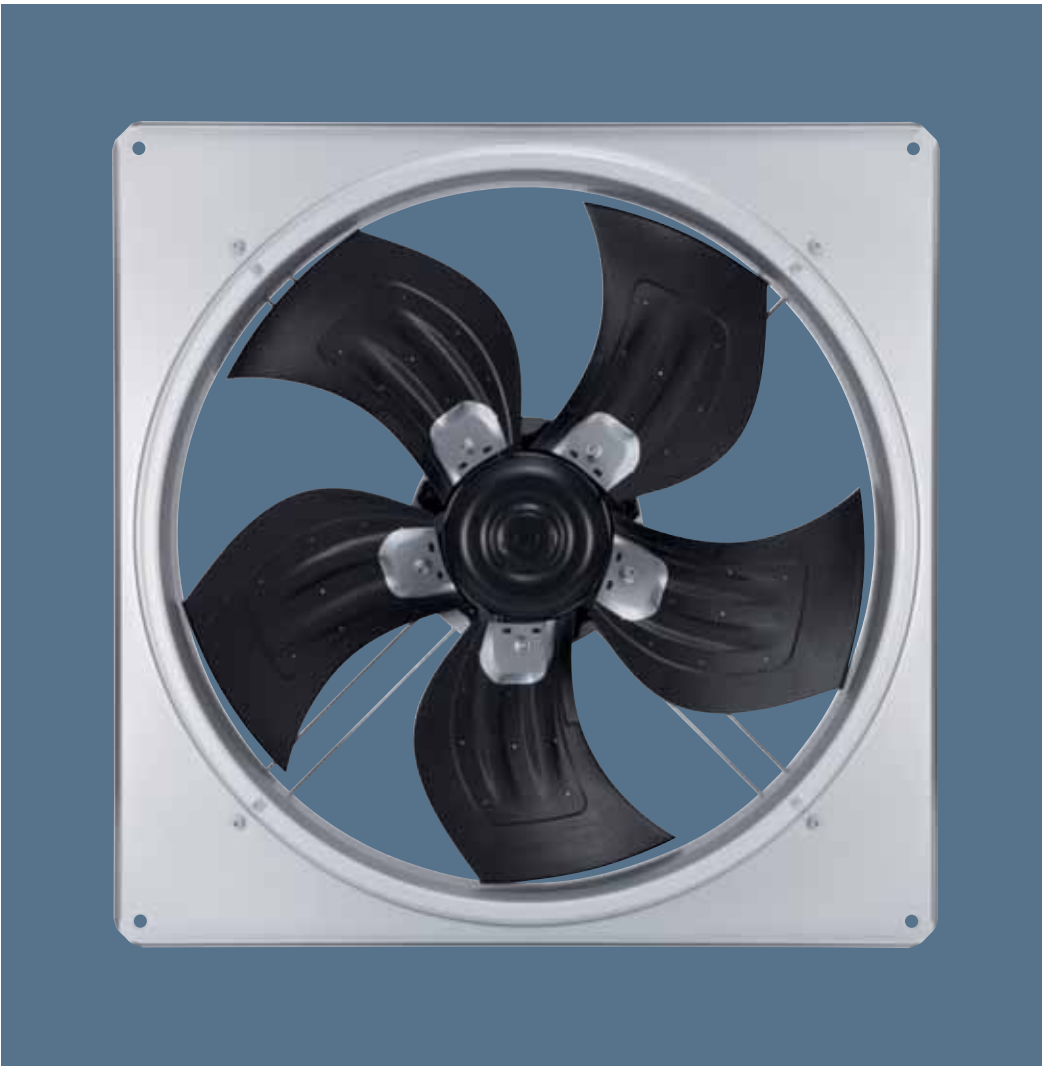
EC axial fans for agricultural ventilation

version 07/2011



The engineer's choice

ebmpapst

The new EC axial fans for agricultural ventilation

Energy-efficient fans are also becoming increasingly important in agriculture. Motivated by legal requirements and increasing energy costs, the market is demanding new, energy-efficient solutions.

To accommodate this trend, ebm-papst has introduced the new axial fan series with energy saving EC technology, fully in line with the GreenTech philosophy.

This brochure contains a selection of axial fans, starting from an outer diameter of 500 mm all the way up to an outer diameter of 1250 mm. This corresponds to an air performance of up to 58.000 m^3/h.

The fans have EC motors and consume, depending on the operating cycle, up to 70% less electrical energy than comparable AC fans. Installation could not be easier: the fan is installed in the exhaust duct or wall of the building using the attached wall ring plate. Alternatively, the fan is integrated directly into a customer-side exhaust duct using an optional support structure.

Depending on the required air performance, customers can choose between a version with low pressure increase and a version for higher pressure drops, such as those encountered in biofilters.

Depending on the attainable air performance, the fans are available in single-phase or three-phase design, 50 or 60 Hz power supply system. The fans are controlled via the standard 0-10V interface or an integrated bus interface.

Comprehensive corrosion protection measures have been taken that allow the fans to be used in almost all climatic applications with outstanding operating reliability.

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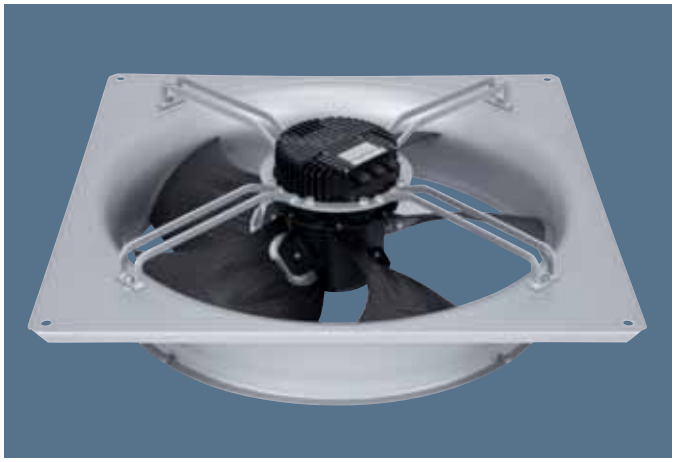
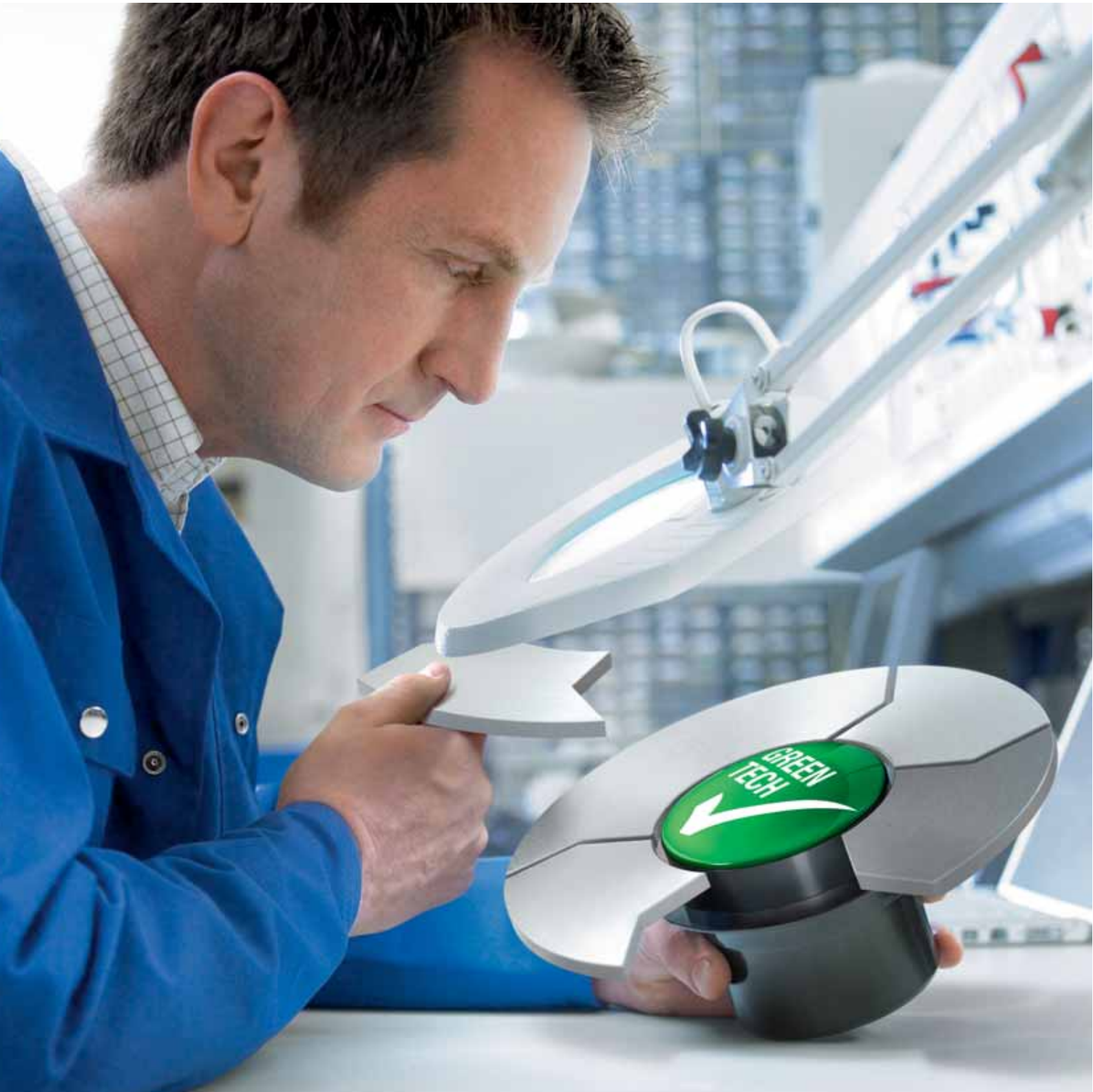


Sustainability is at the centre of our thoughts and actions. Out of conviction!

Eco-friendliness and sustainability have always been at the core of our thoughts and actions. For decades, we have worked according to the simple but strict creed of our co-founder Gerhard Sturm: "Each new product we develop has to be better than the last one in terms of economy and ecology." GreenTech is the ultimate expression of our corporate philosophy.



GreenTech is pro-active development.
Even in the design phase, the materials and processes we use are optimised for the greatest possible eco-friendliness, energy balance and – wherever possible – recyclability. We continually improve the material and performance of our products, as well as the flow and noise characteristics. At the same time, we significantly reduce energy consumption. Close co-operation with universities and scientific institutes and the professorship we endow in the area of power engineering and regenerative energies allows us to profit from the latest research findings in these fields – and at the same time ensure highly qualified young academics.

GreenTech is eco-friendly production.
GreenTech also stands for maximum energy efficiency in our production processes. There, the intelligent use of industrial waste heat and groundwater cooling, photovoltaics and, of course, our own cooling and ventilation technology are of the utmost importance. Our most modern plant, for instance, consumes 91% less energy than currently specified and required. In this way, our products contribute to protecting the environment, from their origin to their recyclable packaging.

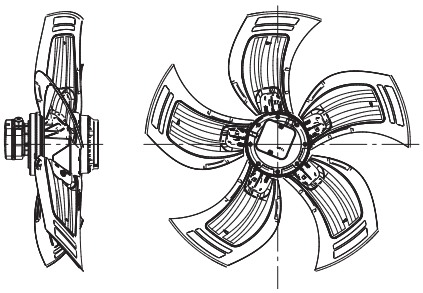
GreenTech is acknowledged and certified.
Every step in our chain of production meets the stringent standards of environmental specialists and the public. The 2008 Environmental Prize of Baden-Wuerttemberg, the Green Award 2009, the Energy Efficiency Award 2009 of the dena – to give just a few examples – testify to this. The environmental advantage gained in the performance of the products developed from our GreenTech philosophy can also be measured in the fulfilment of the most stringent energy and environmental standards. In many instances, our products are already well below the thresholds energy legislation will impose a few years from now – several times over.

Our customers profit from this every day.
The heart of GreenTech is future-oriented EC technology from ebmpapst. The EC technology at the core of our most efficient motors and fans allows efficiency of up to 90%, saves energy at a very high level, significantly extends service life and makes our products maintenance-free. These values pay off not only for the environment, but every cent also pays off for the user! All ebm-papst products – even those for which GreenTech EC technology does not (yet) make sense from an application viewpoint – feature the greatest possible connection of economy and ecology.

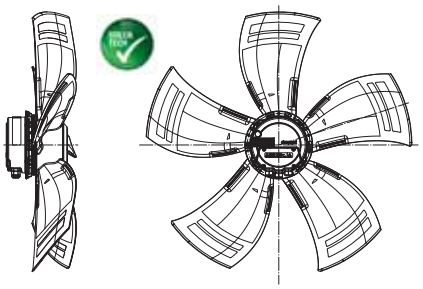
Energy comparison: axial fans size 800

The controlled ventilation of agricultural sheds is carried out primarily using axial fans. The fans are driven using single-phase asynchronous motors installed in the hub, with speeds that are adjusted by changing the supply voltage. The disadvantage of this system is the relatively poor energy balance. New motor and control configurations provide a significant improvement in energy balance. The following comparison between a conventional asynchronous fan and a GreenTech EC fan demonstrates this impressively.

AC axial fan **<>** **GreenTech EC axial fan**



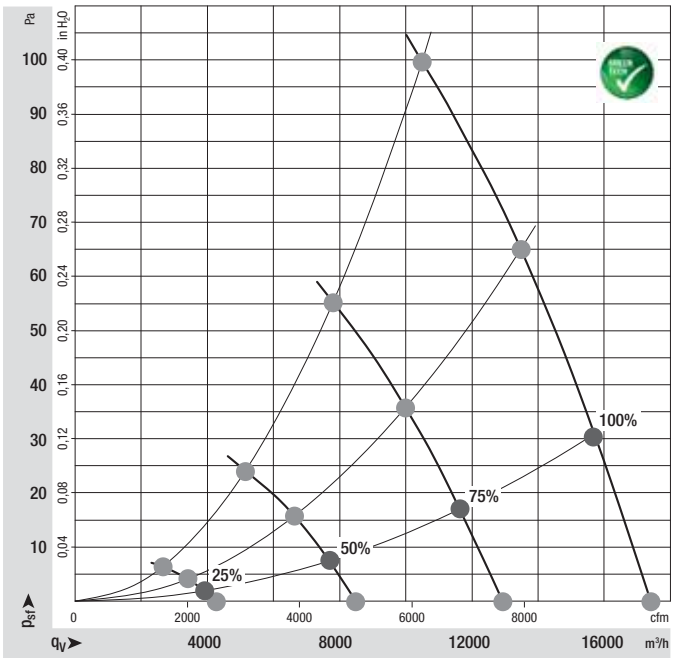
External rotor technology



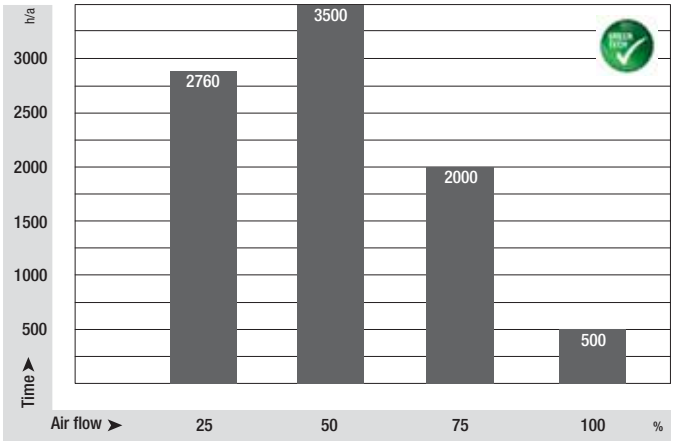
Asynchronous motor / AC motor
External voltage control
3~400 V

Permanent magnet motor / GreenTech EC motor
Integrated frequency inverter control
1~230 V

Comparison: 15.800 m^3/h
@ 30 Pa and partial-load operation



Load profile



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Energy comparison: axial fans size 800

If both fans are operated over the year with the specified load profile, the GreenTech EC fan provides significant cost savings. This is shown in the following image as a function of the energy costs. For example, if the electricity price is 0.10 EUR per kWh, annual savings of 149 EUR can be expected.

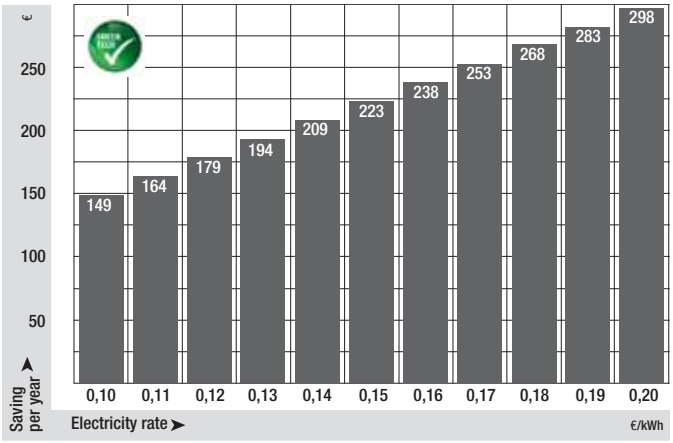

Figure: Annual savings as a function of the energy costs

The following figure provides the view over a longer period. Here, the annual operating costs of both fan concepts are added up over the years. The load profile shown above also served as the basis for the calculation here. The energy costs have been set at 0.10 EUR per kWh.

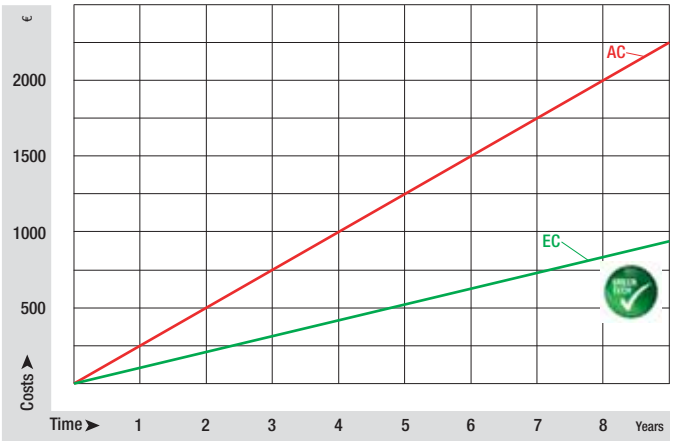

Figure: Operating costs over time at 0.10 EUR/kWh

The specific output of fans is an important and widely used statistic for their efficiency. This is shown by the power requirement in watts relative to a delivery volume of 1000 m^3/h . The graph shows the specific output of both fan concepts, starting at the design operating point of 15.800 m^3/h @ 30Pa. The GreenTech EC technology shows its advantages particularly well in partial-load operation, i.e. at reduced speed. That is precisely where barn fans are primarily operated. Another reason to decide in favour of groundbreaking EC technology.

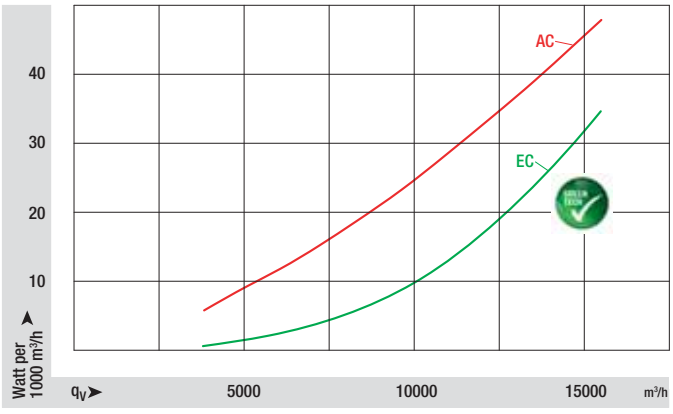

Figure: Comparison of specific fan power

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EC axial fans “low pressure”

Ø 560 - Ø 990

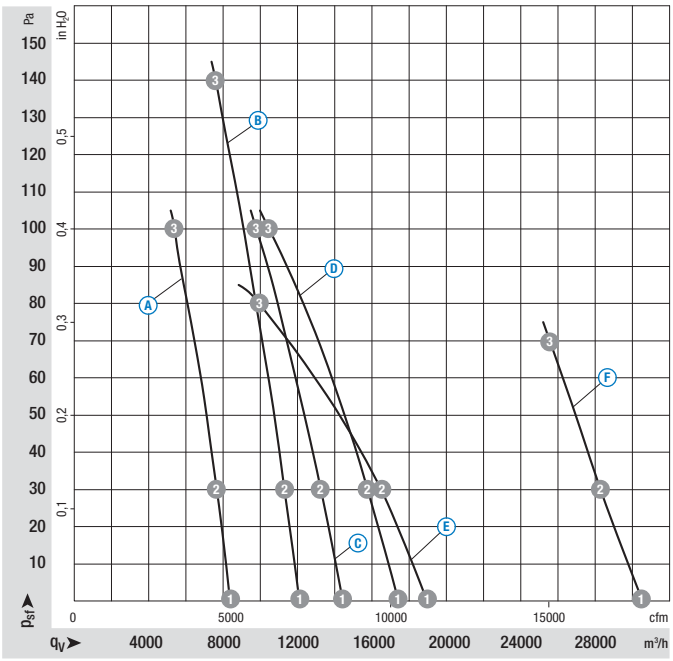
- **Material:** Carrying ring: Steel, galvanised, primed and coated in black plastic
  Wall ring: Sheet steel, pre-galvanised, primed and coated in black plastic
  Blades (5): Ⓑ Ⓓ Ⓔ Pressed-on round sheet steel plate; Ⓐ Ⓒ Ⓕ Insertion part made of sheet aluminium; Both versions are coated and extrusion-coated in PP plastics
  Rotor: Primed and coated in black
  Electronics enclosure: Die-cast aluminium, coated in black
- **Direction of rotation:** Ⓐ Ⓑ Ⓒ clockwise, Ⓓ Ⓔ Ⓕ counter-clockwise seen on rotor
- **Type of protection:** IP 54 (acc. to EN 60529)
- **Insulation class:** Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ "B" ("F" applying to the main components as per EN), Ⓕ "F"
- **Mounting position:** Shaft horizontal or rotor on top
- **Condensate discharges:** Stator-side
- **Mode of operation:** Continuous operation (S1)
- **Bearings:** Maintenance-free ball bearings

Nominal data		Blade angle	Curve	Nominal voltage range	Frequency	Speed/rpm(1)	Max. Input power (1)	Max. Current draw (1)	Max. back pressure	Perm. amb. temp.	Mass without attachments	Technical features and electr. connections
Type	**Motor**			**VAC**	**Hz**	**rpm**	**kW**	**A**	**Pa**	**°C**	**kg**	
***3G 560**	M3G 112-EA	-5°	Ⓐ	1~ 200-277	50/60	1000	0,40	1,80	100	-25..+60	7,2	S. 27 / L3)
***3G 630**	M3G 112-GA	-5°	Ⓑ	1~ 200-277	50/60	1000	0,72	3,20	140	-25..+60	9,3	S. 27 / L3)
***3G 710**	M3G 112-IA	0°	Ⓒ	1~ 200-277	50/60	830	0,70	3,10	100	-25..+60	12,0	S. 27 / L3)
***3G 800**	M3G 112-IA	0°	Ⓓ	1~ 200-277	50/60	710	0,73	3,20	100	-25..+60	12,1	S. 27 / L3)
***3G 910**	M3G 112-IA	0°	Ⓔ	1~ 200-277	50/60	590	0,58	2,60	80	-25..+60	12,2	S. 27 / L3)
***3G 990**	M3G 150-FF	-5°	Ⓕ	1~ 200-277	50/60	820	1,39	6,10	70	-25..+50	22,7	S. 28 / L9)

subject to alterations

(1) Nominal data in operating point with maximum load and 230 VAC

Curves



Air performance measured as per: ISO 5801, Installation category A, in ebm-papst full nozzle without protection against accidental contact

Suction-side noise levels: L_{WA} as per ISO 13347, L_{pA} measured at 1 m distance to fan axis

The acoustic values given are only valid under the measurment conditions listed and may vary depending on the installation situation.

With any deviation to the standard setup, the specific values have to be checked and re-viewed once installed or fitted!

For detailed information see page 30 ff.

	n rpm	P_e W	I A	L_{WA} dB(A)	SFP W/(1000m³/h)
Ⓐ 1	1000	293	1,29	67	35,1
Ⓐ 2	1000	331	1,46	66	43,3
Ⓐ 3	1000	400	1,80	69	74,1
Ⓑ 1	1000	462	2,11	71	38,2
Ⓑ 2	1000	518	2,36	69	45,9
Ⓑ 3	1000	720	3,20	71	94,8
Ⓒ 1	830	448	2,10	69	31,1
Ⓒ 2	830	525	2,41	68	39,6
Ⓒ 3	830	700	3,10	73	71,5
Ⓓ 1	710	462	2,15	70	26,5
Ⓓ 2	710	541	2,49	67	34,3
Ⓓ 3	710	730	3,20	69	69,6
Ⓔ 1	590	346	1,64	67	18,2
Ⓔ 2	590	445	2,07	65	27,0
Ⓔ 3	590	580	2,60	71	58,5
Ⓕ 1	820	1010	4,42	80	33,1
Ⓕ 2	820	1170	5,10	79	41,3
Ⓕ 3	820	1390	6,10	78	53,9

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- **Technical features:** See electrical connections p. 27 ff.
- **EMC:** Ⓕ Interference emission acc. to EN 61000-6-3
  Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ Interference emission acc. to EN 61000-6-4
  Interference immunity acc. to EN 61000-6-2
  Harmonics acc. to EN 61000-3-2/3
- **Leakage current:** < 3.5 mA acc. to EN 61800-5-1
- **Terminal box:** Electrical connection via terminal strip
- **Protection class:** I (acc. to EN 61800-5-1)
- **Product conforming to standards:** CE
- **Approvals:** CCC; VDE, GOST are applied for; UL, CSA on request

Direction of air flow

"A" ›

"A" ›

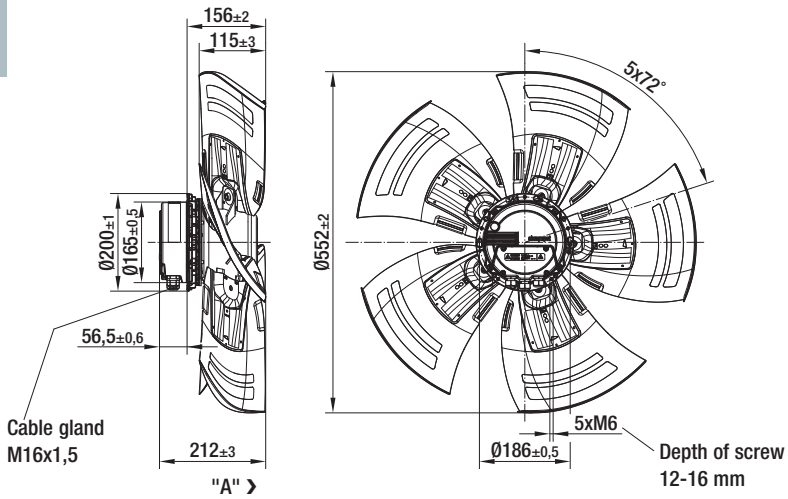
	Without attachments	With full square nozzle
"A"	A3G 560-AP68 -35	W3G 560-DP68 -35
"A"	A3G 630-AQ37 -35	W3G 630-DQ37 -35
"A"	A3G 710-AO85 -35	W3G 710-DO85 -35
"A"	A3G 800-AO81 -35	W3G 800-DO81 -35
"A"	A3G 910-AO84 -35	W3G 910-DO84 -35
"A"	A3G 990-AW21 -55	W3G 990-DW21 -55

EC axial fans “low pressure”

Ø 560 with motor M3G112, drawings for direction of air flow "A"

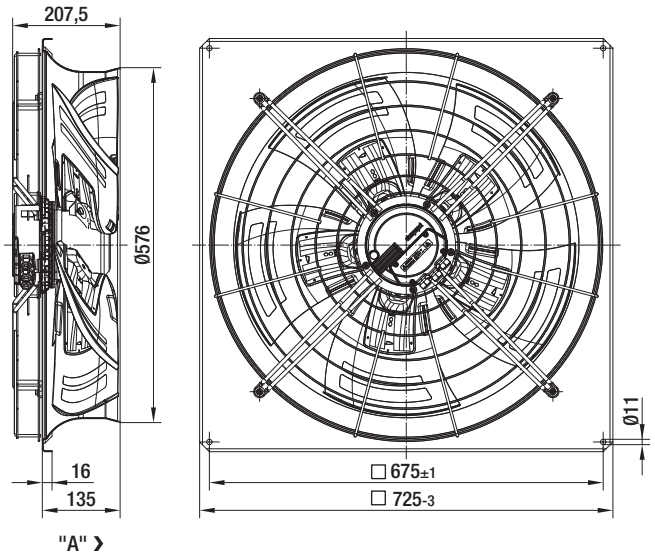
Without attachments

Type	Mass kg
A3G 560-AP68 -35	7,2



With full square nozzle

Type	Mass kg
W3G 560-DP68 -35	18,9



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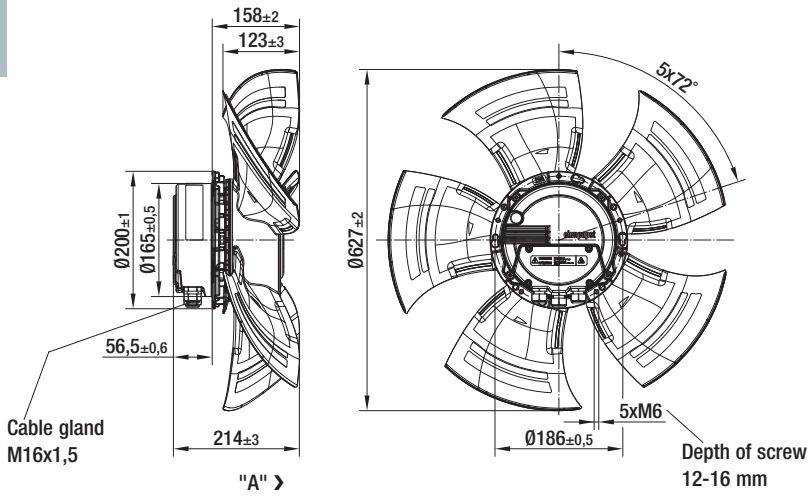
EC axial fans “low pressure”

Ø 630 with motor M3G112, drawings for direction of air flow "A"

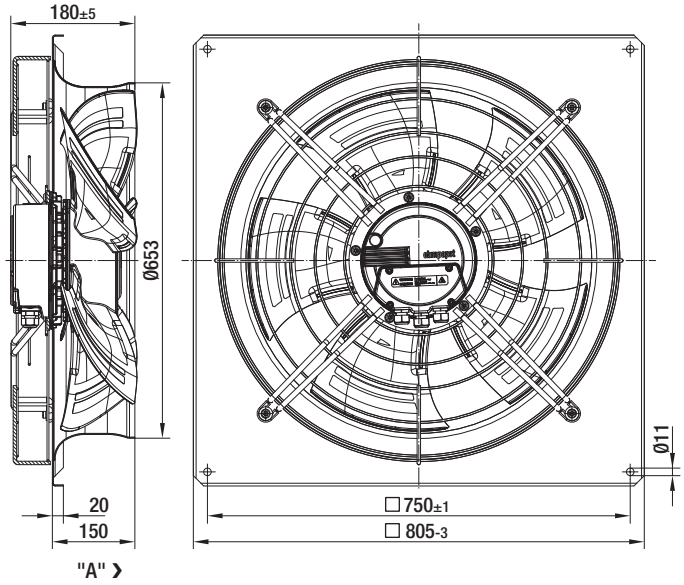
Without attachments

Type	Mass kg
A3G 630-AQ37 -35	9,3



With full square nozzle

Type	Mass kg
W3G 630-DQ37 -35	24,3

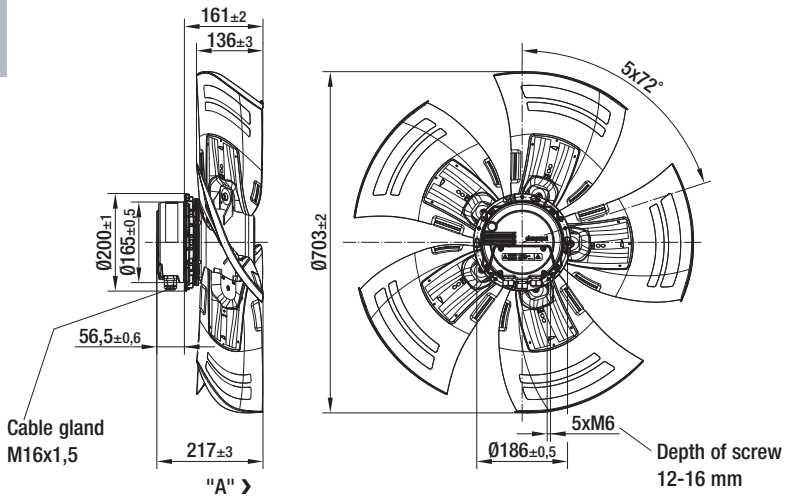


EC axial fans “low pressure”

Ø 710 with motor M3G112, drawings for direction of air flow "A"

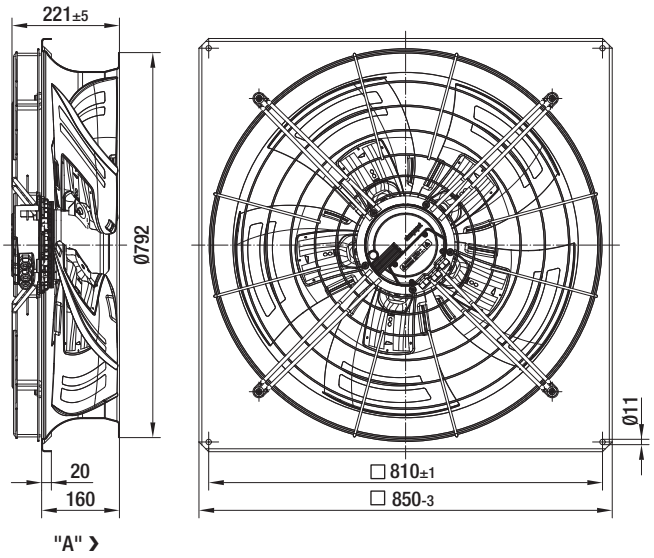
Without attachments

Type	Mass kg
A3G 710-A085 -35	12,0



With full square nozzle

Type	Mass kg
W3G 710-D085 -35	26,9



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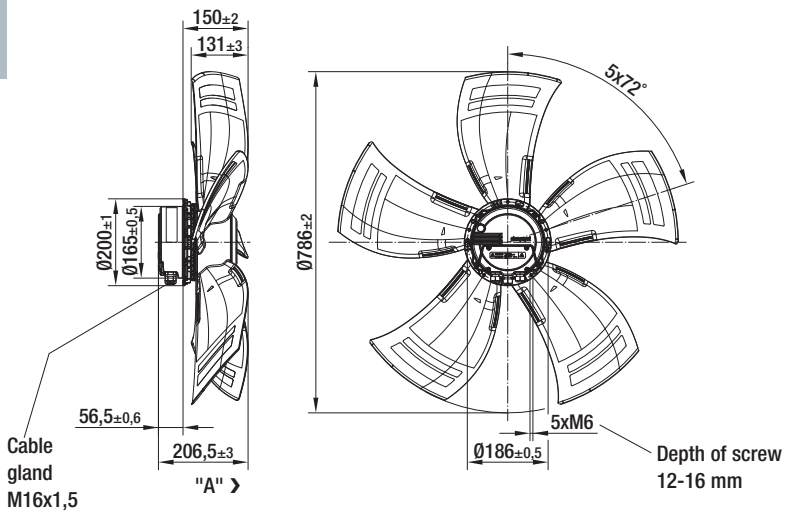
EC axial fans “low pressure”

Ø 800 with motor M3G112, drawings for direction of air flow "A"

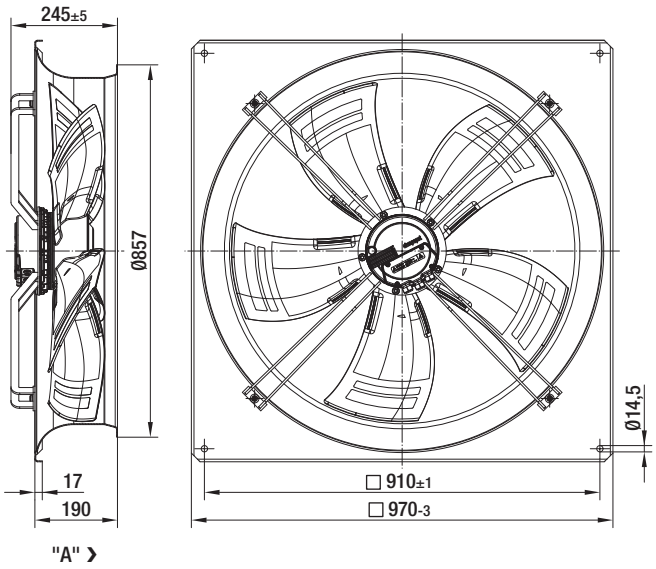
Without attachments

Type	Mass kg
A3G 800-A081 -35	12,1



With full square nozzle

Type	Mass kg
W3G 800-D081 -35	33,3

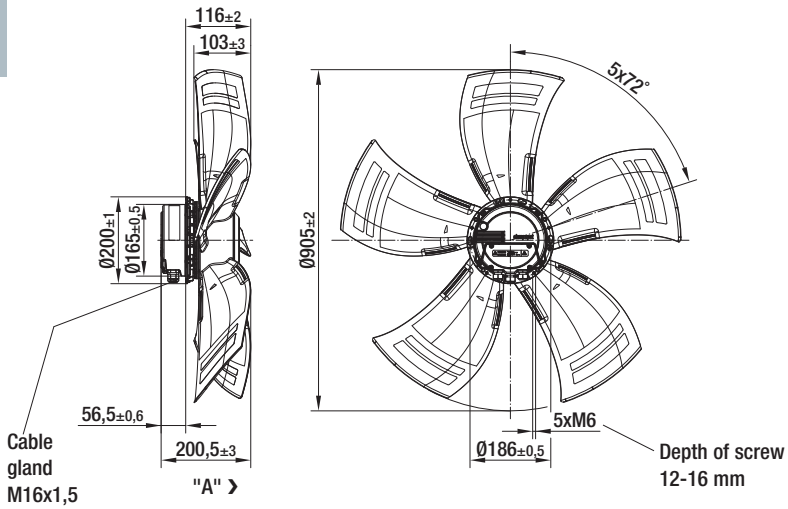


EC axial fans “low pressure”

Ø 910 with motor M3G112, drawings for direction of air flow "A"

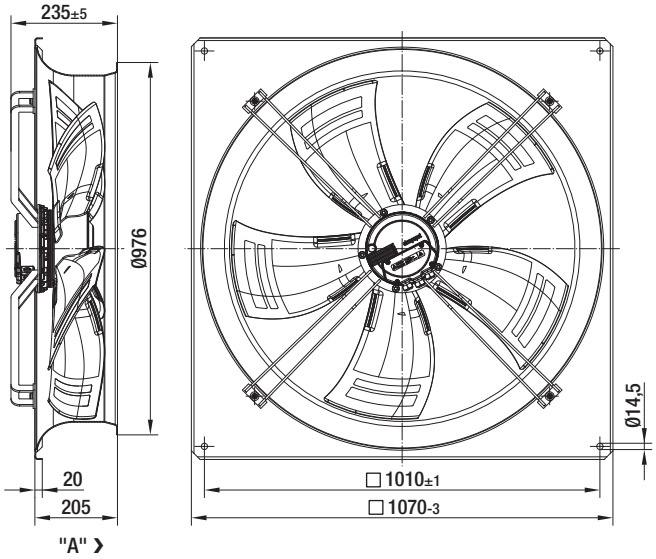
Without attachments

Type	Mass kg
A3G 910-A084 -35	12,2



With full square nozzle

Type	Mass kg
W3G 910-DO84 -35	37,0



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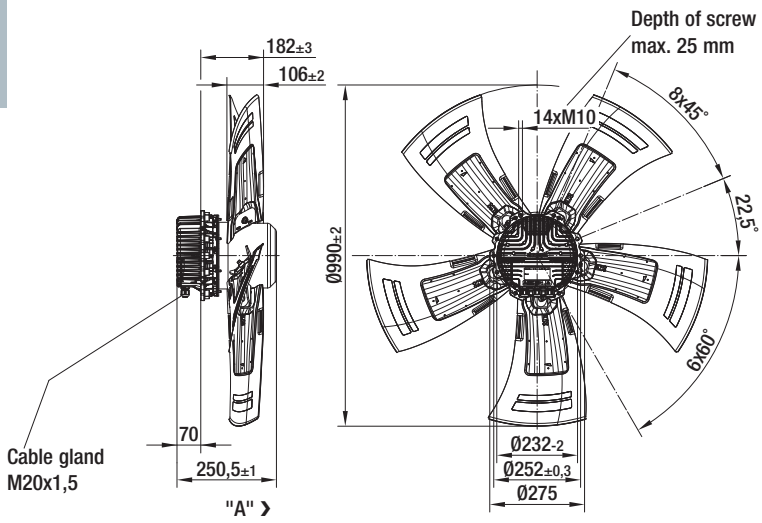
EC axial fans “low pressure”

Ø 990 with motor M3G150, drawings for direction of air flow "A"

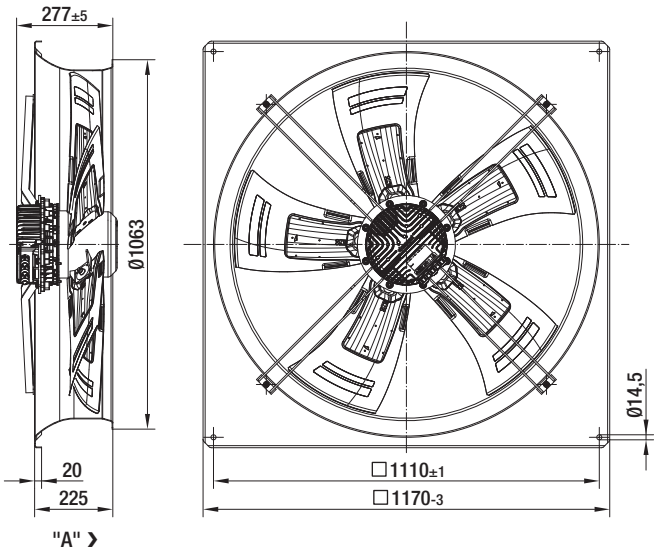
Without attachments

Type	Mass kg
A3G 990-AW21 -55	22,7



With full square nozzle

Type	Mass kg
W3G 990-DW21 -55	52,9



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EC axial fans “high pressure”

Ø 500 - Ø Z50

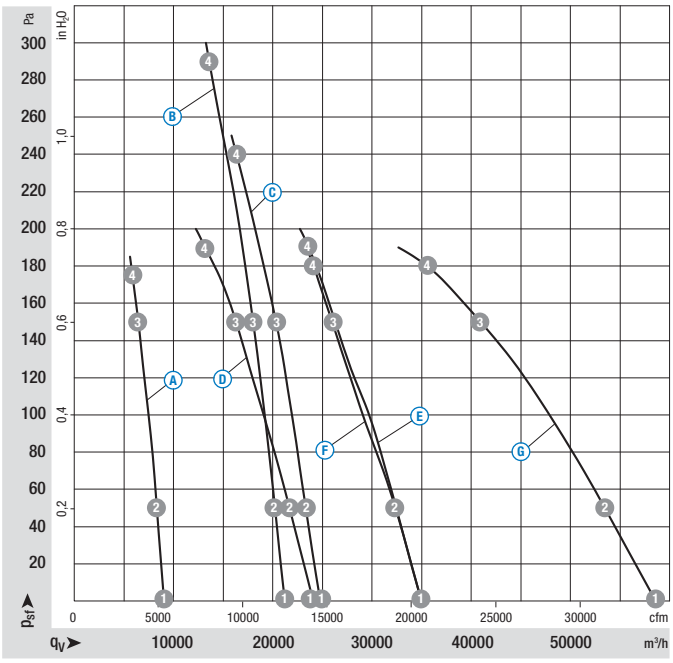
- **Material:** Carrying ring: Steel, galvanised, primed and coated in black plastic
  Wall ring: Sheet steel, pre-galvanised, primed and coated in black plastic
  Blades (5): Ⓐ Pressed-on round sheet steel plate; Ⓑ Ⓒ Ⓓ Ⓔ Ⓕ Ⓖ Insertion part made of sheet aluminium; Both versions are coated and extrusion-coated in PP plastics
  Rotor: Primed and coated in black
  Electronics enclosure: Die-cast aluminium, coated in black
- **Direction of rotation:** Ⓐ clockwise, Ⓑ Ⓒ Ⓓ Ⓔ Ⓕ Ⓖ counter-clockwise seen on rotor
- **Type of protection:** IP 54 (acc. to EN 60529)
- **Insulation class:** Ⓐ "B" ("F" applying to the main components as per EN), Ⓑ Ⓒ Ⓓ Ⓔ Ⓕ Ⓖ "F"
- **Mounting position:** Shaft horizontal or rotor on top
- **Condensate discharges:** Stator-side
- **Mode of operation:** Continuous operation (S1)
- **Bearings:** Maintenance-free ball bearings

Nominal data		Blade angle	Curve	Nominal voltage range	Frequency	Speed/rpm(1)	Max. Input power (1)	Max. Current draw (1)	Max. back pressure	Perm. amb. temp.	Mass without attachments	Technical features and electr. connections
Type	**Motor**			**VAC**	**Hz**	**rpm**	**kW**	**A**	**Pa**	**°C**	**kg**	
***3G 500**	M3G 112-EA	0°	Ⓐ	1~ 200-277	50/60	1420	0,75	3,40	175	-25..+60	7,2	S. 27 / L3)
***3G 630**	M3G 150-IF	0°	Ⓑ	3~ 380-480	50/60	1510	3,20	5,00	290	-25..+65	24,4	S. 26 / L5)
***3G 710**	M3G 150-IF	0°	Ⓒ	3~ 380-480	50/60	1250	2,83	4,30	240	-25..+60	25,3	S. 26 / L5)
***3G 800**	M3G 150-GF	0°	Ⓓ	3~ 380-480	50/60	925	1,85	2,85	190	-25..+60	23,0	S. 26 / L5)
***3G 910**	M3G 150-NA	0°	Ⓔ	3~ 380-480	50/60	1000	2,88	4,40	190	-25..+65	30,9	S. 26 / L5)
***3G 990**	M3G 150-NA	-5°	Ⓕ	3~ 380-480	50/60	960	2,58	4,00	180	-25..+70	31,2	S. 26 / L5)
***3G Z50**	M3G 200-LA	0°	Ⓖ	3~ 380-480	50/60	645	4,10	6,70	180	-25..+60	66,0	S. 26 / L5)

subject to alterations

(1) Nominal data in operating point with maximum load and 230 VAC or 400 VAC

Curves



Air performance measured as per: ISO 5801, Installation category A, in ebm-papst full nozzle without protection against accidental contact

Suction-side noise levels: L_{WA} as per ISO 13347, L_{pA} measured at 1 m distance to fan axis

The acoustic values given are only valid under the measurment conditions listed and may vary depending on the installation situation.

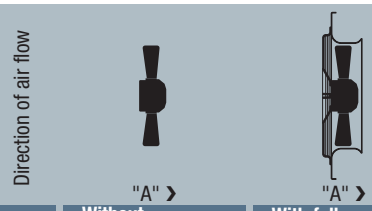
With any deviation to the standard setup, the specific values have to be checked and reviewed once installed or fitted!

For detailed information see page 30 ff.

		n rpm	P_e W	I A	L_{WA} dB(A)	SFP W/(1000m³/h)
Ⓐ	1	1420	549	2,52	79	60,6
Ⓐ	2	1420	602	2,74	77	72,1
Ⓐ	3	1420	705	3,20	73	109,5
Ⓐ	4	1420	750	3,40	74	126,6
Ⓑ	1	1510	2484	3,77	81	117,2
Ⓑ	2	1510	2625	4,00	81	129,7
Ⓑ	3	1510	2863	4,40	81	158,7
Ⓑ	4	1510	3200	5,00	85	234,4
Ⓒ	1	1250	2226	3,40	79	89,8
Ⓒ	2	1250	2330	3,54	79	99,8
Ⓒ	3	1250	2621	4,00	79	128,9
Ⓒ	4	1250	2830	4,30	83	173,2
Ⓓ	1	925	1221	1,85	72	50,7
Ⓓ	2	925	1370	2,07	72	63,2
Ⓓ	3	925	1661	2,50	76	101,7
Ⓓ	4	925	1850	2,85	80	140,2

ebmpapst

- **Technical features:** See electrical connections p. 26 ff.
- **EMC:** Ⓑ Ⓒ Ⓓ Ⓔ Ⓕ Ⓖ Interference emission acc. to EN 61000-6-3
  Ⓐ Interference emission acc. to EN 61000-6-4
  Interference immunity acc. to EN 61000-6-2
  Harmonics acc. to EN 61000-3-2/3
- **Leakage current:** < 3.5 mA acc. to EN 61800-5-1
- **Terminal box:** Electrical connection via terminal strip
- **Protection class:** I (acc. to EN 61800-5-1)
- **Product conforming to standards:** CE
- **Approvals:** Ⓐ CCC; VDE, GOST are applied for; UL, CSA on request
  Ⓑ Ⓒ Ⓓ Ⓔ Ⓕ Ⓖ CCC, UL, CSA; VDE, GOST are applied for



	Without attachments	With full square nozzle
"A"	A3G 500-AM56 -35	W3G 500-DM56 -35
"A"	A3G 630-AU23 -35	W3G 630-DU23 -35
"A"	A3G 710-AU21 -35	W3G 710-DU21 -35
"A"	A3G 800-AT21 -35	W3G 800-DT21 -35
"A"	A3G 910-AV02 -35	W3G 910-DV02 -35
"A"	A3G 990-AZ02 -35	W3G 990-DZ02 -35
"A"	A3G Z50-AB02 -35	W3GZ50 -CB02 -35*

* with full round nozzle

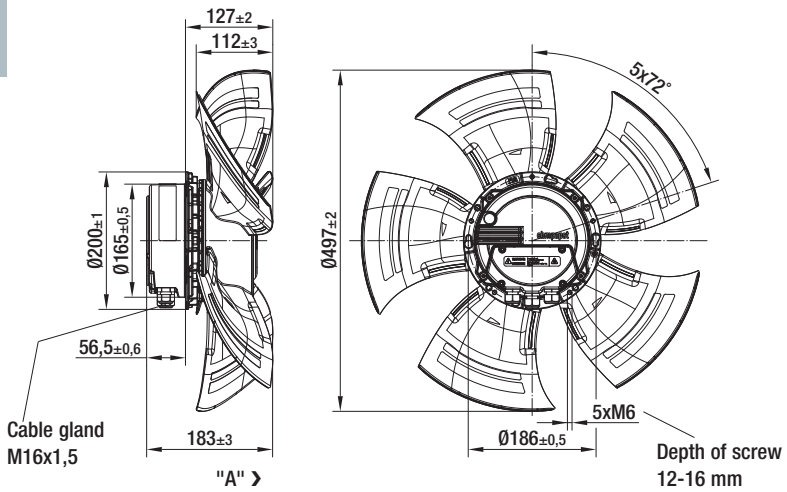
	n rpm	P_e W	I A	L_{WA} dB(A)	$P_{spez.}$ Wh/1000m³
Ⓔ 1	1000	1922	2,91	79	55,0
Ⓔ 2	1000	2194	3,35	78	67,6
Ⓔ 3	1000	2672	4,53	83	101,8
Ⓔ 4	1000	2880	4,40	82	122,1
Ⓕ 1	960	1492	2,27	85	42,6
Ⓕ 2	960	1833	2,78	83	56,6
Ⓕ 3	960	2428	3,70	84	93,4
Ⓕ 4	960	2580	4,00	85	107,3
Ⓖ 1	645	2694	4,64	79	46,0
Ⓖ 2	645	3079	5,20	78	57,6
Ⓖ 3	645	3825	6,33	80	93,3
Ⓖ 4	645	4100	6,70	83	115,3

EC Axialventilatoren “high pressure”

Ø 500 with motor M3G112, drawings for direction of air flow "A"

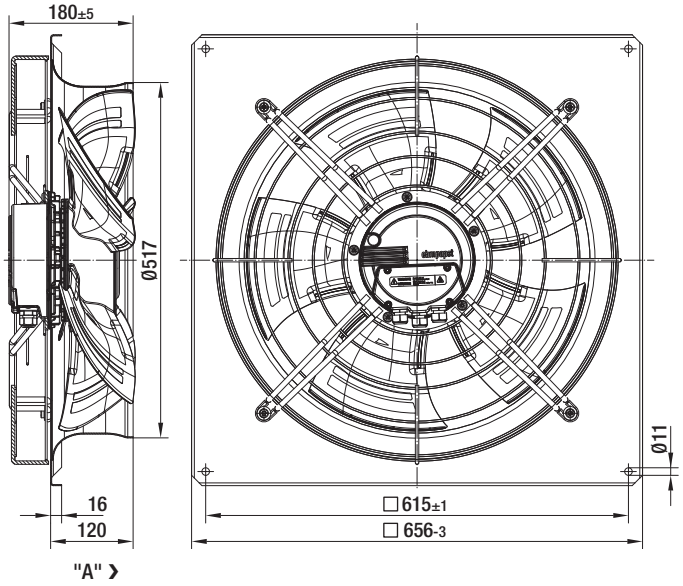
Without attachments

Type	Mass kg
A3G 500-AM56 -35	7,2



With full square nozzle

Type	Mass kg
W3G 500-DM56 -35	17,2



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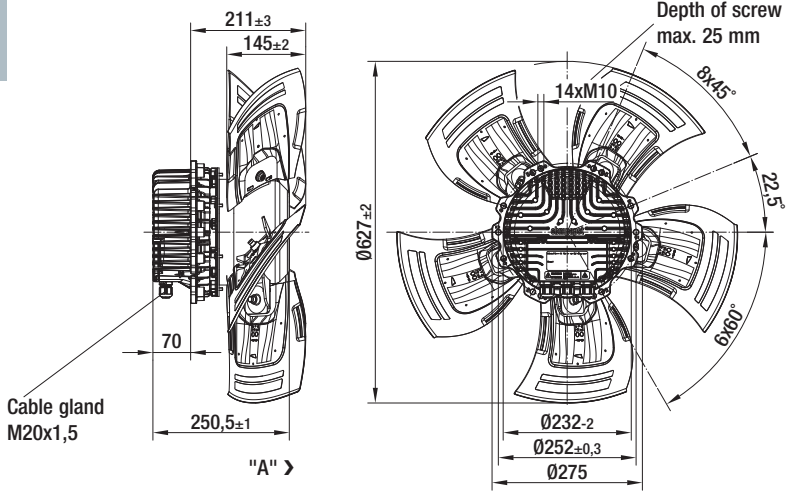
EC Axialventilatoren “high pressure”

Ø 630 with motor M3G150, drawings for direction of air flow "A"

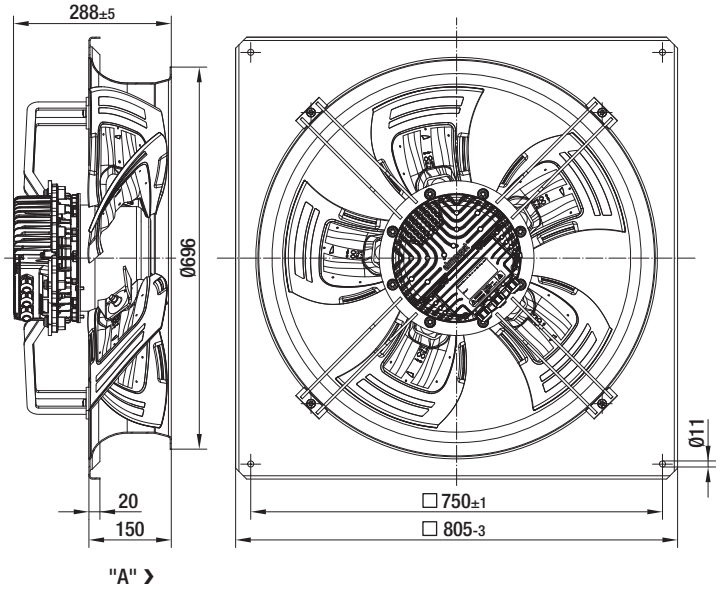
Without attachments

Type	Mass kg
A3G 630-AU23 -35	24,4



With full square nozzle

Type	Mass kg
W3G 630-DU23 -35	39,5

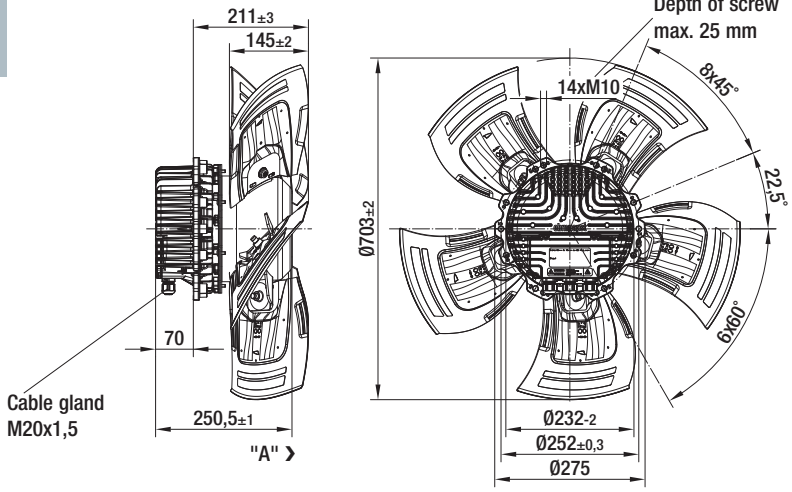


EC Axialventilatoren “high pressure”

Ø 710 with motor M3G150, drawings for direction of air flow "A"

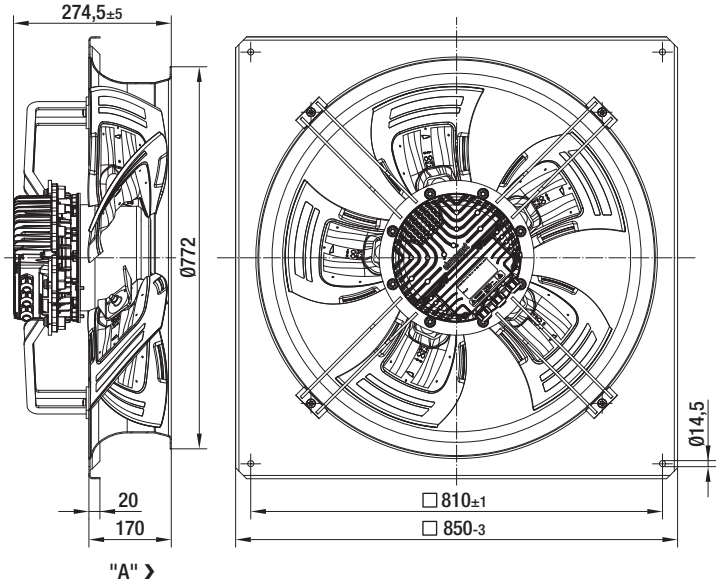
Without attachments

Type	Mass kg
A3G 710-AU21 -35	25,3



With full square nozzle

Type	Mass kg
W3G 710-DU21 -35	42,4



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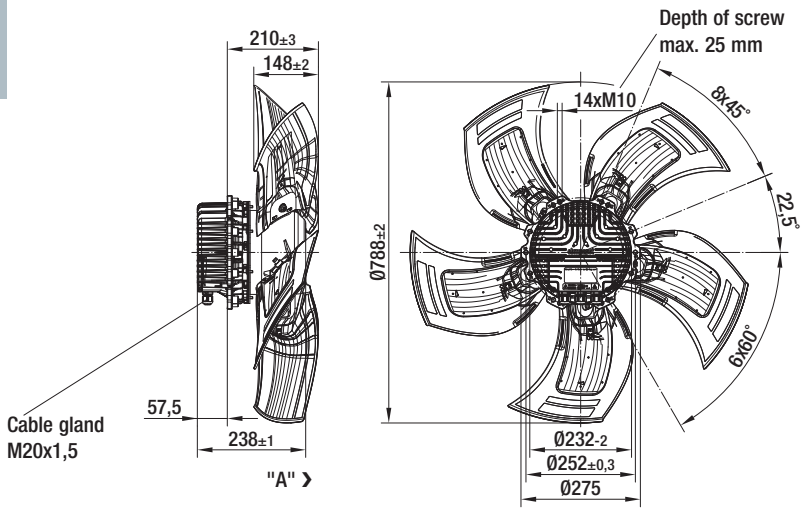
EC Axialventilatoren “high pressure”

Ø 800 with motor M3G150, drawings for direction of air flow "A"

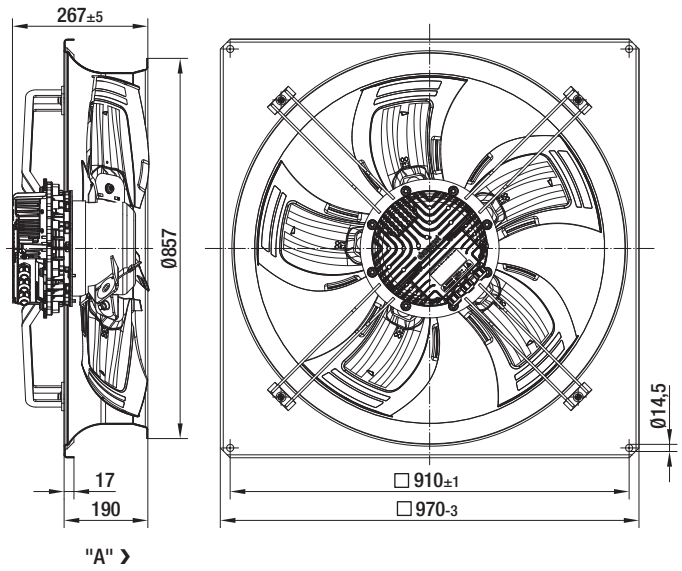
Without attachments

Type	Mass kg
A3G 800-AT21 -35	23,0



With full square nozzle

Type	Mass kg
W3G 800-DT21 -35	42,8

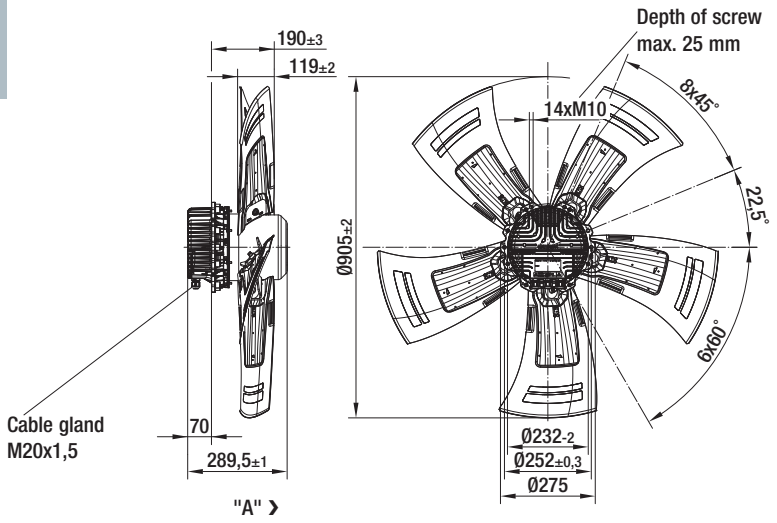


EC Axialventilatoren “high pressure”

Ø 910 with motor M3G150, drawings for direction of air flow "A"

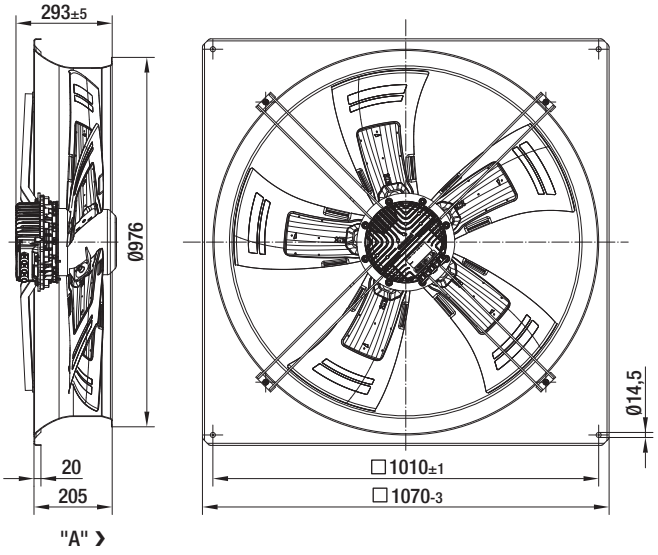
Without attachments

Type	Mass kg
A3G 910-AV02 -35	30,9



With full square nozzle

Type	Mass kg
W3G 910-DV02 -35	56,1



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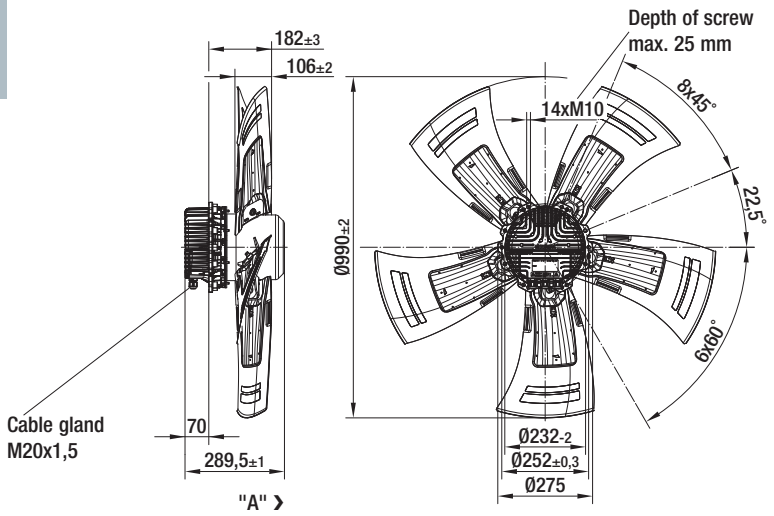
EC Axialventilatoren “high pressure”

Ø 990 with motor M3G150, drawings for direction of air flow "A"

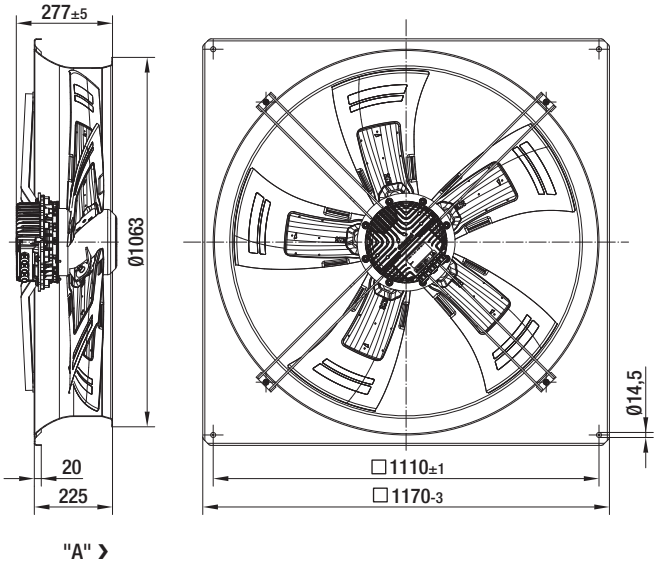
Without attachments

Type	Mass kg
A3G 990-AZ02 -35	31,2



With full square nozzle

Type	Mass kg
W3G 990-DZ02 -35	61,4

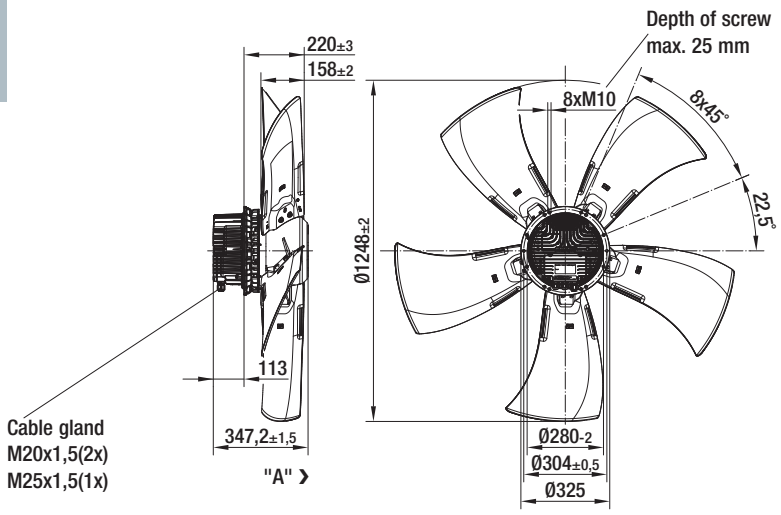


EC Axialventilatoren “high pressure”

Ø Z50 with motor M3G 200, drawings for direction of air flow "A"

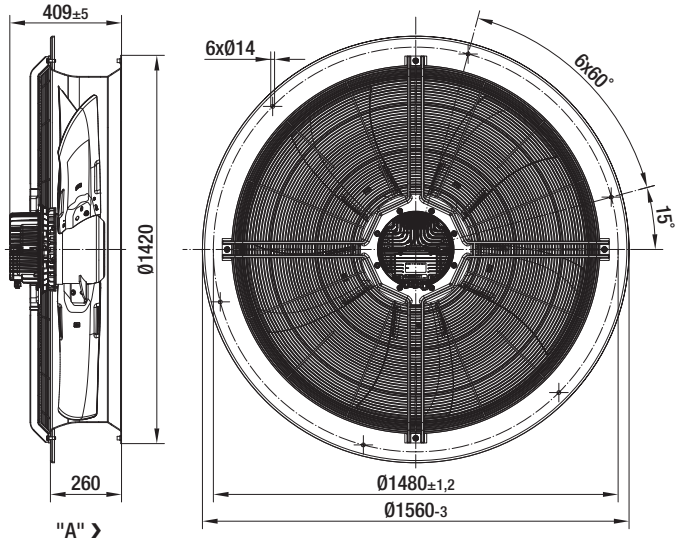
Without attachments

Type	Mass kg
A3G Z50-AB02 -35	66,0



mit runder Volldüse

Type	Mass kg
W3G Z50-CB02 -35	137,0



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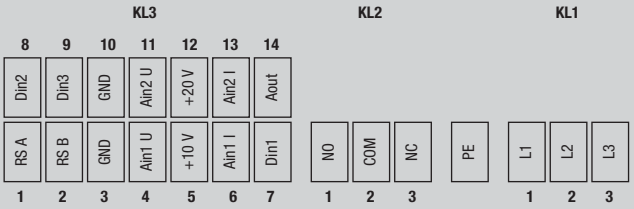
Electrical connections EC

L5)

Technical features:

- PFC (passive)
- Integrated PID controller
- Control input 0-10 VDC or 4-20 mA
- Input for sensor 0-10 V or 4-20 mA
- Slave output 0-10 V max. 5 mA
- Output 20 VDC (±25 % / -10 %) max. 50 mA
- Output 10 VDC (+3 %) max. 10 mA
- RS485 MODBUS
- Motor current limitation, alarm relay
- Line undervoltage / phase failure detection
- Electronics / motor overtemperature protection
- Locked-rotor protection, soft start
- Digital inputs for day/night switch, enabling, cooling / heating



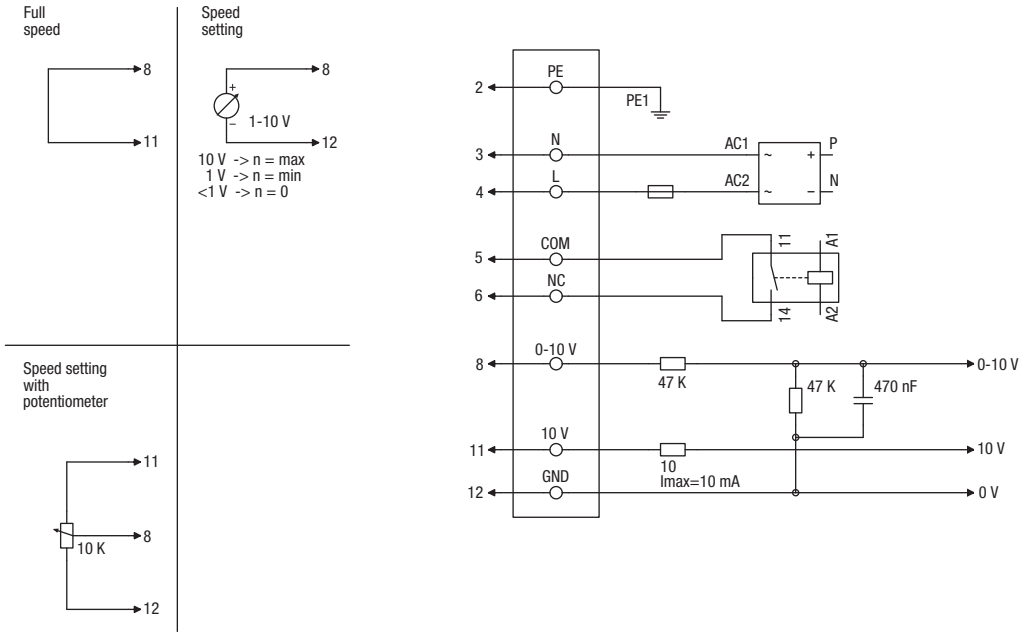
Connector	Pin	Connection	Assignment / function
KL1	1	L1	Mains supply connection, supply voltage 3~380-480 VAC; 50/60 Hz
	2	L2	Mains supply connection, supply voltage 3~380-480 VAC; 50/60 Hz
	3	L3	Mains supply connection, supply voltage 3~380-480 VAC; 50/60 Hz
PE		PE	Earth connection, PE connection
KL2	1	NO	Status relay, floating status contact; normally open; close with error
	2	COM	Status relay; floating status contact; changeover contact; common connection; contact rating 250 VAC / 2 A (AC1)
	3	NC	Status relay, floating status contact; break with error
KL3	1	RSA	Bus connection RS485; RSA; MODBUS RTU
	2	RSB	Bus connection RS485; RSB; MODBUS RTU
	3/10	GND	Signal ground for control interface KL3
	4	Ain1 U	Analogue input 1 (set value); 0-10 V; Ri= 100 kΩ; parametrisable curves; only usable as alternative to input Ain1 I
	5	+10 V	Fixed voltage output 10 VDC; + 10 V ±3 %; max. 10 mA; short circuit proof; power supply for ext. devices (e.g. potentiometer)
	6	Ain1 I	Analogue input 1 (set value); 4-20 mA; Ri= 100 Ω; parametrisable curves; only usable as alternative to input Ain1 U
	7	Din1	Digital input 1: enabling of electronics; enabling: open pin or applied voltage 5 to 50 VDC; disabling: bridge to GND or applied voltage < 1 VDC; reset function: triggers software reset after a level change to <1 V
	8	Din2	Digital input 2: parameter set switch 1/2; according to EEPROM setting, the valid/used parameter set is selectable per BUS or per digital input DIN2. Parameter set 1: open pin or applied voltage 5 to 50 VDC; parameter set 2: bridge to GND or applied voltage < 1 VDC
	9	Din3	Digital input 3: Control characteristic of the integrated controller; according to EEPROM setting, the control characteristic of the integrated controller is normally/inversely selectable per BUS or per digital input; normal: open pin or applied voltage 5 to 50 VDC (control deviation = actual sensor value - set value) inverse: bridge to GND or applied voltage < 1 VDC (control deviation = set value - actual sensor value)
	11	Ain2 U	Analogue input 2 (actual sensor value); 0-10 V; Ri= 100 kΩ; parametrisable curve; only usable as alternative to input Ain2 I
	12	+20 V	Fixed voltage output 20 VDC; + 20 V +25/-10 %; max. 50 mA; short circuit proof; power supply for ext. devices (e.g. sensors)
	13	Ain2 I	Analogue input 2 (actual sensor value); 4-20 mA; Ri= 100 Ω; parametrisable curve; only usable as alternative to input Ain2 U
	14	Aout	Analogue output 0-10 V; max. 5 mA; output of the actual motor control factor (output voltage of electronics)/of the actual motor speed; function selectable per bus; parametrisable curve.

Electrical connections EC

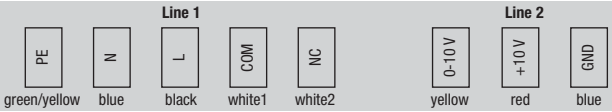
L3)

Technical features:

- PFC (active)
- Control input 0-10 VDC / PWM
- Output 10 VDC max. 10 mA
- alarm relay
- Electronics / motor overtemperature protection
- Line undervoltage detection
- Motor current limitation
- Locked-rotor protection, soft start



Customer circuit **Connection** **Fan**



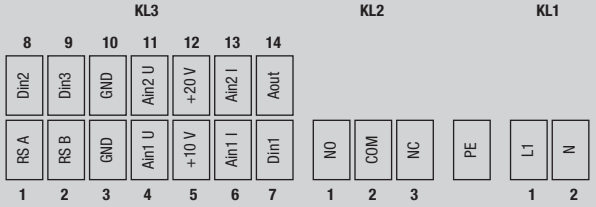
Line	No.	Connection	Colour	Assignment / function
1	2	PE	green/yel.	Earth connection, PE connection
1	3	N	blue	Mains supply connection, supply voltage 1~200-277 VAC; 50/60 Hz; neutral
1	4	L	black	Mains supply connection, supply voltage 1~200-277 VAC; 50/60 Hz; phase
1	5	COM	white1	Status relay; floating status contact; changeover contact; common connection; contact rating 250 VAC / 2 A (AC1)
1	6	NC	white2	Status relay, floating status contact; option 1: break with error; option 2: break with error for run monitor error message
2	8	0-10 V	yellow	Control input, set value 0-10 VDC, impedance 100 kΩ, SELV
2	11	+10 V	red	Fixed voltage output 10 VDC (+/- 3%), max. 10 mA, supply voltage for external devices (e.g. potentiometer), SELV
2	12	GND	blue	Reference mass for control interface, SELV

Electrical connections EC

L9)

Technical features:

- PFC (active)
- Integrated PID controller
- Control input 0-10 VDC / PWM
- Input for sensor 0-10 V or 4-20 mA
- Slave output 0-10 V max. 5 mA
- Output 20 VDC (±25 % / -10 %) max. 50 mA
- Output 10 VDC (+3 %) max. 10 mA
- RS485 MODBUS
- alarm relay
- Line undervoltage / phase failure detection
- Motor current limitation
- Electronics / motor overtemperature protection
- Locked-rotor protection
- soft start



Connector	Pin	Connection	Assignment / function
KL1	1	L1	Mains supply connection, supply voltage 1~200-277 VAC; 50/60 Hz; phase
	2	N	Mains supply connection, supply voltage 1~200-277 VAC; 50/60 Hz; neutral
PE		PE	Earth connection, PE connection
KL2	1	NO	Status relay, floating status contact; option 1: close with error; option 2: close with run monitor error message
	2	COM	Status relay; floating status contact; changeover contact; common connection; contact rating 250 VAC / 2 A (AC1)
	3	NC	Status relay, floating status contact; option 1: break with error; option 2: break with error for run monitor error message
KL3	1	RSA	Bus connection RS485; RSA; MODBUS RTU
	2	RSB	Bus connection RS485; RSB; MODBUS RTU
	3/10	GND	Signal ground for control interface KL3; SELV
	4	Ain1 U	Analogue input 1 (set value); 0-10 V; Ri= 100 kΩ; parametrisable curves; only usable as alternative to input Ain1 I
	5	+10 V	Fixed voltage output 10 VDC; + 10 V ±3 %; max. 10 mA; short circuit proof; power supply for ext. devices (e.g. potentiometer)
	6	Ain1 I	Analogue input 1 (set value); 4-20 mA; Ri= 100 Ω; parametrisable curves; only usable as alternative to input Ain1 U
	7	Din1	Digital input 1: enabling of electronics; enabling: open pin or applied voltage 5 to 50 VDC; disabling: bridge to GND or applied voltage < 0,8 VDC; reset function: triggers software reset after a level change to < 0,8 V
	8	Din2	Digital input 2: parameter set switch 1/2; according to EEPROM setting, the valid/used parameter set is selectable per BUS or per digital input DIN2. Parameter set 1: open pin or applied voltage 5 to 50 VDC; parameter set 2: bridge to GND or applied voltage < 0,8 VDC
	9	Din3	Digital input 3: Control characteristic of the integrated controller; according to EEPROM setting, the control characteristic of the integrated controller is normally/inversely selectable per BUS or per digital input; normal: open pin or applied voltage 5 to 50 VDC (control deviation = actual sensor value - set value) inverse: bridge to GND or applied voltage < 0,8 VDC (control deviation = set value - actual sensor value)
	11	Ain2 U	Analogue input 2 (actual sensor value); 0-10 V; Ri= 100 kΩ; parametrisable curve; only usable as alternative to input Ain2 I
	12	+20 V	Fixed voltage output 20 VDC; + 20 V +25/-10 %; max. 50 mA; short circuit proof; power supply for ext. devices (e.g. sensors)
	13	Ain2 I	Analogue input 2 (actual sensor value); 4-20 mA; Ri= 100 Ω; parametrisable curve; only usable as alternative to input Ain2 U
	14	Aout	Analogue output 0-10 V; max. 5 mA; output of the actual motor control factor (output voltage of electronics)/of the actual motor speed; function selectable per bus; parametrisable curve.

Technical parameters & scope

High standards for all ebm-papst products

Here at ebm-papst, we constantly strive to further improve our products in order to be able to offer you the best possible product for your application. Careful monitoring of the market ensures that technical innovations are reflected in the improvements of our products.
Based on the technical parameters listed below and the ambience you want our product to operate in, we here at ebm-papst can always work out the best solution for your specific application.

General performance parameters

Any deviations from the technical data and parameters described here are listed on the product-specific data sheet.

Type of protection

The type of protection is specified in the product-specific data sheets.

Insulation class

The insulation class is specified in the product-specific data sheets.

Mounting position

The mounting position is specified in the product-specific data sheets.

Condensate discharge holes

Information on the condensate discharge holes is provided in the product-specific data sheets.

Mode of operation

The mode of operation is specified in the product-specific data sheets.

Protection class

The protection class is specified in the product-specific data sheets.

Service life

The service life of ebm-papst products depends on two major factors:

– The service life of the insulation system
– The service life of the bearing system

The service life of the insulation system mainly depends on voltage level, temperature and ambient conditions, such as humidity and condensation.
The service life of the bearing system depends mainly on the thermal load on the bearing.
The majority of our products use maintenance-free ball bearings for any mounting position possible. As an option, sleeve bearings can be used, which is indicated on the product-specific data sheet wherever applicable.
The service life L10 of the ball bearings can be taken as approx. 40,000 operating hours at an ambient temperature of 40 °C, yet this estimate can vary according to the actual ambient conditions.
We will gladly provide you with a lifetime calculation taking into account your specific operating conditions.

Motor protection / thermal protection

Information on motor protection and thermal protection is provided in the product-specific data sheets.
Depending on motor type and field of application, the following protective features are realised:

– Thermal overload protection (TOP), either in-circuit or external
– PTC with electronic diagnostics
– Impedance protection
– Thermal overload protection (TOP) with electronic diagnostics
– Current limitation via electronics

If an external TOP is connected, the customer has to make sure to connect a conventional trigger device for switching it off.
Products without fitted TOP and without protection against improper use, a motor protection complying with the valid standards has to be installed.

Left: Endurance test room
Middle: Shock test
Right: Chamber test rig



Mechanical strain / performance parameters

All ebm-papst products are subjected to comprehensive tests complying with the normative specifications. In addition to this, the tests also reflect the vast experience and expertise of ebm-papst.

Vibration test

Vibration tests are carried out in compliance with

– Vibration test in operation according to DIN IEC 68, parts 2-6
– Vibration test at standstill according to DIN IEC 68, parts 2-6

Shock load

Shock load tests are carried out in compliance with

– Shock load according to DIN IEC 68, parts 2-27

Balancing quality

Testing the balancing quality is carried out in compliance with

– Residual imbalance according to DIN ISO 1940
– Standard balancing quality level G 6.3

Should you require a higher balancing quality level for your specific application, please let us know and specify this when ordering your product.

Chemo-physical strain / performance parameters

Should you have questions about chemo-physical strain, please direct them to your ebm-papst contact.

Fields of application, industries and applications

Our products are used in various industries and applications:
Ventilation, air-conditioning and refrigeration technology, clean room technology, automotive and rail technology, medical and laboratory technology, electronics, computer and office technology, telecommunications, household appliances, heating, machines and plants, drive engineering.
Our products are not designed for use in the aviation and aerospace industry!

Legal and normative directives

The products described in this catalogue are designed, developed and produced in keeping with the standards in place for the relevant product and, if known, the conditions governing the relevant fields of application.

Standards

Information on standards is provided in the product-specific data sheets.

EMC

Information on EMC standards is provided in the product-specific data sheets.
Complying with the EMC standards has to be established on the final appliance, as different mounting situations can result in changed EMC properties.

Leakage current

Information on the leakage current is provided in the product-specific data sheets.
Measuring is according to IEC 60990.

Approvals

In case you require a specific approval for your ebm-papst product (VDE, UL, GOST, CCC, CSA, etc.) please let us know.
Most of our products can be supplied with the relevant approval.
Information on existing approvals is provided in the product-specific data sheets.

Air performance measurements

All air performance measurements are carried out on suction side and on chamber test beds conforming to the specifications as per ISO 5801 and DIN 24163. The fans under test are installed in the measuring chamber at free air intake and exhaust (installation category A) and are operated at nominal voltage, with AC also at nominal frequency, and without any additional components such as guard grilles.
As required by the standard, the air performance curves correspond to an air density of 1.2 kg/m^3.

Room for precision noise measuring

Measurement conditions for air and noise measurement

ebm-papst products are measured under the following conditions:

- Axial and diagonal fans in direction of rotation “V” in full nozzle and without guard grille
- Backward curved centrifugal fans, free-running and with inlet nozzle
- Forward curved single and dual inlet centrifugal fans with housing

Noise measurements

All noise measurements are carried out in low-reflective test rooms with reverberant floor. Thus the ebm-papst acoustic test chambers meet the requirements of precision class 1 according to DIN EN ISO 3745. For noise measurement, the fans being tested are placed in a reverberant wall and operated at nominal voltage (for AC, also at nominal frequency) without additional attachments such as the guard grille.

Sound pressure level and sound level

All acoustic values are established according to ISO 13347, DIN 45635 and ISO 3744/3745 to accuracy class 2 and given in A-rated form.
When the sound pressure level (L_p) is measured, the microphone is on the intake side of the fan being tested, usually at a distance of 1 m on the fan axis.
To measure the sound power level (L_w), 10 microphones are distributed over an enveloping surface on the intake side of the fan being tested (see graphic). The sound power level measured can be roughly calculated from the sound pressure level by adding 7 dB.

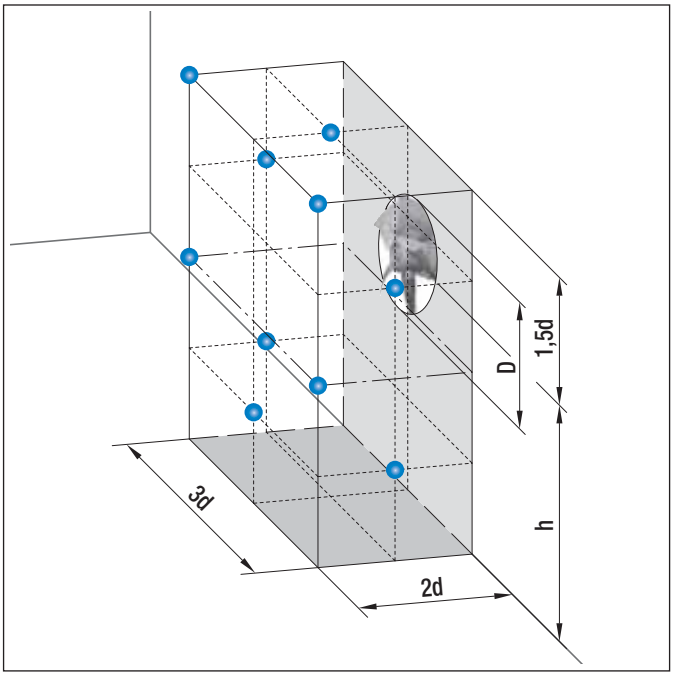
Measuring configuration as per ISO 13347-3 respectively DIN 45635-38:

● 10 measuring points

$d \geq D$

$h = 1{,}5d \ldots 4{,}5d$

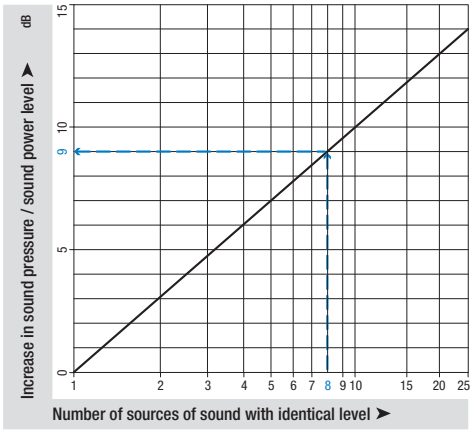
Measurement area $S = 6d^2 + 7d\,(h + 1{,}5d)$



Adding multiple noise sources with the same level

Adding 2 noise sources with the same volume results in a level increase of approx. 3 dB. The noise characteristics of multiple identical fans can be determined in advance based on the noise values specified in the data sheet. This is shown in the diagram opposite.

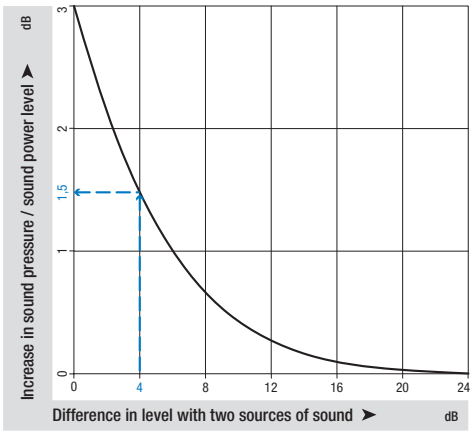
Example: 8 A3G800 axial fans are on a condenser. According to the data sheet, the sound pressure level of a fan is approximately 75 dB(A). The level increase measured from the diagram is 9 dB. Thus the overall sound level of the installation can be expected to be 84 dB(A).



Adding two noise sources with different levels

The acoustic performance of two different fans can be predetermined based on the sound levels given in the data sheet. This is shown in the diagram opposite.

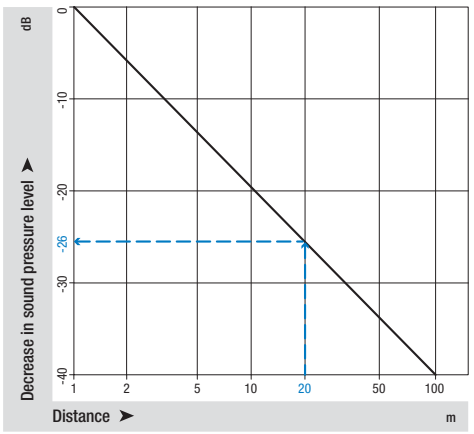
Example: There is an axial fan A3G800 with a sound pressure level of 75 dB(A) at the operating point and an axial fan A3G710 with 71 dB(A) in a ventilation unit. The level difference is 4 dB. The level increase can now be read in the diagram as approx. 1.5 dB. This means that the overall sound level of the unit can be expected to be 76.5 dB(A).



Distance laws

Sound power level is independent of distance to the sound source. In contrast to this, sound pressure level decreases the further away the noise source is. The adjacent diagram shows the decrease in level under far sound field conditions. Far sound field conditions apply whenever the distance between microphone and fan is big when compared to fan diameter and wavelength to be considered. For more information on far sound field, please consult the relevant literature on this complex topic. Per doubling of distance, the level in the far sound field decreases by 6 dB. In the near field of the fan, other correlations apply and the decrease in levels can be considerably smaller. The following example only applies to far sound field conditions and can vary strongly depending on the installation effects:

With an axial fan A3G300, a sound pressure level of 65 dB(A) was measured at a distance of 1 m. According to the adjacent diagram, at a distance of 20 m we would get a reduction by 26 dB, i.e. a sound pressure level of 39 dB(A).



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