10 (254)	23 (590)	24 (618)
TopvexTR1300	59 (1480)	52 (1280)	34 (850)	12 (305)	29 (740)	28 (718)

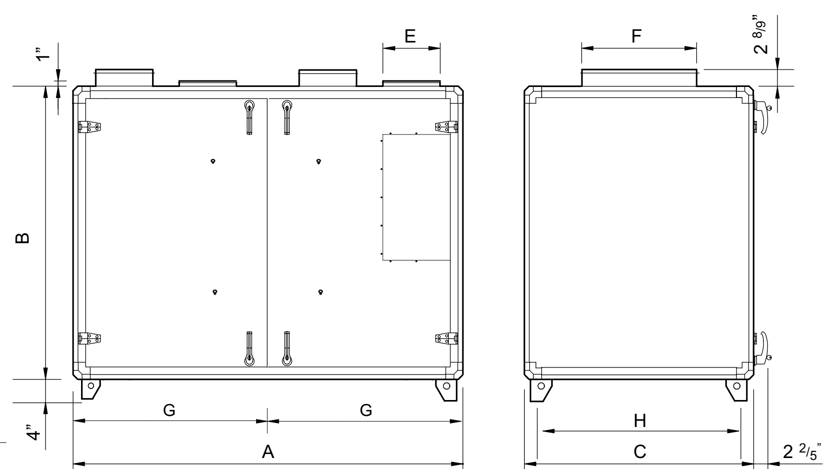
	A	B	C	E	F	G	H
Topvex TR1800	68 (1700)	52 (1279)	40 (1000)	10 (254)	20 (508)	33 (850)	27 (868)

Dimensions are in inches (mm)

TR800, TR1300



TR 1800



*G - required minimum space corresponds to the free area for filter service and maintenance

VENTILATION ACCESSORIES

EFD + AF24
p. 89

ZTR/ZTV
p. 93

LD
p. 88

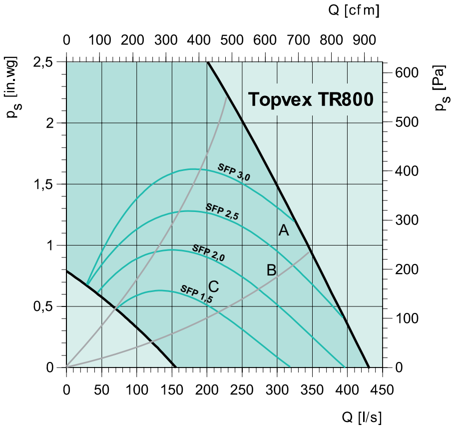
FC
p. 90

BFT
p. 91

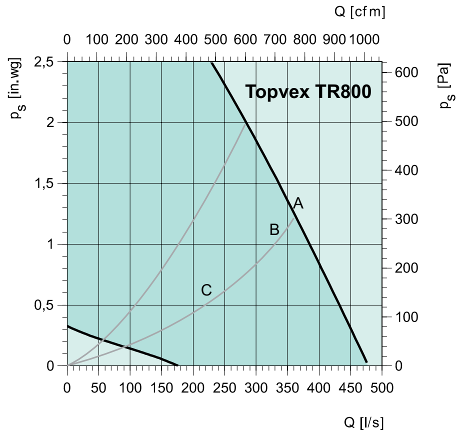
PERFORMANCE

TR 800

SUPPLY AIR



EXTRACT AIR



THERMAL EFFECTIVENESS

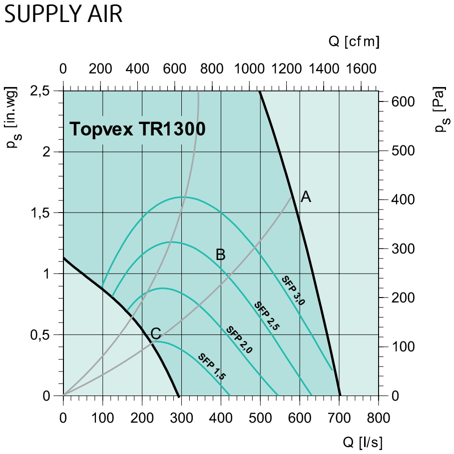
Ratings at 0" pressure differential	Sens. %	Lat. %	Tot. %
100% airflow, heating	72	67	70
75% airflow, heating	76	72	75
100% airflow, cooling	72	65	68
75% airflow, cooling	76	73	74

OCTAVE BAND (mid-frequency, Hz)

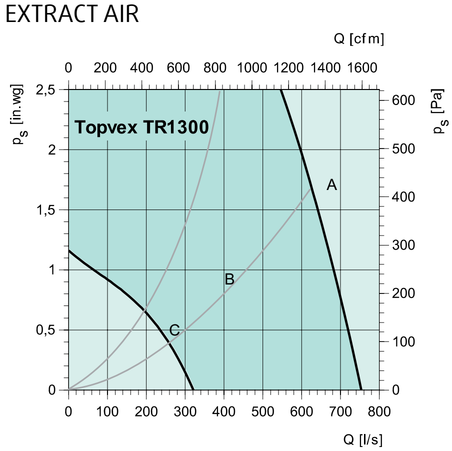
	Tot			63			125			250			500			1000			2000			4000			8000		
L_{wA} dB(A)	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Supply air	81	84	73	56	61	55	68	72	67	77	82	66	71	71	63	75	75	68	72	71	63	66	65	56	54	53	43
Exhaust air	71	72	65	51	50	45	64	65	64	70	70	57	61	58	52	55	53	48	50	48	42	43	41	34	33	32	22
Surrounding	61	66	55	39	44	37	54	58	53	60	65	48	49	47	41	47	47	40	47	46	39	43	42	33	34	33	23

TR 1300

SUPPLY AIR



EXTRACT AIR



THERMAL EFFECTIVENESS

Ratings at 0" pressure differential	Sens. %	Lat. %	Tot. %
100% airflow, heating	72	67	70
75% airflow, heating	76	72	75
100% airflow, cooling	72	65	68
75% airflow, cooling	76	73	74

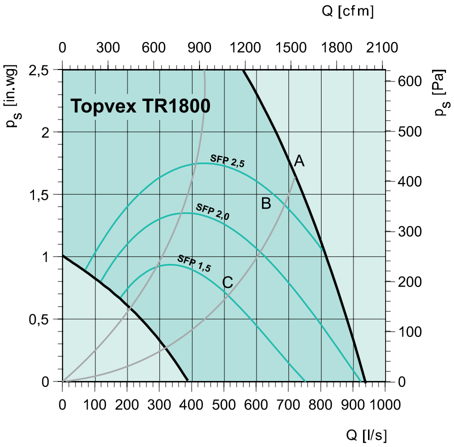
OCTAVE BAND (mid-frequency, Hz)

	Tot			63			125			250			500			1000			2000			4000			8000		
L_{wA} dB(A)	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Supply air	89	80	70	65	56	51	73	68	66	85	75	65	82	73	61	81	72	60	80	72	59	77	68	54	70	62	47
Exhaust air	77	77	66	63	53	47	67	66	65	74	76	55	71	65	50	65	56	44	62	54	43	61	50	42	49	39	44
Surrounding	67	64	54	49	40	36	60	55	53	63	63	44	58	50	36	54	45	34	56	48	37	57	47	38	48	38	41

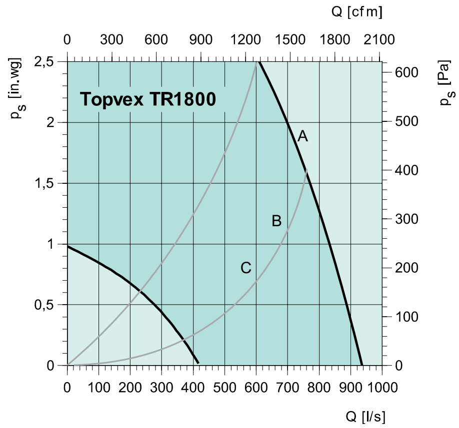
PERFORMANCE

TR 1800

SUPPLY AIR



EXTRACT AIR



THERMAL EFFECTIVENESS

Ratings at 0" pressure differential	Sens. %	Lat. %	Tot. %
100% airflow, heating	72	67	70
75% airflow, heating	76	72	75
100% airflow, cooling	72	65	68
75% airflow, cooling	77	73	75

OCTAVE BAND (mid-frequency, Hz)

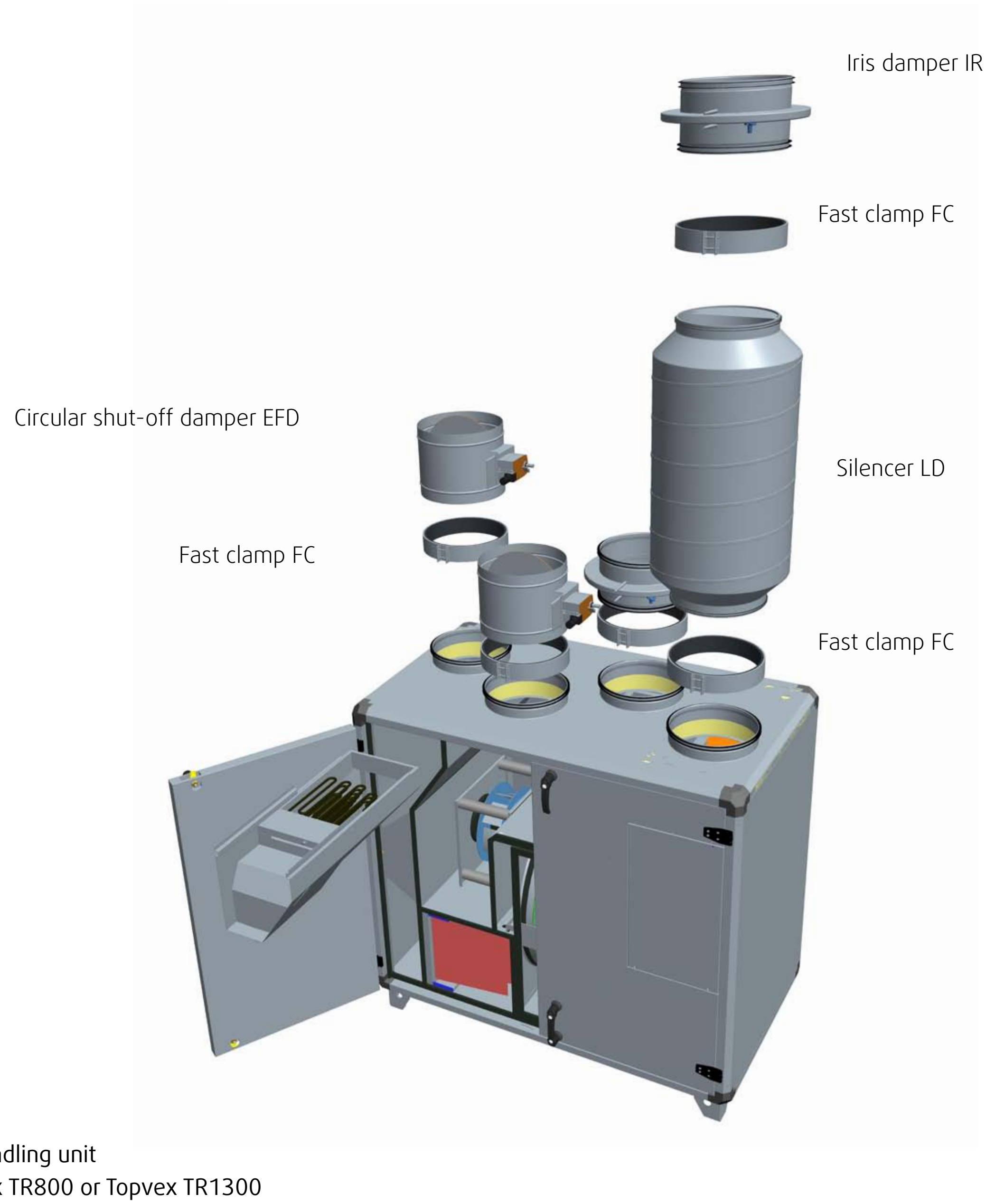
	Tot			63			125			250			500			1000			2000			4000			8000		
L_{WA} dB(A)	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Supply air	90	83	78	62	59	56	66	64	62	88	79	72	81	76	73	79	76	71	79	75	70	74	71	65	68	65	59
Exhaust air	71	68	66	56	53	47	63	59	56	64	63	64	65	61	57	63	60	55	60	57	51	56	53	44	48	45	35
Surrounding	67	63	59	44	42	37	53	51	48	63	60	54	59	55	53	59	56	50	57	54	48	52	49	43	45	42	35

ACCESSORIES

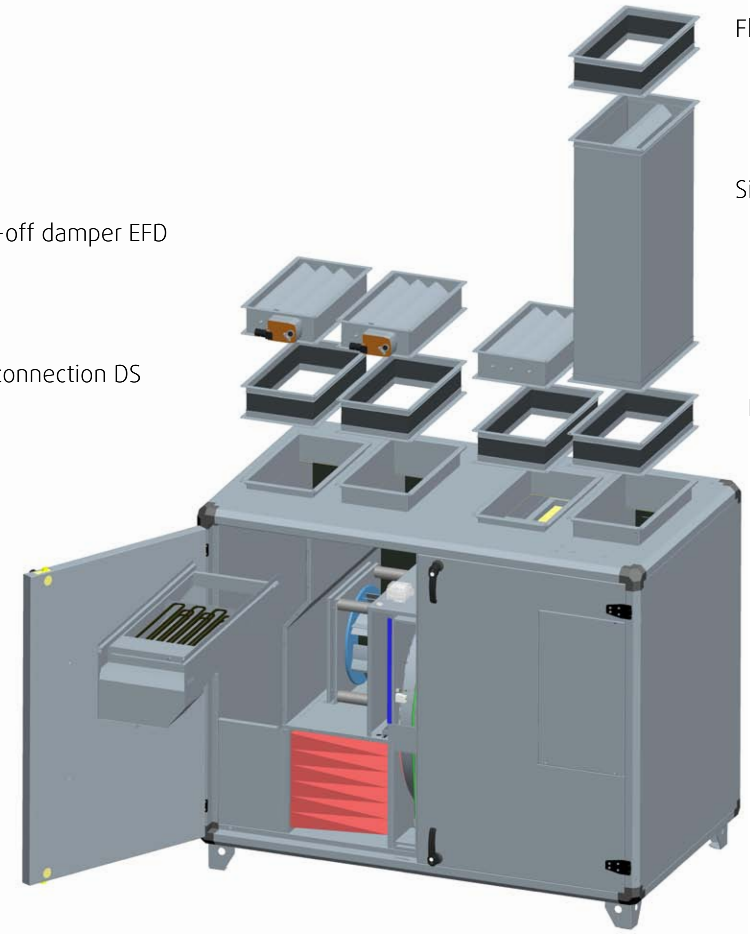
FUNCTION	DESCRIPTION	MODEL NAME
Shut-off damper	1 for exhaust air and 1 for outdoor air	EFD
Water coil control	Valve and valve actuator	ZTV/ZTR and RVAZ4 24A
Room control	Room sensor without set point dial	TG-R5/PT1000

ACCESSORIES	Topvex TR800	Topvex TR1300	Topvex TR1800
Shut-off damper	EFD 12	EFD 16	EFD 20-10
Valve actuator	RVAZ4 24A	RVAZ4 24A	RVAZ4 24A
Valve, 2-way	ZTV 15-1.0	ZTV 15-1.0	ZTV 15-1.6
Valve, 3-way	ZTR 15-1.0	ZTR 15-1.6	ZTR 20-2.0
Room temperature sensor, witout set point dial	TG-R5/PT1000	TG-R5/PT1000	TG-R5/PT1000
Baffle silencer	LD 12	LD 16	LDR 20-10
Filter MERV 9 (exhaust air)	BFT TR800	BFT TR1300	BFT TR1800
Filter MERV 13 (supply air)	BFT TR800	BFT TR1300	BFT TR1800

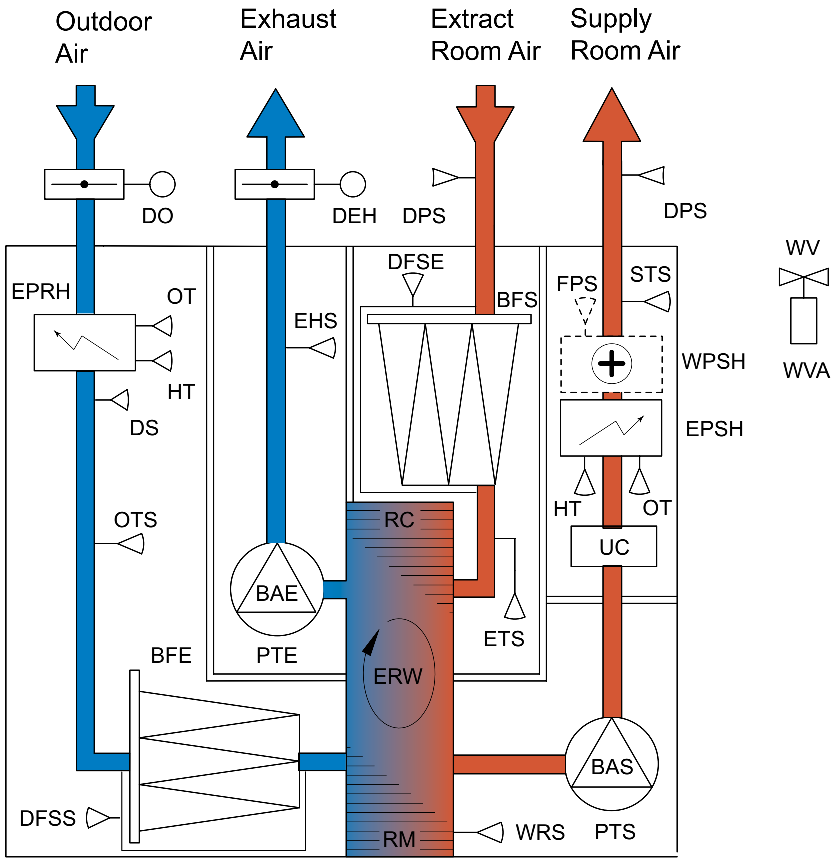
INSTALLATION EXAMPLE WITH ACCESSORIES



INSTALLATION EXAMPLE WITH ACCESSORIES



OPERATION DIAGRAM



BAE	Blower Assembly Exhaust
BAS	Blower Assembly Supply
BFE	Bag Filter Extract
BFS	Bag Filter Supply
CC*	Cooling Coil
DEH*	Damper Exhaust Air, motorized
DO*	Damper Outdoor Air, motorized
DFSE	Dirty Filter Sensor Extract
DFSS	Dirty Filter Sensor Supply
DPS[2]	Duct Pressure Sensor
DS	Defrost Sensor
EPRH	Electric PRe-Heater
EPSH	Electric PoSt-Heater
ERW	Energy Recovery Wheel
EHS	Exhaust Temperature Sensor
ETS	Extract Temperature Sensor
FPS	Frost Protection Sensor
HT	Heater Thermostat
OT	Overheating Thermostat
OTS	Outdoor Temperature Sensor
RC	Rotation Control
RM	Rotating Motor
PTE[1]	Pressure Transmitter Exhaust
PTS[1]	Pressure Transmitter Supply
STS	Supply Temperature Sensor
UC	Unit Control
WPSH	Water PoSt-Heater
WRS	Wheel Rotation Sensor
WV*	Water Valve
WVA*	Water Valve Actuator

* an additional accessory
[1] an option for CAV Version
[2] an option for VAV Version

With the integrated control system it is possible to control airflow, duct pressure, temperatures, heating/cooling recovery and operating times. The functions and functionality in Topvex air handling units give you all that is needed to create an indoor environment with the highest comfort and to the lowest operating costs.

Save the environment by using Topvex units from Systemair!

CONTROL EQUIPMENT

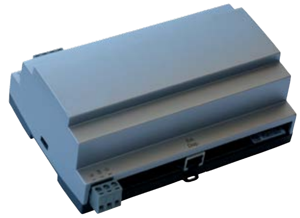
Each Topvex unit comes standard with a remote mounted control and 33 ft (10 m) of cable. Control panel SCP can be placed up to 3280 ft (1000 m) away using special repeaters E-0R. Desired static pressure, airflow or temperature of supply air can be set and held. 24 hour programmable function, wheel sensor and other alarms are standard.

Pre-configurated , menu-based control system available with Exoline, Modbus, LON, TCP/IP or BACnet* communications. A digital CO_2/humidity sensor or movement detector can be used to control airflow according to demand using step-less fan speed settings. Sum alarm output allows central supervision of many units, which ensures early detection of incorrect operation (i.e. dirty filters).

* Communications using BACnet requires the use of a separate protocol gateway

CONTROL EQUIPMENT		E28S
		Settings
Control panel SCP	Separate with 32 ft (10 m) cable	Standard
Repeater E0-R	For installations with > 32 ft (10m) between the unit and the panel	Optional
Software	E-Tool	Optional
Temperature control	Exhaust air	Standard
	Supply air	Programmable
	Outdoor air temperature compensation supply air	Programmable
	Room air control	Programmable
	Outdoor air temperature-dependent exchange between supply air/exhaust air or supply air/room air control	Programmable
Control of airflow	7-day timer with two separate operational periods	Standard
	Air volume control, CAV	Standard
	Constant duct pressure, VAV	Choose on order
	Airflow compensated for outdoor air temperature	Standard
	Rotating	Standard
Pre-heater	Electical	Optional
Heater	Hot water	Choose on order
	Electrical	Choose on order
Free cooling		Programmable
Cool recycling		Programmable
	Variable, CO_2 sensor with 0...10V DC signal	Programmable
Pump control	Heating, 24V AC output signal	Programmable
	Cooling, 24V AC output signal	Programmable
Heat exchanger efficiency	Requires duct-mounted extract air temperature sensor	Programmable
Extended operation		Standard
7-day program	Alternates between operating modes normal, reduced or off.	Standard
Damper control	Fresh air/Extract air	Standard
Alarm	Alarm notification	Standard
	High and low priority	Standard
	Buzzer alarm (24VAC output signal)	Standard
	Filter alarm triggered by pressure differential	Standard
Communication	Exoline, Modbus via RS 485	Standard
	LON, Exoline via TCP/IP	Optional

CONTROL UNIT FUNCTIONS E28S

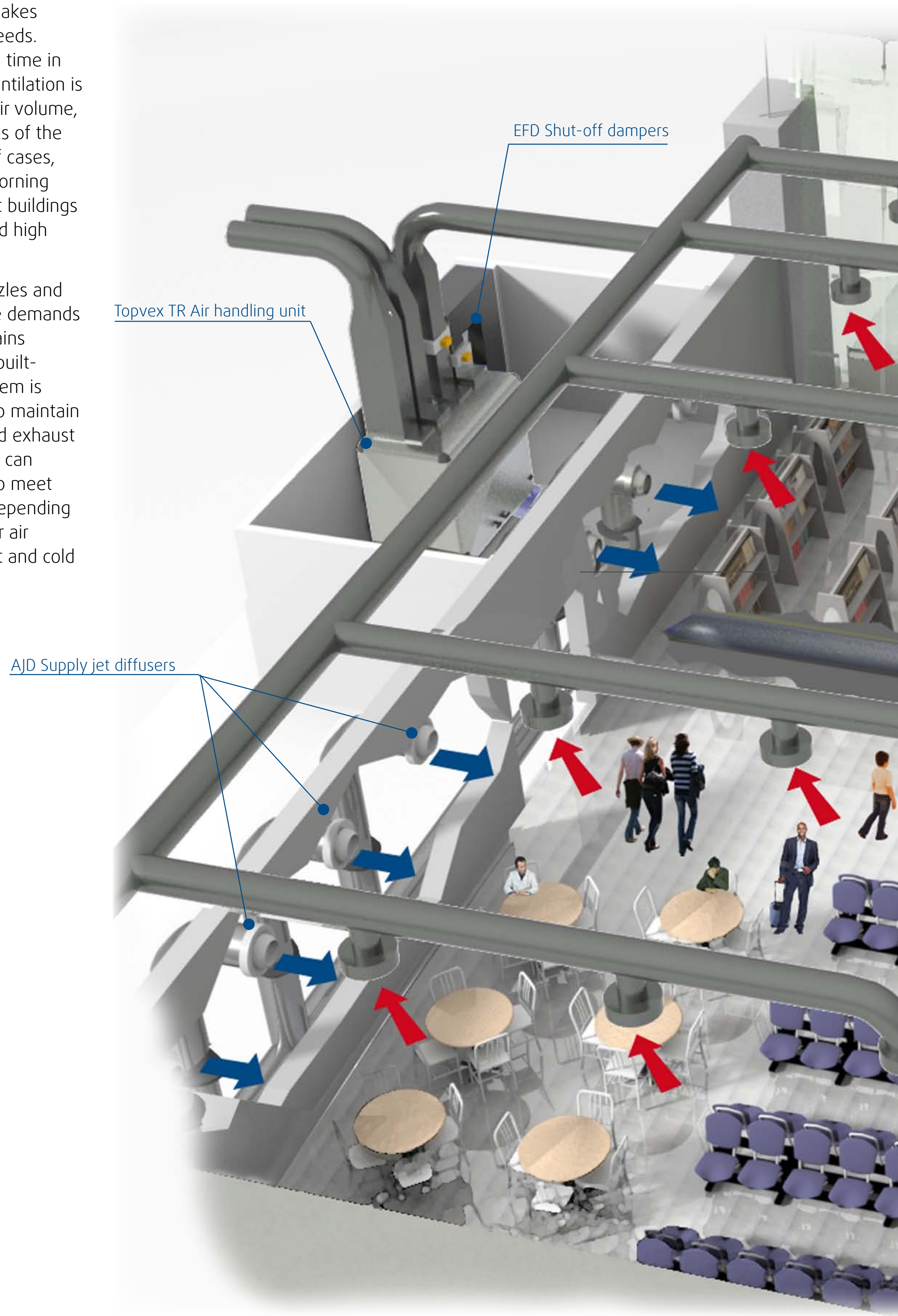


Menu language	English, French, Spanish and another languages
Temperature control	Supply air Supply air with compensation for outdoor air temperature Extract air (cascade) Room air control (cascade) Outdoor air temperature-dependent exchange between room air control and supply air control Outdoor air temperature-dependent exchange between extract air control and supply air control
Fan speed control	Constant air volume control, CAV Constant duct pressure control, VAV Airflow/duct pressure compensated for outdoor air temperature
Heat exchanger control	Rotating heat exchanger (variable)
Heat control	Water coil (0...10V control signal) Electric pre-heating and post-heating (0...10V control signal)
Cold water cooling	Control of cold water cooling (0...10V control signal)
DX-cooling	DX cooling control (up to 3-stage binary control)
Cooling energy recovery	Automatically recovers the cooled indoor air to cool the warmer outdoor air
Free cooling	Free cooling is used to save energy by using the cold outdoor air to cool down the building during the night
Demand-controlled ventilation	For applications with varying loads, the fan speed and mixing damper can be controlled by the air quality, measured using a CO_2sensor. It is also possible to use a digital input for extended/boosted operation via an external signal from an external timer, presence detector or similar sensors with a voltage-free contact
Extended operation	The units have a digital input for extended/boosted operation. This function is activated by an external signal from a button or timer. The function can also be activated via the control panel. Extended operation can be set to run for 0 to 240 minutes
Yearly program	A yearly clock function means you can store a 7-day program with holiday periods. Each day has up to two individual operational periods for normal and reduced speed. Duct for digital timer, e.g. door locks, lighting, etc.
Damper control	24V output signal controlling one or two shut-off dampers
Alarm	Alarm notification in clear text Alarm prioritisation. Alarms can be assigned different priorities: A, B and C alarms or inactive Buzzer alarm output signal (24V) Fire alarm input (voltage-free contact). Different fan modes in the event of a fire
Communication	A repeater (E0R, accessory) is required when the cable between the unit and control panel is longer than 32 ft (10 m). Repeater E-0R can control up to 6 air handling units Standard – Exoline, ModBus via RS 485, TCP/IP, built-in Web Option – LON
E-Tool software	PC-based software

APPLICATION

The indoor climate in airports makes it necessary to satisfy special needs. Since waiting passengers spend time in departure lounges, adequate ventilation is required in such places. As for air volume, the needs vary at different times of the day. However, in the majority of cases, peak ventilation is needed at morning and evening times. Most airport buildings have considerable floor area and high ceilings.

The Topvex TR unit, AJD Jet Nozzles and CRSP Swirl diffusers meet these demands effectively. The Topvex TR contains an energy recovery wheel and built-in control system. The duct system is equipped with IR Iris dampers to maintain the balance between supply and exhaust air volumes. The control system can be programmed various ways to meet energy-savings requirements depending on occupant traffic. Diffusers for air distribution are designed for hot and cold air.




CRSP Swirl Exhaust Diffusers
Gate 2
Now
Boarding
Air Distribution Columns

ERV RT-EC

- Airflows up to 4.600 cfm
- Adsorption type TOTAL energy recovery wheel
- Double wall cabinet
- Pull-pull configuration
- EC motors with integrated protection
- Economizer function

These units are exclusively engineered to meet today's latest energy requirements by using the most efficient impeller design and a state of the art rotating heat exchanger. All units are equipped with a simple pre-configured control system compatible with most building automation systems. Roof curbs are also available to offer a proper fit and seal to simplify the installation.

Double wall contruction with 20 gauge galvanized steel. Insulated with 1" (25 mm) fiberglass for condensation control.

The rotor matrix is made of a corrosion resistant aluminum alloy that is composed of alternating corrugated and flat, continuously wound layers of uniform widths that guarantees laminar air flow, and low static pressure loss. The rotor wheel is reinforced with spokes, welded at the hub and perimeter to prevent any uneven run out during normal operations. All corrugated surfaces are coated with a thin non-migrating adsorbent layer.

Fans

EC-motors with backward inclined impellers offer superior energy performance.

Pre-heater

The pre-heater enables the system to perform in extremely cold climates to preserve performance and ensure a continuous supply of air. It does this by warming the outdoor air before it enters the energy recovery wheel. The preheater is designed to keep the temperature above the frost threshold while remaining within the temperature range of the system.

ELECTRICAL ACCESSORIES

Timer TORK
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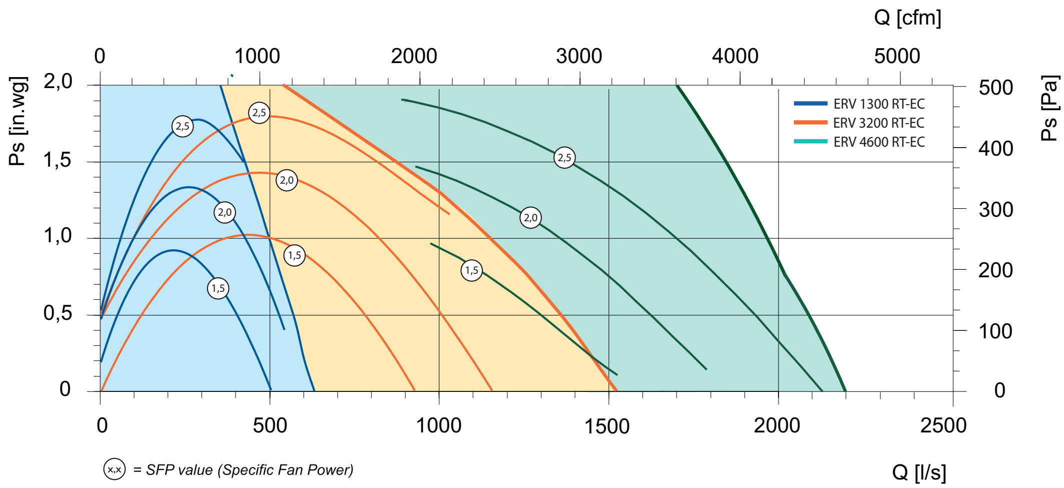
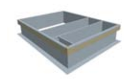
SPECIFICATION DATA

		ERV 1300 RT-EC	ERV 3200 RT-EC	ERV 4600 RT-EC
Voltage/Frequency	60Hz	240V	208-230/460V	208-230/460V
Phase	~	1	3	3
Current	A	6.1	7.1/4.1	17.1/8.8
Power rating, motors	W	2x485	2x1000	2x2700
Power rating, Pre-heater	kW	2, 4, 6 or 8	5, 10, 15, 20 or 25	5, 10, 15, 20 or 25
MCA (without pre-heater)	A	6.5	7.2/4.2	18.9/9.5
MOP (without pre-heater)	A	15	15/15	25/15
Operational temperature	°F (°C)	-4...104 (-25...40)	-4...122 (-20...50)	-4...122 (-20...50)
Weight	lbs (kg)	443 (201)	986 (447)	1028 (466)
Filter, supply/extract air	MERV	11/7	11/7	11/7

WORKING RANGE



VENTILATION ACCESSORIES



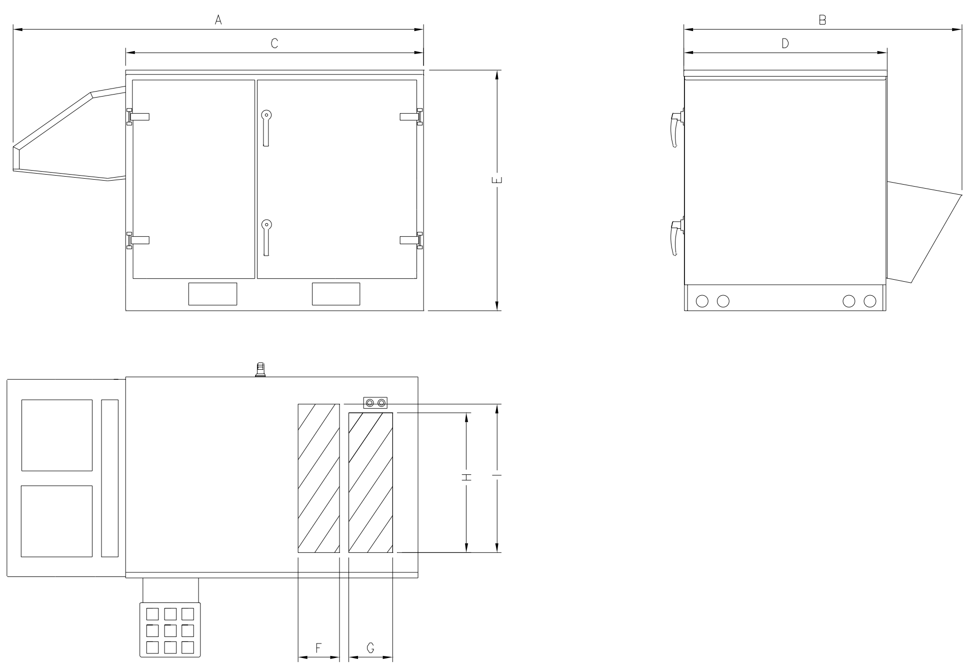
Roof curb
p. 92

Pleated filter
p. 92

DIMENSIONS

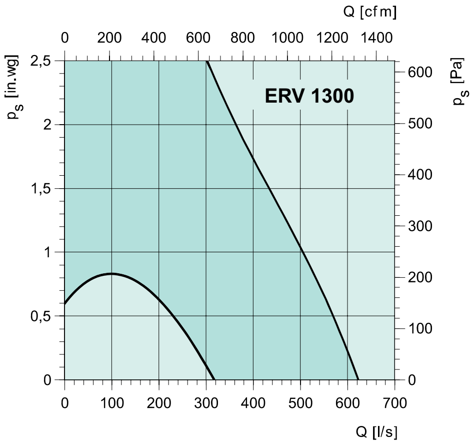
	A	B	C	D	E	F	G	H	I	J
ERV 1300	70 (1763)	47 (1189)	50 (1271)	34 (859)	41 (1028)	7 (178)	$7^{1}/_{4}$ (184)	$23^{1}/_{2}$ (597)	$24^{3}/_{4}$ (630)	$24^{1}/_{4}$ (692)
ERV 3200	95 (2417)	67 (1695)	68 (1727)	54 (1336)	60 (1526)	10 (254)	10 (254)	$39^{1}/_{2}$ (1003)	45 (1134)	38 (967)
ERV 4600	95 (2417)	67 (1695)	68 (1727)	54 (1336)	60 (1526)	10 (254)	10 (254)	$39^{1}/_{2}$ (1003)	45 (1134)	38 (967)

Dimensions are in inches (mm)



PERFORMANCE

ERV 1300 RT-EC



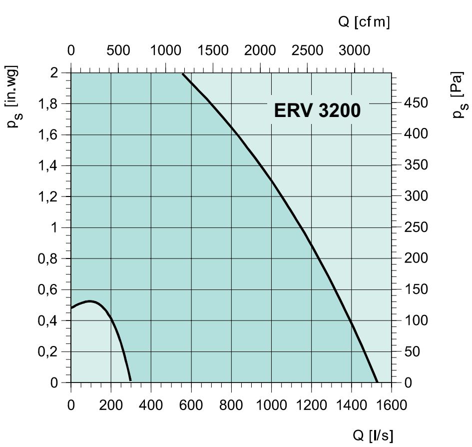
THERMAL EFFECTIVENESS

Ratings at 0" pressure differencial	Sens. %	Lat. %	Tot. %
100% airflow, heating	73	70	72
75% airflow, heating	78	76	77
100% airflow, cooling	74	69	71
75% airflow, cooling	78	76	77

OCTAVE BAND (mid-frequency, Hz)

	Tot			63			125			250			500			1000			2000			4000			8000		
L_{WA} dB(A)	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Supply air	81	84	73	56	61	55	68	72	67	77	82	66	71	71	63	75	75	68	72	71	63	66	65	56	54	53	43
Exhaust air	71	72	65	51	50	45	64	65	64	70	70	57	61	58	52	55	53	48	50	48	42	43	41	34	33	32	22
Surrounding	61	66	55	39	44	37	54	58	53	60	65	48	49	47	41	47	47	40	47	46	39	43	42	33	34	33	23

ERV 3200 RT-EC



THERMAL EFFECTIVENESS

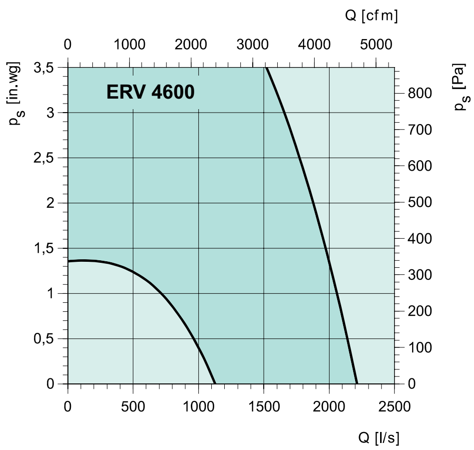
Ratings at 0" pressure differencial	Sens. %	Lat. %	Tot. %
100% airflow, heating	76	76	75
75% airflow, heating	80	78	79
100% airflow, cooling	76	73	74
75% airflow, cooling	80	80	80

OCTAVE BAND (mid-frequency, Hz)

	Tot			63			125			250			500			1000			2000			4000			8000		
L_{WA} dB(A)	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Supply air	89	80	70	65	56	51	73	68	66	85	75	65	82	73	61	81	72	60	80	72	59	77	68	54	70	62	47
Exhaust air	77	77	66	63	53	47	67	66	65	74	76	55	71	65	50	65	56	44	62	54	43	61	50	42	49	39	44
Surrounding	67	64	54	49	40	36	60	55	53	63	63	44	58	50	36	54	45	34	56	48	37	57	47	38	48	38	41

PERFORMANCE

ERV 4600 RT-EC



THERMAL EFFECTIVENESS

Ratings at 0" pressure differencial	Sens. %	Lat. %	Tot. %
100% airflow, heating	70	65	68
75% airflow, heating	75	71	74
100% airflow, cooling	70	63	66
75% airflow, cooling	75	71	73

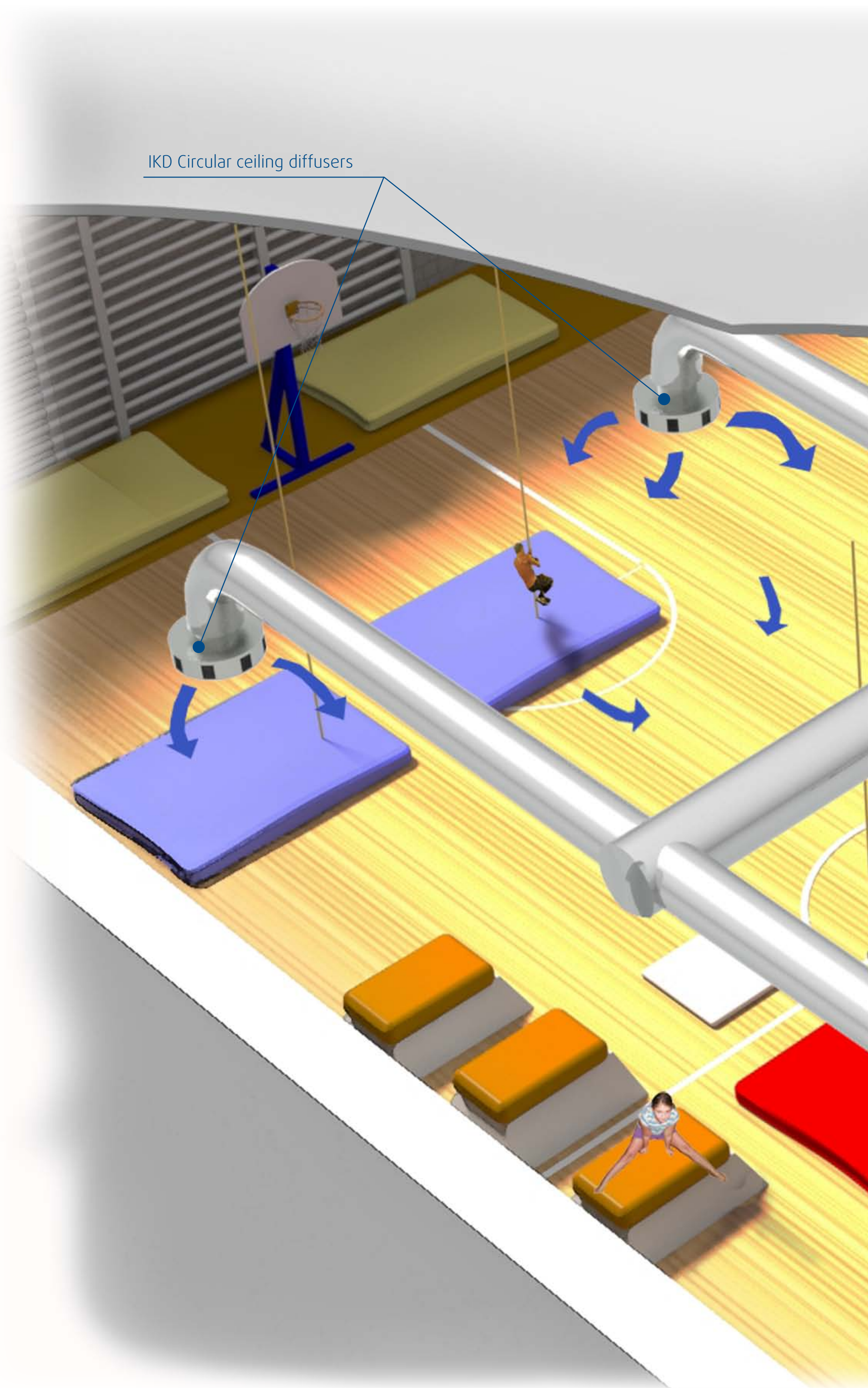
OCTAVE BAND (mid-frequency, Hz)

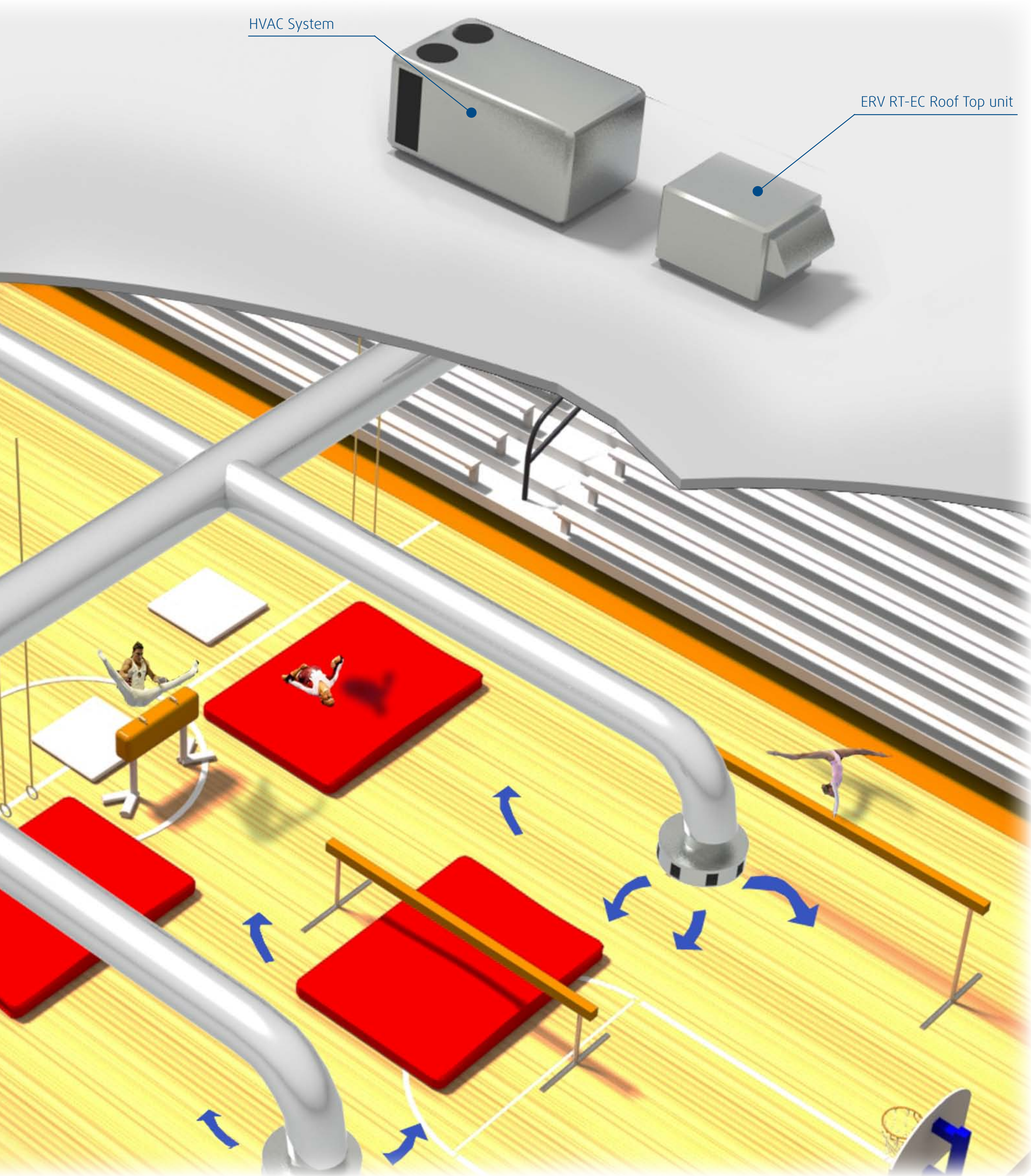
	Tot			63			125			250			500			1000			2000			4000			8000		
L_{wA} dB(A)	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Supply air	90	83	78	62	59	56	66	64	62	88	79	72	81	76	73	79	76	71	79	75	70	74	71	65	68	65	59
Exhaust air	71	68	66	56	53	47	63	59	56	64	63	64	65	61	57	63	60	55	60	57	51	56	53	44	48	45	35
Surrounding	67	63	59	44	42	37	53	51	48	63	60	54	59	55	53	59	56	50	57	54	48	52	49	43	45	42	35

APPLICATIONS

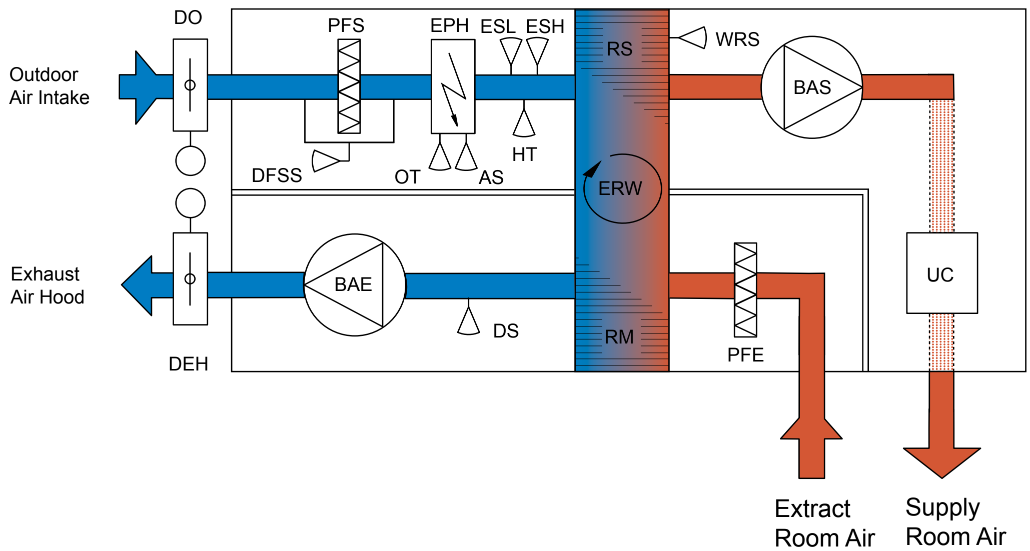
One of the most significant indicators of a sports facility's quality is the indoor climate. The air quality is directly related to the well-being of the people doing sport activities. Performance always improves if comfort and air quality are maintained properly. The other issue for facilities operated all day long is the optimization of energy consumption.

In this example, the gymnasium rooms are ventilated with ERV RT-EC Roof Top units as required, connected to a centrally located cooling system. The unit supplies the fresh air along ducts and supply IKD diffusers and extracts used air through NOVA-R wall grills. EC-motors with integrated control, together with a total energy recovery wheel, optimize unit operation and maintain the room climate for every period of the day.




HVAC System
ERV RT-EC Roof Top unit

OPERATION DIAGRAM



AS*	Airflow Sensor	DS*	Defrost Sensor	OT*	Overheating Thermostat
BAE	Blower Assembly Exhaust	EPH*	Electric Pre-Heater	RM	Rotating Motor
BAS	Blower Assembly Supply	ERW	Energy Recovery Wheel	RS	Rotation Sensor
DEH*	Damper Exhaust Air, motorized	ESH	Economizer Sensor High Limit	PFE	Pleated Filter Extract
DO*	Damper Outdoor Air, motorized	ESL	Economizer Sensor Low Limit	PFS	Pleated Filter Supply
DFSS	Dirty Filter Sensor Supply	HT*	Heater Thermostat	UC	Unit Control
				WRS	Wheel Rotating Sensor

* an additional accessory

MUB

- Airflows up to 6.400 cfm
- High capacity fan
- 100% controllable fan
- Flexible solution
- Safe operation
- Low noise emissions

ELECTRICAL ACCESSORIES

MTP 10
p. 91

The MUB commercial inline fan is designed to be an efficient, flexible and versatile supply or exhaust ventilation system.

MUB fans use EC-motors with integral electronic control via 0 - 10V contact. This contact can be controlled through the built-in potentiometr in the fan’s electrical box or through external MTP10 speed control unit.

It allows them to run in the optimal operating range to create the desired airflow thus less energy is needed to operate the fan.

Flexible solution

The flexibility offered by the removable panels allows the MUB’s airflow direction to be selected on site. Straight through or 90 degree airflow paths are possible. Any outlet side can be chosen.

Built-in protection

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

Demand-oriented

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 $^{7}/_{9}$ inches (20 mm) polyolefin insulation for excellent sound reduction and thermal properties. The insulated space between the panels prevents condensation on the screws.

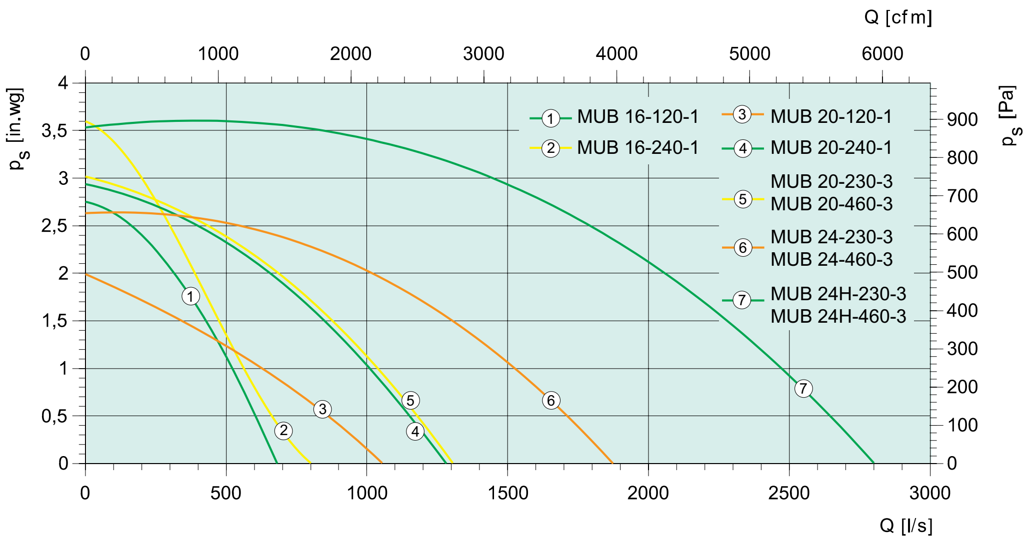
Reduced energy: more than just air

The fans’ optimized workload will reduce wear and tear, giving the ventilation system a longer lifespan and reducing maintenance costs.

SPECIFICATION DATA

		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 (90°)	cfm (l/s)	1439 (679)	1588 (750)	2231 (1053)	2735 (1291)	2773 (1309)
Rpm	min^{-1}	2190	2480	1324	1708	1762
Power rating, motors	W	350	505	380	775	770
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 (°C)	-13...140 (-25...60)	-13...104 (-25...40)	-13...104 (-25...40)	-13...104 (-25...40)	-13...104 (-25...60)
Weight	lbs (kg)	60 (27)	60 (27)	95 (43)	95 (43)	95 (43)
Insulation / Enclosure class	-	B / IP44	B / IP44	B / IP54	B / IP54	B / IP54
Wiring diagram, page 95		3	3	3	1	2

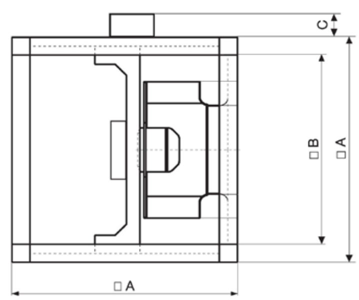
WORKING RANGE



DIMENSIONS

	A	B	C
MUB 16	$19^{5}/_{8}$ (500)	$16^{1}/_{2}$ (420)	$2^{3}/_{8}$ (60)
MUB 20	$23^{5}/_{8}$ (600)	$20^{1}/_{2}$ (520)	$2^{3}/_{8}$ (60)
MUB 24	$27^{5}/_{8}$ (700)	$24^{1}/_{2}$ (620)	$2^{3}/_{8}$ (60)

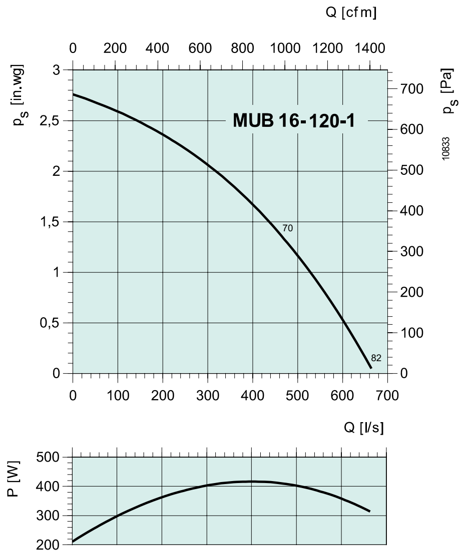
Dimensions are in inches (mm)

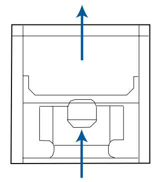


		MUB 20-460-3	MUB 24-230-3	MUB 24-460-3	MUB 24H-230-3	MUB 24H-460-3
Voltage/Frequency	50/60Hz	460	230	460	230	460
Nominal voltage range	V	380...480	200...240	380...480	200...240	380...480
Phase	~	3	3	3	3	3
Maximum airflow (90°)	cfm (l/s)	2773 (1309)	3986 (1881)	3986 (1881)	5974 (2819)	5974 (2819)
Rpm	min^{-1}	1762	1556	1556	1711	1711
Power rating, motors	W	830	750	1000	2800	2700
Current	A	1.6	2.9	1.85	8.5	4.3
MCA	A	2.0	3.7	2.4	10.7	5.4
MOP	A	15	15	15	20	15
Operational temperature	°F (°C)	-13...104 (-25...40)	-25...122 (-25...50)	-25...140 (-25...60)	-13...122 (-25...50)	-13...140 (-25...60)
Weight	lbs (kg)	95 (43)	128 (58)	128 (58)	150 (68)	150 (68)
Insulation / Enclosure class	-	B / IP44	B / IP54	B / IP54	B / IP54	B / IP54
Wiring diagram, page 94		2	2	2	2	2

PERFORMANCE

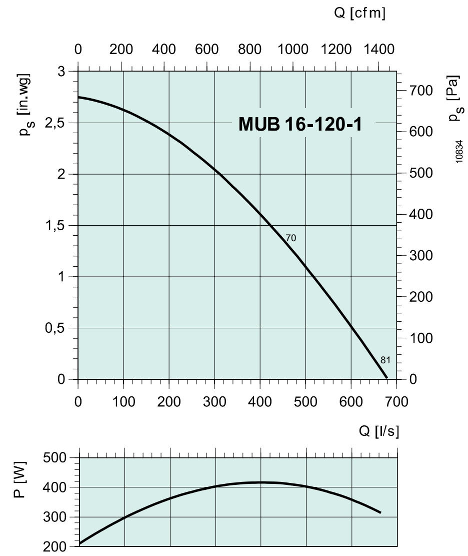
MUB 16-120-1

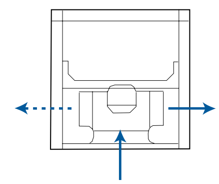




dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{WA} Inlet	82	41	60	72	77	77	72	71	67

Measurement point: 1407 cfm, 0 in.wg (664 l/s; 0 Pa)

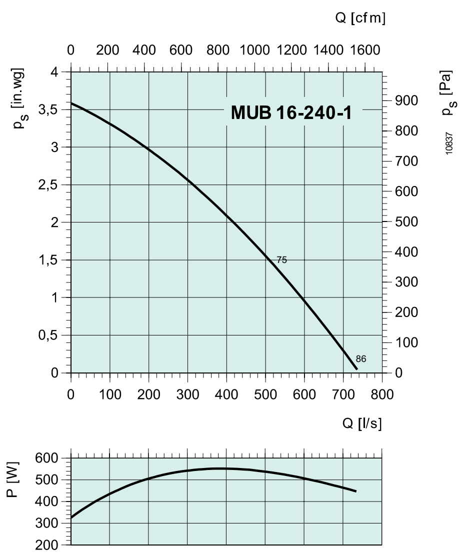


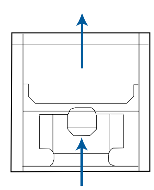


dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{WA} Inlet	81	48	61	71	76	77	72	71	66

Measurement point: 1407 cfm, 0 in.wg (664 l/s; 0 Pa)

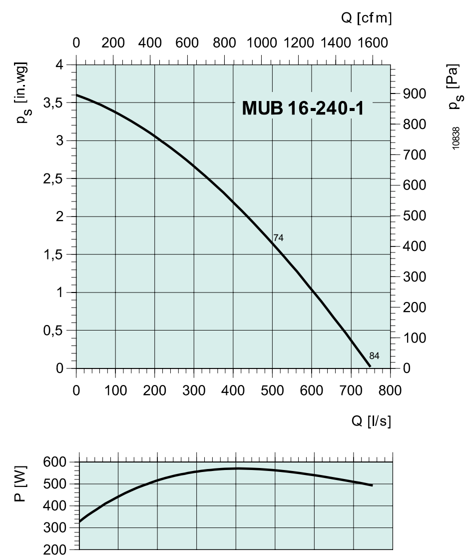
MUB 16-240-1

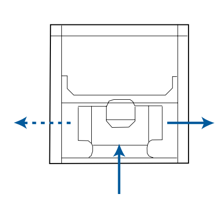




dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{WA} Inlet	86	49	62	73	79	81	76	80	67

Measurement point: 1555 cfm, 0 in.wg (734 l/s; 0 Pa)



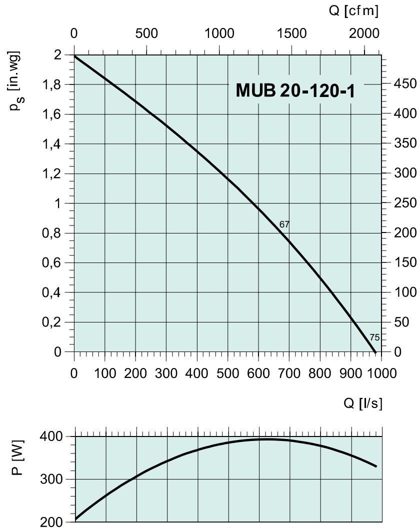


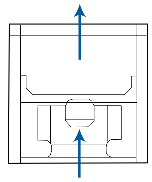
dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{WA} Inlet	85	49	63	72	78	79	77	78	69

Measurement point: 1556 cfm, 0 in.wg (734 l/s; 0 Pa)

PERFORMANCE

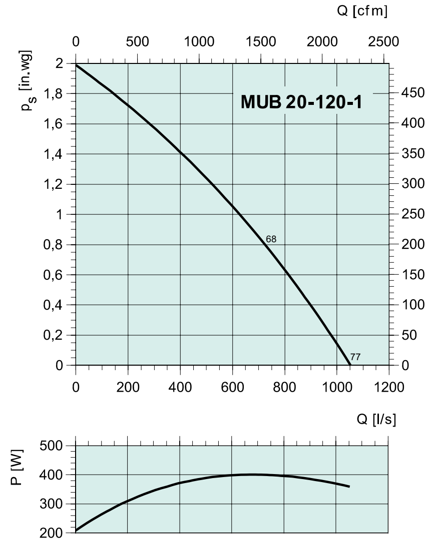
MUB 20-120-1

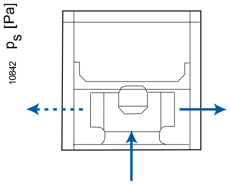




dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{wA} Inlet	75	48	61	66	69	66	65	63	71

Measurement point: 2084 cfm, 0 in.wg (984 l/s; 0 Pa)

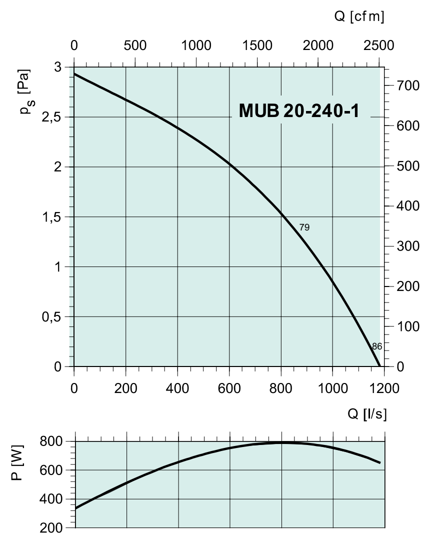


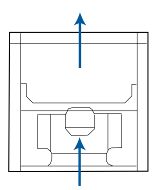


dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{wA} Inlet	77	48	63	68	70	68	68	65	72

Measurement point: 2230 cfm, 0 in.wg (1052 l/s; 0 Pa)

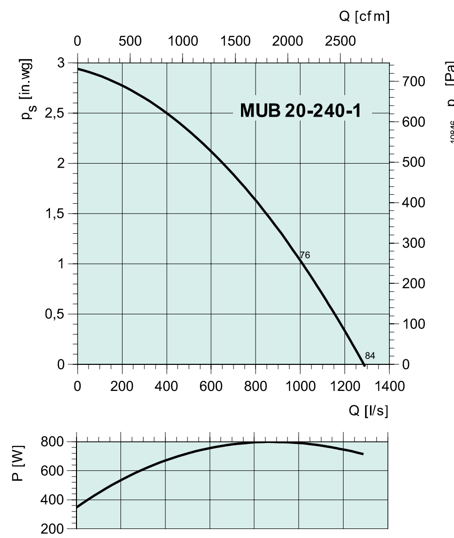
MUB 20-240-1

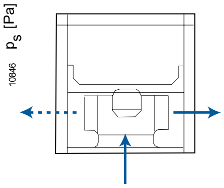




dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{wA} Inlet	86	51	68	74	77	77	73	79	81

Measurement point: 2506 cfm, 0 in.wg (1183 l/s; 0 Pa)



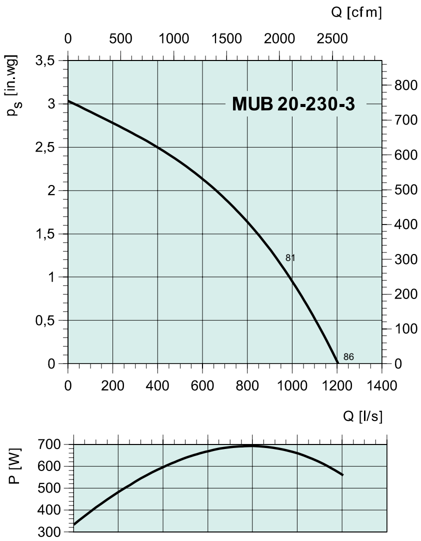


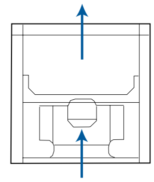
dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{wA} Inlet	84	51	67	73	76	75	76	76	79

Measurement point: 2735 cfm, 0 in.wg (1291 l/s; 0 Pa)

PERFORMANCE

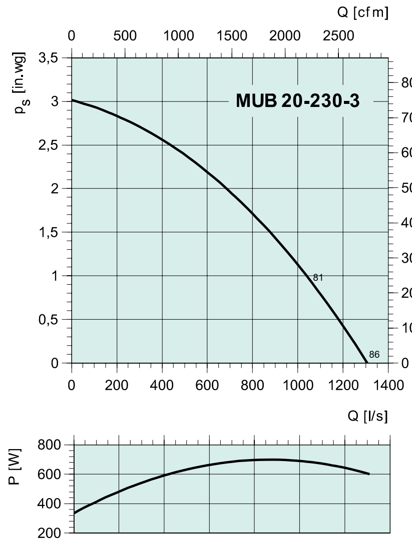
MUB 20-230-3

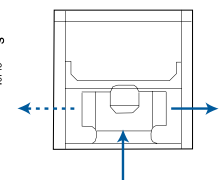




dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{WA} Inlet	86	68	76	78	79	77	76	77	79

Measurement point: 2552 cfm, 0 in.wg (1204 l/s; 0 Pa)

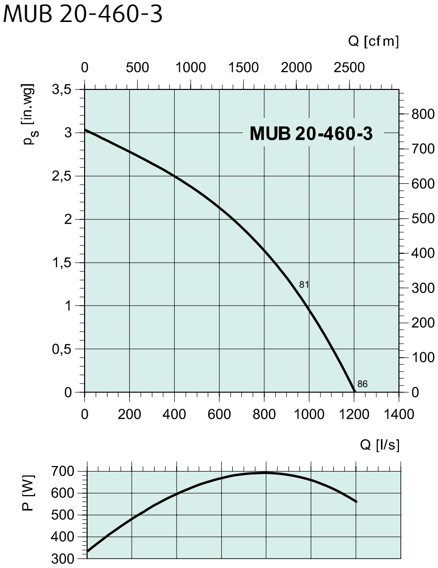


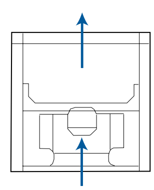


dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{WA} Inlet	86	53	68	74	78	77	78	78	81

Measurement point: 2773 cfm, 0 in.wg (1309 l/s; 0 Pa)

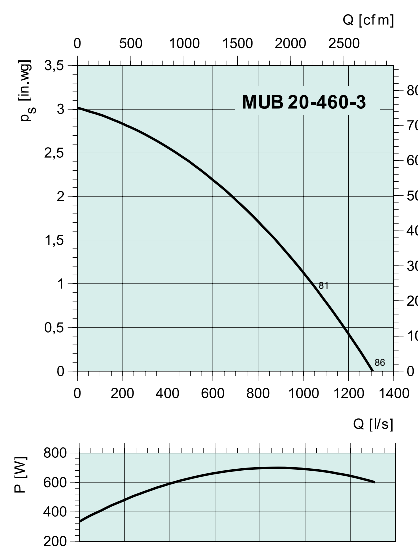
MUB 20-460-3

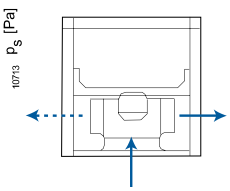




dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{WA} Inlet	86	68	76	78	79	77	76	77	79

Measurement point: 2552 cfm, 0 in.wg (1204 l/s; 0 Pa)



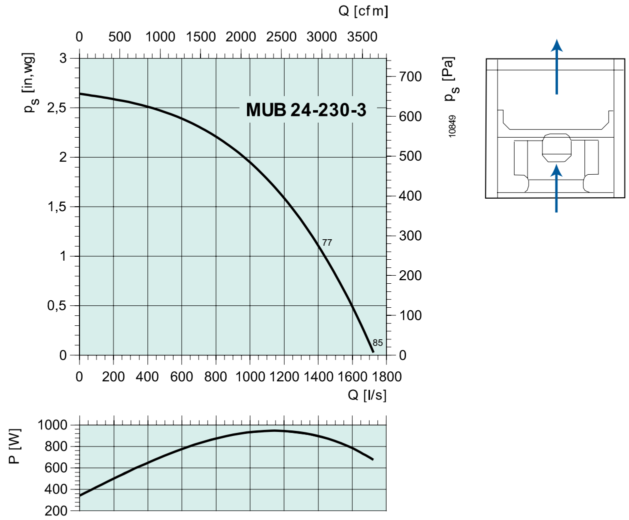


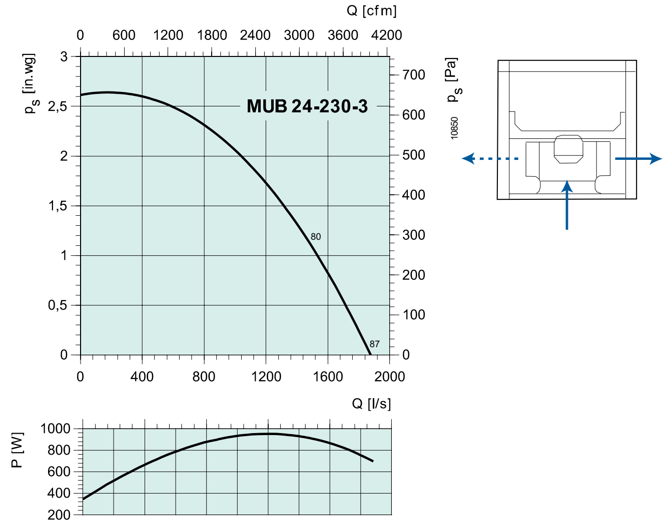
dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{WA} Inlet	86	53	68	74	78	77	78	78	81

Measurement point: 2773 cfm, 0 in.wg (1309 l/s; 0 Pa)

PERFORMANCE

MUB 24-230-3





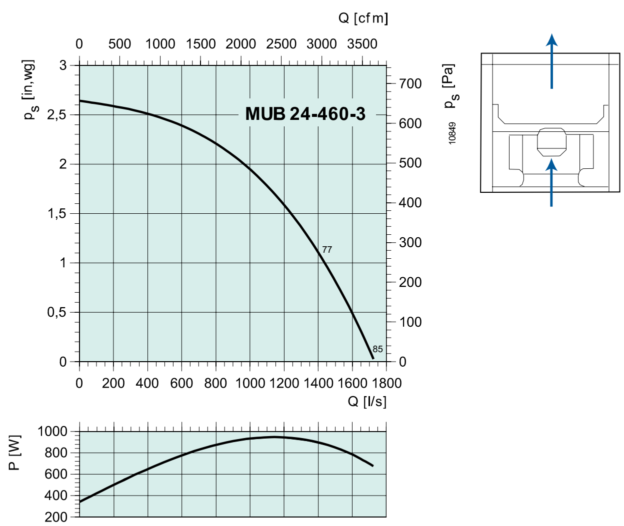
dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{WA} Inlet	85	49	68	72	76	71	72	83	63

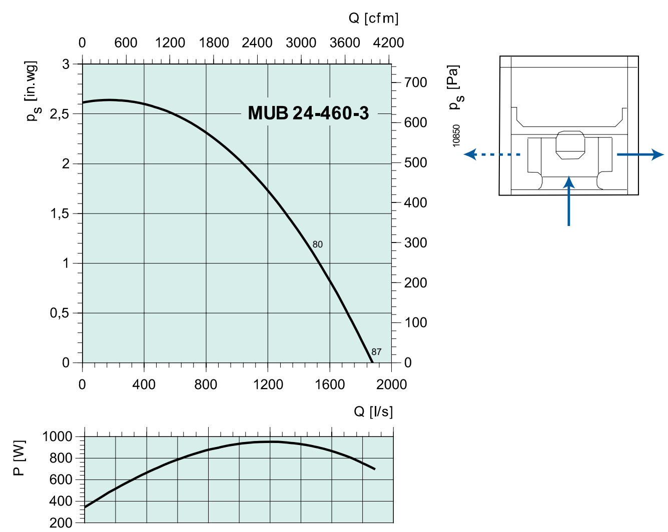
Measurement point: 3651 cfm, 0 in.wg (1723 l/s; 0 Pa)

dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{WA} Inlet	87	50	68	74	78	74	75	86	68

Measurement point: 3654 cfm, 0 in.wg (1724 l/s; 0 Pa)

MUB 24-460-3





dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{WA} Inlet	85	49	68	72	76	71	72	83	63

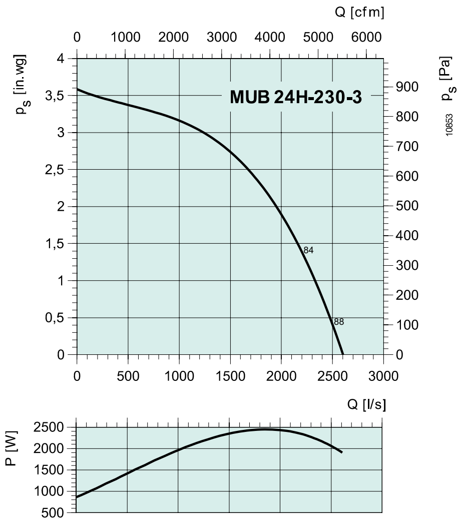
Measurement point: 3651 cfm, 0 in.wg (1723 l/s; 0 Pa)

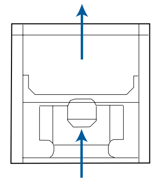
dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{WA} Inlet	87	50	68	74	78	74	75	86	68

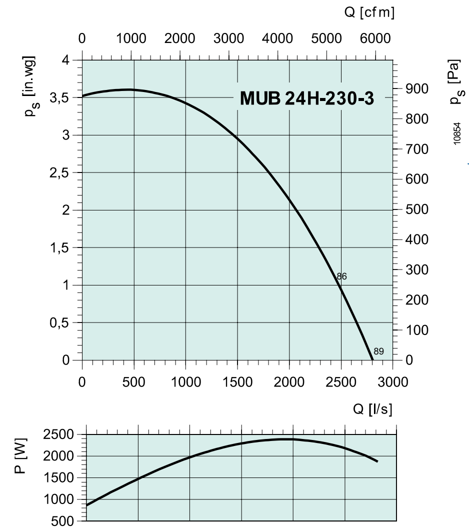
Measurement point: 3654 cfm, 0 in.wg (1724 l/s; 0 Pa)

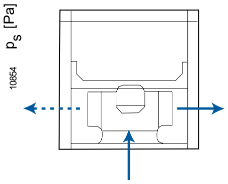
PERFORMANCE

MUB 24H-230-3









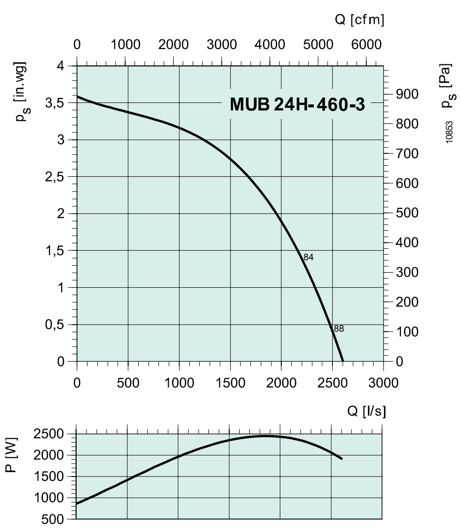
dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{wA} Inlet	88	57	71	79	80	80	80	83	70

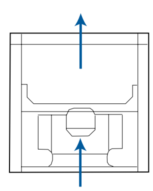
Measurement point: 5280 cfm, 0 in.wg (2492 l/s; 0 Pa)

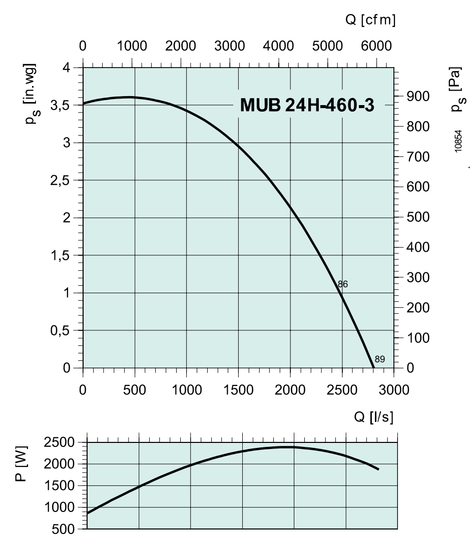
dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{wA} Inlet	90	58	71	82	83	82	83	84	75

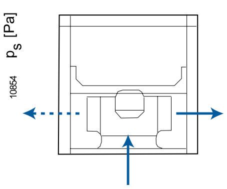
Measurement point: 5974 cfm, 0 in.wg (2819 l/s; 0 Pa)

MUB 24H-460-3









dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{wA} Inlet	88	57	71	79	80	80	80	83	70

Measurement point: 5280 cfm, 0 in.wg (2492 l/s; 0 Pa)

dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{wA} Inlet	90	58	71	82	83	82	83	84	75

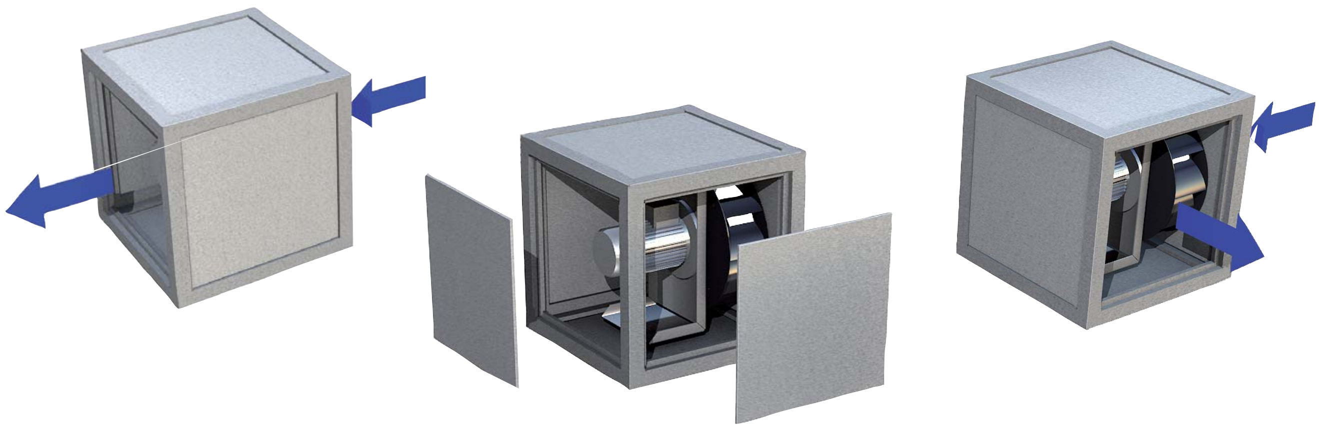
Measurement point: 5974 cfm, 0 in.wg (2819 l/s; 0 Pa)

INSTALLATION EXAMPLE

Exhaust to the rear

Change the exhaust direction

Exhaust to the side



Change the exhaust simply by changing the positions of the side panels

K EC

- EC-motors, high level of efficiency
- 100% speed controllable
- Speed regulator included
- Integrated motor protection
- Supplied with mounting bracket

The special feature of EC fans is their energy-saving potential not only at full load, but especially at partial-load. When operating at partial-load, the energy used is much lower than with an asynchronous motor of equivalent output.

Reduced energy usage guarantees a drop in operating costs.

The K EC series is designed for installation in ducts. All the K-fans have minimum 1" (25 mm) long spigot connections. The fans have backward-curved blades and external rotor motors (EC). The FK mounting clamp facilitates easy installation and removal, and prevents the transfer of vibration to the duct. The fans are delivered with a pre-wired potentiometer (0-10V) that allows you to easily find the desired working point.

Motor protection is integrated in the electronics of the motor. The casing is manufactured from galvanised sheet steel with the seams folded to give the fan a close to airtight casing. This allows for the possibility of outdoor mounting and wet room applications.

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

ELECTRICAL ACCESSORIES

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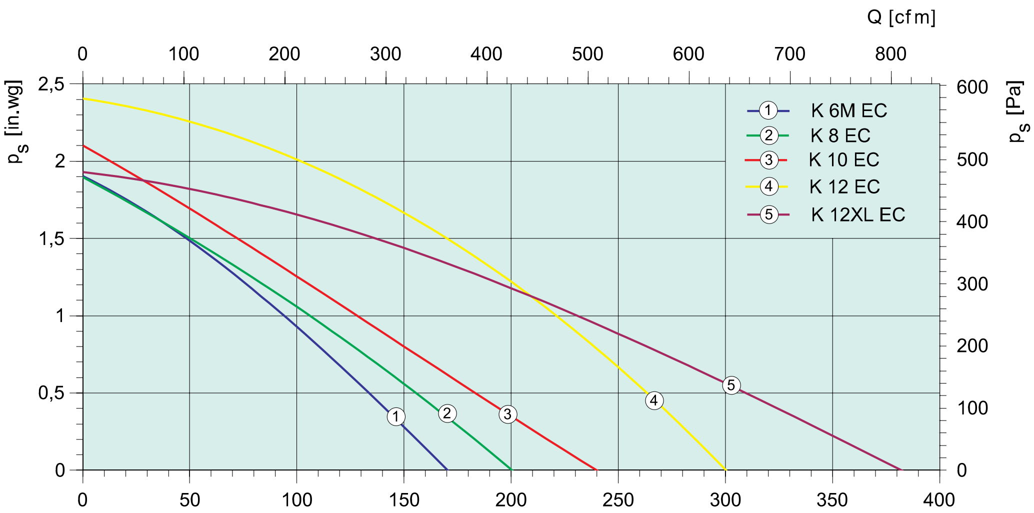
SPECIFICATION DATA

		K 6M EC	K 8 EC	K 10 EC	K 12 EC	K 12XL EC
Voltage/Frequency	50/60Hz	120	120	120	120	120
Nominal voltage range	V	100...130	100...130	100...130	100...130	100...130
Phase	~	1	1	1	1	1
Maximum airflow	cfm (l/s)	362 (171)	428 (202)	513 (242)	634 (299)	805 (380)
Rpm	min^{-1}	2486	2598	2444	2675	2520
Power rating, motors	W	76	70	88	129	162
Current	A	1,16	1,07	1,30	1,77	2,17
MCA	A	1.25	1.25	1.63	2.50	2.50
MOP	A	15	15	15	15	15
Operational temperature	°F (°C)	-13...140 (-25...60)	-13...140 (-25...60)	-13...104 (-25...40)	-13...104 (-25...40)	-13...131 (-25...55)
Weight	lbs (kg)	6.6 (3)	7.3 (3.3)	7.7 (3.5)	13.2 (6)	16 (7.2)
Insulation / Enclosure class	-	IP44 / B	IP44 / B	IP44 / B	IP44 / B	IP44 / B
Wiring diagram, page 95		4	4	4	4	4

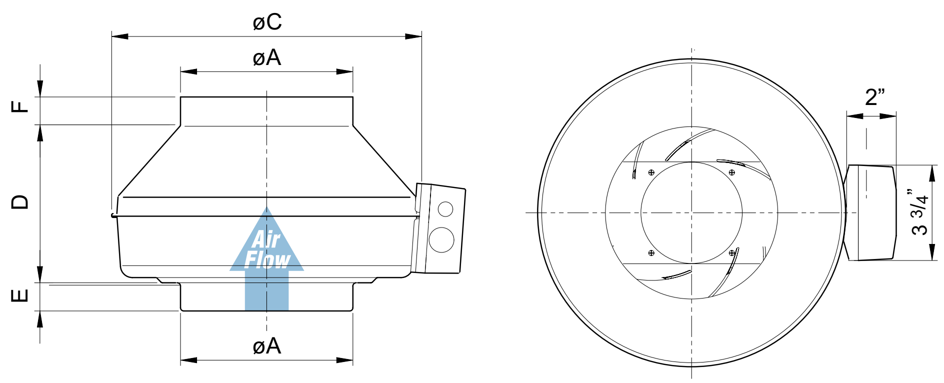
WORKING RANGE



DIMENSIONS

	A	B	C	D	E	F
K 6M EC	6 (152)	2 (51)	$13^{1}/_{8}$ (333)	$6^{5}/_{8}$ (168)	1 (25)	1 (25)
K 8 EC	8 (203)	2 (51)	$13^{3}/_{8}$ (340)	6 (152)	$1^{1}/_{8}$ (29)	$1^{1}/_{8}$ (29)
K 10 EC	10 (254)	2 (51)	$13^{3}/_{8}$ (340)	$4^{11}/_{16}$ (119)	$1^{1}/_{8}$ (29)	1 (25)
K 12 EC	12 (305)	2 (51)	16 (406)	$8^{1}/_{4}$ (210)	$1^{1}/_{16}$ (27)	$1^{3}/_{16}$ (30)
K 12XL EC	12 (305)	2 (51)	16 (406)	$8^{1}/_{4}$ (210)	$1^{1}/_{16}$ (27)	$1^{3}/_{16}$ (30)

Dimensions are in inches (mm)



VENTILATION ACCESSORIES

FC
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LD
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RSK
p. 88

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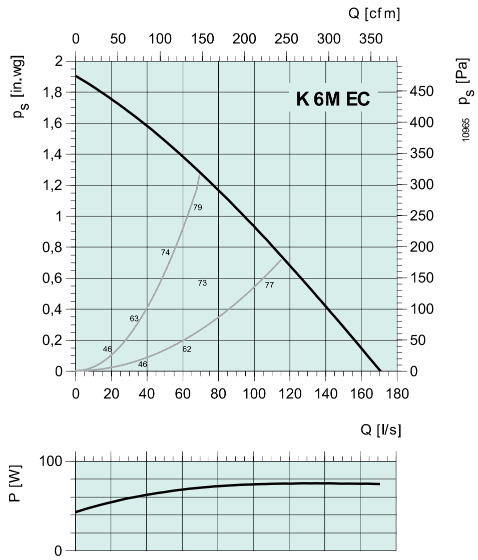
Performance certified is for installation type D – Ducted inlet, Ducted outlet. Speed (RPM) shown is nominal. Performance based on actual speed of test. Performance ratings do not include the effect of appurtenance (accessories). The AMCA Certified Ratings Seal applies to air performance ratings only.

PERFORMANCE

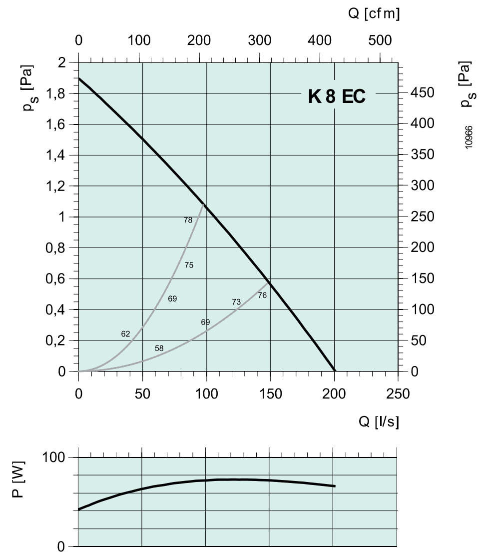
K 6M EC



dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{WA} Supply air	71	54	64	64	62	64	62	55	44
L_{WA} Exhaust air	63	53	62	57	41	41	34	24	20
L_{WA} Surrounding	52	36	50	48	38	33	28	25	18

Measurement point: 153 cfm, 1.47 in.wg (72 l/s; 367 Pa)

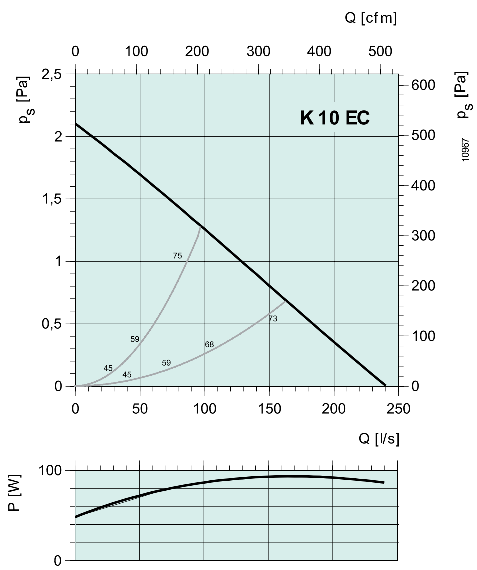
K 8 EC



dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{WA} Supply air	71	54	64	64	62	64	62	55	44
L_{WA} Exhaust air	63	53	62	57	41	41	34	24	20
L_{WA} Surrounding	52	36	50	48	38	33	28	25	18

Measurement point: 229 cfm, 1.10 in.wg (108 l/s; 274 Pa)

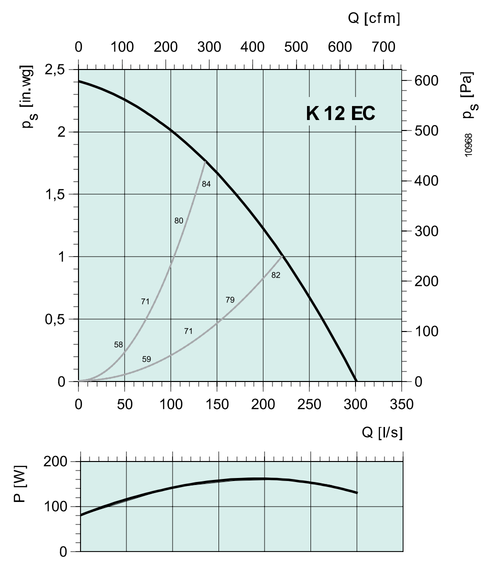
K 10 EC



dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{WA} Supply air	71	54	64	64	62	64	62	55	44
L_{WA} Exhaust air	63	53	62	57	41	41	34	24	20
L_{WA} Surrounding	52	36	50	48	38	33	28	25	18

Measurement point: 252 cfm, 1.44 in.wg (119 l/s; 359 Pa)

K 12 EC



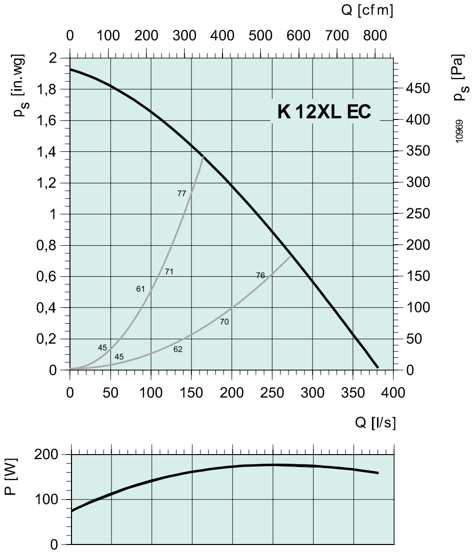
dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{WA} Supply air	71	54	64	64	62	64	62	55	44
L_{WA} Exhaust air	63	53	62	57	41	41	34	24	20
L_{WA} Surrounding	52	36	50	48	38	33	28	25	18

Measurement point: 384 cfm, 1.28 in.wg (181 l/s; 319 Pa)

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 applies to air performance ratings only.

PERFORMANCE

K 12XL EC

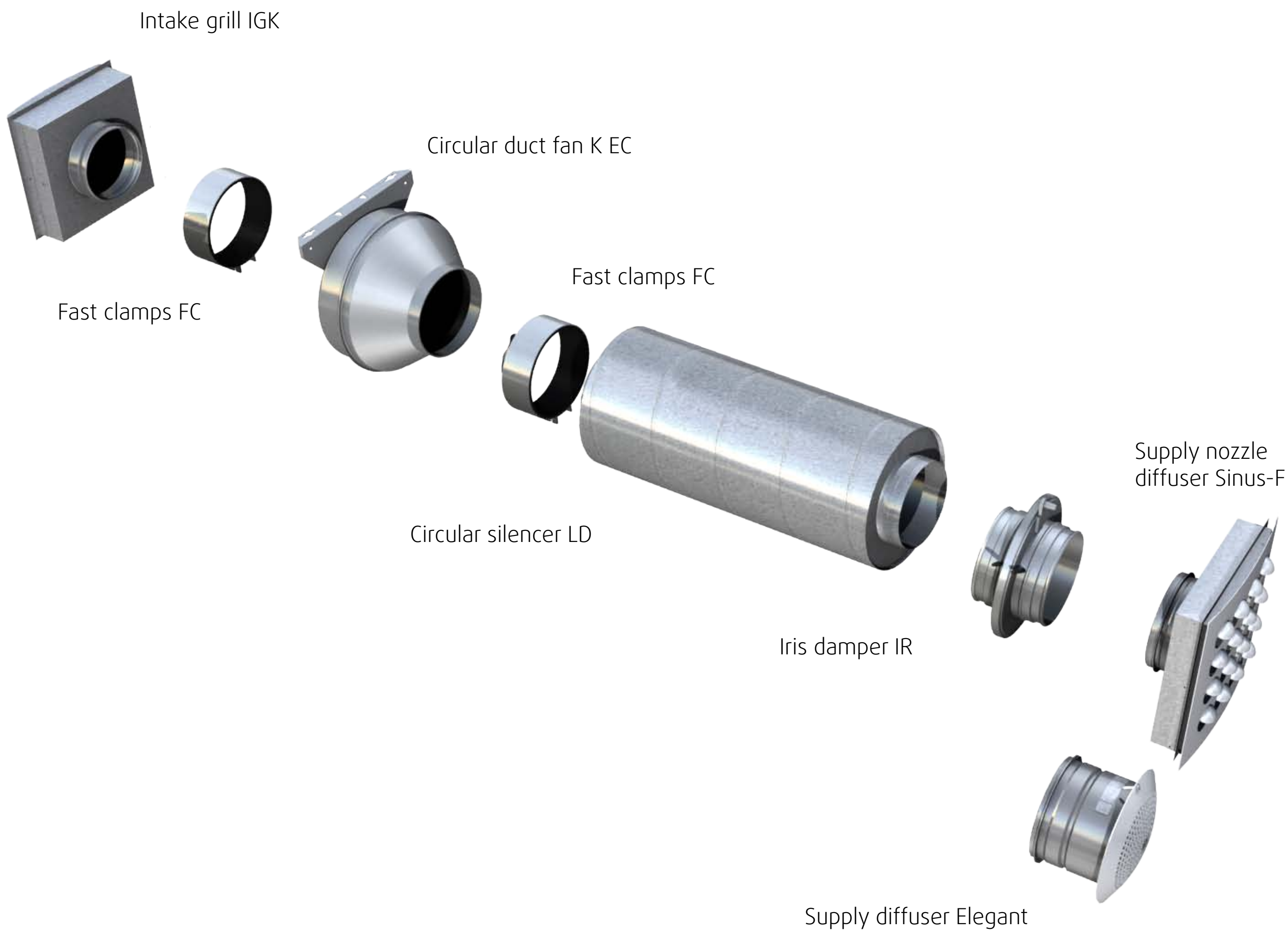


dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{wA} Supply air	71	54	64	64	62	64	62	55	44
L_{wA} Exhaust air	63	53	62	57	41	41	34	24	20
L_{wA} Surrounding	52	36	50	48	38	33	28	25	18

Measurement point: 481 cfm, 2.38 in.wg (227 l/s; 591 Pa)

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 applies to air performance ratings only.

INSTALLATION EXAMPLE WITH ACCESSORIES



All of our products are based on intelligent EC technology. They use integral electronic controls which eliminate slip losses in the motor and ensure that the motor always runs at optimal load.

This guarantees that the energy usage is considerably lower compared with other motor types.

DVC P/S

- Airflows up to 7,000 cfm
- High capacity fan
- 100% controllable motor
- Low noise emissions
- Safe operation
- Day/night control mode

The DVC P/S roof fans are driven by EC-external rotor 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.

The DVC-P versions have integrated pressure sensors and the electronics are programmed for a constant pressure operation.

Motor protection is integrated in the electronics of the motor; no additional external motor protection device is needed.

Energy saving made easy

Looking at today's control systems, it quickly becomes clear that the use of conventional speed controllers using variable frequency drives can have problems both large and small.

For applications that are noise sensitive, speed control at low speed is almost impossible when using variable frequency systems. When using frequency inverters, missing signal information can cause problems with motors. Often the installation of sine filters and shielded cables, necessary for a trouble-free operation of the motor when used with a frequency inverter, is not given consideration even at the design stage.

Systemair Mfg. Inc. certifies that the DVC Series shown herein 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 if sound is also certified and comply with the requirements of the AMCA Certified Ratings Program.

ELECTRICAL ACCESSORIES

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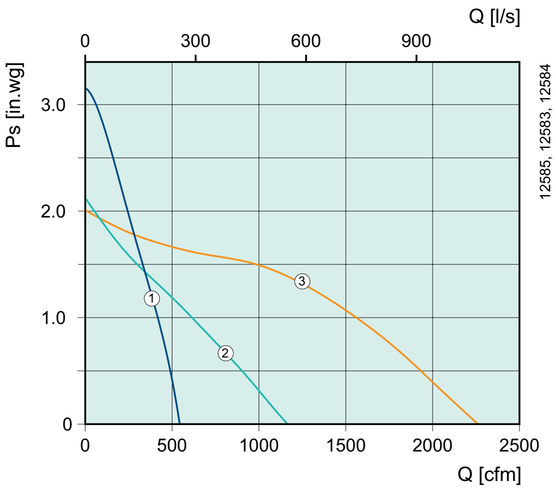
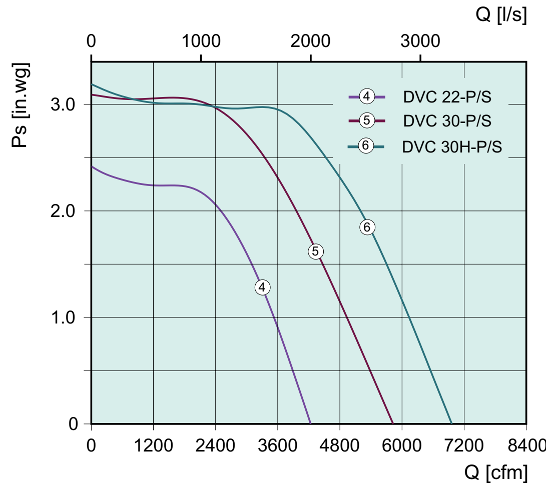
SPECIFICATION DATA

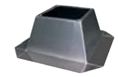
		DVC 10-P/S -230-1	DVC 14-P/S -230-1	DVC 18-P/S-230-1	DVC 22-P/S-460-3	DVC 30-P/S-460-3	DVC 30H-P/S-460-3
Voltage/Frequency	60Hz	230	230	230	460	460	460
Nominal voltage range	V	200..277	200...277	200...277	380...480	380...480	380...480
Phase	~	1	1	1	3	3	3
Maximum airflow	cfm (l/s)	542 (256)	1161 (548)	2265 (1069)	4236 (2000)	5829 (2751)	6963 (3286)
Rpm	min^{-1}	3427	1675	1324	1339	1360	1209
Power rating, motors	W	173	178	385	1119	1863	2502
Current	A	1.17	1.18	2.3	1.66	2.88	3.72
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 (°C)	-13...140 (-25...60)	-13...140 (-25...60)	-13...140 (-25...60)	-13...140 (-25...60)	-13...140 (-25...60)	-13...140 (-25...60)
Weight	lbs (kg)	20 (9)	29 (13)	46 (21)	108 (49)	159 (72)	179 (80)
Insulation / Enclosure class	-	B / IP44	B / IP44	B / IP54	B / IP54	F / IP54	F / IP54
Wiring diagram, page 96		5	5	5	6	6	6

WORKING RANGE





VENTILATION ACCESSORIES



FDS
p. 90

ASC
p. 90

LD
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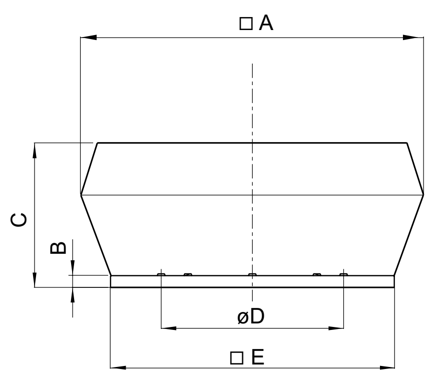
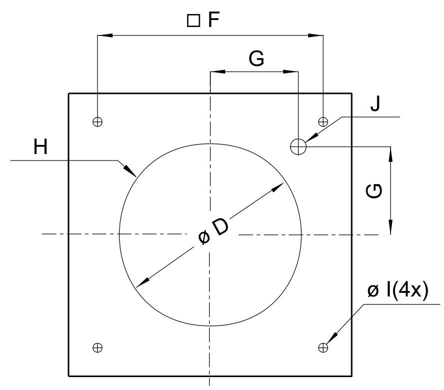
DIMENSIONS





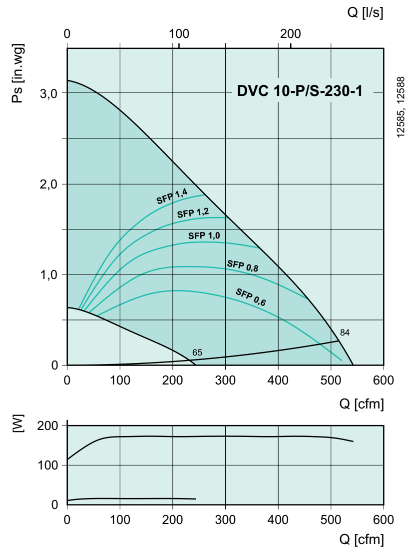
	A	B	C	øD	E	F	G	H	øI	J
DVC 10-P/S-230-1	$14^{1}/_{2}$ (370)	$1^{1}/_{5}$ (30)	$6^{2}/_{3}$ (170)	$8^{1}/_{3}$ (213)	$13^{1}/_{5}$ (335)	$9^{2}/_{3}$ (245)	$4^{1}/_{8}$ (105)	M6(6x)	10(4x)	M20x1,5
DVC 14-P/S-230-1	22 (560)	$1^{1}/_{5}$ (30)	13 (330)	$11^{1}/_{5}$ (285)	$17^{1}/_{8}$ (435)	13 (330)	$5^{3}/_{4}$ (146)	M6(6x)	10(4x)	M20x1,5
DVC 18-P/S-230-1	$14^{1}/_{3}$ (720)	$1^{1}/_{5}$ (30)	$15^{1}/_{3}$ (390)	$17^{1}/_{4}$ (438)	$23^{3}/_{7}$ (595)	$17^{3}/_{4}$ (450)	$7^{7}/_{8}$ (200)	M6(6x)	12(4x)	M20x1,5
DVC 22-P/S-460-3	$35^{2}/_{5}$ (900)	$1^{1}/_{5}$ (30)	$18^{1}/_{3}$ (465)	$17^{1}/_{4}$ (438)	$26^{1}/_{5}$ (665)	21 (535)	$9^{1}/_{3}$ (237)	M6(6x)	12(4x)	M20x1,5
DVC 30-P/S-460-3	$45^{1}/_{4}$ (1150)	$1^{1}/_{5}$ (30)	22 (560)	$23^{4}/_{5}$ (605)	37 (939)	$29^{1}/_{2}$ (750)	$11^{1}/_{2}$ (293)	M6(6x)	12(4x)	M20x1,5
DVC 30H-P/S-460-3	$45^{1}/_{4}$ (1150)	$1^{1}/_{5}$ (30)	22 (560)	$23^{4}/_{5}$ (605)	37 (939)	$29^{1}/_{2}$ (750)	$11^{1}/_{2}$ (293)	M6(6x)	12(4x)	M20x1,5

Dimensions are in inches (mm)

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

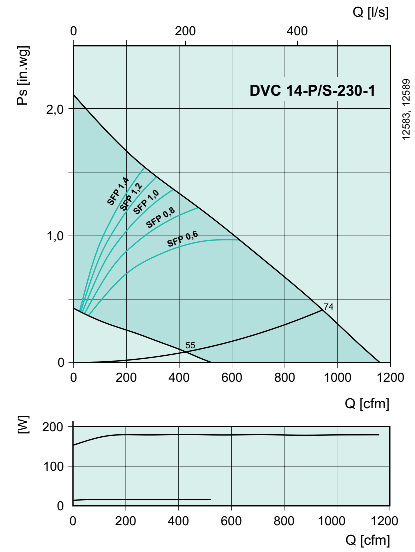
DVC 10-P/S-230-1



dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{wA} Inlet	84	50	59	71	79	78	77	74	69

Measurement point: 515 cfm, 0.25 in.wg (243 l/s, 62 Pa)

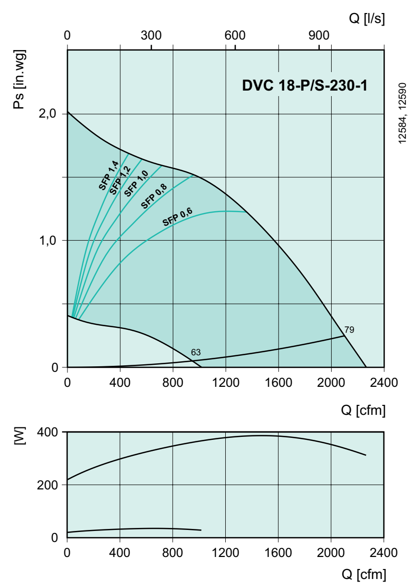
DVC 14-P/S-230-1



dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{wA} Inlet	74	43	60	70	69	64	66	59	61

Measurement point: 943 cfm, 0.25 in.wg (445 l/s, 62 Pa)

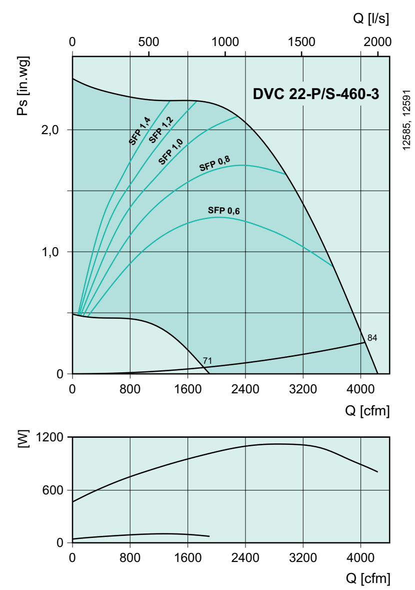
DVC 18-P/S-230-1



dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{wA} Inlet	79	46	65	75	71	65	65	71	69

Measurement point: 2100 cfm, 0.25 in.wg (991 l/s, 62 Pa)

DVC 22-P/S-460-3



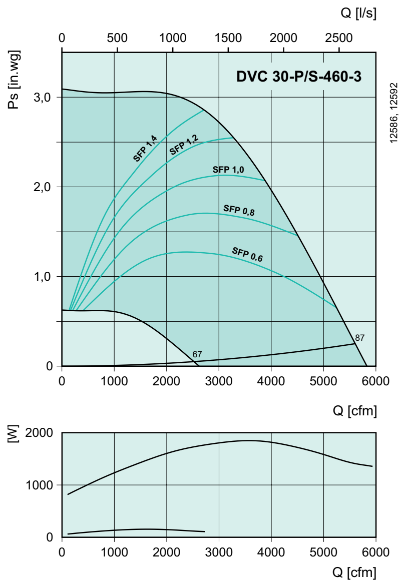
dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{wA} Inlet	84	51	76	80	76	71	72	77	75

Measurement point: 4060 cfm, 0.25 in.wg (1916 l/s, 62 Pa)

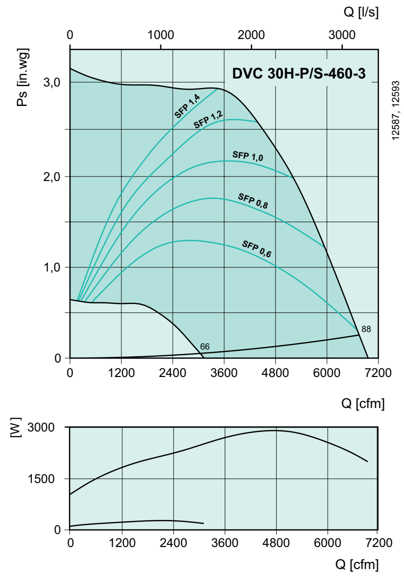
Performance Certified is for Installation Type A: free inlet, free outlet. Performance ratings include the effects of an outlet bird screen. Speed (RPM) shown is nominal. Performance is based on actual speed of test. The sound power level ratings shown are in decibels, referred to 10-12 watts calculated 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

DVC 30-P/S-460-3



DVC 30H-P/S-460-3



dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{wA} Inlet	87	60	75	81	77	76	78	80	79

Measurement point: 5605 cfm, 0.25 in.wg (2645 l/s, 62 Pa)

dB(A)	Tot	Frequency bands [Hz]							
		63	125	250	500	1k	2k	4k	8k
L_{wA} Inlet	88	60	78	85	75	77	76	78	78

Measurement point: 6753 cfm, 0.25 in.wg (3187 l/s, 62 Pa)

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.

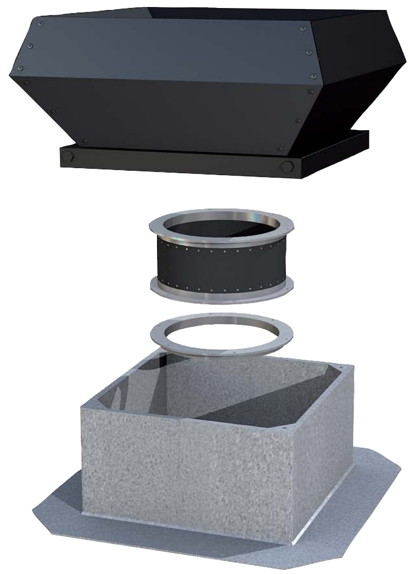
APPLICATIONS

Nowadays, many residential buildings comprising several stories are equipped with ventilation systems to pull used air out of apartments. Most of the time they are sized for the maximum number of people present. The level of occupancy varies according to the time of day in question, which means that the installed ventilation system may be oversized, costing both money and energy unnecessarily. For this reason, Systemair offers a system that is demand-controlled with regard to occupancy and time of day.

The DVC Roof fan is designed to exhaust used air in systems with a high static pressure in the ducts. The fan has a pressure control unit, which turns out to be a real “wonder control”. Together with BHC Self regulating valves installed in kitchens and bathrooms, the DVC-P Roof fan controls the exhausted air volume based on the pressure difference in the ducts.

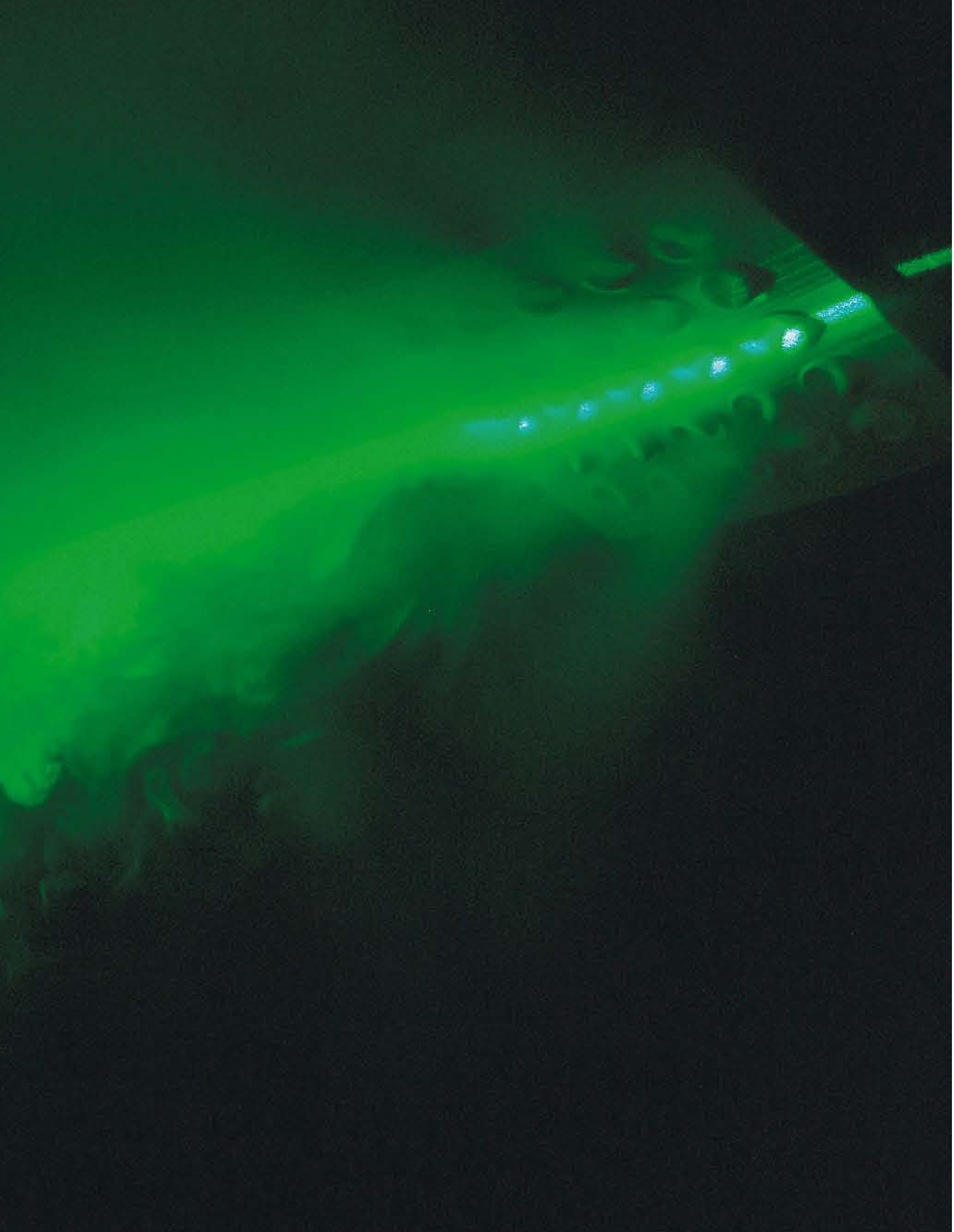

DVC-P Roof fan
BHC Self regulating valve

INSTALLATION EXAMPLE



A completely new generation of Systemair roof fans which were developed and built consistently according to the company's set target: low noise level, high performance.

Especially suited to all uses and areas of application sensitive to noise. You can see and hear the result: a reduction in sound of almost 50 % at the same system performance and an increased level of efficiency compared to its predecessors.



BHC

Return air self regulating motorized valve with motion and humidity sensor

Function

BHC 4 is a motorized 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 BHC 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.

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 BHC uses 12V AC. The humidity sensors will open the damper regardless of a power supply.

Spigot Versions

Ø4″ (100 mm) and Ø5″ (125 mm with the adapter).

Accessories

- Ø4/5″ inlet adapter
- 12V transformer

Airflow/Pressure Chart

Enables the ability to adapt the fixed shutter position. Supplied in installation instructions.

Buzzer

Informs the occupant when the battery needs to be replaced (i.e. when the battery level is below 2.2V). This buzzer rings when the presence sensor or the switch is activated.

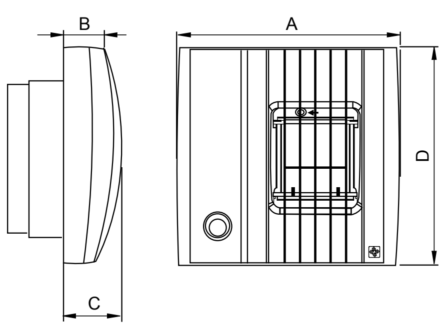
Possibility to connect a dedicated "CAL" for 12VAC supply.

2 x 1.5 Volts AAA LR03 Batteries

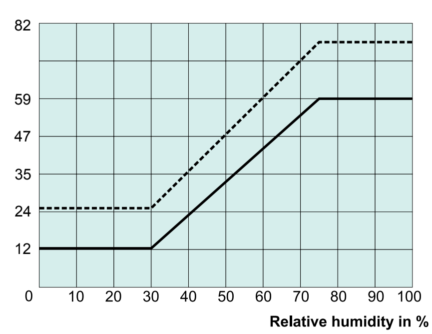
DIMENSIONS

	A	B	C	D
BHC 4	$6\frac{7}{8}$ (174)	$1\frac{1}{3}$ (33)	$1\frac{9}{11}$ (46)	$6\frac{2}{3}$ (169)

Dimensions are in inches (mm)



SPECIFICATION DATA



Elegant AT

Supply step diffuser

Function

The Elegant has been especially developed for providing a draught-free air supply from the rear walls of offices, hotel rooms, etc. The guide jet prevents the air stream from falling into the occupied zone before it has reached an acceptable temperature. Max. temperature difference ΔT=10K is permissible. The Elegant is also suitable for VAV systems, as the distribution pattern is maintained across the entire flow area.

Design

The Elegant is manufactured from steel and consists of a convex front plate with perforations and guide jet opening. The front plate is finished in the standard white powder-coating (RAL 9010-80).

Versions

The Elegant is available in sizes 4" (100 mm) and 5" (125 mm). The Elegant AT has a perforated front plate. It can be mounted directly in a T-piece or pre-embedded bend. The air flow can be adjusted by using different combinations of plastic plugs.

Mounting

The diffuser is installed directly onto the spiral duct. To dismantle the supply air unit, turn the unit and pull straight out.

Selection Table

The table below shows the general product performance. For more details please see Systemair's selection software.

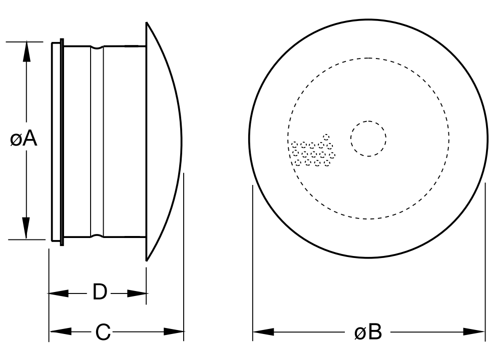
SPECIFICATION DATA

		Air flow range, cfm (l/s) and throw $l_{0,2}$ ft (m)				ΔP_t - Pressure drop in.wg (Pa)		
Elegant AT4		13 (4)	13 (4)	16 (5)		0.27 (68)	0.45 (112)	0.63 (158)
Elegant AT5			13 (4)	13 (4)	16 (5)	0.19 (47)	0.31 (78)	0.44 (110)
	cfm	26	35	44	53	20-25	30	35-40
	l/s	12	17	21	25		dB (A)	

DIMENSIONS

	øA	øB	C	D
Elegant AT4	4 (98)	$6^1/_2$ (165)	$4^1/_3$ (111)	$3^2/_5$ (87)
Elegant AT5	5 (123)	$6^1/_2$ (165)	$4^1/_2$ (115)	$3^1/_2$ (89)

Dimensions are in inches (mm)



SOUND POWER LEVEL, L_W (dB)

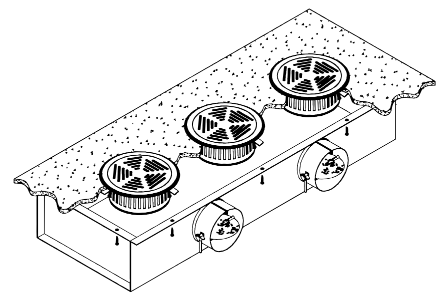
L_W(dB) = L_{pA} + K_{ok} (L_{pA} = diagram K_{ok} = table) correction factor K_{ok}

dB(A)	Frequency bands [Hz]							
	63	125	250	500	1k	2k	4k	8k
Elegant AT 4	10	-5	-4	1	-1	-6	-10	-18
Elegant AT 5	13	1	0	-1	-1	-5	-6	-14

SFD
Floor Diffuser

Description
Circular diffuser with swirl air supply, suitable for false floor installation. 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 may be used in rooms with a variable or constant air volume.

Product Characteristics
- Manufactured in aluminum
- Sheet steel drip trap and swirl unit
- High levels of induction
- Simple to clean
- Can be used with connection plenum



SPECIFICATION DATA

		Airflow range, cfm (l/s) and throw $l_{0,2}$ ft (m)							ΔP_t - Pressure drop, in.wg (Pa)		
SFD 6		2,3 (0,7)	3,9 (1,2)	5,2 (1,6)	7,5 (2,3)				0,04 (10)	0,06 (15)	0,12 (30)
SFD 8			2 (0,6)	2,6 (0,8)	3,9 (1,2)	4,9 (1,5)	5,6 (1,7)	6,5 (2)	0,03 (7)	0,04 (11)	0,09 (23)
	cfm	18	29	41	59	77	88	100	20-25	30	35-40
	l/s	8	14	19	28	36	42	47		dB (A)	

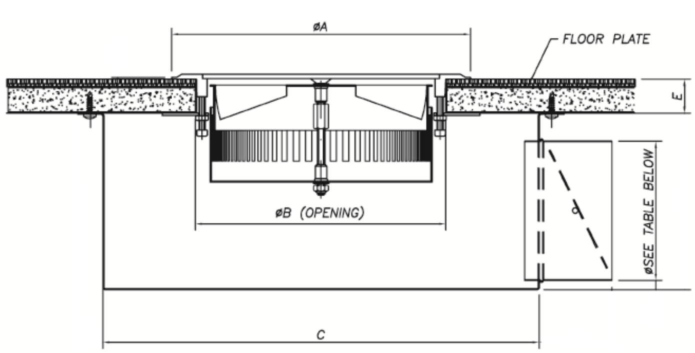
ΔT = -6K

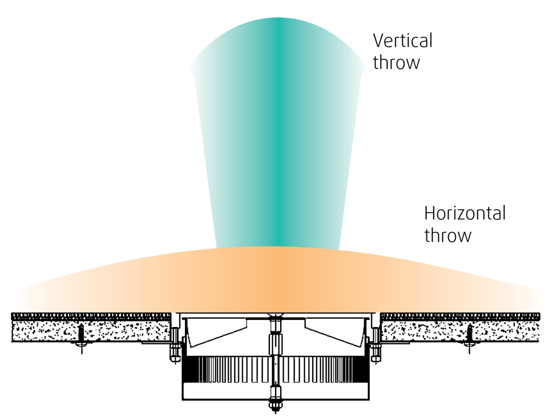
When ΔT = -4K, then $l_{0.2}$ x 1.2 ; ΔT = -8K, then $l_{0.2}$ x 0.88

DIMENSIONS

	øA	øB	C
SFD 6	$7^1/_2$ (190)	$5^7/_8$ (150)	$8^7/_8$ (225)
SFD 8	$9^3/_7$ (240)	$7^8/_9$ (200)	$10^9/_{11}$ (275)

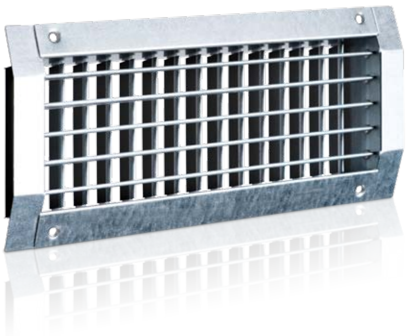
Dimensions are in inches (mm)





NOVA-C

Single deflection grille for circular ducts



Function

NOVA-C grille series are designed specifically to be installed onto round ducts. The construction allows the mounting of each grille height to various duct diameters. Adjustable single or double deflection with opposed blade design allows for full flexibility of the usage and a reduction in drafts in occupied zones and facilitates system balancing. All grilles are manufactured with a galvanized finish to match the look of the duct.

Design

The frame, blades and the damper assembly are manufactured from roll-formed galvanized sheet steel to provide a robust construction.

Mounting

NOVA-C grilles are pre-punched through the front face frame so they can be mounted onto the duct with self tapping screws.

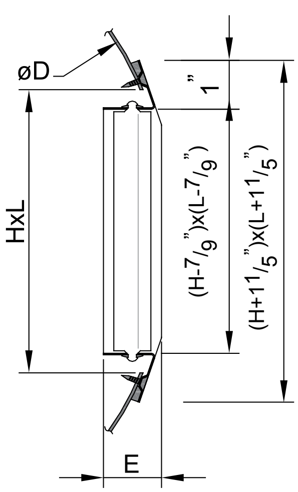
Selection Table

Table below shows the general product performance. For more details please see Systemair's selection software.

SPECIFICATION DATA

Size	Air flow range, cfm (l/s) and throw $l_{0,2}$ ft (m)							ΔP_t - Pressure drop, in.wg (Pa)		
NOVA-C-1-9x3	46 (14)	72 (22)		91 (28)				0.06 (15)	0.15 (37)	0.2 (50)
NOVA-C-1-9x5			56 (17)	79 (24)	98 (30)			0.05 (13)	0.10 (25)	0.15 (38)
NOVA-C-1-13x3		49 (15)	82 (25)		98 (30)			0.05 (12)	0.13 (32)	0.17 (42)
NOVA-C-1-13x5				66 (20)	95 (29)		118 (36)	0.05 (13)	0.10 (26)	0.14 (36)
NOVA-C-1-17x3			53 (16)	91 (28)		108 (33)		0.04 (10)	0.12 (30)	0.15 (37)
cfm	132	176	221	309	362	398	456	20-25	30	35-40
l/s	62	83	104	146	171	188	215		dB (A)	

DIMENSIONS



DUCTING DATA

Height of the grille H, inch (mm)	Duct penetration E, inch (mm) NOVA-C-1	Duct Diameter D, inch (mm) min	Duct Diameter D, inch (mm) Max
3 (75)	$1^1/_4$ (32)	5 (150)	16 (406)
5 (125)	$1^1/_4$ (32)	12 (305)	36 (914)

Dimensions are in inches (mm)
* L - Length of the grill, available in 3 sizes: 9, 13, 17 inches (225, 325, 425 mm)

NOVA-R

Non-visible return air grille

Function

The grille is used to return air from internal premises. Because of the inclined deflectors, it's not possible to see through the grille. The damper or plenum box balances the air.

Description

NOVA-R is a sqare 24"x24" aluminum grille with fixed deflectors and can be used in commercial and industrial premises. The grille is intended for return air and is built into the ceiling. NOVA-R is supplied with springs as standard.

Design

NOVA-R grille is manufactured from natural anodized aluminum profiles painted white to RAL 9010. Deflectors are at a 45° angle inclined downwards for anti-rain function with a $^{7}/_{9}$" pitch.

Mounting

The NOVA-R grille can be mounted directly into a wall or celing on a T-bar, fixing with springs.

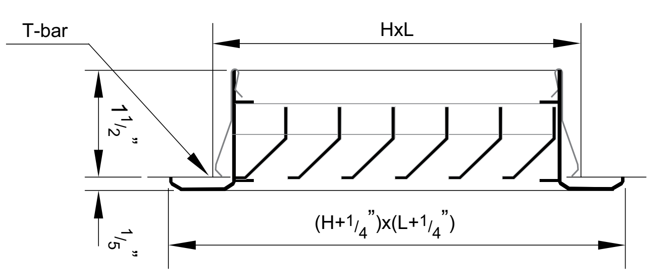
SPECIFICATION DATA

Size		Air flow range, cfm (l/s)			ΔP_t - Pressure drop, in.wg (Pa)		
NOVA-R-24x24					0.01 (4)	0.04 (10)	0.05 (12)
	cfm	398	589	779	20-25	30	35-40
	l/s	188	278	368		dB (A)	

DIMENSIONS

	H	L	Free area, ft² (m²)	Weight, lbs (kg)
NOVA-R-24x24	24 (610)	24 (610)	1.72 (0.16)	6.4 (2.9)

Dimensions are in inches (mm)



NOVA-E

Egg crate return air grille

Function

The grille has a very large free area opening and therefore is ideal for return air.

Description

NOVA-E is a rectangular aluminum return grille with egg crate core which can be used in commercial and industrial premises. The grille is intended for return air and is build into the wall or ceiling. NOVA-E is supplied with springs as standard.

Design

NOVA-E grille is manufactured from aluminum profiles painted white to RAL 9010. If needed, the grille can be fitted into a T-bar ceiling with a 24” x 24” square opening.

Mounting

The NOVA-E grille can be mounted directly into a wall or celing on a T-bar, fixing with springs.

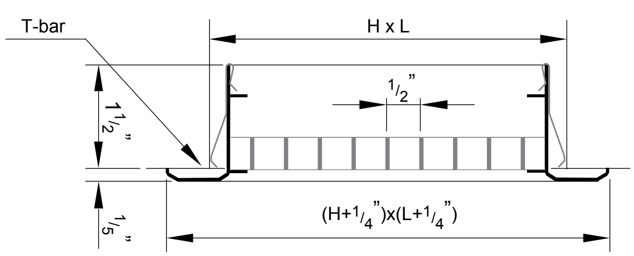
SPECIFICATION DATA

Size		Air flow range, cfm (l/s)			ΔP_t - Pressure drop, in.wg (Pa)		
NOVA-E-24x24					0 (2)	0.04 (9)	0.06 (15)
	cfm	1471	1765	2060	20-25	30	35-40
	l/s	694	833	972		dB (A)	

DIMENSIONS

	H	L	Free area, ft² (m²)	Weight, lbs (kg)
NOVA-E-24x24	24 (610)	24 (610)	3.87 (0.36)	3.6 (1.62)

Dimensions are in inches (mm)



Sinus-DR

Rectangular duct or wall mounted nozzle supply diffuser

Function

Sinus-DR is a nozzle diffuser for duct mounting. Sinus-DR (for rectangular duct) consists of a front plate with several nozzles (size 57 mm) and a check rail. The design of the nozzles enables the diffuser to achieve very high induction of room air. The Sinus-DR can be used for both cooled and heated air. Max. temperature difference: ΔT 10 K.

Mounting

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. Ensure that the opening of the check rail is pointed against the direction of the air.

ACOUSTIC CHARACTERISTICS

Sound power level, Lw

$L_w(dB) = L_{pA} + K_{ok}$ (L_{pA} = diagram K_{ok} = table)

correction factor K_{ok}

	Mid-frequency band, Hz							
Sinus	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
-DR 1001	4	8	7	1	-8	-14	-18	-13
-DR 1002	5	9	9	2	-8	-15	-17	-12
-DR 1003	8	11	8	1	-7	-15	-16	-13
-DR 1004	12	14	7	1	-6	-14	-17	-12
-DR 1501	4	7	8	2	-9	-14	-19	-16
-DR 1502	3	7	9	2	-8	-17	-20	-16
-DR 1503	7	10	8	2	-7	-15	-18	-15
-DR 1504	11	14	7	1	-5	-13	-17	-14
Tolerance	±4	±2	±1	±1	±3	±3	±6	±8

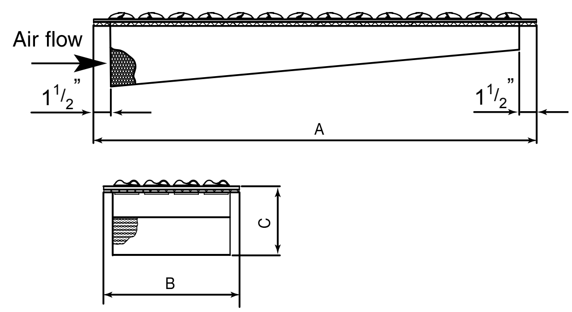
Sound attenuation,ΔL (dB)

	Mid-frequency band, Hz							
Sinus	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
-DR 1001	11	6	6	5	6	5	4	5
-DR 1002	11	6	5	5	6	5	4	5
-DR 1003	10	7	5	4	4	4	4	5
-DR 1004	9	7	5	4	4	3	3	6
-DR 1501	10	5	4	4	5	4	3	4
-DR 1502	10	5	3	4	5	4	3	4
-DR 1503	6	2	4	3	4	3	3	4
-DR 1504	6	5	4	3	3	2	3	5

DIMENSIONS

	A	B	C	Size, hole
Sinus DR-1001	41 (1042)	$4^{1}/_{3}$ (110)	$2^{1}/_{3}$ (60)	$38^{1}/_{5}$ x $2^{3}/_{4}$ (970x70)
Sinus DR-1501	$60^{1}/_{3}$ (1542)	$4^{1}/_{3}$ (110)	$2^{1}/_{3}$ (60)	$57^{8}/_{9}$ x $2^{3}/_{4}$ (1470x70)
Sinus DR-1002	41 (1042)	$7^{1}/_{11}$ (180)	$3^{1}/_{2}$ (90)	$38^{1}/_{5}$ x $5^{1}/_{2}$ (970x140)
Sinus DR-1502	$60^{1}/_{3}$ (1542)	$7^{1}/_{11}$ (180)	$3^{1}/_{2}$ (90)	$57^{8}/_{9}$ x $5^{1}/_{2}$ (1470x140)
Sinus DR-1003	41 (1042)	$9^{9}/_{11}$ (250)	5 (125)	$38^{1}/_{5}$ x $8^{1}/_{4}$ (970x210)
Sinus DR-1503	$60^{1}/_{3}$ (1542)	$9^{9}/_{11}$ (250)	5 (125)	$57^{8}/_{9}$ x $8^{1}/_{4}$ (1470x210)
Sinus DR-1004	41 (1042)	$12^{6}/_{11}$ (320)	5 (125)	$38^{1}/_{5}$ x 11 (970x280)
Sinus DR-1504	$60^{1}/_{3}$ (1542)	$12^{6}/_{11}$ (320)	5 (125)	$57^{8}/_{9}$ x 11 (1470x280)

Dimensions are in inches (mm)



SPECIFICATION DATA

		Air flow range, cfm (l/s) and throw $l_{0,2}$ (m)										ΔP$_t$ - Pressure drop, in.wg (Pa)		
Sinus DR-1001		6 (2)	10 (3)	15 (5)								0.03 (7)	0.06 (16)	0.10 (25)
Sinus DR-1501				13 (4)	20 (6)		29 (9)					0.01 (4)	0.07 (18)	0.14 (34)
Sinus DR-1002						20 (6)	36 (11)		43 (13)			0.01 (4)	0.10 (26)	0.14 (37)
Sinus DR-1502							23 (7)	36 (11)		46 (14)		0.02 (5)	0.08 (20)	0.13 (32)
Sinus DR-1003			10 (3)	13 (4)	20 (6)							0.01 (4)	0.04 (11)	0.09 (23)
Sinus DR-1503						15 (5)	23 (7)	33 (10)				0.02 (6)	0.07 (17)	0.10 (26)
Sinus DR-1004							20 (6)	33 (10)		43 (13)		0.02 (5)	0.07 (17)	0.11 (27)
Sinus DR-1504									26 (8)	36 (11)	49 (15)	0.03 (8)	0.06 (15)	0.12 (29)
	cfm	35	53	71	106	124	182	235	294	383	544	20-25	30	35-40
	l/s	17	25	33	50	58	86	111	139	181	257		dB (A)	

Sinus-DC

Circular duct mounted nozzle supply diffuser

Function

Sinus-DC is a nozzle diffuser for duct mounting. Sinus-DC (for circular duct) consists of a front plate with several nozzles (size 2 inches or 57 mm) and a check rail. The design of the nozzles enables the diffuser to achieve very high induction of room air. The Sinus-DC can be used for both cooled and heated air. Max. temperature difference: ΔT=10 K.

Mounting

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. Ensure that the opening of the check rail is pointed against the air flow.

ACOUSTIC DATA

Sound power level, Lw

L_w(dB) = L_{pA} + K_{ok} (L_{pA} = diagram K_{ok} = table)
correction factor K_{ok}

		Mid-frequency band, Hz							
Sinus		**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
-DC	1001	4	8	7	1	-8	-14	-18	-13
-DC	1002	5	9	9	2	-8	-15	-17	-12
-DC	1003	8	11	8	1	-7	-15	-16	-13
-DC	1004	12	14	7	1	-6	-14	-17	-12
-DC	1501	4	7	8	2	-9	-14	-19	-16
-DC	1502	3	7	9	2	-8	-17	-20	-16
-DC	1503	7	10	8	2	-7	-15	-18	-15
-DC	1504	11	14	7	1	-5	-13	-17	-14
Tolerance		±4	±2	±1	±1	±3	±3	±6	±8

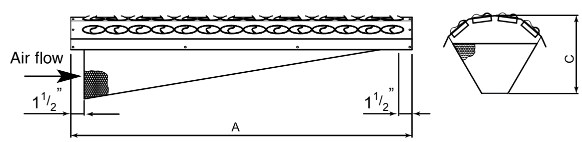
Sound attenuation, ΔL (dB)

		Mid-frequency band, Hz							
Sinus		**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
-DC	1001	11	6	6	5	6	5	4	5
-DC	1002	11	6	5	5	6	5	4	5
-DC	1003	10	7	5	4	4	4	4	5
-DC	1004	9	7	5	4	4	3	3	6
-DC	1501	10	5	4	4	5	4	3	4
-DC	1502	10	5	3	4	5	4	3	4
-DC	1503	6	2	4	3	4	3	3	4
-DC	1504	6	5	4	3	3	2	3	5

DIMENSIONS

	A	C	Size, hole	Fits, duct
Sinus DC-1001	41 (1040)	$2^{3}/_{4}$ (70)	$38^{1}/_{5}$ x $2^{3}/_{4}$ (970x70)	4-10
Sinus DC-1501	$60^{1}/_{3}$ (1540)	$2^{3}/_{4}$ (70)	$57^{8}/_{9}$ x $2^{3}/_{4}$ (1470x70)	4-10
Sinus DC-1002	41 (1040)	5 (125)	$38^{1}/_{5}$ x $5^{1}/_{3}$ (970x135)	6-10
Sinus DC-1502	$60^{1}/_{3}$ (1540)	5 (125)	$57^{8}/_{9}$ x $5^{1}/_{3}$ (1470x135)	6-10
Sinus DC-1003	41 (1040)	$7^{1}/_{4}$ (185)	$38^{1}/_{5}$ x $7^{7}/_{8}$ (970x200)	12-24
Sinus DC-1503	$60^{1}/_{3}$ (1540)	$7^{1}/_{4}$ (185)	$57^{8}/_{9}$ x $7^{7}/_{8}$ (1470x200)	12-24
Sinus DC-1004	41 (1040)	$7^{8}/_{9}$ (200)	$38^{1}/_{5}$ x $9^{8}/_{9}$ (970x250)	12-24
Sinus DC-1504	$60^{1}/_{3}$ (1540)	$7^{8}/_{9}$ (200)	$57^{8}/_{9}$ x $9^{8}/_{9}$ (1470x250)	12-24

Dimensions are in inches (mm)



SPECIFICATION DATA

Size		Air flow range, cfm (l/s) and throw $l_{0,2}$ ft (m)										ΔP$_t$ - Pressure drop, in.wg (Pa)		
Sinus DC-1001		6 (2)	10 (3)	15 (5)								0.03 (7)	0.06 (16)	0.10 (25)
Sinus DC-1501				13 (4)	20 (6)		29 (9)					0.01 (4)	0.07 (18)	0.14 (34)
Sinus DC-1002						20 (6)	36 (11)		43 (13)			0.01 (4)	0.10 (26)	0.14 (37)
Sinus DC-1502							23 (7)	36 (11)		46 (14)		0.02 (5)	0.08 (20)	0.13 (32)
Sinus DC-1003			10 (3)	13 (4)	20 (6)							0.01 (4)	0.04 (11)	0.09 (23)
Sinus DC-1503						15 (5)	23 (7)	33 (10)				0.02 (6)	0.07 (17)	0.10 (26)
Sinus DC-1004							20 (6)	33 (10)		43 (13)		0.02 (5)	0.07 (17)	0.11 (27)
Sinus DC-1504									26 (8)	36 (11)	49 (15)	0.03 (8)	0.06 (15)	0.12 (29)
	cfm	35	53	71	106	124	182	235	294	383	544	20-25	30	35-40
	l/s	17	25	33	50	58	86	111	139	181	257		dB (A)	

Kvadra

Louver faced ceiling diffuser

Function

Kvadra supply- and exhaust diffusers for ceiling installation can be used in offices, shops or similar premises. It can be connected to square ducts or circular ducts via connection transition KRC or to a plenum box. The diffuser can be dismantled for duct cleaning. Kvadra has a high induction which makes it suitable for cooled air. Maximum temperature difference is ΔT=12 K.

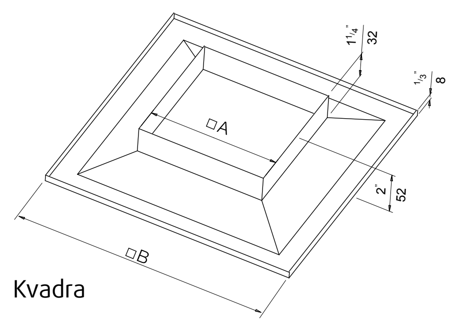
Design

Kvadra is manufactured from aluminum with a white powder-coated finish (RAL9010). With the transition KRC (included) fits to imperial ducts 5", 6", 10", 12" and 16".

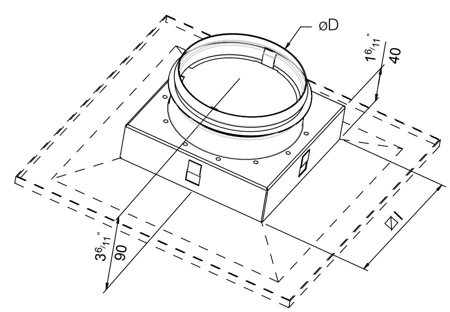
The connection transition KRC is manufactured from galvanized sheet metal and has a perforated metal sheet for pressure distribution and is simple to connect.

Mounting

Correct adjustment requires a length of straight duct 4 times the duct diameter in front of the plenum box. The distribution unit is connected to the duct with screws or pop rivets. To dismantle the supply air unit, release the cones by gently pressing and turning the cones simultaneously. Reassemble the unit correspondingly. When assembling KRC to the Kvadra, make sure that the connection edges fit into the KRC hold down springs. Gently tap the two parts together so that the connection edges rest in the hold down springs.



Kvadra



Accessory KRC

DIMENSIONS

	A	B	øD	I	Size, hole
Kvadra-5	5 15/16 (150)	11 5/8 (295)	5 (127)	5 11/16 (145)	8 8/9 (226)
Kvadra-6	8 7/8 (225)	14 9/16 (370)	6 (152)	8 1/3 (220)	11 6/7 (301)
Kvadra-10	11 7/8 (300)	17 1/2 (445)	10 (254)	11 5/8 (295)	14 4/5 (376)
Kvadra-12	14 3/4 (375)	20 1/2 (520)	12 (305)	14 9/16 (370)	17 3/4 (451)
Kvadra-16	17 3/4 (450)	23 7/16 (595)	16 (406)	17 1/2 (445)	20 5/7 (526)

Dimensions are in inches (mm)

SPECIFICATION DATA

		Air flow range, cfm (l/s) and throw $l_{0,2}$ ft (m)									ΔP_t - Pressure drop, in.wg (Pa)		
Kvadra-5		10 (3)	13 (4)	20 (6)							0.03 (7)	0.09 (21)	0.14 (37)
Kvadra-6				13 (4)	15 (5)	20 (6)					0.03 (8)	0.08 (19)	0.12 (30)
Kvadra-10						15 (5)	20 (6)	26 (8)			0.03 (9)	0.08 (20)	0.12 (30)
Kvadra-12						13 (4)	20 (6)		26 (8)		0.01 (4)	0.07 (18)	0.10 (25)
Kvadra-16								20 (6)	23 (7)	33 (10)	0.02 (5)	0.04 (10)	0.09 (21)
	cfm	59	88	118	162	206	280	353	427	633	20-25	30	35-40
	l/s	28	42	56	76	97	132	167	201	299		dB (A)	

VVKR

Swirl ceiling supply and extract diffuser

Function

VVKR is a square ceiling swirl diffuser with manually adjustable air guiding blades which allows the airflow pattern to be adapted to the individual requirements of the room at any time. Ideal for use in shopping halls, receptions or offices. The diffuser can be used for supply or return air. The height of the room can be up to 13 feet (4 m). Swirled airstreams quickly lose speed and temperature thanks to high induction therefore it can be used for high air exchanges and temperature can vary from -10K to +10K. The front plate is installed to a plenum box with a screw.

Design

The diffuser is manufactured from galvanized steel powder painted to RAL9010 white. The blades are manufactured from black plastic. In the centre of the diffuser is a pre-punched hole for screw fixing. A screw with white decorative cap is provided along with a self adhesive seal. The seal must be applied at the installation site.

Mounting

The diffuser is installed into a plenum box with a screw in the front face or inserted into a T-bar ceiling.

Accessory

VVK-0-P-H-1-Q-24/10 - Plenum box

Non-insulated plenum box with inlet damper for supply air with square face size of 24” x 24” and duct connection 10”.

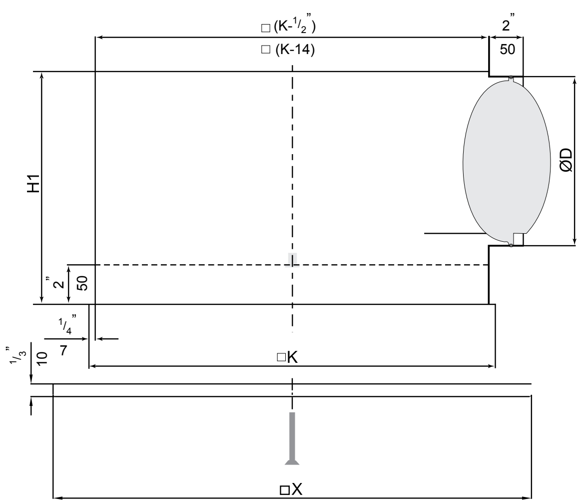
SPECIFICATION DATA

Size		Air flow range, cfm (l/s) and throw $l_{0,2}$ ft (m)							ΔP_t - Pressure drop, in.wg (Pa)		
VVKR-A-S-24x32						6 (2)	6 (2)	6 (2)	0.04 (10)	0.07 (19)	0.11 (28)
	cfm	88	118	146	176	206	235	280	20-25	30	35-40
	l/s	42	56	69	83	97	111	132		dB (A)	

DIMENSIONS

	X	øD	K	H1
VVKR-A-S-24x32	$24^{1}/_{4}$ (616)	10 (254)	$23^{1}/_{2}$ (590)	$13^{1}/_{3}$ (340)

Dimensions are in inches (mm)



Sinus-F

Square multi nozzle ceiling diffuser for T-bar ceiling

Function

Exterior dimensions are 24” x 24”. It is possible to remove the diffuser face to access the duct system. The front plate is attached with a chain to the main body for easy cleaning and service. Pull the front plate one step out from the main body to create an air gap around the diffuser. Max temp. diff. for cooled air is ΔT=12 K.

Mounting

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

ACOUSTIC DATA

Sound attenuation, ΔL (dB)

Closed gap	Mid-frequency band, Hz							
	63	125	250	500	1k	2k	4k	8k
Sinus-F-5-L	25	17	14	15	18	17	12	16
Sinus-F-6-L	14	17	11	10	16	15	11	14
Sinus-F-8-L	20	15	12	14	18	15	13	13
Sinus-F-10-L	15	13	11	16	15	11	13	12
Sinus-F-12-L	24	11	12	14	11	10	13	11

$^{7}/_{8}$” (20 mm) open gap

Sound power level, Lw

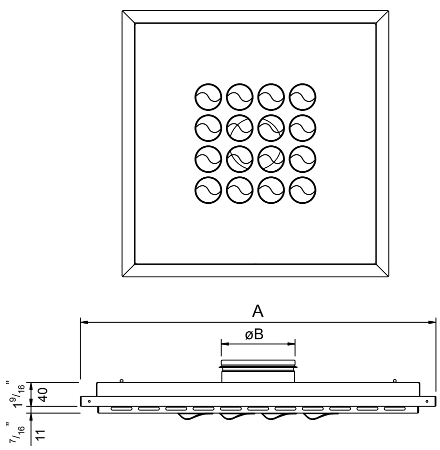
Lw(dB) = LpA + Kok (LpA = diagram Kok = table) correction factor Kok

Open gap	Mid-frequency band, Hz							
	63	125	250	500	1k	2k	4k	8k
Sinus-F-5-L	12	7	4	2	-4	-11	-13	-9
Sinus-F-6-L	11	4	4	2	-1	-9	-17	-14
Sinus-F-8-L	10	7	5	3	-2	-11	-18	-14
Sinus-F-10-L	17	9	4	-2	-2	-7	-15	-14
Sinus-F-12-L	11	12	3	0	-2	-9	-13	-12
Closed gap								
Sinus-F-5-L	13	7	4	3	-5	-12	-15	-11
Sinus-F-6-L	11	6	5	2	-2	-10	-17	-15
Sinus-F-8-L	5	6	4	4	-3	-12	-19	-17
Sinus-F-10-L	16	10	5	-1	-2	-8	-14	-15
Sinus-F-12-L	12	11	4	0	-1	-10	-18	-17

DIMENSIONS

	A	øB
Sinus-F-5-L	$23^{3}/_{4}$ (603)	5 (127)
Sinus-F-6-L	$23^{3}/_{4}$ (603)	6 (152)
Sinus-F-8-L	$23^{3}/_{4}$ (603)	8 (203)
Sinus-F-10-L	$23^{3}/_{4}$ (603)	10 (254)
Sinus-F-12-L	$23^{3}/_{4}$ (603)	12 (305)

Dimensions are in inches (mm)



The diagram shows

Air volume, cfm (l/s), total pressure, in.wg (Pa), throw ($l_{0,2}$) and sound pressure level [dB(A)].

Sound attenuation ΔL, the air terminal device’s self-damping (dB), including its aperture damping, can be found in the tables below.

SPECIFICATION DATA

Size		Air flow range, cfm (l/s) and throw $l_{0,2}$ ft (m)								$ΔP_t$ - Pressure drop, in.wg (Pa)		
Sinus-F-5-L		< 3 (1)	< 3 (1)	3 (1)						0.07 (18)	0.14 (36)	0.25 (63)
Sinus-F-6-L			3 (1)	3 (1)	3 (1)					0.06 (16)	0.12 (30)	0.17 (42)
Sinus-F-8-L				3 (1)	6 (2)	6 (2)				0.04 (10)	0.07 (18)	0.13 (33)
Sinus-F-10-L						3 (1)	6 (2)	9 (3)		0.06 (15)	0.11 (28)	0.18 (44)
Sinus-F-12-L							6 (2)	9 (3)	9 (3)	0.06 (15)	0.10 (24)	0.13 (34)
	cfm	159	212	286	350	477	636	795	953	20-25	30	35-40
	l/s	21	28	38	46	62	83	104	125		dB (A)	

Sinus-C/T
Circular nozzle ceiling diffuser

Function
The Sinus-C ceiling diffuser is suitable for visible connection and can be connected throught a transition to the duct using the connection sleeve fitted with a rubber seal tested for air tightness. The side gap is adjustable between 0 and $^{7}/_{9}$" (0 and 20 mm) to enable increased air supply. The Sinus-C consists of a front plate with 2" (57 mm) nozzles and a sound-insulated plenum box and damper.

Max. temperature difference: ΔT=12 K.

Mounting
The Sinus C has to be connected directly onto a duct through a 4-12" transition with pop rivets or screws.

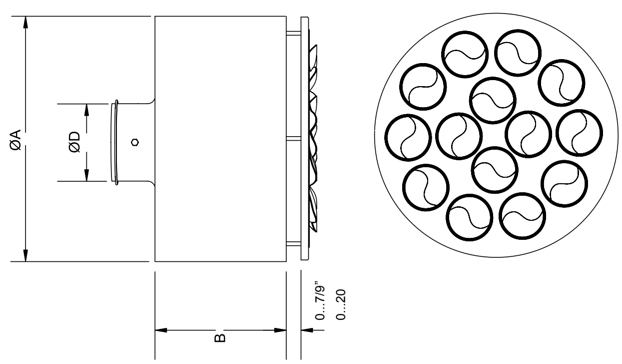
ACOUSTIC DATA
Sound attenuation, ΔL (dB)

	Mid-frequency band, Hz							
open gap	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Sinus-C/T-100	9	2	8	-1	-8	-11	-8	-8
Sinus-C/T-125	10	3	7	1	-7	-12	-11	-8
Sinus-C/T-160	9	5	8	3	-10	-18	-17	-12
Sinus-C/T-200	6	7	6	3	-11	-19	-14	-11
Sinus-C/T-250	7	10	5	3	-11	-19	-16	-12
Sinus-C/T-315	6	13	6	1	-11	-18	-16	-10
closed gap								
Sinus-C/T-100	5	4	10	-1	-11	-16	-12	-12
Sinus-C/T-125	9	6	8	1	-9	-15	-13	-10
Sinus-C/T-160	11	5	9	3	-10	-19	-18	-15
Sinus-C/T-200	6	10	7	3	-11	-20	-16	-14

DIMENSIONS

	øA	B	øD
Sinus-C/T-4	12 1/3 (314)	6 1/3 (170)	4 (99)
Sinus-C/T-5	15 3/4 (399)	7 7/8 (200)	5 8/9 (124)
Sinus-C/T-6	15 3/4 (399)	9 7/8 (250)	6 1/5 (159)
Sinus-C/T-8	23 1/2 (599)	11 1/4 (285)	7 7/9 (199)
Sinus-C/T-10	23 1/2 (599)	13 (330)	9 3/4 (249)
Sinus-C/T-12	31 1/2 (800)	16 1/2 (420)	12 1/2 (314)

Dimensions are in inches (mm)

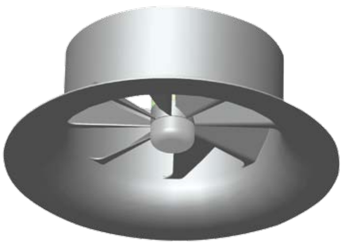


SPECIFICATION DATA

Size		Air flow range, cfm (l/s) and throw $l_{0,2}$ ft (m)								ΔP$_t$ - Pressure drop, in.wg (Pa)		
Sinus-C/T-4		3 (1)	3 (1)	6 (2)						0.04 (9)	0.13 (33)	0.22 (56)
Sinus-C/T-5			3 (1)	3 (1)	3 (1)					0.02 (5)	0.07 (17)	0.18 (45)
Sinus-C/T-6				3 (1)	3 (1)	6 (2)				0.01 (3)	0.06 (15)	0.11 (29)
Sinus-C/T-8						6 (2)	6 (2)			0.02 (5)	0.07 (18)	0.15 (38)
Sinus-C/T-10						6 (2)	6 (2)			0.05 (11)	0.10 (26)	
Sinus-C/T-12							6 (2)	10 (3)	10 (3)	0.04 (9)	0.08 (19)	0.12 (29)
	cfm	47	71	94	153	212	315	433	550	20-25	30	35-40
	l/s	22	33	44	72	100	149	204	260		dB (A)	

CRSP

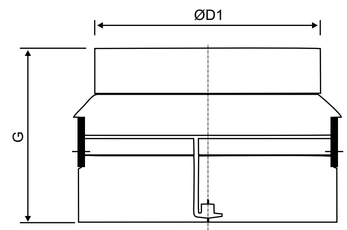
High capacity swirl diffuser with fixed deflectors



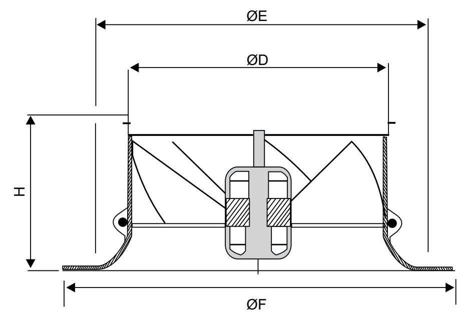
Description

The CRSP swirl diffuser is specifically constructed to achieve larger air volume capacities with high induction levels. The diffuser is manufactured from plastic and comes standard in white. The CRSP has as standard a central screw fixing system for a M6 or M8 mounting screw. The diffuser has fixed deflectors to make it an ideal setting for cooling and heating for ceiling installations of 9-11 feet (2.7- 3.5 meter) and above.

One-step reduction unit CRSP-RED (included) simplifies the duct connection.



CRSP-RED



CRSP

DIMENSIONS

	øD1	øE	øF	G	H
CRSP 4	4 (101)	$6^{1}/_{2}$ (165)	$7^{1}/_{2}$ (190)	6 (153)	$2^{1}/_{2}$ (65)
CRSP 5	5 (127)	$8^{8}/_{9}$ (225)	$9^{7}/_{8}$ (250)	$6^{1}/_{4}$ (159)	$3^{1}/_{3}$ (85)
CRSP 6	6 (152)	$10^{9}/_{11}$ (275)	$11^{7}/_{8}$ (300)	6 (151)	$4^{1}/_{8}$ (105)
CRSP 8	8 (203)	$13^{7}/_{9}$ (350)	$14^{15}/_{16}$ (380)	$6^{1}/_{2}$ (167)	$5^{1}/_{8}$ (130)
CRSP 10	10 (254)	$17^{3}/_{4}$ (450)	$18^{15}/_{16}$ (480)	$6^{15}/_{16}$ (176)	$6^{2}/_{3}$ (170)
CRSP 12	12 (305)	23 (585)	24 (610)	$7^{1}/_{2}$ (183)	$8^{1}/_{4}$ (210)
CRSP 16	16 (406)	$28^{15}/_{16}$ (735)	$29^{15}/_{16}$ (760)	n/a	$10^{1}/_{4}$ (260)

Dimensions are in inches (mm)

SPECIFICATION DATA

Size		Air flow range, cfm (l/s) and throw $l_{0,2}$ ft (m)													ΔP_t - Pressure drop, in.wg (Pa)		
CRSP 4		3 (1)	6 (2)	6 (2)											0.07 (19)	0.13 (33)	0.24 (61)
CRSP 5				6 (2)	6 (2)	6 (2)									0.09 (23)	0.16 (39)	0.23 (57)
CRSP 6							6 (2)	6 (2)	10 (3)						0.10 (25)	0.17 (42)	0.24 (60)
CRSP 8								10 (3)	10 (3)	13 (4)					0.09 (22)	0.16 (39)	0.24 (61)
CRSP 10									10 (3)	13 (4)	13 (4)				0.06 (16)	0.11 (27)	0.22 (56)
CRSP 12											13 (4)	15 (5)	20 (6)		0.06 (15)	0.16 (40)	0.28 (70)
CRSP 16												15 (5)	20 (6)	23 (7)	0.07 (17)	0.17 (42)	0.30 (75)
	cfm	127	160	233	297	360	466	572	763	954	1377	1910	2331	2755	20-25	30	35-40
	l/s	17	22	31	39	47	61	75	100	125	181	250	305	360	dB (A)		

Throw data above is based on an installation height of 10 ft (3m)

TSD

Circular swirl diffuser with adjustable blades

Function

TSD is designed for comfort ventilation of large buildings. It is suitable for heating and cooling due to its adjustable geometry construction. Installation height is between 13 and 49 feet (4 and 15 meters). The air stream pattern (horizontal, vertical and intermittent) can be adjusted manually or by a motor. The TSD consists of an inlet assembly containing the fixed blades and frontal conic outlet and an inner assembly with an adjustable set of deflectors which are mobile.
For cooling, a horizontal outlet air pattern is achieved when the blades are in the closed position. They have a vertical swirl jet stream when the deflectors are in the fully open position to achieve heating in the occupied zone. Intermittent positions can be achieved when the deflectors are set between the closed and fully open positions for ventilation of the occupied zone

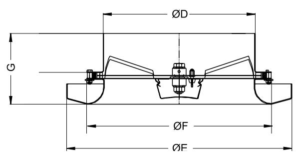
Design

The TSD swirl diffusers are manufactured of sheet steel, with a standard white (RAL 9010) powder paint finish.

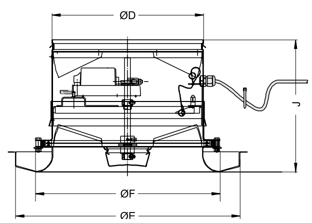
Mounting

TSD can be mounted through a transition (included) to a vertical duct, or mounted to the entry plenum and then fixed to the ceiling with threaded drop-rods.

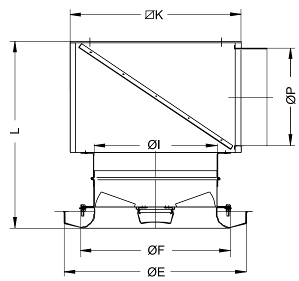
DIMENSIONS



TSD



TSD-M



TSD-PB

	øD	øE	øF	G	J	øI	K	L	øP
TSD 14	$12^{1}/_{2}$ (313)	$18^{1}/_{4}$ (464)	15 (381)	$5^{11}/_{16}$ (145)	$8^{7}/_{16}$ (215)	$12^{1}/_{2}$ (317)	$17^{1}/_{9}$ (435)	$18^{1}/_{3}$ (474)	$9^{3}/_{4}$ (248)
TSD 16	$15^{2}/_{3}$ (398)	$22^{1}/_{3}$ (567)	$18^{2}/_{5}$ (468)	$6^{2}/_{5}$ (157)	$9^{5}/_{16}$ (236)	$15^{7}/_{8}$ (402)	$17^{11}/_{14}$ (500)	$22^{7}/_{8}$ (581)	$12^{1}/_{3}$ (313)
TSD 24	$24^{3}/_{4}$ (628)	$34^{1}/_{3}$ (871)	$27^{9}/_{16}$ (700)	$8^{1}/_{9}$ (204)	$14^{7}/_{16}$ (367)	$24^{3}/_{4}$ (628)	$29^{1}/_{2}$ (750)	$31^{15}/_{16}$ (812)	$15^{2}/_{3}$ (398)
TSD 30	$31^{2}/_{5}$ (798)	$42^{2}/_{5}$ (1077)	$34^{1}/_{3}$ (871)	$9^{1}/_{9}$ (229)	$21^{3}/_{16}$ (538)	$31^{2}/_{5}$ (798)	$39^{3}/_{8}$ (1000)	$43^{9}/_{16}$ (1081)	$19^{2}/_{3}$ (498)

SPECIFICATION DATA

Cooling

		Air flow range, cfm (l/s) and throw $l_{0,2}$ ft (m)								ΔP_t - Pressure drop, in.wg (Pa)		
TSD 14		15 (5)	15 (5)	20 (6)						0 (2)	0.07 (18)	0.16 (41)
TSD 16				15 (5)	15 (5)	20 (6)				0.06 (16)	0.12 (29)	0.19 (47)
TSD 24						15 (5)	15 (5)	20 (6)		0.04 (11)	0.08 (19)	0.10 (25)
TSD 30							15 (5)	20 (6)	20 (6)	0.02 (6)	0.06 (14)	0.08 (19)
	cfm	118	235	353	471	589	736	1104	1471	20-25	30	35-40
	l/s	56	111	167	222	278	347	521	694		dB (A)	

Heating

		Air flow range, cfm (l/s) and throw $l_{0,2}$ ft (m)								ΔP_t - Pressure drop, in.wg (Pa)		
TSD 14		3 (1)	3 (1)	6 (2)						0 (2)	0.07 (18)	0.16 (41)
TSD 16				3 (1)	6 (2)	6 (2)				0.06 (16)	0.12 (29)	0.19 (47)
TSD 24						6 (2)	10 (3)	12 (4)		0.04 (11)	0.08 (19)	0.10 (25)
TSD 30							6 (2)	10 (3)	12 (4)	0.02 (6)	0.06 (14)	0.08 (19)
	cfm	118	235	353	471	589	736	1104	1471	20-25	30	35-40
	l/s	56	111	167	222	278	347	521	694		dB (A)	

IKD

Circular ceiling diffuser with dual adjustable cones

Function

IKD is suited for comfort ventilation of large industrial buildings. It is suitable for heating and cooling because of the adjustable construction. Installation height is between 13 and 49 feet (4 and 15 meters). The air stream pattern (horizontal or vertical) can be adjusted manually or by an actuator. The IKD consists of an inlet cone and an inner and outer cage with openings for supply air in the peripheral surface and the underside. Dependent of the operation method, the openings in the peripheral surface (cooling, horizontal air stream) or the underside (heating, vertical air stream) are opened. There is no difference in pressure drop or sound level when the operation method is changed.

Design

The IKD is made of powder coated steel (RAL 9010) and is available in duct connection sizes 8, 10, 12, 16 and 20 inches. The standard type has a perforated plate (flow straightener). The plenum box is from galvanized steel and includes a damper.

Mounting

The IKD can be mounted through a transition (included) in a spiro duct or combined with the plenum box.

Versions

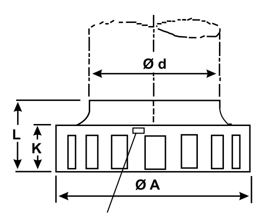
IKD – Standard version

M3 – Actuator 24V, 0-10V stepless control

DIMENSIONS

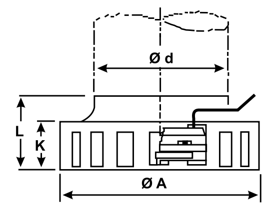
	øA	ød	L	K
IKD 8	$11^{7}/_{8}$ (302)	$7^{1}/_{16}$ (180)	$5^{2}/_{3}$ (144)	$3^{1}/_{9}$ (79)
IKD 10	$15^{7}/_{8}$ (402)	$9^{7}/_{8}$ (250)	7 (178)	$3^{7}/_{8}$ (98)
IKD 12	$19^{3}/_{4}$ (502)	$12^{2}/_{5}$ (315)	$7^{2}/_{3}$ (200)	$4^{3}/_{4}$ (120)
IKD 16	$23^{11}/_{16}$ (602)	$15^{3}/_{4}$ (400)	$8^{11}/_{16}$ (221)	$5^{5}/_{16}$ (136)
IKD 20	$31^{9}/_{16}$ (802)	$19^{11}/_{16}$ (500)	$12^{1}/_{5}$ (310)	$7^{1}/_{4}$ (185)

IKD Standard Version



Openings can be fixed with a screw on the peripheral surface.

IKD-M with Motor



For sizes 16-20 the motor is inside the diffuser, while for size 8-12 the motor is on the outside.

SPECIFICATION DATA

Cooling, Horizontal outlet -10K

		Air flow range, cfm (l/s) and throw $l_{0,2}$ ft (m)							ΔP_t - Pressure drop, in.wg (Pa)		
IKD 8		10 (3)	13 (4)	20 (6)					0.05 (14)	0.12 (29)	0.21 (52)
IKD 10			6 (2)	10 (3)	15 (5)				0.04 (10)	0.06 (15)	0.16 (40)
IKD 12				13 (4)	15 (5)	23 (7)			0.03 (8)	0.06 (14)	0.18 (44)
IKD 16					10 (3)	15 (5)	23 (7)		0.04 (10)	0.09 (22)	0.18 (45)
IKD 20						13 (4)	20 (6)	26 (8)	0.01 (2)	0.03 (8)	0.12 (30)
	cfm	118	182	235	383	647	912	1501	20-25	30	35-40
	l/s	56	86	111	181	306	431	708		dB (A)	

Heating, Vertical outlet at +15K

		Air flow range, cfm (l/s) and throw $l_{0,2}$ ft (m)							ΔP_t - Pressure drop, in.wg (Pa)		
IKD 8		6 (2)	10 (3)	13 (4)					0.05 (14)	0.12 (29)	0.21 (52)
IKD 10			6 (2)	10 (3)	15 (5)				0.04 (10)	0.06 (15)	0.16 (40)
IKD 12				6 (2)	10 (3)	15 (5)			0.03 (8)	0.06 (14)	0.18 (44)
IKD 16					6 (2)	13 (4)	20 (6)		0.04 (10)	0.09 (22)	0.18 (45)
IKD 20						6 (2)	10 (3)	15 (5)	0.01 (2)	0.03 (8)	0.12 (30)
	cfm	118	182	235	383	647	912	1501	20-25	30	35-40
	l/s	56	86	111	181	306	431	708		dB (A)	

JSR

Circular multi-cone jet diffuser with narrow concentric or wide cones for long or short air pattern

Function

The JSR is a circular multiple-cone diffuser for supplying air to large areas, which can be installed onto a PER plenum box or a duct. A scattered distribution pattern (short throw) or concentrated distribution pattern (long throw) can be set by rotating the diffuser 180°. This unit can be mounted on either the wall or the ceiling, and is suitable for both cooled and heated supply air. The angle of the diffuser can be set between 15 and 30° depending on the distribution pattern.

Design

The JSR is manufactured from sheet metal with a white powder-coated finish (RAL 9010-80) and is available in the following diameters: Ø8, Ø10, Ø12, Ø16 and Ø20.

Mounting

The diffuser can be mounted through a transition (included) onto a spiral duct and fixed with pop rivets. If the diffuser is fitted to a plenum box, there must be a straight length, 4 times the duct's diameter, in front of the plenum box.

ACOUSTIC DATA

The diagram shows airflow (l/s and cfm), total pressure (in.wg and Pa), throw $l_{0,2}$ and sound pressure level [dB(A)].

Sound attenuation, ΔL (dB)

	Mid-frequency band, Hz							
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
JSR-8	13	9	4	-	-	-	-	-
JSR-10	11	7	3	-	-	-	-	-
JSR-12	10	5	2	-	-	-	-	-
JSR-16	8	4	1	-	-	-	-	-
JSR-20	7	3	1	-	-	-		-

Sound power level, scattered distribution pattern, Lw

Lw(dB) = LpA + Kok (LpA = diagram Kok = table)

correction factor Kok

	Mid-frequency band, Hz						
	125	**250**	**500**	**1k**	**2k**	**4k**	**8k**
JSR-8	5	1	1	1	-5	-13	-19
JSR-10	5	2	0	0	-5	-12	-17
JSR-12	6	1	0	1	-6	-14	-18
JSR-16	6	2	1	0	-8	-13	-17
JSR-20	8	2	3	0	-9	-13	20

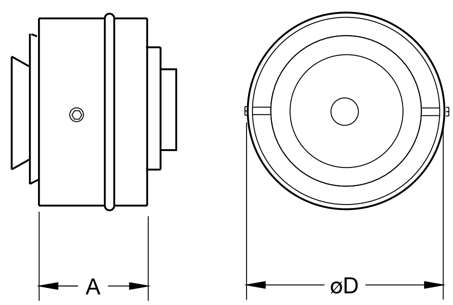
Sound power level, concentrated distribution pattern, Lw

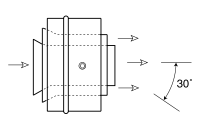
JSR-8	3	-1	-2	1	-4	-13	-18
JSR-10	2	-1	-3	2	-6	-16	-20
JSR-12	1	-2	-3	2	-8	-18	-21
JSR-16	2	-1	4	0	-9	-14	-18
JSR-20	5	0	4	0	-13	-18	-22
Tolerance	±6	±3	±2	±2	±3	±3	±4

DIMENSIONS

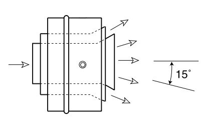
	A	øD
JSR 8	4 1/2 (115)	199
JSR 10	4 1/2 (115)	249
JSR 12	4 1/2 (115)	314
JSR 16	4 1/2 (115)	399
JSR 20	4 1/2 (115)	499

Dimensions are in inches (mm)





Concentrated distribution pattern (long throw)



Scattered distribution pattern (short throw)

SPECIFICATION DATA

Size		Air flow range, cfm (l/s) and throw $l_{0,2}$ ft (m)										ΔP$_t$ - Pressure drop, in.wg (Pa)		
JSR 8		20 (6)	29 (9)	39 (12)								0.06 (16)	0.14 (34)	0.21 (52)
JSR 10			23 (7)	33 (10)		43 (13)						0.05 (13)	0.15 (38)	0.24 (59)
JSR 12					20 (6)	26 (8)	43 (13)					0.05 (12)	0.10 (24)	0.20 (49)
JSR 16							23 (7)	29 (9)	36 (11)			0.06 (15)	0.11 (28)	0.16 (41)
JSR 20									20 (6)	26 (8)	36 (11)	0.05 (12)	0.09 (23)	0.14 (34)
	cfm	177	235	294	353	441	647	853	1059	1413	1766	20-25	30	35-40
	l/s	83	111	139	167	208	306	403	500	667	833		dB (A)	

AJD
Long throw adjustable nozzles

Function
The AJD nozzle has an extraordinarily good aesthetic design and can be painted by special order to fit any decorative need. The AJD nozzles provide long throws with a low noise level, releasing a long air jet with exceptional precision to a length of over 100 feet (30 m). 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 long throw nozzles are manufactured in aluminium, with a white (RAL 9010) powder paint finish. The duct connection is manufactured of galvanised sheet steel.

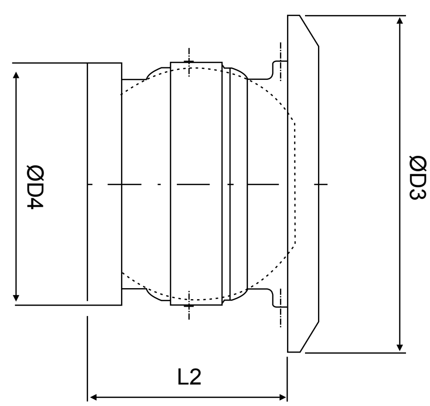
Mounting
The AJD can be mounted through a transition (included) with concealed screws.

Versions
IKD – Standard version
IKD-M3 – Actuator 24V,
0-10V stepless control

DIMENSIONS

	øD3	øD4	L2
AJD 4	$5^{7}/_{16}$ (138)	$3^{7}/_{8}$ (98)	3 (78)
AJD 5	$6^{2}/_{3}$ (168)	$4^{7}/_{8}$ (123)	$3^{1}/_{3}$ (86)
AJD 6	$7^{7}/_{8}$ (200)	$6^{1}/_{5}$ (158)	$3^{7}/_{8}$ (98)
AJD 8	$10^{1}/_{9}$ (257)	$7^{7}/_{9}$ (198)	$4^{2}/_{3}$ (117)
AJD 10	$11^{7}/_{8}$ (302)	$9^{3}/_{4}$ (248)	$6^{1}/_{9}$ (155)
AJD 12	$15^{1}/_{9}$ (384)	$12^{2}/_{5}$ (313)	$7^{1}/_{2}$ (183)
AJD 16	$18^{1}/_{3}$ (467)	$15^{2}/_{3}$ (398)	$8^{1}/_{2}$ (208)

Dimensions are in inches (mm)



SPECIFICATION DATA

Size												ΔP_t - Pressure drop, in.wg (Pa)		
AJD 4		108 (33)										0.23 (57)	0.42 (105)	0.62 (155)
AJD 5		78 (24)	131 (40)									0.27 (68)	0.46 (115)	0.69 (171)
AJD 6			82 (25)	154 (47)								0.18 (46)	0.28 (70)	0.57 (142)
AJD 8				121 (37)	157 (48)	184 (56)						0.23 (57)	0.38 (96)	0.59 (146)
AJD 10					121 (37)	194 (59)		246 (75)				0.15 (37)	0.35 (87)	0.53 (133)
AJD 12							138 (42)	167 (51)	256 (78)			0.15 (37)	0.21 (52)	0.46 (114)
AJD 16									200 (61)	253 (77)	312 (95)	0.14 (36)	0.22 (55)	0.34 (86)
	cfm	74	121	180	238	297	371	459	680	871	1062	20-25	30	35-40
	l/s	35	57	85	112	140	175	217	321	411	501		dB (A)	

IR / IR-F

Iris damper for measuring and adjusting airflow

Function

The IR is an iris damper for measuring and adjusting air flow. The IR has the following specifications: low noise level, centrically formed air flow and fixed test points for precise measurements. The IR-F models are iris dampers fitted with a motor designed for controlling the air flow using two predetermined settings. The minimum and maximum air flow settings are adjusted with the help of a measuring nipple, and are fixed mechanically with damper stops. The IR-F models have a low sound level and produce a centrically patterned airflow. They are ideal for use as adjustable, motorized dampers.

The damper also has an adjustment aperture which can be opened completely, which means there is no need for an access door for cleaning. Available in sizes Ø4"-25".
Max temperature for IR is 158°F (70°C).

Design

The damper is manufactured from galvanised sheet steel and is fitted with a rubber seal tested for air-tightness. The IR-F iris damper consists of an IR device with an actuator for forced air flow. It is manufactured from galvanised sheet steel, and equipped with test points for easy setup. Units are fitted with Belimo actuators, type LM24A-SR, with a 0-10V modulating control signal.

Mounting

The IR or IR-F adjustment dampers must be installed in accordance with the distances required to minimise air flow deviation. The IR 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).

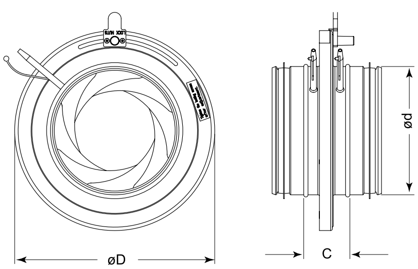
Protective distance

before bends	1 X ØD
afterbends	1 X ØD
before T-pipes	3 X ØD
after T-pipes	1 X ØD
before supply-air devices	3 X ØD

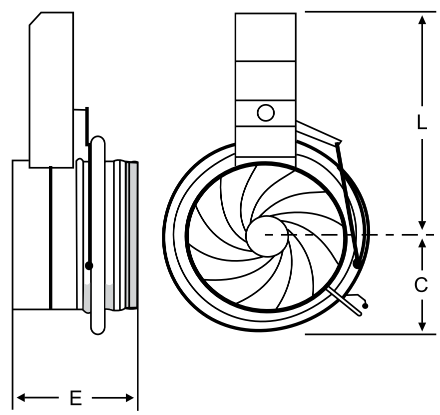
Selection

Visit our online Catalogue at **www.systemair.net** to select an iris damper which fits your needs.

DIMENSIONS



	ød	øD	C
IR4	4 (99)	$6^1/_2$ (163)	$2^1/_4$ (54)
IR5	5 (124)	$8^1/_4$ (210)	$2^1/_2$ (53)
IR6	6 (159)	9 (230)	2 (54)
IR8	8 (199)	$11^1/_4$ (285)	$2^1/_4$ (62)
IR10	10 (249)	13 (333)	$2^1/_4$ (62)
IR12	12 (299)	16 (405)	$2^3/_8$ (65)
IR16	16 (399)	22 (560)	$3^1/_4$ (70)
IR20	$19^3/_4$ (499)	$25^3/_8$ (644)	$2^3/_8$ (60)
IR25	$24^3/_4$ (629)	32 (811)	$2^3/_8$ (60)



	C	L	E
IR4-F	$3^1/_4$ (82)	$8^1/_2$ (215)	$7^1/_4$ (185)
IR5-F	$4^1/_5$ (106)	$9^1/_4$ (235)	$7^2/_3$ (195)
IR6-F	$4^9/_{16}$ (116)	$10^7/_{16}$ (265)	$7^7/_8$ (200)
IR8-F	$5^2/_3$ (143)	$11^1/_4$ (285)	$8^1/_4$ (210)
IR10-F	$6^9/_{16}$ (167)	$14^1/_3$ (365)	$8^1/_4$ (210)
IR12-F	8 (203)	16 (408)	$8^1/_4$ (210)

RPK-R

Constant volume damper with adjustable air flow

Description

RPK is a constant air flow regulator which is used for exact mechanical adjustment of required air volume in ventilation systems without any electrical requirements.

RPK is characterized by:

- regulation accuracy
- easy mounting
- maintenance-free
- tight connection with the duct

Function

The RPK enables regulation of individually required amounts of air in separate ventilation system zones.
RPK works from -4 to 176°F (-20 to 80°C) and relative humidity up to 80%.
Recommended air flow velocity is from 580 to 1570 ft/min (3 to 8 m/s) a pressure differential of Δp=2 in.wg (500 Pa). Accuracy is ±5 %(±10% for outer settings).

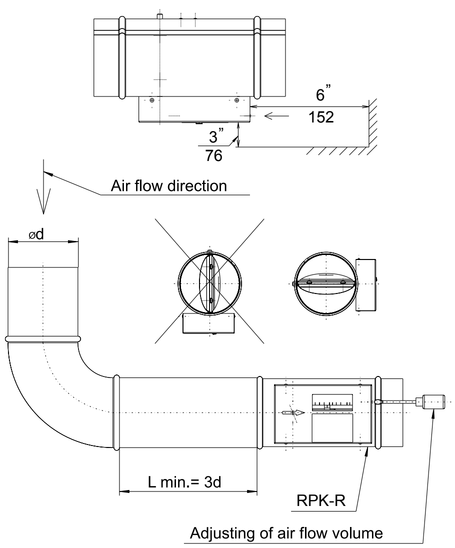
Design

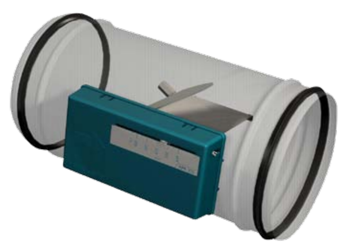
The RPK is manufactured from galvanized sheet metal, with an aluminum blade. All steel parts are zinc plated and the spring is made from high quality steel. The sliding bearing is suitable for high temperatures and doesn´t require any lubrication. The cover of the adjusting mechanism is made from ABS plastic and the functional parts are from PA plastic.

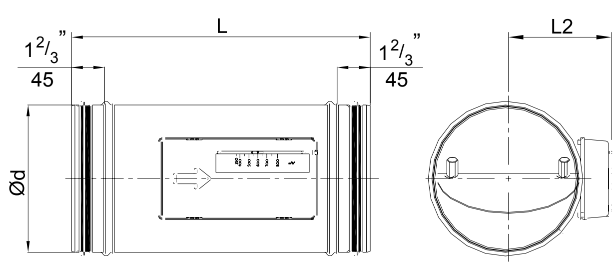
Mounting

The regulator can be mounted to horizontal, diagonal or vertical ducts. The blade must always be horizontal. It is necessary to pay attention to the mounting orientation, so that the air is entering the regulator according to the arrow direction located on the regulator casing. Connecting the duct and the regulator is done according to its size with rivets of the same diameter and the connection is sealed with sealing tape. After mounting, set the required air volume by turning the working screw on the controller box.

MOUNTING







SPECIFICATION DATA

	V, ft/min (m/s)	q, cfm (l/s)	ød, “ (mm)	L, “ (mm)	L2, “ (mm)	L3, “ (mm)	M, lbs (kg)
RPK-R 4	725-1475 (3,7-7,5)	59 (28) - 118 (56)	$3^{7}/_{8}$ (97)	$13^{3}/_{4}$ (350)	$3^{1}/_{3}$ (86)	$5^{5}/_{6}$ (136)	2.2 (1)
RPK-R 5	630-1400 (3,2-7,1)	74 (35) - 177 (83)	$4^{3}/_{8}$ (122)	$14^{3}/_{16}$ (360)	4 (100)	$5^{7}/_{8}$ (148)	2.6 (1.2)
RPK-R 6	845-1750 (4,3-8,9)	177 (83) - 365 (172)	$6^{1}/_{5}$ (157)	$14^{15}/_{16}$ (380)	$4^{2}/_{3}$ (117)	$6^{1}/_{2}$ (166)	3.5 (1.6)
RPK-R 8	630-1435 (3,2-7,3)	206 (97) - 471 (222)	$7^{3}/_{4}$ (197)	$15^{3}/_{4}$ (400)	$5^{7}/_{16}$ (138)	$7^{1}/_{3}$ (186)	4.6 (2.1)
RPK-R 10	750-1475 (3,8-7,5)	383 (181) - 765 (361)	$9^{3}/_{4}$ (247)	$16^{3}/_{4}$ (425)	$6^{7}/_{16}$ (164)	$8^{1}/_{5}$ (208)	7.3 (3.3)
RPK-R 12	610-1260 (3,1-6,4)	500 (236) - 1030 (486)	$12^{1}/_{4}$ (312)	$19^{15}/_{16}$ (500)	$7^{3}/_{4}$ (196)	$9^{9}/_{16}$ (243)	11 (5)

Optima R

Circular variable air volume damper

Function

This VAV terminal unit is commonly used for return air applications or for supply applications at low system pressures. Terminal units are ideal for single zone control with supply and return in Master and Slave setup such as offices, hotel rooms or meeting rooms where the required cooling and heating load will vary on demand.

Design

VAV unit housing constructed of galvanized sheet steel, large surface pleated for extra stiffness.

Special design of differential cross velocity pressure sensor assures accurate air flow readings even in difficult installations. Button punch snap lock seams, lock form with airtight nylon bearings assure low casing leakage.

Controls

The standard VAV terminal units are equipped with a Belimo compact controller that does not include MP or any capability to be used as stand alone or in Master and Slave setting.

The compact controllers which are supplied with MP-Bus communication capability, can be connected later in time to building management systems to create a zone control by creating bus-rings solutions.

The compact controllers are equally available with MP-Bus and LON communication capability on demand.

Compact controllers are factory calibrated prior to dispatch.

Mounting

The diffuser can be mounted through a transition (included) onto a spiral duct.

DIMENSIONS

	øD	L
Optima R4	4 (99)	$15^3/_4$ (400)
Optima R5	5 (124)	$31^1/_2$ (800)
Optima R6	6 (159)	$31^1/_2$ (800)
Optima R8	8 (199)	$31^1/_2$ (800)
Optima R10	10 (249)	$31^1/_2$ (800)
Optima R12	12 (299)	$39^1/_3$ (1000)
Optima R16	16 (399)	$39^1/_3$ (1000)
Optima R20	$19^3/_4$ (499)	$39^1/_3$ (1000)
Optima R24	$24^3/_4$ (629)	$39^1/_3$ (1000)

Dimensions are in inches (mm)

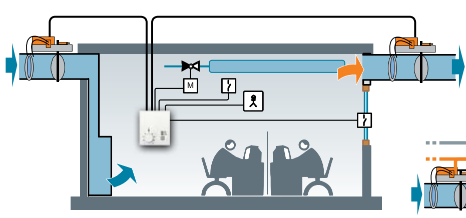
VAV-COMPACT SOLUTIONS

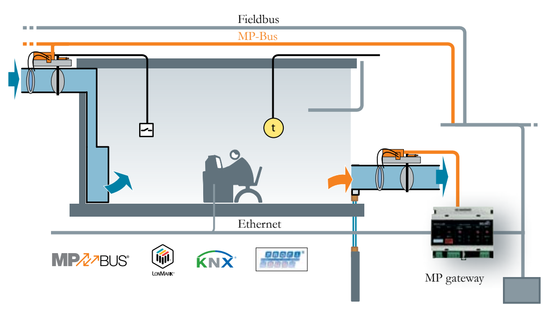
Individual room comfort

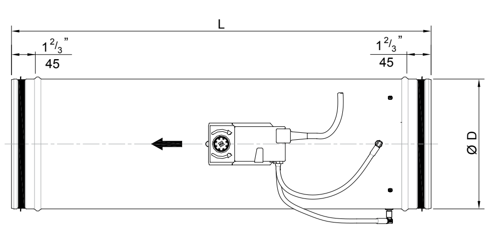
- Wide range of potential applications
- Adjustable to each application
- Demand-based single-room application
- Operation with Fan Optimiser

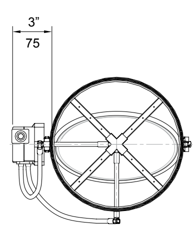
Intelligent simplicity with bus connection

- System connection to DDC controller with MP interface via MP-Bus®
- Integration with higher-level systems such as LonWorks®, Ethernet TCP/IP, Profibus DP, etc. via MP gateway
- Maximum flexibility in new and renovated buildings









Luftrichtung / air direction
BELIMO
SF230A
Vor Öffnen des Gehäuses Hauptschalter abstellen!
MOTOR 2
MOTOR 1
Luftrichtung / air direction
BELIMO
SF230A


HENSEL
PROMATECT LS

LD

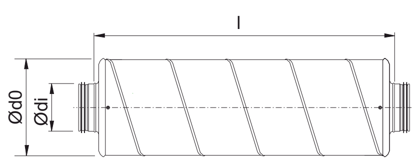
Silencer for circular ducts

Easily-fitted silencer for circular ducts,fitted with a connection which is compatible with a standard spiral duct. The LD effectively reduces noise in the duct. Two silencers can be used together in installations where noise reduction is critical. For the most effective noise reduction, the silencer should be fitted immediately behind a fan or bend. 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. Insulation thickness 2" (50 mm).

DIMENSIONS

	ød1	ød0	l	lbs
LD 6	6	$10^{1}/_{4}$	$23^{5}/_{8}$	12
LD 8	8	$12^{1}/_{2}$	$23^{5}/_{8}$	15
LD 10	10	14	$35^{1}/_{2}$	26
LD 12	12	$17^{3}/_{4}$	$35^{1}/_{2}$	36
LD 16	16	25	$35^{1}/_{2}$	54

Dimensions are in inches



SOUND POWER LEVEL, L_W (dB)

	63	125	250	500	1k	2k	4k	8k
LD 6	-	3	7	20	27	31	16	11
LD 8	2	3	7	16	21	23	9	8
LD 10	3	4	8	20	26	23	10	8
LD 12	1	3	7	16	22	12	6	7
LD 16	1	3	6	13	18	10	6	7

LDR

Silencer for rectangular ducts

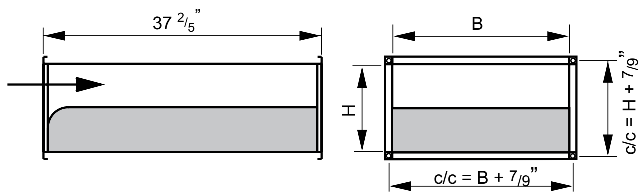
This easily-fitted silencer can be installed immediately before Topvex TR air handling units. Effectively suppresses noise transmitted through the duct. The silencer should be used together with an insulated fan where there is a requirement for noise suppression both in the duct and in the surroundings as a whole. All silencers are supplied with a universal flange suitable for PG flange $^{7}/_{9}$" (20 mm).

NB! Ensure that the LDR silencer is mounted in the correct position. Failure to do so will result in air starvation and a high pressure drop.

DIMENSIONS

	Front area sq. inch
LDR 20-10	200

Dimensions are in inches



RSK

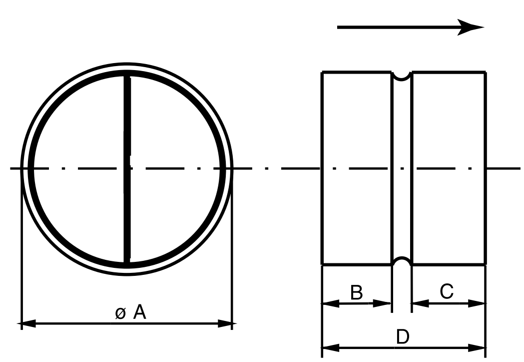
Backdraft damper

Backdraft damper for circular ducts, manufactured from galvanised sheet steel. The two blades are spring-loaded. The damper can also be mounted vertically.

DIMENSIONS

	øA	D
RSK 6	6	$3^{1}/_{8}$
RSK 8	8	$3^{1}/_{8}$
RSK 10	10	3
RSK 12	12	3

Dimensions are in inches



EFD

Circular shut-off damper

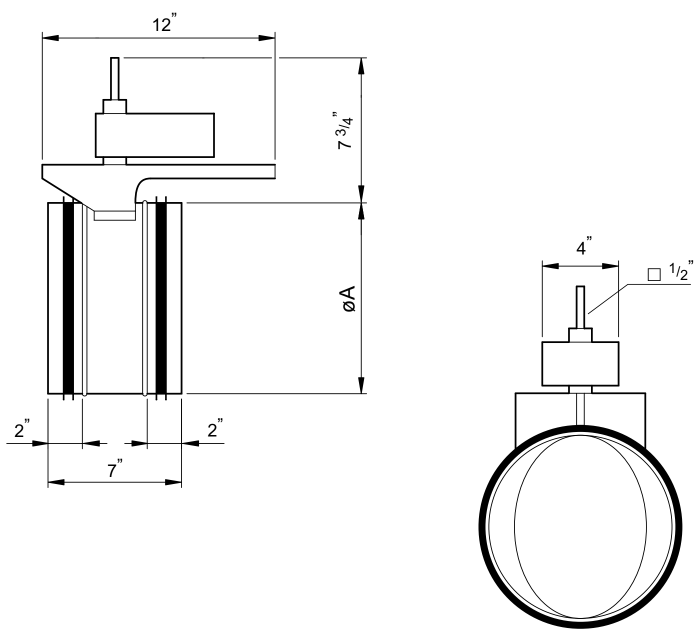
The EFD shutter damper is a shut-off damper. The damper is equipped with 24 V motors with spring-return actuators. The EFD conforms to leakage less than 1% of the local design airflow rate at the local maximum static pressure. The outdoor/exhaust air damper prevents the hot water coil from freezing.

The EFD consists of a tubular housing equipped with a damper blade pivoting on an axle. The connection ends are equipped with silicon rubber sealing rings. The damper is made from hot-dip galvanised sheet steel. The EFD shut-off damper is prepared for external insulation and has arrows showing the damper blade position.

DIMENSIONS

	øA
EFD 12	12
EFD 16	16

Dimensions are in inches



EFD

Shut-off damper for rectangular ducts

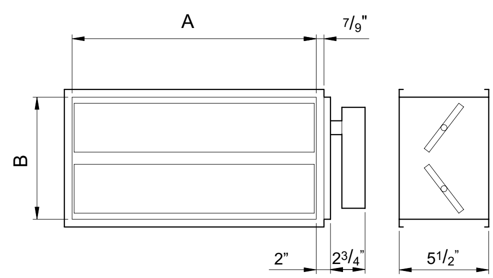
EFD is a shut-off damper. The damper is provided with 24 V motors with spring-return actuators.The EFD conforms to leakage less than 1% of the local design airflow rate at the local maximum static pressure. The outdoor/exhaust air damper prevents the hot water coil from freezing and also prevents the cold air from cooling down the building if the unit stops.

The EFD multi-leaf damper comprises a number of opposed blades, swivelling on nylon bearings in a sheet metal framework. The blades are connected via a system of linkages (protected) on the outside of the frame.

DIMENSIONS

	A	B
EFD 20-10	20	10

Dimensions are in inches



ASC*

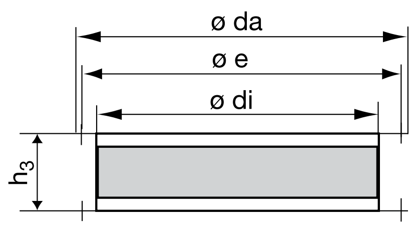
Flexible connection

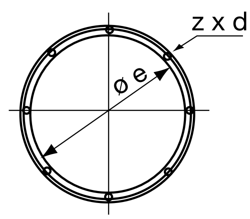
Manufactured from galvanised sheet steel, with neoprene coated fabric. Rated for temperatures up to 158F (70°C). Suitable for use with DVC roof fan. A length h_3 is 5" (125 mm).

DIMENSIONS

	ø da	ø e	ø di	zxd
ASC 10	$9^{1}/_{4}$	$8^{1}/_{3}$	$7^{1}/_{5}$	6xø7
ASC 14	12	$11^{1}/_{5}$	10	6xø7
ASC 18-22	$18^{1}/_{4}$	$17^{1}/_{4}$	$15^{11}/_{13}$	6xø9
ASC 28-30	$25^{1}/_{8}$	$23^{4}/_{5}$	$22^{2}/_{5}$	8xø9

Dimensions are in inches



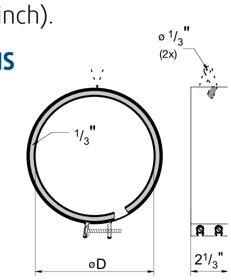


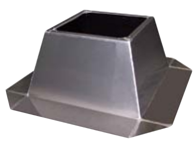
FC

Fast clamps

Mounting clips which facilitate the installation and removal of fans for service and cleaning. Made from galvanised sheet steel and fitted with an $^{1}/_{3}$" (8 mm) 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 (6, 8, 10, 12, 16, 20 and 24 inch).

DIMENSIONS





FDS

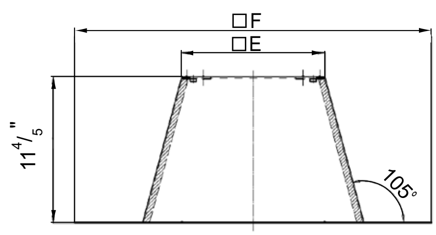
Flat roof socket

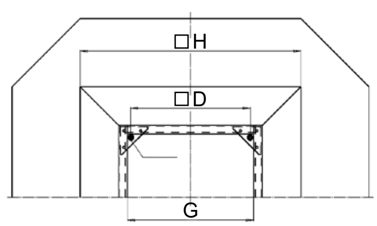
FDS is manufactured from corrosion-resistant aluminum and is supplied ready for assembly with insulation rated for temperatures up to 212F (100°C). Suitable for use with DVC roof fans. Supplied with washers and screws.

DIMENSIONS

FDS	D	E	F	G	H
10	$9^{2}/_{3}$	$11^{1}/_{2}$	$28^{3}/_{4}$	$10^{3}/_{16}$	$17^{3}/_{4}$
14	$17^{3}/_{4}$	$18^{4}/_{5}$	$35^{1}/_{3}$	$16^{15}/_{16}$	$25^{1}/_{9}$
18	$17^{3}/_{4}$	$21^{7}/_{8}$	$38^{3}/_{7}$	$19^{8}/_{9}$	28
22	21	$24^{3}/_{5}$	$39^{1}/_{4}$	$22^{1}/_{4}$	$30^{4}/_{5}$
30	$29^{1}/_{2}$	$35^{1}/_{5}$	$45^{3}/_{16}$	$32^{8}/_{9}$	$35^{1}/_{5}$

Dimensions are in inches





DS*

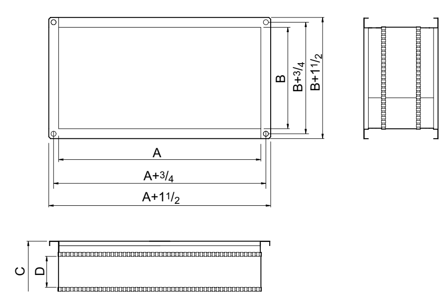
Rectangular flexible connections

Suitable for use with Topvex TR06-15. Flange width 1" (25 mm)

DIMENSIONS

	A	B	C	D
DS 20-10	20	10	$4^{3}/_{4}$	$2^{1}/_{3}$
DS 28-12	28	12	$4^{3}/_{4}$	$2^{1}/_{3}$
DS 32-14	32	14	$4^{3}/_{4}$	$2^{1}/_{3}$
DS 40-14	40	14	$4^{3}/_{4}$	$2^{1}/_{3}$

Dimensions are in inches



* Contact your local Systemair representative for availability

BFT FR / BFT TR

Bag filter for Topvex FR/TR

The Topvex FR/TR units are delivered with bag filters as standard. Both of the filters are placed before the heat exchanger, to keep the exchanger clean. The filters are mounted in guide rails that facilitate insertion and removal for inspection and service. Topvex are fitted with sealing strips to provide optimal sealing around the filters. Filter class MERV13 on supply air and MERV9 on extract air are used as standard. Filter monitoring is done via the built-in timer (Standard controller) or via built in pressure transmitters measuring the pressure drop across the filters.

Pleated filter ERV

The ERV Roof Top units are delivered with pleated filters as standard. Both of the filters are placed before the heat exchanger, to keep the exchanger clean. Filter class MERV11 on supply air and MERV7 on extract air are used as standard.

E-Bacnet-V

Converter

E-Bacnet-V is a pre-configured converter used to connect a Corrigo E running the ventilation application to a SCADA system.

SPECIFICATION DATA

Voltage supply	V/DC	12...48
Power consumption	W	4,5
Weight	lbs (kg)	0,42 (0,19)

TG-R5/PT1000

Temperature sensor for room installation

SPECIFICATION DATA

Ambient temperature	F (°C)	32..122 (0..50)
Enclosure class	IP	30

TG-UH/PT1000

Temperature sensor for outdoor installation

SPECIFICATION DATA

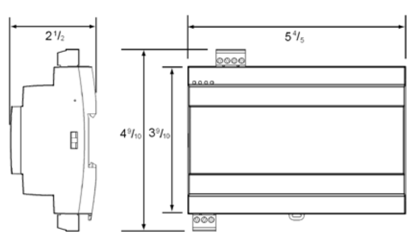
Ambient temperature	F (°C)	-40..122 (-40..60)
Enclosure class	IP	65

E0-R

Repeater

Repeater E0-R is used when there are long distances between the Topvex FR or Topvex TR units and the SCP control panel. The E0-R can be used when the distance between the AHU and the SCP control panel is more than 33 ft (10 m) between the AHU and the SCP control panel. The repeater makes it possible to use a cable length up to 4000 ft (1200 m). The E0-R model should be mounted in a cabinet. Protection class IP20 and is powered by 24 VAC.

DIMENSIONS



MTP 10

Potentiometer

Potentiometer 10kΩ for speed controlling MUB, DVC and K EC fans.

For the manual control of speed and air flow of electrical fans with 0-10V output. The jetproof IP 54 enclosure is achieved with the included surface mounting case.

SPECIFICATION DATA

Voltage supply	V	10, DC
Control signal	kOhm	0...10
Rangeability	V	0...10
Contact		1 NO
Switching capacity	A / V	4 / 250
Enclosure class	IP	44
Weight	lbs (kg)	0.44 (0.2)

Timer Tork

Digital time switch

An electronic day/week timer with an automatic summer/winter time setting.

SPECIFICATION DATA

Voltage supply	V	120...277
Frequency	Hz	50/60
Power consumption	VA	6 max
Working temperature	F (°C)	- 40 ..+149 (- 40...+60)
Relatuve humidity	% RH	0...90

CO2RT

CO_2 Sensor

CO2RT is a room sensor for measuring carbondioxide, CO2 concentration in indoor environments. Measuring range 0...2000ppm. Output signal 0...10 V for the full measuring range.

SPECIFICATION DATA

Voltage supply	V	24
Frequency	Hz	50/60
Power consumption	W	3 max
Working temperature	F (°C)	- 40 ..+149 (- 40...+60)
Enclosure class	IP	30
Relatuve humidity	% RH	0...90

IR24-P

Presence detector

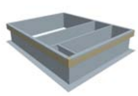
A detector that gives a signal when someone is present in the room under supervision. The detector has a pulse detecting function that minimizes the risk for false alarm. Settable output on/off delay. Intended for wall or ceiling mounting.

IR24-P is a presence detector designed for automatic ventilation control of HVAC systems.

SPECIFICATION DATA

Voltage supply	V	24
Frequency	Hz	50/60
Circuit-breaking relay		NC/NO
Switching capacity	V / A	24 / 0,2
Working temperature	F (°C)	- 4 ..+122 (- 20...+50)
Enclosure class	IP	40
Relatuve humidity	% RH	0...95

Roof curb



The roof curb makes it easy to install the ERV EC-RT Roof top units on the site, and also function as a silencer. Manufactured from galvanised sheet steel and insulated with a 2" (50 mm) rockwool sheet.

Pre-heater Topvex FR

The pre-heater is an option and can be ordered as an accessory, to be installed outside the FR unit. For proper operation, the correct indoor conditions must also be met. The common ambient indoor temperature for the winter season is 22°C with 30-40% RH.

Operating outside of that range may result in condensation of the casing and a considerable reduction in airflow.

SPECIFICATION DATA

Pre-heater FR800

Voltage supply	V	208
Power consumption	W	4500
Current	A	7.2
Weight	lbs (kg)	37 (17)

Pre-heater FR1600

Voltage supply	V	208
Power consumption	W	9000
Current	A	16
Weight	lbs (kg)	51 (23)

RVAZ4 24A

Valve motor

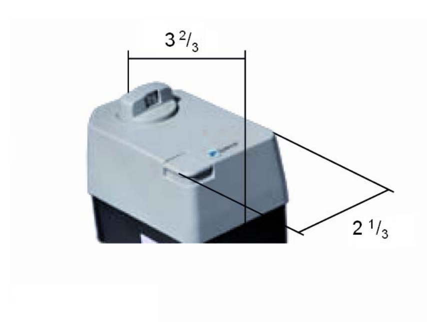
RVAZ4 24A is a valve actuator controlled by a 0...10V signal. It requires a 24 VAC supply voltage. Suitable for controlling ZTV/ZTR valves.

This product conforms with the EMC requirements of European harmonised standards EN60730-1:2000 and EN60730-2-8:2002 and carries the CE mark.

SPECIFICATION DATA

Voltage supply	V	24 V AC +/- 15%
Power consumption	W	max 6
Frequency	Hz	50/60
Maximum stroke	inch (mm)	$^{1}/_{5}$" 5.5
Full stroke time	sec	121
Stem force	Nm	400
Max. ambient humidity	%RH	95
Ambient temperature	°F (°C)	32..122 (0...50)
Enclosure class	IP	44

DIMENSIONS



ZTV/ZTR

Water valve/ heating water, 2/3-way

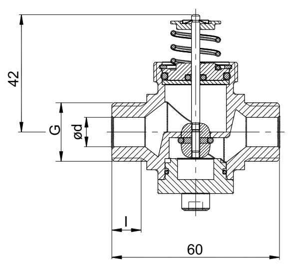
ZTV/ZTR is a 2 and 3-way control valve to control the flow of water to the heating coil. They are intended for use together with the RVAZ4 24A actuator.

SPECIFICATION DATA

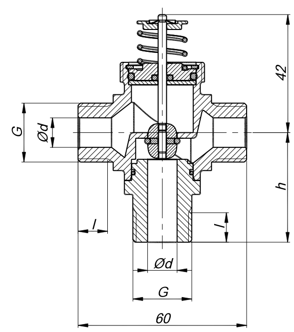
Flow charac.		Percental increase
Media temp.	°F (°C)	34...230 (1...110)
Media		Hot, cold, glycol mixed (max. 30% glycol)
Max. stroke	inch (mm)	$^{1}/_{5}$″ 5.5
Leakage		0% in closed position
Pressure class		PN16 (1.6MPa)
Rangeability		50:1
Mat	Body	Brass
	Spindle	Stainless steel
	Seat	Brass
O-ring		EPDM

DIMENSIONS

ZTV



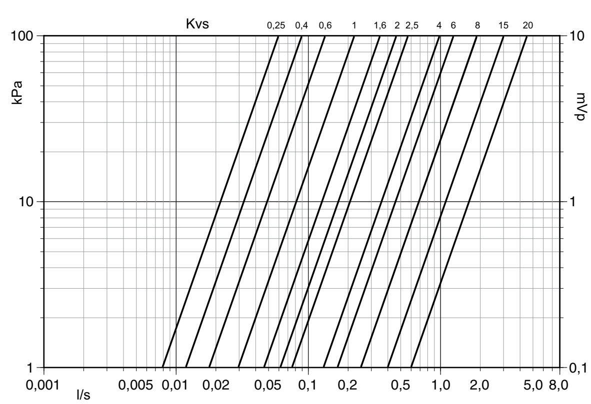
ZTR



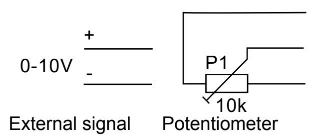
	Connection	G	l	h
ZTV/ZTR 15-0.25	DN15	$^{1}/_{2}$″	9	40
ZTV/ZTR 15-0.4	DN15	$^{1}/_{2}$″	9	40
ZTV/ZTR 15-0.6	DN15	$^{1}/_{2}$″	9	40
ZTV/ZTR 15-1.0	DN15	$^{1}/_{2}$″	9	40
ZTV/ZTR 15-1.6	DN15	$^{1}/_{2}$″	9	40
ZTV/ZTR 20-2.0	DN20	$^{3}/_{4}$″	12,5	40
ZTV/ZTR 20-2.5	DN20	$^{3}/_{4}$″	12,5	40
ZTV/ZTR 20-4.0	DN20	$^{3}/_{4}$″	11,5	50
ZTV/ZTR 20-6.0	DN20	$^{3}/_{4}$″	11,5	50
ZTV/ZTRB 25-8	DN25	1″	-	65
ZTV/ZTRB 25-15	DN32	1 $^{1}/_{4}$″	-	66
ZTV/ZTRB 25-20	DN40	1 $^{1}/_{4}$″	-	68

Dimensions are in inches (G) and in mm (l and h)

PRESSURE DROP

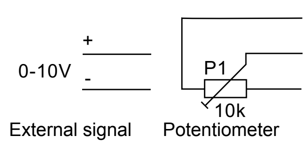


1



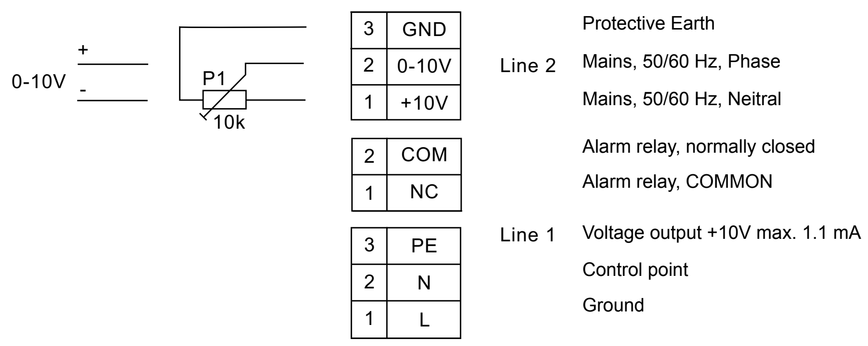
Cl. 3 / class 3	12	RS A	Interface RS485 for ebmBUS
	11	RS B	Interface RS485 for ebmBUS
	10	RS A	Interface RS485 for ebmBUS
	9	RS B	Interface RS485 for ebmBUS
	8	GND	Ground
	7	0-10V	Control-/Actual value inlet
	6	4-20mA	Control-/Actual value inlet
	5	+20V	Supply ext. sensor 50mA
	4	+10V	Supply ext. potentiometer 10mA
	3	0-10V	Control/Actual value inlet
	2	GND	Ground
	1	OUT	Master exit 0-10V max 3mA
Cl. 2 / class 2	3	NO	Error signal relay, COMMON (2A, 250 VAC)
	2	COM	Error signal relay, closes in case of fire
	1	NC	Mains, 50/60 Hz, Phase
Cl. 1 / class 1	3	L1	Mains, 50/60 Hz, Neitral
	2	N	Protective Earth
	1	PE	

2

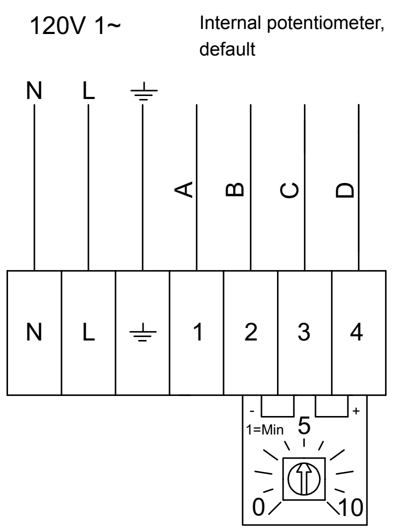


Cl. 3 / class 3	12	RS A	Interface RS485 for ebmBUS
	11	RS B	Interface RS485 for ebmBUS
	10	RS A	Interface RS485 for ebmBUS
	9	RS B	Interface RS485 for ebmBUS
	8	GND	Ground
	7	0-10V	Control-/Actual value inlet
	6	4-20mA	Control-/Actual value inlet
	5	+20V	Supply ext. sensor 50mA
	4	+10V	Supply ext. potentiometer 10mA
	3	0-10V	Control/Actual value inlet
	2	GND	Ground
	1	OUT	Master exit 0-10V max 3mA
Cl. 2 / class 2	3	NO	Error signal relay, closes in case of fire
	2	COM	Error signal relay, COMMON (2A, 250 VAC)
	1	NC	Error signal relay, error signal relay, closes in case of fire
Cl. 1 / class 1	3	L1	Mains, 50/60 Hz, L1
	2	L2	Mains, 50/60 Hz, L2
	1	L3	Mains, 50/60 Hz, L3
		PE	Protective Earth

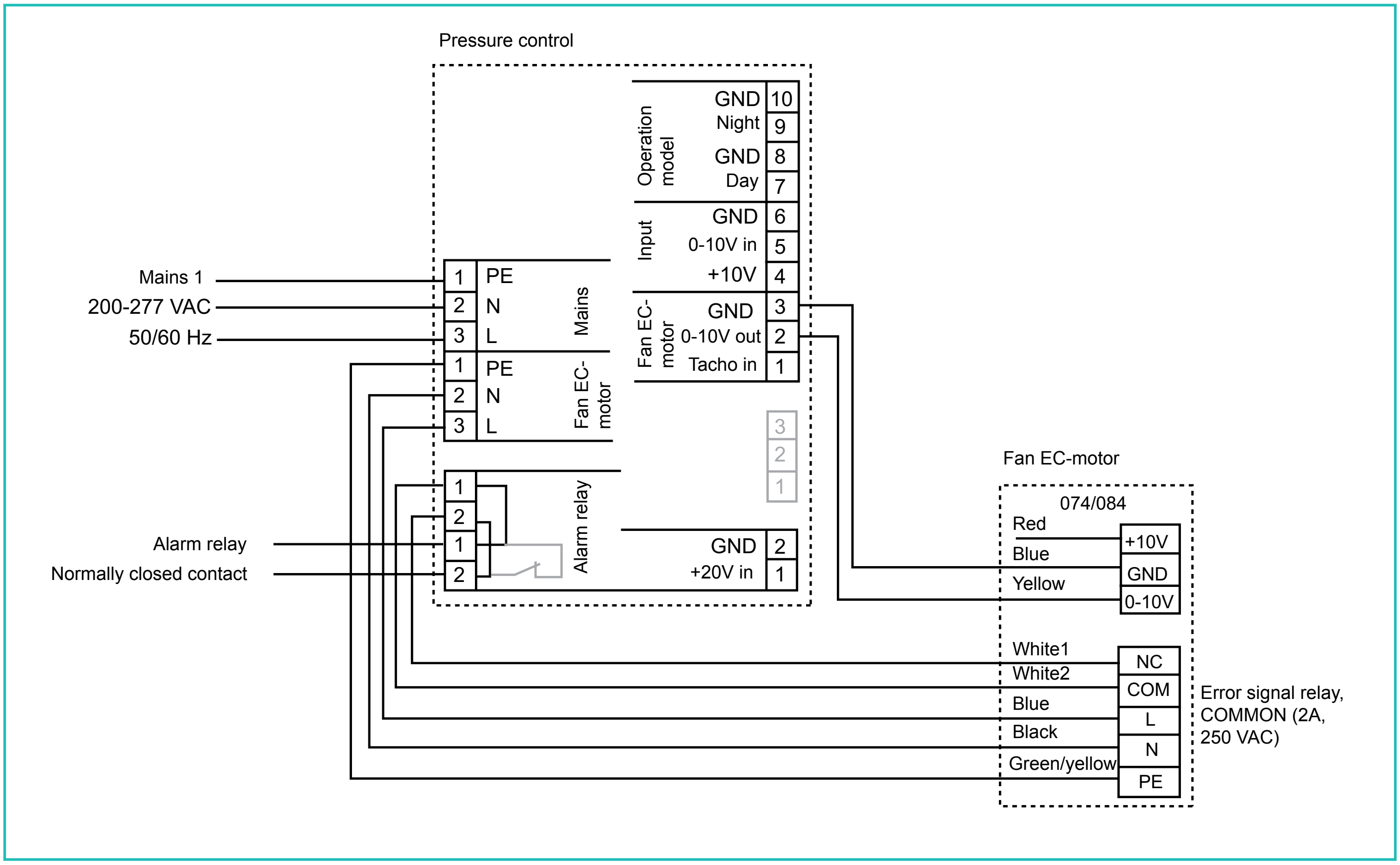
3


0-10V
+
-
P1
10k
3 GND
2 0-10V
1 +10V
2 COM
1 NC
3 PE
2 N
1 L
Line 2
Line 1
Protective Earth
Mains, 50/60 Hz, Phase
Mains, 50/60 Hz, Neitral
Alarm relay, normally closed
Alarm relay, COMMON
Voltage output +10V max. 1.1 mA
Control point
Ground

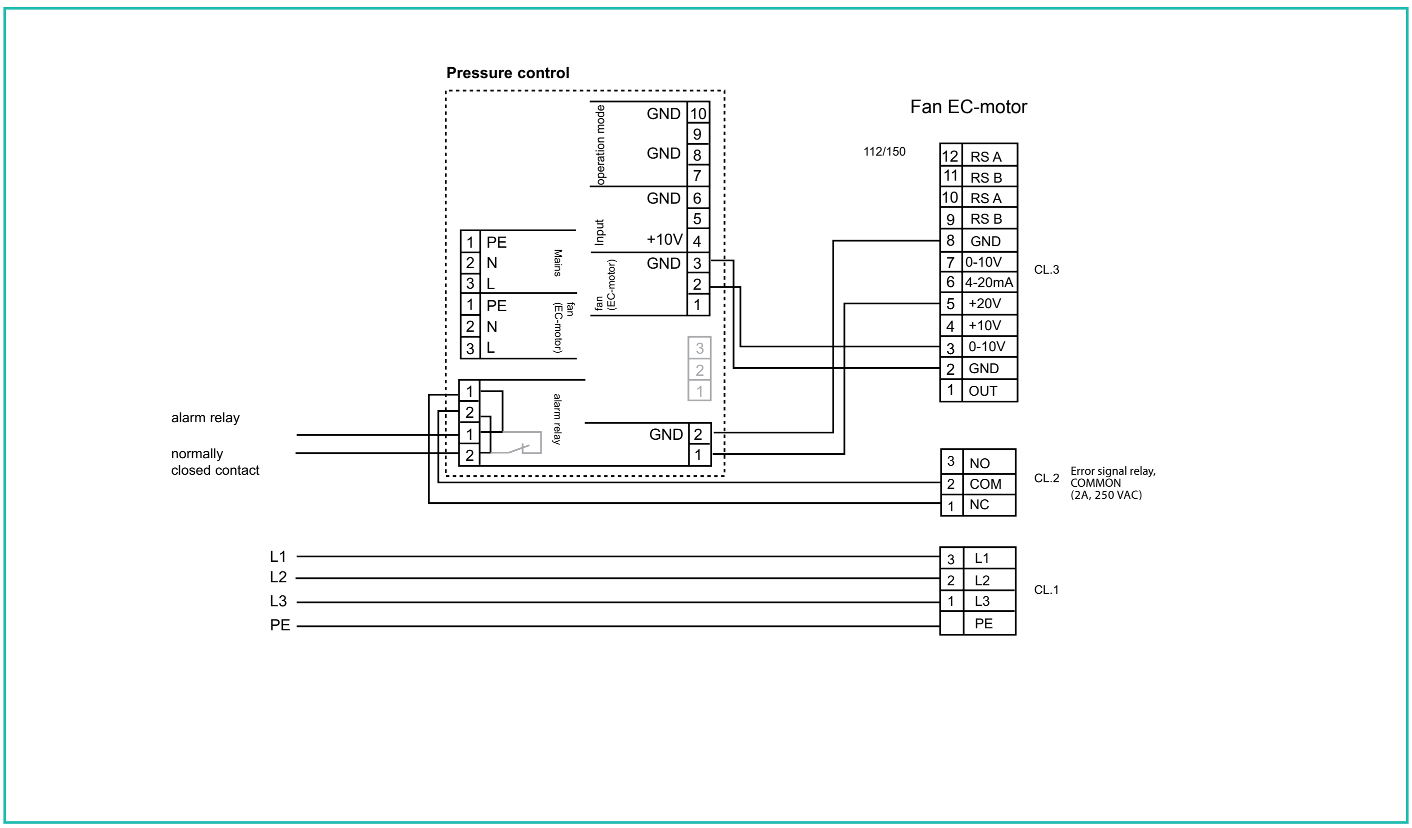
4


120V 1~
Internal potentiometer,
default
N
L
A
B
C
D
N
L
1
2
3
4
-
+
1=Min
5
0
10

5


Pressure control
Operation model
GND 10
Night 9
GND 8
Day 7
Input
GND 6
0-10V in 5
+10V 4
Fan EC-motor
GND 3
0-10V out 2
Tacho in 1
Mains 1
200-277 VAC
50/60 Hz
1 PE
2 N
3 L
Mains
1 PE
2 N
3 L
Fan EC-motor
Alarm relay
Normally closed contact
Alarm relay
GND 2
+20V in 1
Fan EC-motor
074/084
Red
Blue
Yellow
+10V
GND
0-10V
White1
White2
Blue
Black
Green/yellow
NC
COM
L
N
PE
Error signal relay, COMMON (2A, 250 VAC)

6


Pressure control
operation mode
GND 10
9
GND 8
7
Input
GND 6
5
+10V 4
fan (EC-motor)
GND 3
2
1
1 PE
2 N
3 L
Mains
1 PE
2 N
3 L
fan (EC-motor)
alarm relay
normally closed contact
alarm relay
GND 2
1
Fan EC-motor
112/150
12 RS A
11 RS B
10 RS A
9 RS B
8 GND
7 0-10V
6 4-20mA
5 +20V
4 +10V
3 0-10V
2 GND
1 OUT
CL.3
3 NO
2 COM
1 NC
CL.2
Error signal relay, COMMON (2A, 250 VAC)
L1
L2
L3
PE
3 L1
2 L2
1 L3
PE
CL.1

THEORY

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 .... page 99
Heat recovery units .... page 105
Acoustics .... page 108
Air distribution products .... page 113

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.

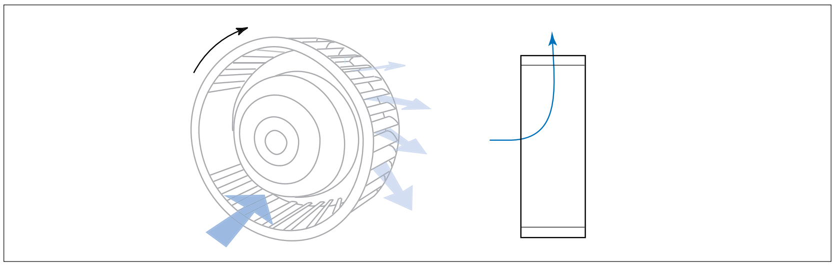


Figure 1: *The air stream through a radial fan with forward-curved blades*

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.

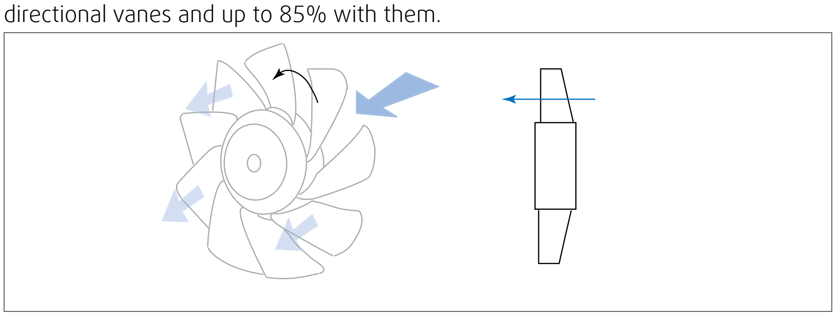
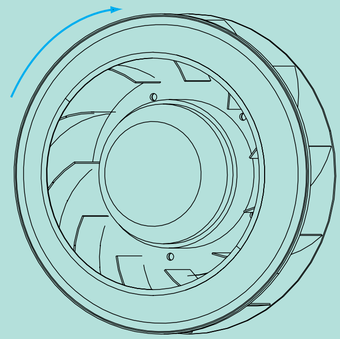


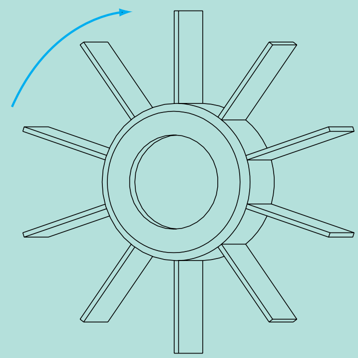
Figure 2: *The air flow through an axial fan*

Blade profiles for radial fans

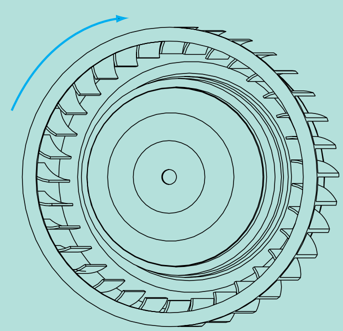
The arrow indicated the impeller's direction of rotation



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.

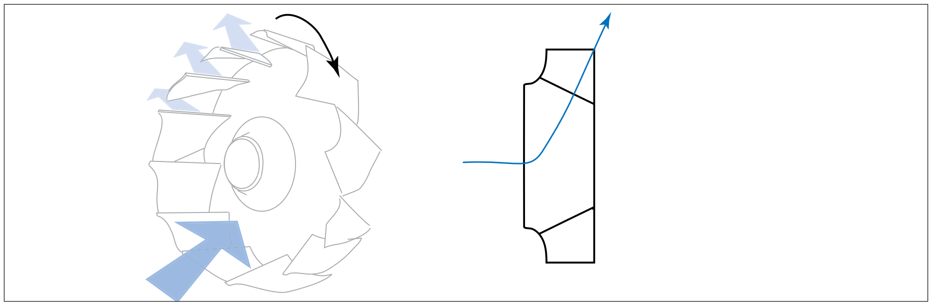


Figure 3: *The air flow through a mixed flow fan*

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.

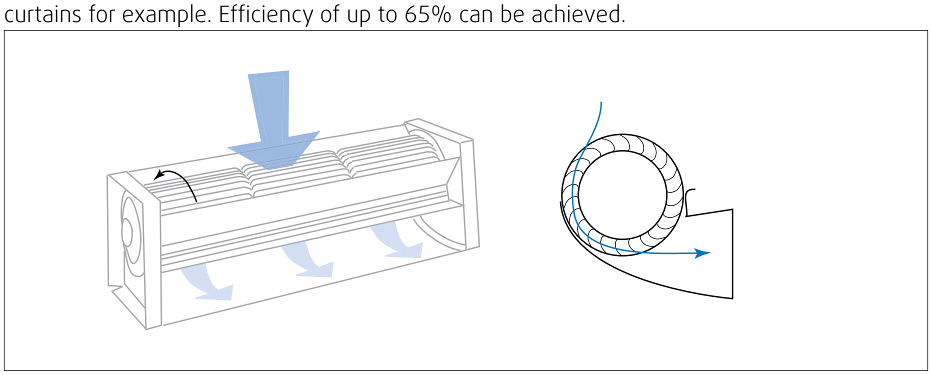


Figure 4: *The air flow through a cross-flow fan*

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.

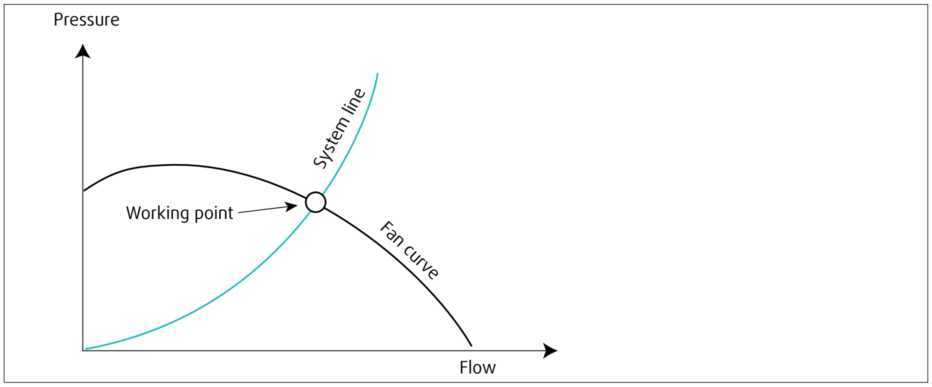


Figure 5: *Curves in a typical fan diagram*

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).

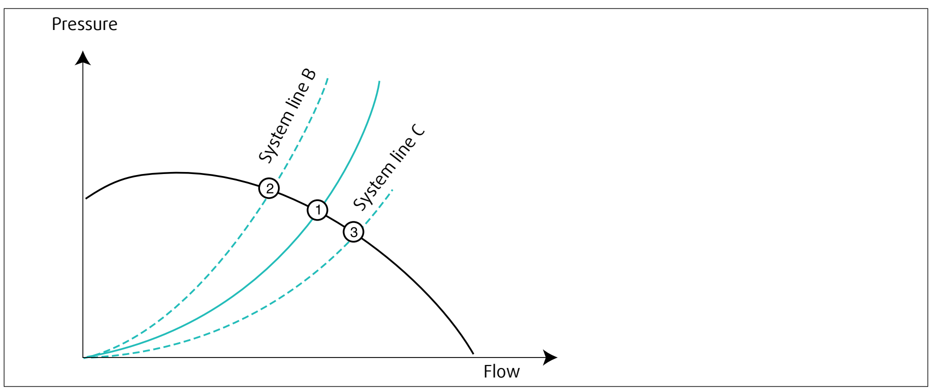


Figure 6: *Changes in pressure give rise to new system lines*

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 $_{(Pa)}$
q_v - air flow, cfm $_{(l/s)}$
k - constant

Example

A certain fan produces an air flow of 3000 cfm $_{(1416\ l/s)}$ at a pressure of 1 in.wg $_{(250\ Pa)}$.

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 $_{(250\ Pa)}$ and the air flow is 3000 cfm $_{(1416\ l/s)}$.

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

$k = \Delta P/q_v^2 = 1/3000^2 = 0.0000001$

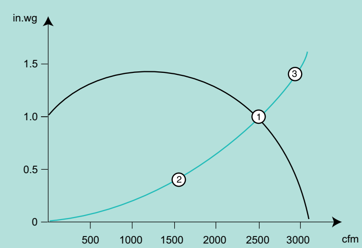
b) Select an arbitrary pressure reduction, for example 0,4 in.wg $_{(100\ Pa)}$, calculate the air flow and mark point (2) in the diagram.

$$q = \sqrt{0,4/(0,00000011)} = 1907 \text{ cfm}$$

c) Do the same thing for 1,4 in.wg $_{(350\ Pa)}$ and mark point (3) in the diagram.

$$q = \sqrt{1,4/(0,00000011)} = 3550 \text{ cfm}$$

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



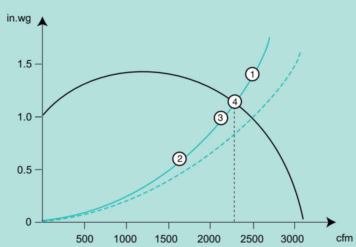
B. What will happen if the pressure in the system increases by 0,4 in.wg $_{(100\ Pa)}$ (for example because of a clogged filter)?

a) Calculate the constant for the new system line:
$k = 1{,}4/3000^2 = 0{,}00000015$

b) Select two other pressure reductions, for example 0,6 in.wg $_{(150\ Pa)}$ and 1 in.wg $_{(250\ Pa)}$, and calculate the air flow for them.

$$q = \sqrt{0{,}6/(0{,}00000015)} = 1964 \text{ cfm}$$

$$q = \sqrt{1/(0{,}00000015)} = 2540 \text{ cfm}$$



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 2300 cfm $_{(1085\ l/s)}$.

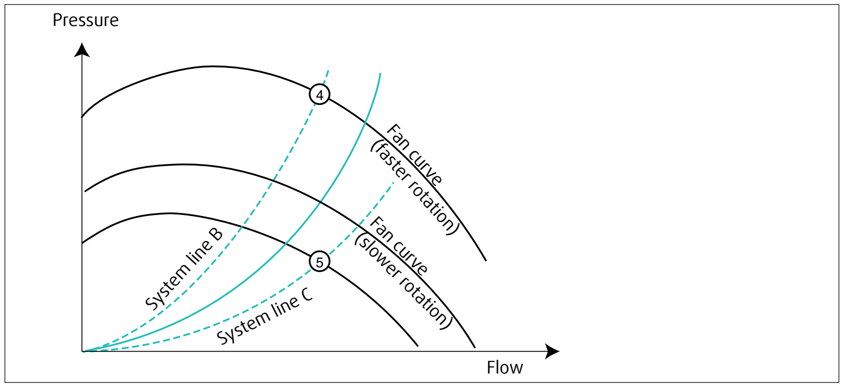


Figure 7: *Increase or reduction of the fan speed*

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.

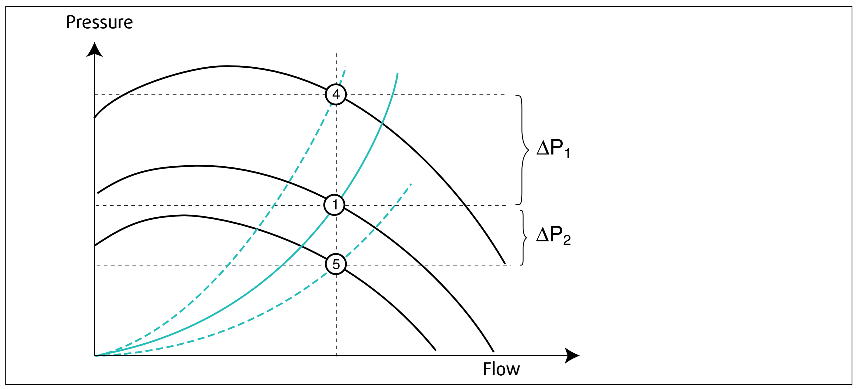


Figure 8: *Pressure differences at different rotational speeds*

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 $\Delta P1$ and $\Delta P2$ 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.

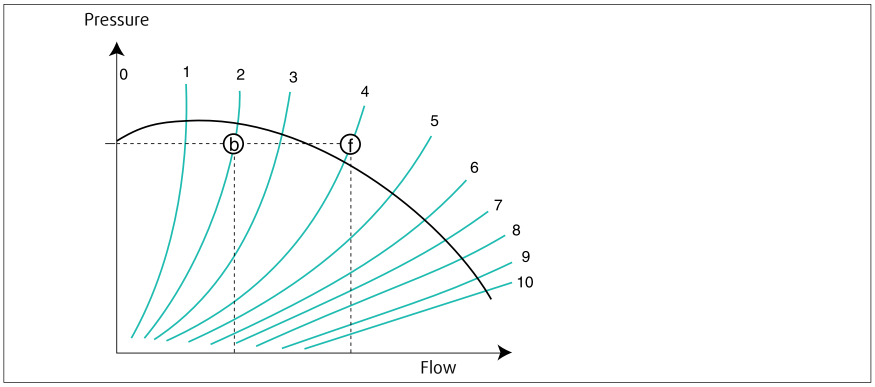


Figure 9: *System lines (0-10) in a fan diagram*

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.

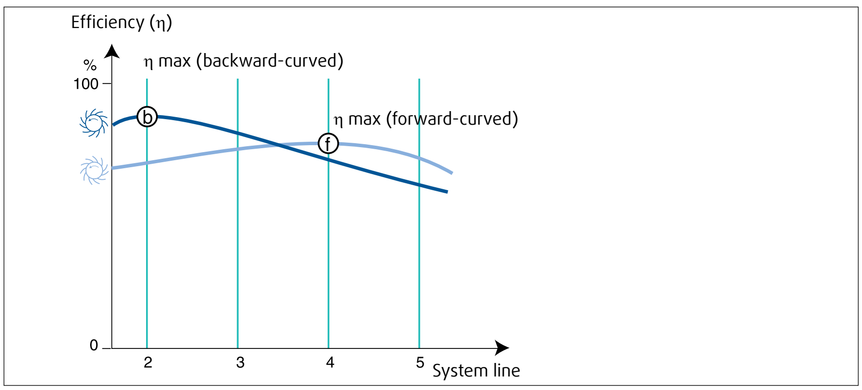


Figure 10: *Efficiency values for the same size of radial fan with backward-curved and forward-curved blades respectively*

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 $_{(Pa)}$

P_t - total pressure, in.wg $_{(Pa)}$

Efficiency of a fan

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

where
P_t = total pressure, in.wg $_{(Pa)}$
q = airflow, cfm $_{(l/s)}$
P = power, W

Specific Fan Power

The Specific fan power for an entire building

$$SFP_E = \frac{P_{tf} + P_{ff}}{q_f} \text{ (W/l/s)}$$

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

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, l/s
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).

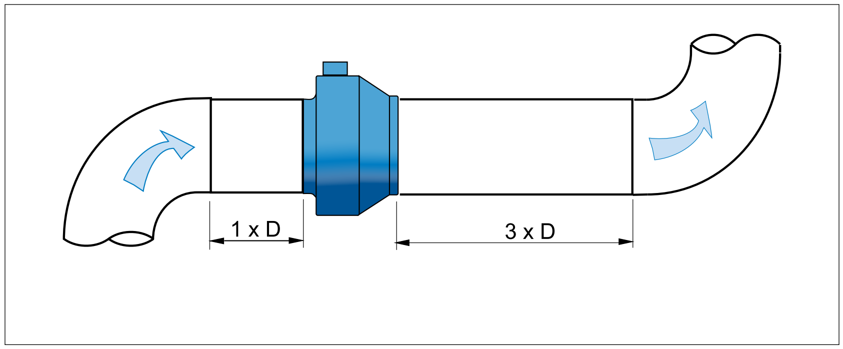


Figure 11: *Correctly installed duct fan*

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

There are now stringent requirements to ensure that power consumption in a building is as efficient as possible so as to minimise 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.

HEAT RECOVERY UNITS

In a ventilating unit, it is often economical to attempt to recover the heat which is contained in the exhaust air and use it to warm the supply air. There are several methods for achieving this type of heat recovery.

Plate heat recovery units

The exhaust air and supply air pass on each side of a number of plates or lamellae. The exhaust- and supply air are not in contact with each other which results in low leakage. There may be some condensation in a plate heat recovery unit, so they need to be fitted with condensation drains. The drains should have a water seal to prevent the fans from sending the water back into the unit. Because of this condensation there is also a serious risk of ice formation, so some type of defrosting system is also needed. Heat recovery can be regulated by means of a bypass valve which controls the intake of exhaust air. Plate heat recovery units have no moving parts. High efficiency (50-90%).

Rotary heat recovery units

Heat is transferred by a rotating wheel between exhaust and supply air. This system is open and there is a risk that impurities and odours will be transferred from the exhaust to the supply air. This can be avoided to some extent a correctly designed ventilation system with the right pressure conditions or by positioning the fans in a preventing way. The degree of heat recovery can be regulated by increasing or decreasing the rotational speed. There is little risk of freezing in the heat recovery unit. Rotary heat exchange units contain moving parts. High efficiency (75-85%).

Coil heat recovery units

Water, or water mixed with glycol, circulates between a water coil in the exhaust air duct and a water coil in the supply air duct. The liquid in the exhaust air duct is heated so that it can transfer the heat to the air in the supply air duct. The liquid circulates in a closed system and there is no risk of transferring impurities from exhaust air to supply air. Heat recovery can be regulated by increasing or decreasing the water flow. Coil heat recovery units have no moving parts. Low efficiency (45-60%).

Chamber heat exchangers

A chamber is divided into two parts by a damper valve. The exhaust air first heats one part of the chamber, then the damper valve changes the air stream so that the supply air is heated by the warmed-up part of the chamber.

Impurities and odours can be transferred from exhaust air to supply air. The only moving part in a chamber heat exchanger is the damper valve. High efficiency (80-90%).

Heat pipe

This heat recovery unit consists of a closed system of pipes filled with a liquid that vaporises when heated by the exhaust air. When the supply air passes the pipes, the vapour condenses back into liquid again. There can be no transfer of impurities, and the heat recovery unit has no moving parts. Low efficiency (50-70%).

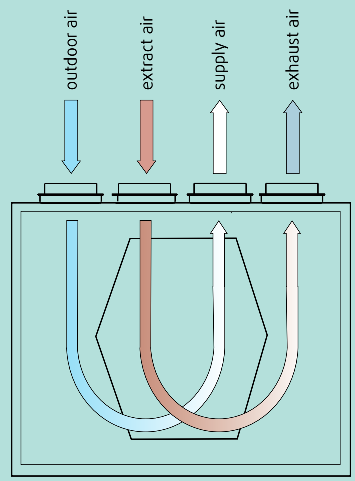
Thermal efficiency

$$\eta = \frac{t_i - t_u}{t_f - t_u}$$

where
t_u - outside air temperature
t_f - exhaust air temperature (no heat recovery)
t_i - supply air temperature (after heat recovery)

Counterflow plate heat recovery units

The air streams (exhaust and supply air) pass in opposite directions through the entire heat recovery unit, which results in an efficient recovery of heat.



Water-heating coil

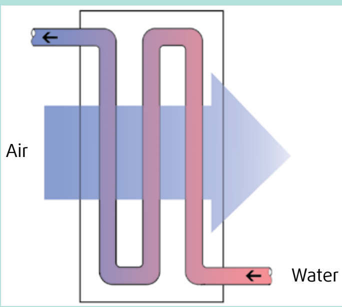
The power input (kW) to a water-heating coil in a ventilating unit is:

$$Q = \frac{L \cdot 1{,}2}{3600} \cdot (t_i - t_u) \cdot (1-\eta)$$

where
L - airflow (cfm)
t_i - required supply air temperature, $F_{(°C)}$
t_u - dimensioned outside air temperature, $F_{(°C)}$
η - efficiency of the heat recovery unit

Water coil

The hot water should be conducted in the opposite direction to the air, otherwise it will cool too quickly and the water coil's warming of the air will not be as efficient.



Heating coils

In most cases the outside air is colder than the required temperature for the supply air, so it is often necessary to warm the air before it enters the building. The air can be warmed in a heating coil, by using either a hot water, or an electric heating coil.

Electric-heating coil

An electric-heating coil consists of a number of enclosed metal filaments or wire spirals. They create an electrical resistance which converts the energy to heat. The advantages of the electric coil are: it has a small pressure drop, it is easy to calculate the power and it is inexpensive to install. The disadvantage is that the metal filaments have a considerable heat inertia so the electric battery has to be fitted with overheating protection.

Water-heating coil

Crossflow water-heating coils are the most common type of water-heating coils in ventilation units. The water flows at right angles and in the opposite direction to the air stream. The water is conducted from below and flows upwards through the coil, and this allows any air bubbles to collect at the highest point where they can be easily drawn off via a ventilating pipe.

Water-heating coils have to be protected against ice formation to ensure they do not crack as a result of freezing. The greatest risk of this happening is actually when the air temperature is immediately below 0°C. Most water coils therefore have a frost guard which stops the intake of fresh air when there is a risk of freezing. Because still water freezes faster than flowing water, it is also usual to fit an internal pump which keeps the water flowing through the coils.

The air velocity through the coils, calculated for the entire front area, should be dimensioned to 390-985 ft/min $_{(2\text{-}5\ m/s)}$. The water velocity should not be below 40 ft/min $_{(0.2\ m/s)}$, as this could cause difficulties with venting. Nor should the water velocity be higher than 295 ft/min $_{(1.5\ m/s)}$ in copper pipes or 590 ft/min $_{(3\ m/s)}$ in steel pipes, as this could lead to erosion of the metal pipes.

Filters

There are two reasons for using filters in an air-handling unit: to prevent impurities in the outside air from entering the building and to protect the unit's components from contamination.

An analysis of the impurities in the air indicates that among other things the air contains soot particles, smoke, metallic dust, pollen, viruses and bacteria. The particles vary in size from less than 1 µm to whole fibres, leaves and insects. It is thought that these pollutants are a significant contributing factor in the cause of many asthmatic and allergic conditions, and it is therefore important for people to protect themselves against them.

Since as much as 99.99% of all particles in the air are smaller than 1 µm, it is necessary to use filters in a ventilation system that are adequately fine-meshed. The filter's capacity to trap particles is called its Dust Holding Capacity and filters are often divided into three classes depending on this capacity: coarse filters, fine filters and absolute filters.

Filter classes according ASHRAE 52.1-1992

Throwaway, washable and electrostatic filters	MERV1 to MERV4
Cartridge and pleated filters	MERV5 to MERV8
Box and bag filters	MERV9 to MERV16
HEPA/ULPA Filters	MERV17 to MERV20

The coarse filter essentially only traps particles larger than 5 µm, and has virtually no effect at all on particles smaller than 2 µm. This means, therefore, that it does not trap soot particles, which are the most prevalent impurities in the outside air. Fine filters should be fitted in a ventilation unit instead. The best fine filters work effectively with particles larger than 0.1 µm, and therefore trap the most important impurities in the outside air.

Pressure drop

The pressure drop caused by a completely clean filter is called the start pressure drop, and this is somewhere between 0,32 in.wg $_{(80\ Pa)}$ and 0,48 in.wg $_{(120\ Pa)}$ for fine filters. After impurities have been trapped by the filter, the pressure drop will increase and the air flow will be reduced. Eventually there will be a pressure drop which makes the filter no longer usable. For fine filters this will be between 0,8 in.wg $_{(200\ Pa)}$ and 1,0 in.wg $_{(250\ Pa)}$. It is usual for filters in a unit to be fitted with some kind of filter monitor which constantly measures the pressure drop caused by the filter. This can give a signal when a pre-set pressure drop has been reached and it is time to replace the filter. In any event it is advisable to replace the filter twice a year, irrespective of whether or not the final pressure drop has been reached, so as to prevent the dirt in the filter becoming a breeding ground for bacteria.

Suppliers of filters have been debating for a long time as to whether glass fibre or synthetic fibre provides the best filter material. Some research has been carried out, but without any clear results. It appears, however, that glass fibre filters maintain a better *Dust Holding Capacity* throughout their working life.

Just as important as the selection of the filter material is the need to ensure that there is a good seal around the filter to prevent dirt and dust passing around the edge. The filter housing should be designed so that repeated filter replacements can be made without any space developing between the filter and the housing. It is also important to protect the filter from moisture as this can alter the characteristics of the filter fibres and impair its *Dust Holding Capacity*. Glass fibre filters are more susceptible to the effects of moisture than synthetic filters.

Calculation of equivalent absorption area A_{eqv}

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

where
S_n - a size of surface, sq.ft $_{(m2)}$
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 ft^3 $_{(30\ cub.m)}$, 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 ft^2 $_{(10\ sq.m)}$ Sabine, or 4 dB(A).

A) What will the sound pressure level be in this room, 3,28 ft $_{(1\ m)}$ 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}).

Fig.14 shows that

ΔL (space damping) = L_{pA} - L_{WA}

$L_{WA} = L_{pA} + \Delta L$

$L_{WA} = 33 + 4 = 37$ dB(A)

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 Pascal (Pa).

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.

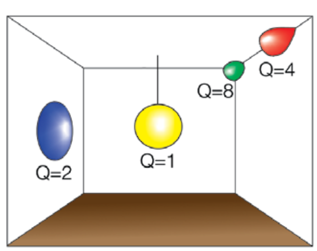
Sound power level and sound pressure level

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 centre 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*

2) Distance from sound source, r

where *r* indicates the distance from the sound source in metres.

3) The room's equivalent absorption area, Aeqv

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 ft^2 (m^2) 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.

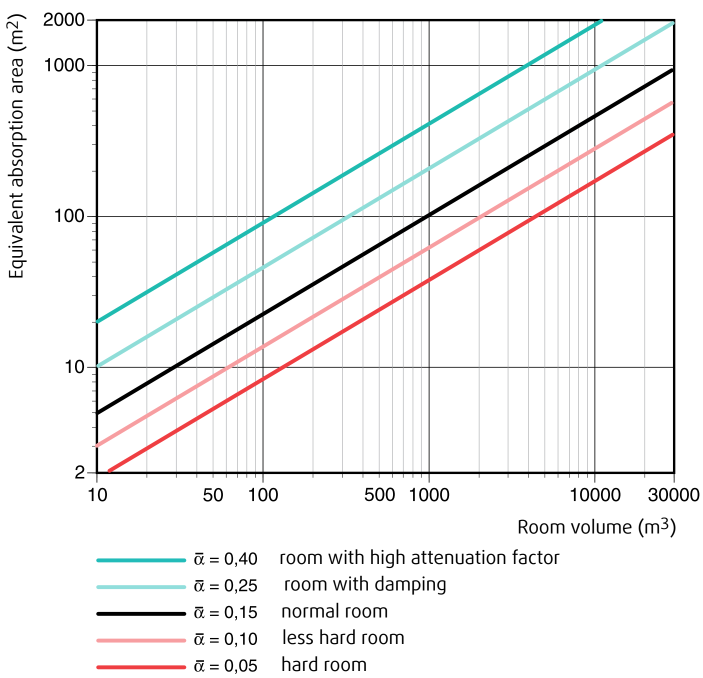


Figure 13: *Estimate of equivalent absorption area*

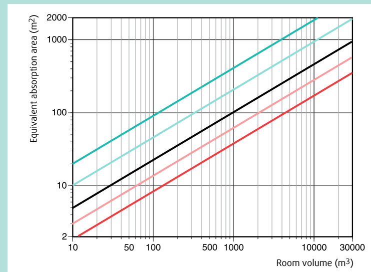
Type of room	Mean absorption factor
Radio studios, music rooms	0.30 - 0.45
TV studios, department stores, reading rooms	0.15 - 0.25
Domestic housing, offices, hotel & conference rooms, theatres	0.10 - 0.15
School halls, nursing homes, small churches	0.05 - 0.10
Industrial premises, swimming pools, large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

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

With the following values

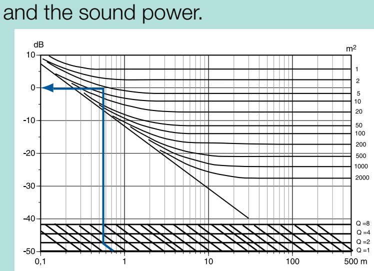
r = 1
Q = 2 (fig. 12)

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 m^2.

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 metre 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 m^2 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 catalogue.

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, $ft_{(m)}$
A_{eqv} - equivalent absorption area, ft^2 $_{(sq.m)}$ 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, ft^3 $_{(cub.m)}$
A_{eqv} - the room's equivalent absorption area, ft^2

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 113).

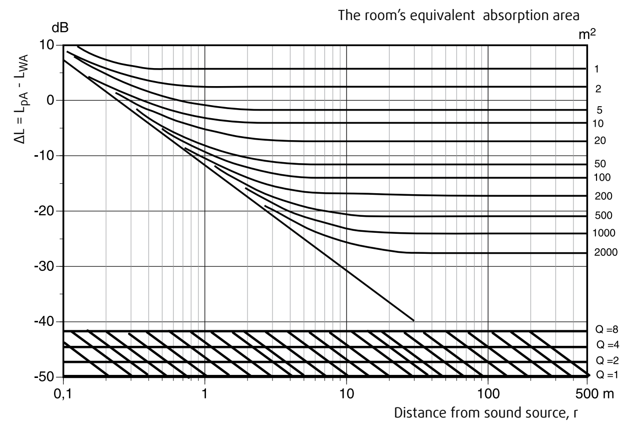


Figure 14: *Diagram for estimating the sound pressure level*

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.

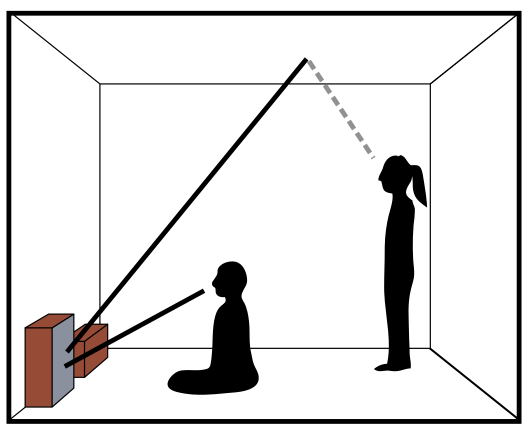


Figure 15: *Direct and reflected sound*

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.

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.

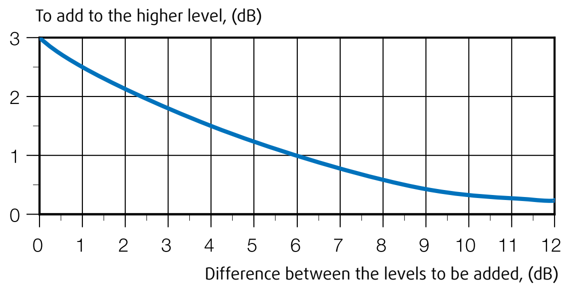


Figure 16: *Logarithmic addition*

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.

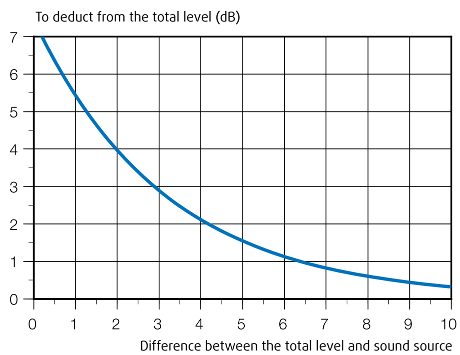
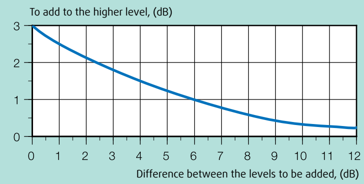


Figure 17: *Logarithmic subtraction*

Example of addition

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

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



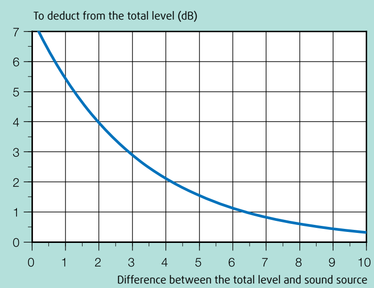
The difference between the sound levels is 2 dB and, according to the diagram, 2 dB must be added to the highest level.

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.

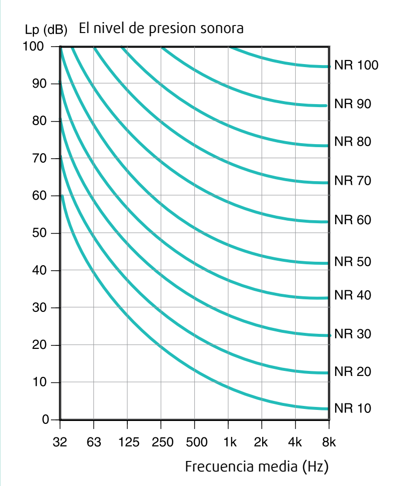
2) What is the sound level produced by the exhaust system?



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.

NR Curves



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.

A 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.

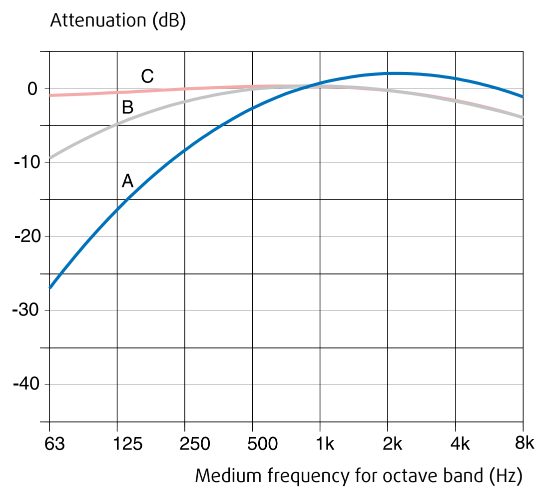


Figure 18: *Damping with different filters*

The A filter, 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.

AIR DISTRIBUTION PRODUCTS

There are essentially two ways of ventilating a building: ventilation by displacement and ventilation by diffusion.

Ventilation by diffusion is the preferable method for supplying air in situations requiring what is known as comfort ventilation. This is based on the principle of supplying air outside the occupied zone which then circulates the air in the entire room. The ventilation system must be dimensioned so that the air which circulates in the occupied zone is comfortable enough, in other words the velocity must not be too high and the temperature must be more or less the same throughout the zone.

Ventilation by displacement is chiefly used to ventilate large industrial premises, as it can remove large volumes of impurities and heat if properly dimensioned. The air is supplied at low velocity directly into the occupied zone. This method provides excellent air quality, but is less suitable for offices and other smaller premises because the directional supply-air terminal device takes up a considerable space and it is often difficult to avoid some amount of draught in occupied areas.

The theory section which follows will discuss what happens to the air in rooms ventilated by diffusion, how to calculate air velocity and displacement in the room, and also how to select and position a directional supply-air terminal device correctly in the premises.

Ventilation by diffusion

An air stream which is injected into a room will attract, and mix together with, large volumes of ambient air. As a result, the air stream's volume increases while at the same time the air velocity is reduced the further into the room it travels. The mixing of the surrounding air into the air stream is termed 'induction'.

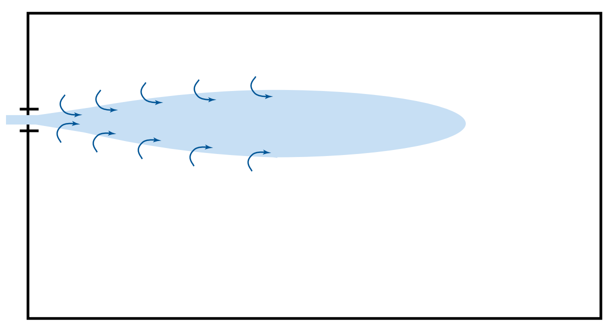
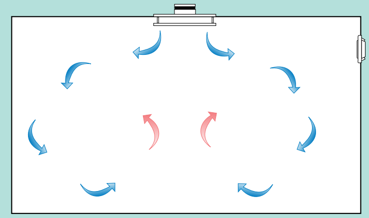


Figure 19: *Induction of the surrounding air into the air stream.*

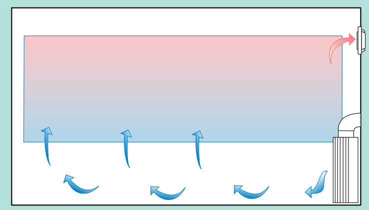
The air movements caused by the air stream very soon mix all the air in the room thoroughly. Impurities in the air are not only attenuated but also evenly distributed. The temperatures in the different parts of the room are also evened out.

When dimensioning for ventilation by diffusion, the most important consideration is to ensure that the air velocity in the occupied zone will not be too high, as this will be experienced as a draught.



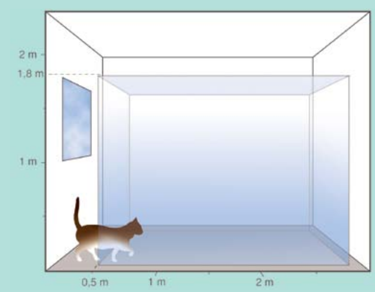
Ventilation by diffusion

The air is blown in from one or more air streams outside the occupied zone.



Ventilation by displacement

Air which is somewhat cooler than the ambient air flows at low velocity into the occupied zone.



Occupied zone

The occupied zone is that part of the room normally occupied by people. This is usually defined as being a space 50 cm from an outer wall with windows, 20 cm from other walls, and up to 180 cm above the floor.

α = the discharge angle

The discharge angle

According to ASHRAE's Handbook (AHRAE,1996) the distribution of an air stream has a constant angle of 20-24° (22° on average).

The shape of the vent, the geometry of the room and also the number of vents all have an effect on the discharge angle. Diffusers and valves with plates or other details which spread the air can produce a wider discharge angle, but even after a relatively short distance from the valve opening, these air streams have a distribution of between 20 and 24°.

Calculation of air velocity

For a conical or radial air stream:

$$\frac{v_x}{v_0} = K \cdot \frac{\sqrt{A_{eff}}}{x} \qquad A_{eff} = \frac{q}{v_0}$$

where

x - distance from the diffuser/valve, ft $_{(m)}$
v_x - centre velocity at distance x, ft/min $_{(m/s)}$
v_0 - velocity at the diffuser/valve outlet, ft/min $_{(m/s)}$
A_{eff} - the diffuser/valve's effective outlet area, ft^2 $_{(sq.m)}$
q - volume through the vent, ft^3/min $_{(cub.m/s)}$

For a flat air stream:

$$\frac{v_x}{v_0} = \sqrt{K \cdot \frac{h}{x}}$$

where

x - distance from the diffuser/valve, ft $_{(m)}$
v_x - centre velocity at distance x, ft/s $_{(m/s)}$
v_0 - velocity at the diffuser/valve outlet, ft/s $_{(m/s)}$
K - the diffuser coefficient
h - the height of the slot, ft $_{(m)}$

The velocity at the cross section of the air stream will be:

$$\frac{v}{v_x} = \left[1 - \left(\frac{y}{0{,}3 \cdot x}\right)^{1{,}5}\right]^2$$

where

y - vertical distance from the central axis, ft $_{(m)}$
x - distance from the diffuser/valve, ft $_{(m)}$
v - velocity at distance y, ft $_{(m)}$

Air stream theory

The figure below shows an air stream that is formed when air is forced into a room through an opening in the wall. The result is a free air stream. If it also has the same temperature as the rest of the room, it is referred to as a free isotherm stream. To begin with, this section will only deal with streams of this type.

Distribution and shape

The air stream actually consists of several zones with different flow conditions and air velocities. The area which is of most practical interest is the main section. The centre velocity, the velocity around the centre axis, is in inverse proportion to the distance from the diffuser or valve, i.e. the further away from the diffuser the slower the air velocity.

The air stream is fully developed in the main section, and the prevailing conditions here are the ones that will principally affect the flow conditions in the room as a whole.

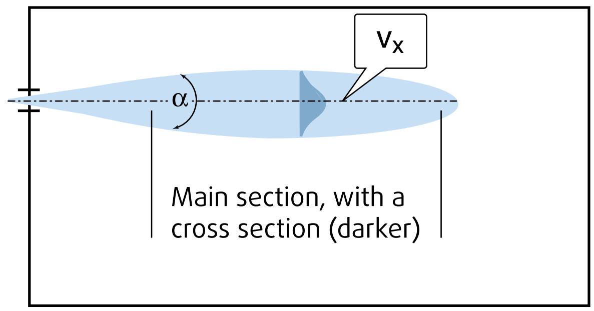


Figure 20: *The main section of the air stream, the centre velocity vx and discharge angle.*

The shape of the diffuser or valve opening determines the shape of the air stream. Circular or rectangular openings produce a conic (axial) stream, and this also applies to very long and narrow openings.

To produce a completely flat air stream, the opening must be more than ten times as wide as it is high, or nearly as wide as the room so that the walls prevent the stream widening out laterally.

Radial air streams are produced by completely circular openings where the air can spread in all directions, as is the case with a supply-air diffuser.

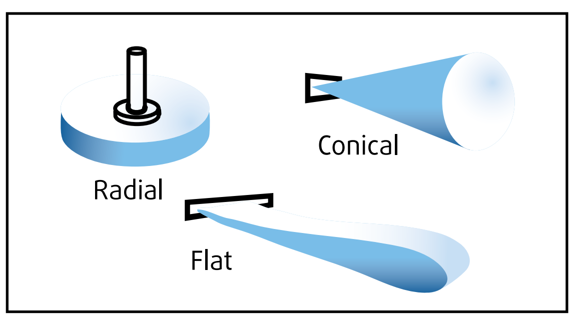


Figure 21: *Different kind of air streams*

Velocity profile

It is possible to calculate mathematically the air velocity in each part of the stream. To calculate the velocity at a particular distance from the diffuser or valve, it is necessary to know the air velocity at the diffuser/valve outlet, the shape of the diffuser/valve and the type of air stream produced by it. In the same way, it is also possible to see how the velocities vary in every cross section of the stream.

Using these calculations as the starting point, velocity curves for the entire stream can be drawn up. This enables one to determine the areas which have the same velocity. These areas are called isovels. By checking that the isovel corresponding to 0.2 m/s is outside the occupied zone, one can ensure that the air velocity will not exceed this level in the normally occupied areas.

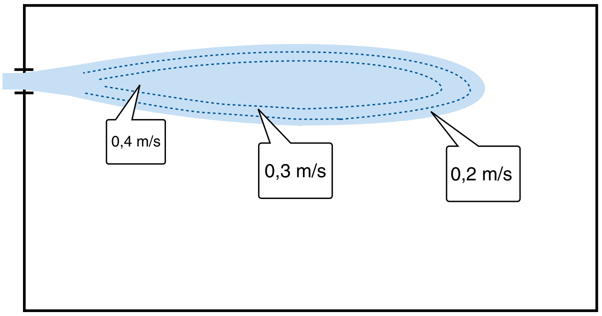


Figure 22: *The different isovels of an air stream*

The diffuser coefficient

The diffuser coefficient is a constant which depends on how the diffuser or valve is shaped. It can be calculated theoretically by using the following factors: the impulse dissipation and contraction of the air stream at the point where it is blown into the room, together with the degree of turbulence created by the diffuser or valve.

In practice, the constant is simply determined by taking measurements on each type of diffuser or valve. The air velocity is measured at a minimum of eight different distances from the diffuser/valve, with at least 1 ft (30 cm) between each measuring point. These values are then plotted into a logarithmic diagram, which indicates the measurement value for the main section of the air stream, and this in turn provides a value for the constant.

The diffuser coefficient enables one to calculate air velocities and to predict an air stream's distribution and path. It must not be confused with the K-factor which is used for such tasks as entering the correct air volume from a directional supply-air terminal device or iris damper.

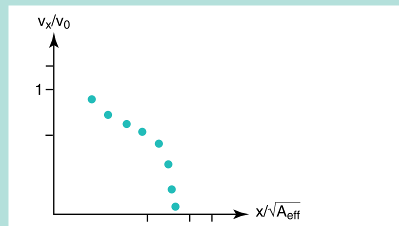
Theoretical calculation of the diffuser coefficient

$$K = \sqrt{\frac{i}{\varepsilon}} \cdot \frac{1{,}5}{C_b}$$

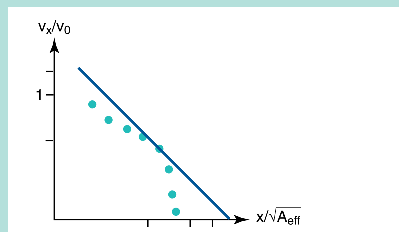
i - impulse factor indicating impulse dissipation at point where air is blown in ($i<1$)
ε - contraction factor
C_b - turbulence constant (0.2-0.3 depending on type of diffuser or valve)

Practical calculation of the diffuser coefficient

The measurement values (v_x/v_0) and ($x/\sqrt{A_{eff}}$) are plotted into the diagram.



Using the values obtained from the main section of the air stream, a tangent (angle coefficient) is drawn at an angle of -1 (45°).

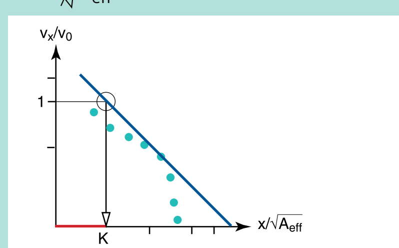


The formula for the velocity profile shows that

$$\frac{V_x}{V_0} = K \cdot \frac{\sqrt{A_{eff}}}{x}$$

when

$$K = \frac{X}{\sqrt{A_{eff}}}$$



A line should now be drawn from the intersection of the angle coefficient and 1 on the *y* scale to produce a value for the diffuser coefficient K.

The diffuser coefficient when the Coanda effect is influencing the air stream:

$$K_{corrected} = \sqrt{2} \cdot K_{free\ flow}$$

The horizontal discharge angle also increases to 30° when the stream is sucked towards the ceiling, while the vertical angle remains unchanged (20-24°).

Deflection

The deflection from the ceiling to the central axis of the air stream (Y) can be calculated using

$$Y = \sqrt{A_{eff}} \cdot 0{,}0014 \cdot \frac{\Delta t_0 \cdot \sqrt{A_{eff}}}{K \cdot v_0^2} \cdot \left[\frac{x}{\sqrt{A_{eff}}}\right]^3$$

where

Δt_0 - the temperature difference between the air stream and the ambient air

x - distance from the diffuser/valve, ft $_{(m)}$
v_0 - velocity at the diffuser/ valve outlet, ft/min $_{(m/s)}$
K - the diffuser coefficient
A_{eff} = the diffuser or valve's effective outlet area, ft^2 $_{(sq.m)}$

Point of separation

The point where a conical air stream leaves the ceiling (x_m) will be:

$$x_m = \frac{1{,}6 \cdot K \cdot v_0 \cdot A_{eff}}{(A_{eff})^{0{,}75} \cdot \sqrt{\Delta t_0}}$$

and for a radial air stream will be

$$x_m = \frac{3{,}5 \cdot K^{1{,}5} \cdot v_0 \cdot A_{eff}}{(A_{eff})^{0{,}75} \cdot \sqrt{\Delta t_0}}$$

Δt_0 - the temperature difference between the air stream and the ambient air
v_0 - velocity at the diffuser/ valve outlet, ft/min $_{(m/s)}$
K - the diffuser coefficient
A_{eff} - the diffuser or valve's effective outlet area, ft^2 $_{(sq.m)}$

After the stream has left the ceiling, a new path can be calculated with the aid of the formula for deflection (above). The distance x is then calculated as the distance from the point of separation.

Coanda effect

If a directional supply-air terminal device is fitted close enough to a flat surface, usually the ceiling, the air stream will cling to the surface. This is due to the fact that the ambient air will be drawn into the stream, but close to the flat surface, where no new air can flow from above, an underpressure forms instead, and this causes the stream to be sucked to the surface. This is known as the Coanda effect.

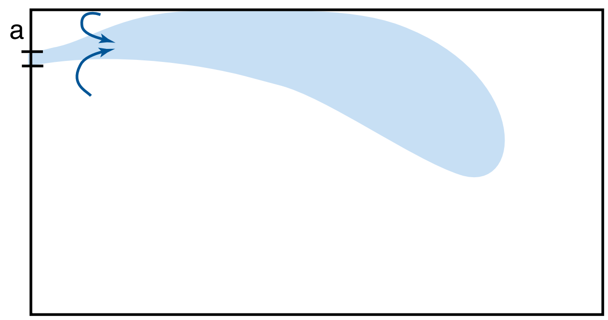


Figure 23: *The Coanda effect*

Practical experiments have shown that the distance between the diffuser or valve's upper edge and the ceiling ('a' in figure 23) must not be greater than 1 ft $_{30\ cm}$ if there is to be any suction effect.

The Coanda effect can be used to make a cold air stream stick to the ceiling and travel further into the room before it reaches the occupied zone.

The diffuser coefficient will be somewhat greater in conjunction with the suction effect than for a free air stream. It is also important to know how the diffuser or valve is mounted when using the diffuser coefficient for different calculations.

Non-isothermal air

The flow picture becomes more complex when the air that is blown in is non-isothermal air, in other words warmer or colder than the ambient air. A thermal energy, caused by differences in the air's density at different temperatures, will force a cooler air stream downwards and a warmer air stream upwards.

This means that two different forces affect a cooler stream that is sticking close to the ceiling: both the Coanda effect which attempts to adhere it to the ceiling and the thermal energy which attempts to force it towards the floor. At a given distance from the diffuser or valve's outlet, the thermal energy will dominate and the air stream will eventually be dragged down from the ceiling.

The stream's deflection and point of separation can be calculated using formulae which are based on the temperature differentials, the type of diffuser or valve and the size of its outlet, together with air velocities etc.

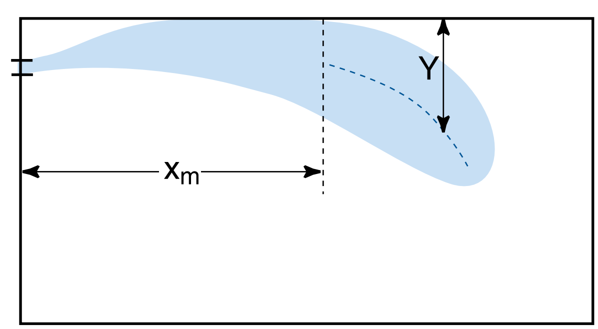


Figure 24: *The air stream's point of separation (Xm) and deflection (Y)*

Important considerations when dimensioning air supply

It is important to select and position the directional supply-air terminal device correctly. It is also important that the air temperature and velocity are as required for producing acceptable conditions in the occupied zone.

Correct air velocity in the occupied zone

A specification called 'throw' is indicated for most supply-air equipment in the manufacturer's product catalogue. 'Throw' is defined as the distance from the diffuser or valve opening to the point in the air stream where the centre velocity has been reduced to a particular value, generally 0.2 m/s. A throw of this type is designated by $l_{0.2}$ and is measured in metres.

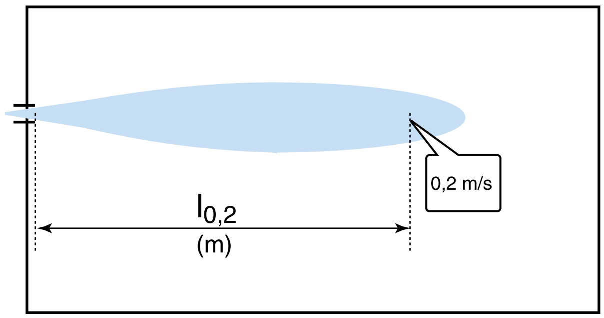


Figure 25: *The 'throw' concept*

One of the first considerations when dimensioning an air supply system is usually to avoid velocities in the occupied zone that are too high, but as a rule it is not the air stream itself that reaches us there.

In the occupied zone we are more likely to be exposed to high velocities in the return air stream: see the figure below.

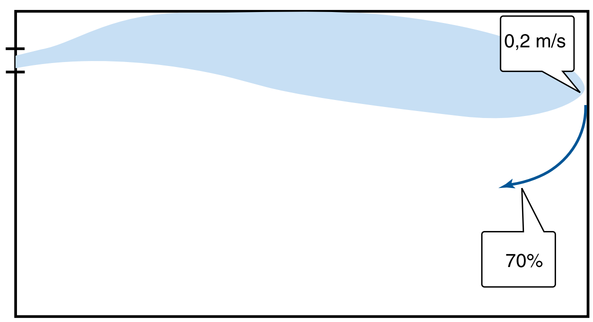


Figure 26: *Return air stream with a wall-mounted diffuser*

It has been shown that the velocity of the return air stream is approximately 70% of the velocity it had when it reached the wall. This means that a diffuser or valve fitted on the rear wall, with an end velocity of 0.2 m/s, will cause an air velocity of 0.14 m/s in the return air stream. This is within the limits for comfort ventilation, which is understood to mean that the velocity should not exceed 0.15 m/s in the occupied zone.

The throw for the diffuser or valve described above is the same as the length of the room, and in this instance is an excellent choice. A suitable throw for wall-mounted ventilation is somewhere between 70% and 100% of the room's length.

Effective penetration

The most common method for selecting the correct directional supply-air terminal device is to consider the throw $l_{0,2}$. But since the desired end velocity in the air stream depends on both the room's geometry and the required air velocity in the occupied zone, this can sometimes be rather misleading. Therefore the concept of the air stream's effective penetration has been introduced instead.

The effective penetration is the distance to the point where an end velocity is to be calculated. This can be the distance along the centre of the air stream from the diffuser itself to the furthest point in the room where the supply air is required. For wall-mounted diffusers, this means that the effective penetration is the same as the room's depth, while for ceiling diffusers the penetration is half the room's depth.

The velocity of the return air stream is approximately 30% slower than the air stream's velocity when it meets the wall. If the maximum air velocity in the occupied zone is to be 0.18 m/s, this means that the air stream must have a maximum velocity of 0.26 m/s when it meets the wall.

Effective penetration – calculation

The velocity at the effective penetration depth of a diffuser can be calculated theoretically by using the formula for calculating air velocity.

$$v_x = v_0 \cdot K \cdot \frac{\sqrt{A_{eff}}}{x_v}$$

where

v_x - velocity at the effective penetration, ft/min $_{(m/s)}$
v_0 - velocity at the diffuser outlet, ft/min $_{(m/s)}$
K - the diffuser coefficient
A_{eff} - the vent's effective outlet area, ft^2 $_{(sq.m)}$
x_v - the effective penetration, ft $_{(m)}$

This method enables one to dimension the ventilation system more precisely than is possible when only using the throw data, and is therefore frequently used in different diffuser selection programmes.

Throw data for isothermal air

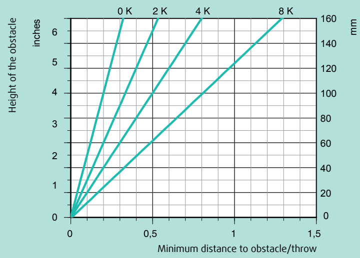
Rear-wall diffuser and wall-mounted diffuser: *0.7 to 1.0 x room depth*

Ceiling diffuser (supply air blown horizontally): *0.5 x room depth*

(with rectangular rooms, the distance is calculated to the nearest wall).

Distance to an obstacle (estimate)

The diagram shows the minimum distance to the obstacle as a function of the obstacle's height (h in figure 28) and the air stream's temperature at the lowest point.



The penetration of the air stream

The shape of the room can affect the flow picture. If the cross section of the air stream is more than 40% of the cross section of the room, all induction of air in the room will stop. As a result, the air stream will deflect and start to suck in the induction air itself. In such a situation it does not help to increase the velocity of the supply air, as the penetration will remain the same while the velocity of both the air stream and the ambient air will increase.

Other air streams, secondary vortices, will start to appear further into the room where the main air stream does not reach. However, if the room is less than three times as long as it is high, it can be assumed that the air stream will reach all the way in.

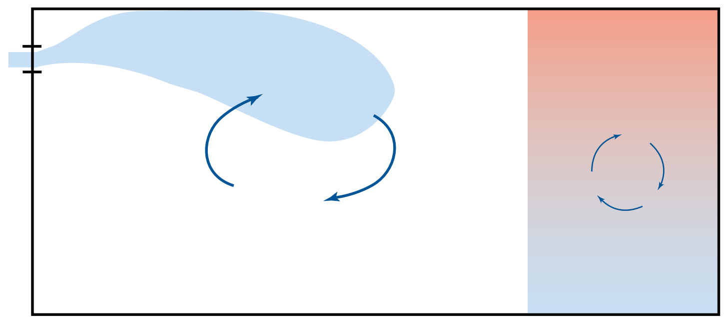


Figure 27: *Secondary vortices are formed at the furthest point in the room, where the air stream does not reach*

Avoid obstacles

Unfortunately, it is very common for the air stream to be obstructed by light fittings on a ceiling. If these are too close to the diffuser and hang down too far, the air stream will deflect and descend into the occupied zone. It is therefore necessary to know what distance (A in the diagram) is required between an air supply device and an obstacle for the air stream to remain unimpeded.

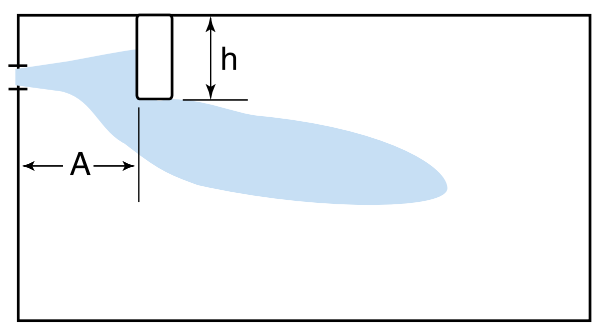


Figure 28: *Minimum distance to an obstacle*

Installing several directional supply-air terminal devices

If a single ceiling diffuser is intended to service an entire room, it should be positioned as close to the centre of the ceiling as possible, and the total surface should not exceed the dimensions indicated in Figure 29 below.

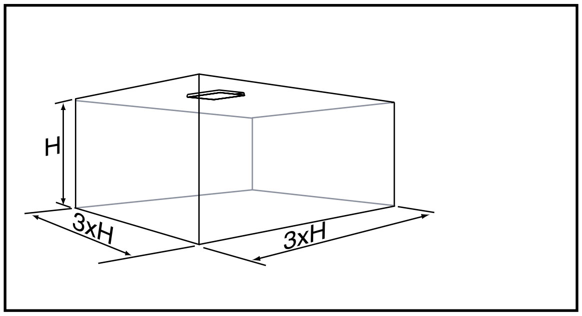


Figure 29: *A small room ventilated by a single ceiling diffuser*

If the room is larger than this, it usually has to be divided into several zones, with each zone ventilated by its own diffuser.

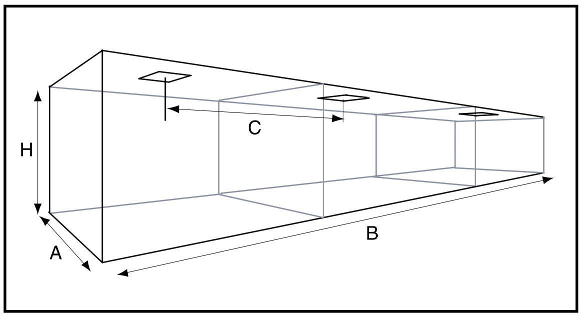


Figure 30: *A large room ventilated by several ceiling diffusers*

A room which is ventilated by several wall-mounted diffusers must also be divided into several zones. The number of zones is determined by the requirement to ensure sufficient distance between the diffusers to prevent the air streams affecting each other. If two air streams mix together, the result will be one stream with a longer throw.

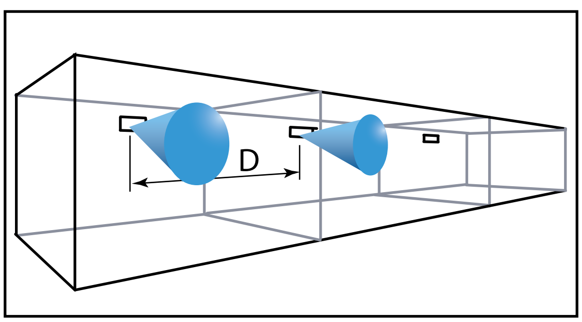


Figure 31: *A large room ventilated by several wall diffusers*

Dimensioning with several ceiling diffusers

A large room has to be divided into several zones. The maximum dimension for each zone is 1.5 x the room's length (A), as long as this does not exceed 3xH (see figure 29).

The appropriate throw is 0.5 x C, where C = the distance between two diffusers, (see figure 30).

Example

A large room (see figure 30) has the following dimensions:

H = 3 m
A = 4 m
B = 16 m

1) How many zones should the room be divided into?

2) What will the distance be between the diffusers?

1) The maximum size for each zone is 1.5 x A = 6 m, which means that the room should be divided into three zones, each 5.33 m long

2) If the diffuser is placed in the centre of each zone, the distance (C) will be 5.33 m

Dimensioning with several wall diffusers

The smallest distance between two wall-mounted valves or diffusers (D in figure 31) is 0.2 x $l_{0.2}$.

The appropriate throw is between 0.7 and 1.0 x A, where A = the depth of the room.

Example

A room which is 5 m deep is ventilated from the rear wall by means of diffusers with a throw of 4 m.

1) What distance should there be between two diffusers?

0.2 x $l_{0.2}$ = 0.2 x 4 = 0.8 m

1) There should be 80 cm between two diffusers.

Blowing in warm air

Blowing supply air horizontally from the ceiling works excellently for most rooms, including those with very high ceilings. If the supply air is above ambient temperature and also used to heat the premises, practical experiments have shown that this works well in rooms with ceiling heights of no more than 11,5 feet $_{(3,5\ m)}$. This assumes that the maximum temperature difference is 50-59^{0}F $_{(10\text{-}15C)}$.

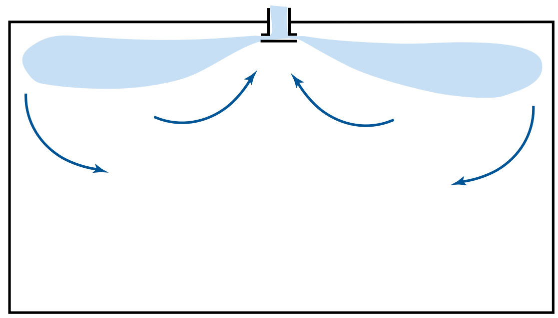


Figure 21: *Blowing supply air horizontally from a ceiling diffuser*

In very high rooms, however, the supply air has to be jetted vertically if it is also used for heating. If the temperature difference is no more than 10 degrees, the air stream should flow down to approximately 3 feet $_{(1\ m)}$ above the floor in order to produce a satisfactory evenness of temperature in the occupied zone.

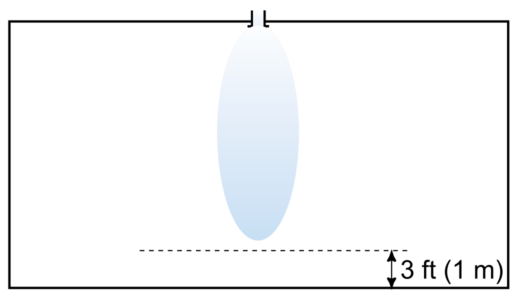


Figure 22: *Supply air blowing vertically from a ceiling diffuser*

Blowing in cold air

When supplying air that is colder than the ambient air, it is particularly important to make use of the Coanda effect to prevent the air stream from falling down into the occupied zone too early. The ambient air will then be sucked in and mixed more effectively, and the temperature of the air stream will have a better chance to increase before it reaches the occupied zone.

If the sub-ambient-temperature air is directed along the ceiling in this way, it is also important that the air stream velocity is high enough to ensure that there is sufficient adherence to the ceiling. If the velocity is too low there is also a risk that the thermal energy will push the air stream down towards the floor too early.

At a certain distance from the supply-air diffuser, the air stream will in any case separate from the ceiling and deflect downwards. This deflection occurs more rapidly in an air stream that is below the ambient temperature, and therefore in such cases the throw will be shorter.

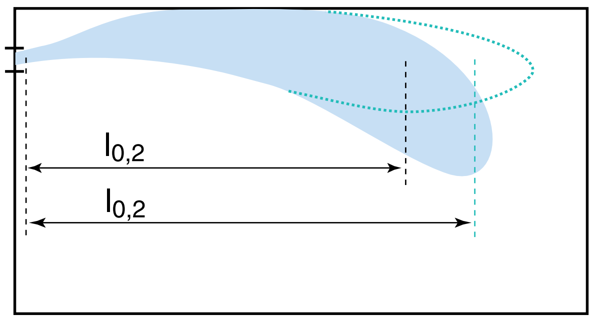


Figure 23: *The difference between the throws of isothermal and non-isothermal air streams*

The air stream should have flowed through at least 60% of the room's depth before separating from the ceiling. The maximum velocity of the air in the occupied zone will thus be almost the same as when the air supply is isothermal.

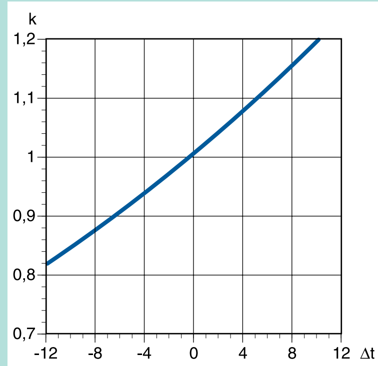
The method for calculating where the air stream will separate from the ceiling is explained in the paragraph headed 'Non-isothermal air' on page 121.

When the supply air is below ambient temperature, the ambient air in the room will be cooled to some extent. The acceptable degree of cooling (known as the maximal cooling effect) depends on the air velocity requirements in the occupied zone, the distance from the diffuser at which the air stream separates from the ceiling, and also on the type of diffuser and its location.

In general a greater degree of cooling is accepted from a ceiling diffuser than a wall-mounted diffuser. This is because the air from a ceiling diffuser spreads in all directions, and therefore takes less time to mix together with the ambient air and to even out the temperature.

Correction of throw (estimate)

This diagram can be used to obtain an approximate value for the throw of non-isothermal air.



$l_{0.2}$ (corrected) = k · $l_{0.2}$ (isothermal air)

Maximum acceptable cooling effect

A rule of thumb for the maximum acceptable cooling effect (Q_{max}) is:

Supply air blown from rear wall

Q_{max} = 20-40 W per m^2 floor surface at Δt 8K

Supply air blown from ceiling

Q_{max} = 60-100 W per m^2 floor surface at Δt 12K

Selecting the correct supply-air terminal device

A supply-air terminal device for ventilation by diffusion can be fitted on either the ceiling or the wall. Diffusers are often equipped with nozzles or perforations which facilitate the admixture of ambient air in the air stream.

Nozzle diffusers are the most flexible devices because they allow individual fitting of each nozzle. They are ideal for supplying air that is well below ambient temperature, particularly if they are fitted in the ceiling. The throw pattern can be altered by turning the nozzles in different directions.

Perforated diffusers have a positive effect where the air stream temperature is significantly below that of the ambient air. They are not as flexible as nozzle diffusers, but by shielding off the air supply in different directions it is still possible to change the distribution pattern.

Wall-mounted grilles have a long throw. They have limited possibilities for altering the distribution pattern, and they are not particularly suitable for the supply of air that is below ambient air temperature.

	Ceiling			Wall		
						
	Nozzle diffuser	Swirl ceiling diffuser	Conical jet diffuser	Jet nozzle diffuser	Perforated diffuser	Grille
Short throw	x	x	(x)	x	x	
Long throw	x			x		x
Flexible distribution pattern	x	(x)	(x)	x		
Sub ambient temperature air	x	(x)		x	(x)	

Table 3. Comparison of the different types of directional supply-air terminal device.

A

AJD 82
ASC 90

B

BFT FR 91
BFT TR 91
BHC 66

C

CRSP 78
CO2RT 91

D

DS 90
DVC P/S 56

E

E-0R 91
E-Bacnet 91
E28 Corrigo 30
EFD 89
Elegant AT 67
ERV RT-EC 34

F

FC 90
FDS 90

I

IKD 80
IR24-P 92
IR, IR-F 83

J

JSR 81

K

K EC 50
Kvadra 74

L

LD 88
LDR 88

M

MTP 10 91
MUB 42

N

Nova-C 69
Nova-E 71
Nova-R 70

O

Optima-R 85

P

Pleated filter 91
Pre-heater 92

R

Roof curb 92
RPK-R 84
RSK 88
RVAZ4..24 92

S

SFD 68
Sinus-C/T 77
Sinus-DC 73
Sinus-DR 72
Sinus-F 76

T

TG-R5 91
TG-UH 91
Timer TORK 91
Topvex FR 14
Topvex TR 22
TSD 79

V

VVKR 75

Z

ZTR 93
ZTV 93

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