1.1 Design

Elektror medium pressure blowers of the RD range are radial ventilators with double-wall impellers made from sheet aluminium respectively from sheet steel. They are directly driven by asynchronous squirrel cage motors of the company's own make, especially adapted to the blower requirements and amply dimensioned.

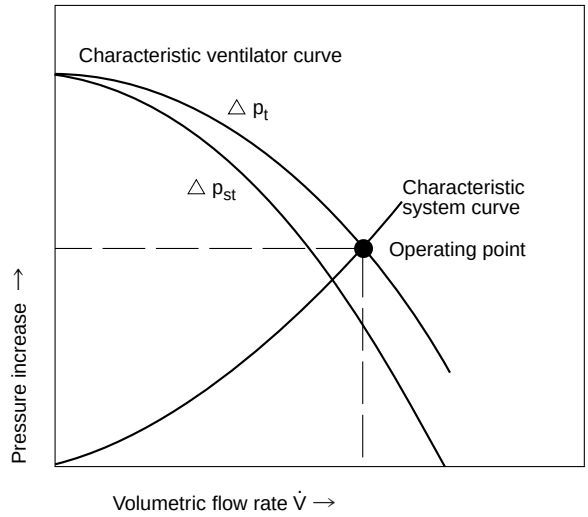
The attractively shaped, stream-line aluminium-cast housings as well as the dynamically balanced impellers ensure vibration-free operation at low noise levels.

The solid design of the Elektror medium pressure blowers is basic for long-life operation and low operating cost.

All drive motors are manufactured in conformity with IP 54 and comply with EN 60034-1 (VDE 0530 – Part 1).

The standard version of the motors is designed for 50 Hz mains frequency and voltages of 230/400 △/Y or 400 V△ for three-phase AC and for 230 V single-phase AC in conformity with IEC 38. On demand the motors for 60 Hz mains frequency can also be supplied to IEC 38.

Figure 1: Operating point of the ventilator



1.2 Performance

Ventilators are flow-generating appliances for the conveyance of air and other gases. In radial blowers the conveyed medium is drawn in axially, accelerated radially through the rotation of the impeller and expelled tangentially. The resistance to the discharged air (by ducts, pipes, filters and other parts of the installed system) must be overcome by the excess pressure generated by the ventilator. With increasing flow volume (volumetric flow rate) the ability of the ventilator to generate pressure is decreased. The performance behaviour depends on the ventilator design and size and is presented as characteristic curves of pressure difference and volumetric flow rate (ventilator characteristics).

The resistances of air conveying systems (system resistances) change (in most cases) quadratically with the change of volumetric flow, i. e.: If the volumetric flow rate shall be doubled, four times the installation resistance must be overcome. The resultant characteristics are termed resistance parabolas or system characteristics.

The operating point of the ventilator is determined by the intersection point of the two curves.

Insofar as the installation resistance cannot be computed without difficulty, recourse to experiments or experience is suggested. At a growing system resistance the flow volume of the ventilators and the power consumption decrease.

The maximum volumetric flow of a ventilator occurs at the intersection of the static pressure difference curve △ p_{st} and the volume flow coordinate (cf. Fig. 1).

1.3 Noise generation

The noise generated by a ventilator ensues from flow processes and vortices inside the impeller and the housing and is determined by:

a) the ventilator design (axial ventilator, radial ventilator, construction principle of the impeller).

b) the ventilator size in relation to the specified pressure differences and volumetric flow rates.

c) the operating point of the ventilator, i.e. in which section of the characteristic curve the ventilator operates.

d) the rotational speed which can be reduced by the variable speed control for the Elektror medium pressure blowers.

The noise emissions are not constant over the whole performance range.
Ventilator housing and impeller are designed in conformity with flow-technical requirements and thus the noise generation depends mainly on the requirements for flow volume and pressure difference as well as on the correct selection of the blower.

As a measure for noise and sound pressure level the unit dB (A) is used. The letter "A" in the unit refers to the standardised frequency evaluation of the sound pressure level that takes the strong frequency dependence of the subjective perception of the noise level into consideration:
high frequencies are perceived as more unpleasant than low frequencies.

If several noise sources emitting the same noise level are evaluated together, the noise pressure level increased, e.g. by 3 dB (A) in the case of two blowers, by 5 dB (A) for three blowers, by 6 dB (A) for four blowers and by 7 dB (A) for five blowers.

And finally, a change of 10 dB (A) corresponds to double or half the noise perception.

With increasing distance to the noise source the emitted noise becomes weaker, doubling the distance can reduce the noise level up to 5 dB (A).

1.4 Performance curves

The characteristics shown of the total pressure $\triangle p_t$ and of the static pressure $\triangle p_{st}$ as a function of the volumetric flow rate $\dot{V}$ were determined in measurements and some are higher than the ratings shown in the technical tables. The measurements were performed without a protective mesh guard on the intake port.

All measurements took place in a tubular test assembly in compliance with DIN 24163 with a throttle at the pressure side and apply for an air density of 1.2 kg/m^3.

The noise pressure levels L_A were measured in the tubular test assembly with the ventilators connected at the pressure side and at a spacing of 1 m from the intake port.

1.5 Blower selection

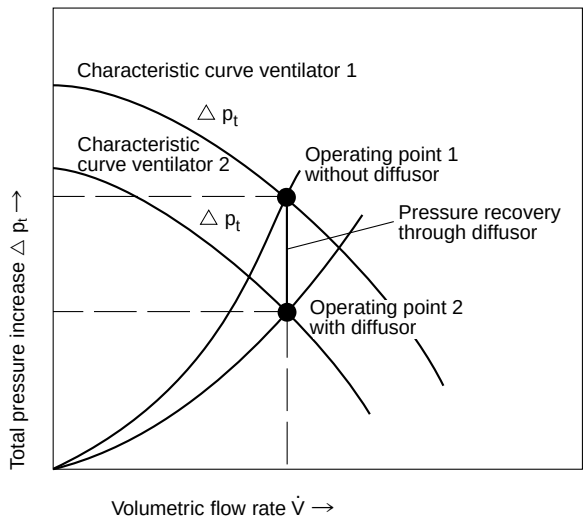
Usable pressure difference

Once the necessary pressure difference has been determined by computation or experiments, the amount must be checked of the total pressure increase of the ventilator which may be used as static pressure difference.

If the duct connected at the pressure side features the same cross-section as the ventilator discharge port or if the ventilator discharges unimpeded, the dynamic pressure component p_{d2} must be considered loss.
The remaining component of the total pressure increase is available as usable static pressure difference $\triangle p_{st}$.

If the duct cross-section is increased gradually (diffusor), the flow is decreased and the dynamic pressure is converted to static pressure. The pressure recovery may be included to overcome the system resistances or, with the same volumetric flow rate, a smaller ventilator may be used (cf. characteristic ventilator 2, Fig. 2). The effect of diffusor is dependent on the angle of flow spread. Pressure recovery at the intake port by means of the diffusor effect are small and may be neglected.

Figure 2: Pressure recovery



Influence of the density

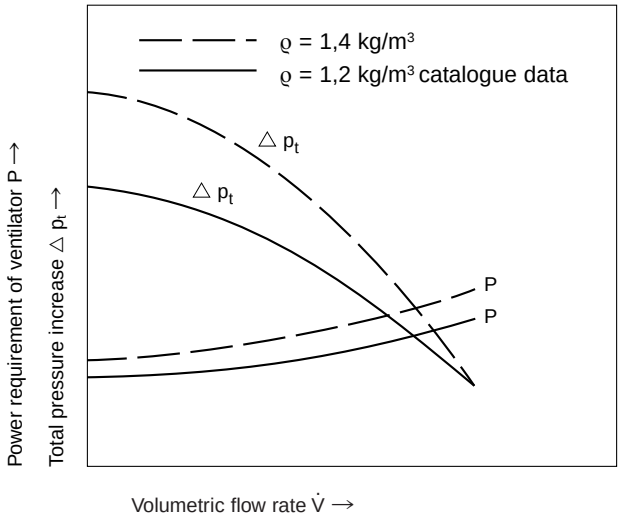
Total pressure increase, dynamic pressure, static pressure and power requirement of the ventilator change proportionally to the pressure of the conveyed medium and must be taken into consideration on selecting the ventilator (Fig. 3).

Density changes through temperature influences may be calculated as follows:

$$\varrho_2 = \varrho_1 \frac{273 + \vartheta_1}{273 + \vartheta_2}$$

ϑ = temperature of conveyed medium [° C]
ϱ = air density [kg/m^3]

Figure 3: Influence of conveyed medium density



Fields of application

Elektror medium pressure blowers offer a wide field of application facilities:

- Conveying medium air volumes at higher system resistances
- Exhausting gases and vapours
- Cooling of apparatus and machinery parts
- Ventilation of systems with higher resistances
- Air supply of gas, oil and coalfired systems
- Air supply of drying installations
- Air supply of air cushion tables
- Extraction of exhaust gas
- Filter installations

1.6 Designs

Standard designs

The use is recommended in all cases where unchangeable operating conditions prevail or the pressure relationships change only slightly and thus uniform volumetric flow rates are desired.

Speed controlled blowers

They are to be used wherever for process-inherent reasons the change of volumetric flow is needed.

Model range RVE

By means of a generalised phase control, which is housed in the terminal box of the motor in a space-saving way, any random operating point can be continuously adjusted within a range of 20 to 100 % within the characteristic field by means of the potentiometer supplied. A two-stage setting is possible as well.

In case of speed reduction, energy is saved effectively in the partial load range, and the noise generation is reduced distinctly.

Alternating current motors speed adjustable by voltage reduction from own production are used as drives especially adapted to the ventilator. The motors have been equipped with PTC thermistors so that a thermistor-type motor protection is ensured in combination with the generalised phase control.

Thus, the user has a wide range of applications with ideal problem solution and the following advantages:

- Continuously adjustable from 20 to 100 %
- Absolutely free from maintenance
- Considerable reduction of the sound emission in case of speed reduction

Model range RS

2-step version for three phase and single phase a.c. with installed temperature controller as motor protection for which the speed-control can be effected via step switch.

Speed controlled blowers of the range RVE and RS cannot be delivered with temperature barrier. Maximum temperature of the conveyed medium is 40° C.

Model range FU

All standard blowers can be speed-controlled via frequency converter. The motors are equipped with PTC thermistor sensors for trip device and with a reinforced barrier.

The technical data are identical with those of the standard blowers. Speed control from 0 to 50 Hz maximum.

Temperature of conveyed media and environment

The admissible ambient temperature (cooling air temperature) of the drive motors is –20° C to +40° C. The motors invariably comply with thermal class B in accordance with EN 60034-1 (VDE 0530 Part 1), in speed-controlled execution with thermal class F.

The admissible ambient temperature may be increased over 40° C by using suitable insulating materials. In such cases the manufacturer must always be consulted.

For the standard version the admissible temperature of the conveyed medium is –20° C to + 80° C.

Temperatures of the conveyed medium up to 180° C may be achieved by fitting a temperature barrier between ventilator and motor.

Insulation

All motors can be supplied for the more stringent protection categories IP 55, as well as with tropical and moisture protection insulation.

If the ventilators shall be extensively insulated, a PTFE radial shaft gasket can be fitted at the shaft bushing. Further insulation possibilities are given by means of flat gaskets and permanently elastic sealers.

Protection against corrosion

Through choosing cast and sheet aluminium as manufacturing material the standard ventilators are substantially resistant to corrosion.

For special applications the ventilators may be appropriately varnished or be coated with plastic. A version of the impellers made from material 1.4301 can be supplied.

Ventilator speeds

The standard ventilators are fitted with two-pole motors. Change-pole motors 4/2-pole or 4-pole motors can be supplied on demand.

On changing the ventilator rotation speed the total pressure increases, the volumetric flow rate and the power requirement change as follows:

$$\dot{V}_2 = \dot{V}_1 \frac{n_2}{n_1}$$

$$\triangle p_{t2} = \triangle p_{t1} \left(\frac{n_2}{n_1}\right)^2$$

$$n_2 = n_1 \frac{\dot{V}_2}{\dot{V}_1}$$

$$P_2 = P_1 \left(\frac{n_2}{n_1}\right)^3$$

$\dot{V}$	=	Flow volume
$\triangle p_t$	=	Total pressure increase
n	=	Number of revolutions
P	=	Power consumption
f	=	Frequency

Voltages and frequencies

In the standard versions the motors are designed for 50 Hz mains frequency and voltages of 230/400 V△/ᛉ and 400 V△ at three-phase current and for 230 V single phase current in conformity with IEC 38. Motors for 60 Hz mains frequency are likewise designed in compliance with IEC 38.

Motors for special voltages and special frequencies as well as voltage change-over motors or motors with multi-range voltage winding are also supplied to order.

On three-phase supply the maximum admissible voltage is 690 V and 255 V for single phase current.

On changing the mains frequency the rotation speed of the impeller is changed and thus the total pressure increase, the volumetric flow rate and the power requirement of a ventilator as follows:

$$n_2 = n_1 \frac{f_2}{f_1}$$

$$\triangle p_{t2} = \triangle p_{t1} \left(\frac{f_2}{f_1}\right)^2$$

$$\dot{V}_2 = \dot{V}_1 \frac{f_2}{f_1}$$

$$P_2 = P_1 \left(\frac{f_2}{f_1}\right)^3$$

The characteristic curves and the power consumption of blowers with 60 Hz drive change as indicated in the technical data for each model.

1.7 Instructions for operation and maintenance

Elektror medium pressure blowers are fitted with closed deep groove ball bearings, which need not be relubricated.

Inspections and necessary cleaning work must be undertaken at appropriate intervals under observation of the safety regulations. Dirty or worn impellers cause imbalance, which may cause failure of the bearings.

In such case the reliability and published performance data cannot be guaranteed.

All ventilators are fitted with a mesh guard at the intake port as a standard item.

Conveying of solids is not permitted for the RD series as the closed-type impellers are unsuited for the transport of such materials.

If the medium to be conveyed contains solid bodies or other coarse impurities, they must be removed before entering the ventilator by means of filters fitted at the intake port.

However, open-type and welded steel impellers for conveying may me offered on demand which may be employed for the transport of dust and light-weight bulk materials.
A detailed clarification with the manufacturer is necessary.

Potentially explosive mixtures must not be conveyed.

Ventilators with unrestricted intake and discharge must be provided with protection against accidental contact at the intake and discharge in conformity with DIN EN 294, Part 1, insofar as it has not been fitted in the factory.

The ventilators must be installed protected against weather influences and must not be exposed to vibrations and shocks or shaking.

Ventilators rated above 3.5 kW must be connected ⅄/△.

The installation and operating instructions supplied with the blowers must be followed.

1.8 Ordering data

Blower type
Flow volume
Required total or static pressure difference
Voltage, frequency, three or single phase AC
Ambient and conveyed medium temperature
Conveyed medium density
Type of conveyed medium
Housing position
Accessories / special requirements

1.9 Remarks

Dimensions, technical data and descriptions are approximate only.
Subject to modifications and errors.

Medium Pressure Blowers

2. Housing positions

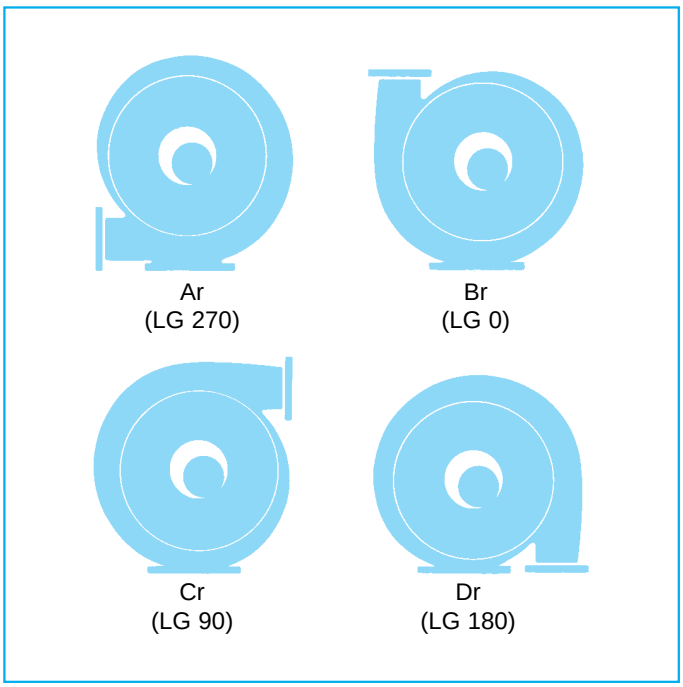
The housing position is determined when facing the intake side.
Positions Ar–Dr = Clockwise rotation
Positions El–Hl = Counter-clockwise rotation

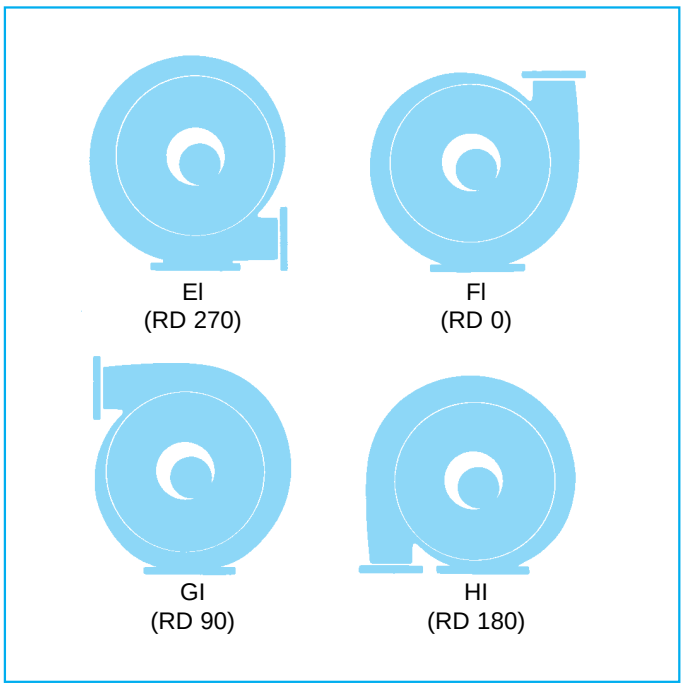
The designations in brackets are according to EUROVENT1/1 but they are determined when facing the drive side.

Housings positions A, B, C and E, F, G as well as the version without foot base are available for all types of medium pressure blowers.

Other positions are deliverable on demand. The intended position should also be stated for the version without foot base.

Order without indicated housing position will be supplied in our standard version Ar.





Type code

Blower R D or E 6 RVE, RS

RVE Stepless speed-controlled only for single phase a.c.
RS Speed variable, by 2 steps

Construction size

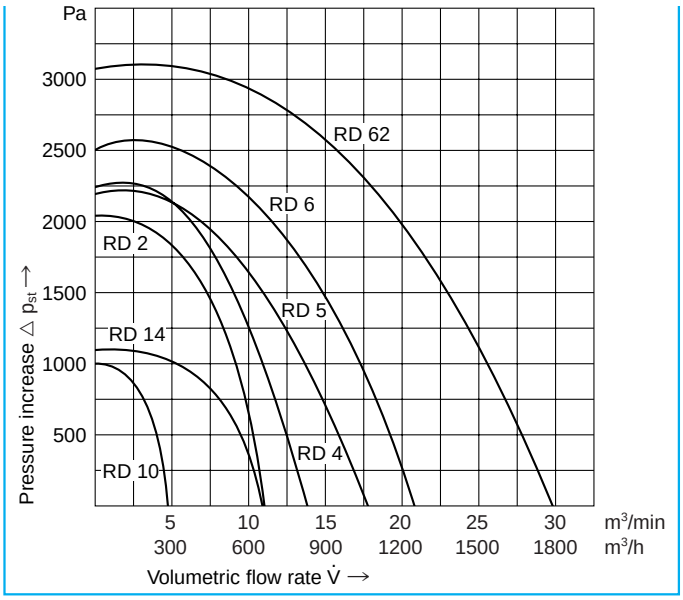
D With three phase a.c. motor
E With single phase a.c. motor

Radial blower design

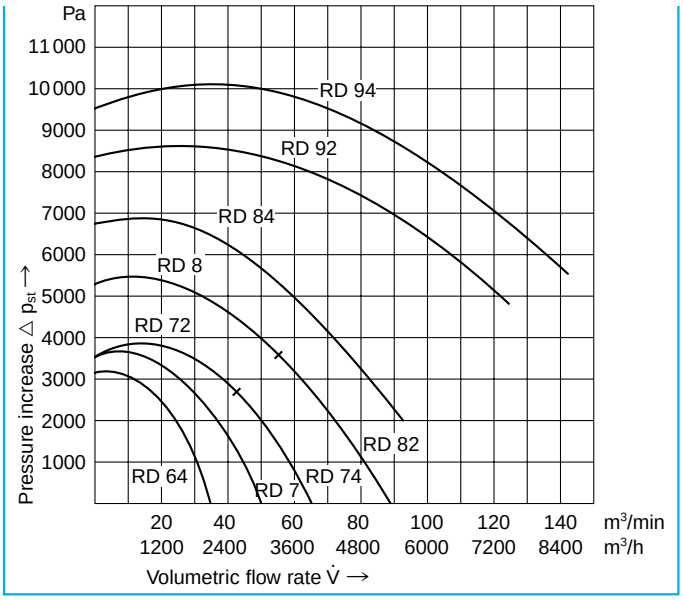
Medium Pressure Blowers

3. Preselection, characteristic curves

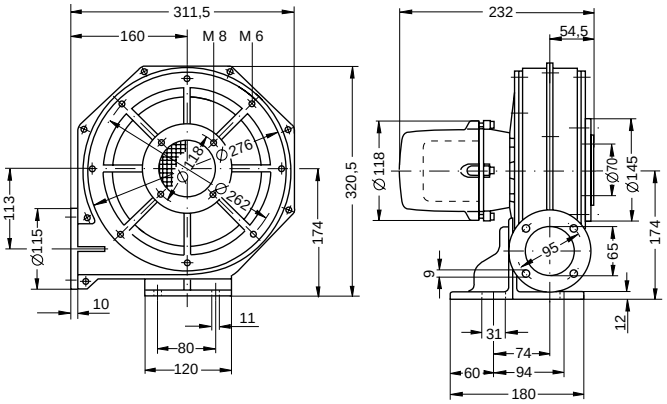
RD 10 – RD 62 Page 11–17



RD 64 – RD 94 Page 18–24



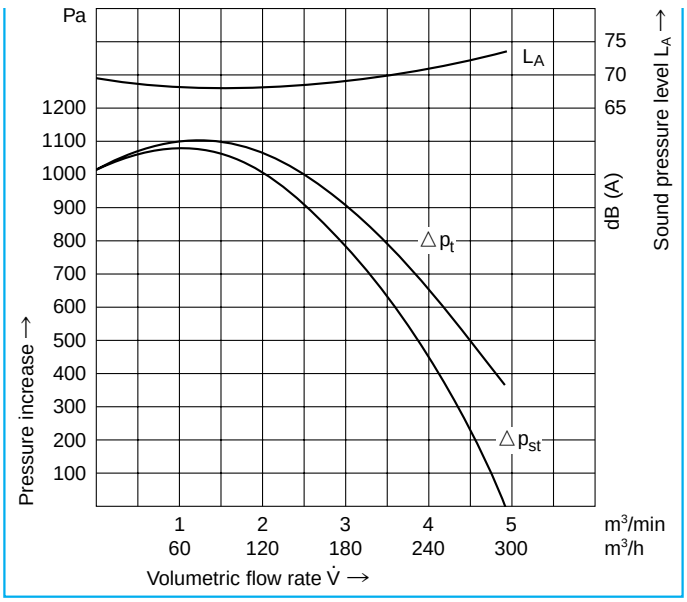
RD 10, RE 10



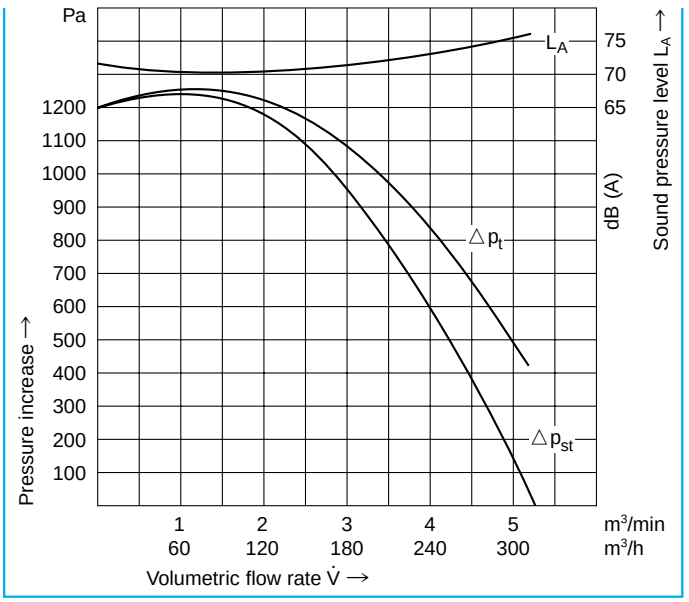
Dimensions in mm – subject to modifications

Type	Volumetric flow rate	Total pressure difference	Voltage	Frequency	Current consumption	Number of revolutions	Motor rating	Capacitor	Weight
	m^3/min	Pa	V	Hz	A	min^{-1}	kW	µF/V	kg
RD 10	4,9	1000	230/400	50	0,45/0,26	2760	0,075	–	8,5
RD 10	5,2	1200	277/480	60	0,50/0,29	3380	0,11	–	8,5
RE 10	4,8	1000	230	50	0,65	2700	0,075	5/450	8,6
RE 10	5,1	1200	230	60	0,85	3280	0,10	5/450	8,6

50 Hz

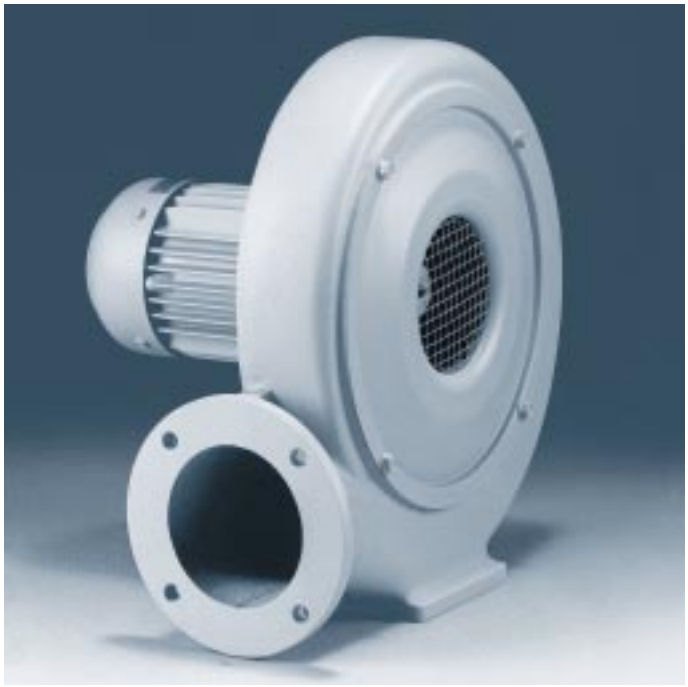


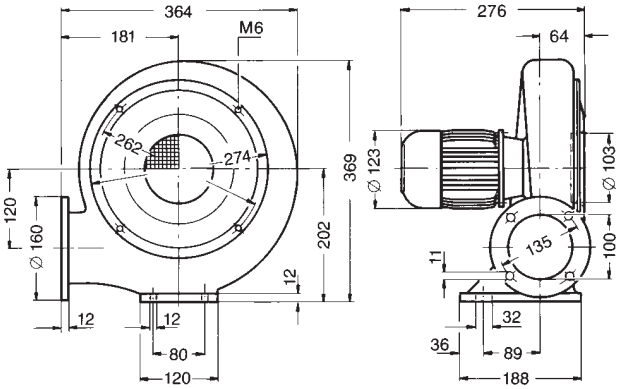
60 Hz



Elektror

RD 14, RE 14

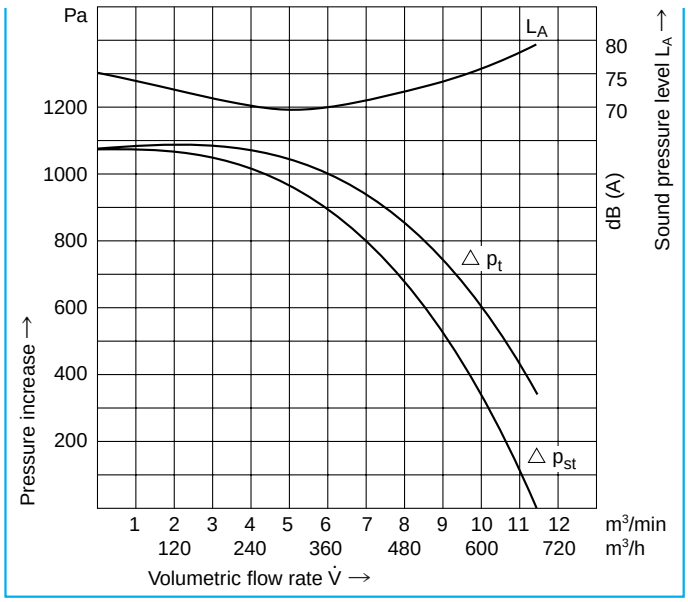




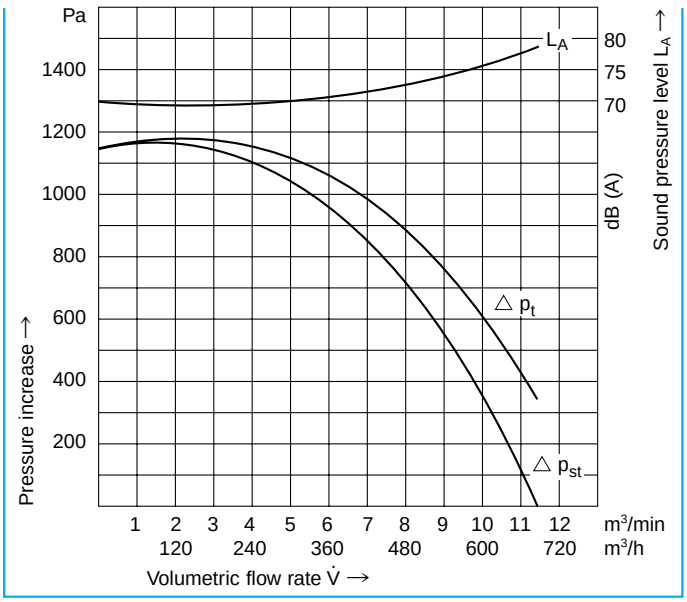
Dimensions in mm – subject to modifications

Type	Volumetric flow rate	Total pressure difference	Voltage	Frequency	Current consumption	Number of revolutions	Motor rating	Capacitor	Weight
	m^3/min	Pa	V	Hz	A	min^{-1}	kW	µF/V	kg
RD 14	11	1000	230/400	50	1,7/0,95	2860	0,2	–	10,2
RD 14	11	1100	277/480	60	1,32/0,76	3500	0,2	–	10,2
RE 14	11	1000	230	50	1,9	2860	0,2	12/450	10,7
RE 14	11	1000	230	60	2,0	3490	0,18	12/450	10,7

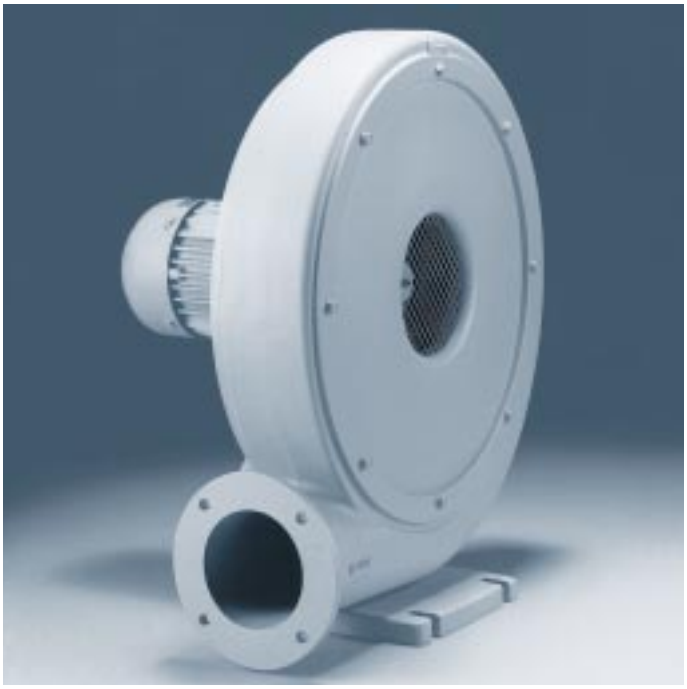
50 Hz

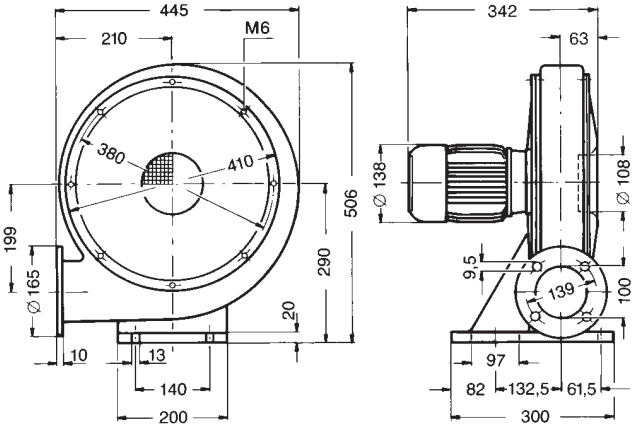


60 Hz



RD 2, RE 2

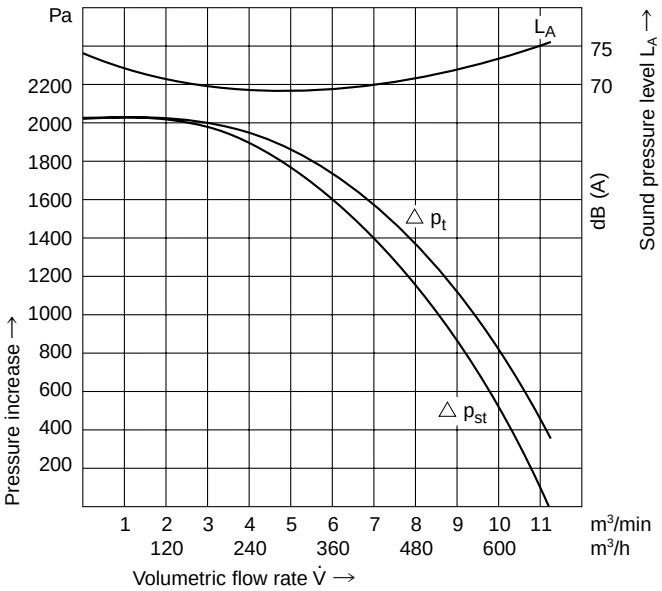




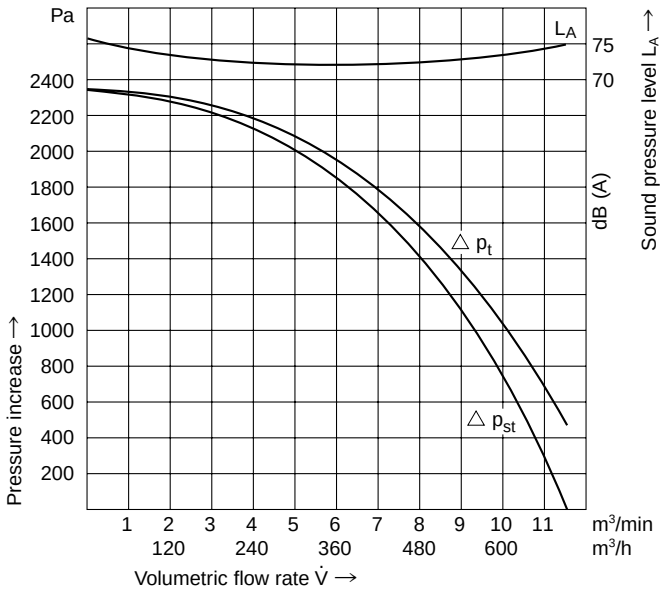
Dimensions in mm – subject to modifications

Type	Volumetric flow rate	Total pressure difference	Voltage	Frequency	Current consumption	Number of revolutions	Motor rating	Capacitor	Weight
	m^3/min	Pa	V	Hz	A	min^{-1}	kW	µF/V	kg
RD 2	11	2000	230/400	50	2,3/1,3	2880	0,3	–	18,5
RD 2	11	2200	277/480	60	2,15/1,24	3500	0,3	–	18,5
RE 2	11	2000	230	50	2,4	2850	0,3	12/450	20,4
RE 2	11	2100	230	60	2,7	3480	0,3	12/450	20,4

50 Hz

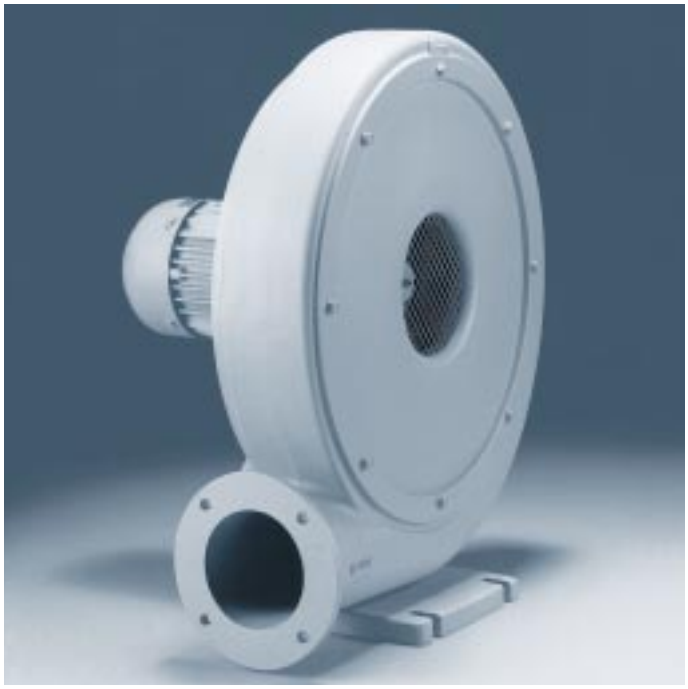


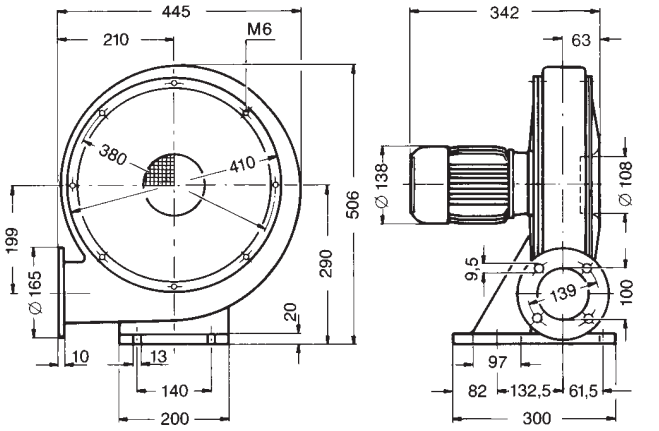
60 Hz



Elektror

RD 4, RE 4

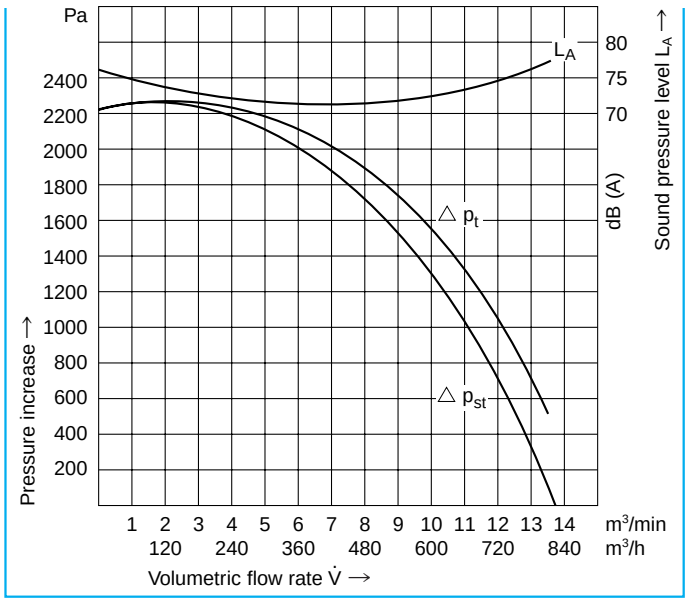




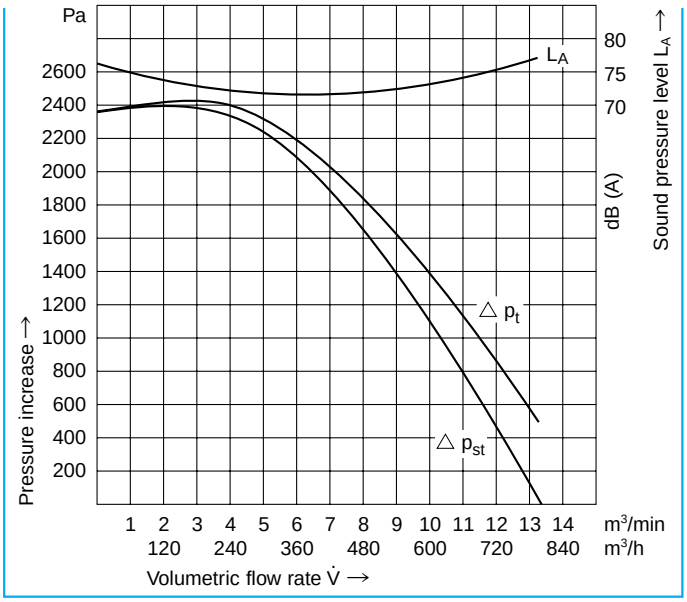
Dimensions in mm – subject to modifications

Type	Volumetric flow rate	Total pressure difference	Voltage	Frequency	Current consumption	Number of revolutions	Motor rating	Capacitor	Weight
	m^3/min	Pa	V	Hz	A	min^{-1}	kW	µF/V	kg
RD 4	13,5	2200	230/400	50	2,3/1,3	2850	0,42	–	19
RD 4	13,0	2300	277/480	60	2,25/1,30	3480	0,38	–	19
RE 4	13,5	2200	230	50	3,2	2840	0,42	16/450	20,7
RE 4	13,0	2300	230	60	3,5	3500	0,38	16/450	20,7

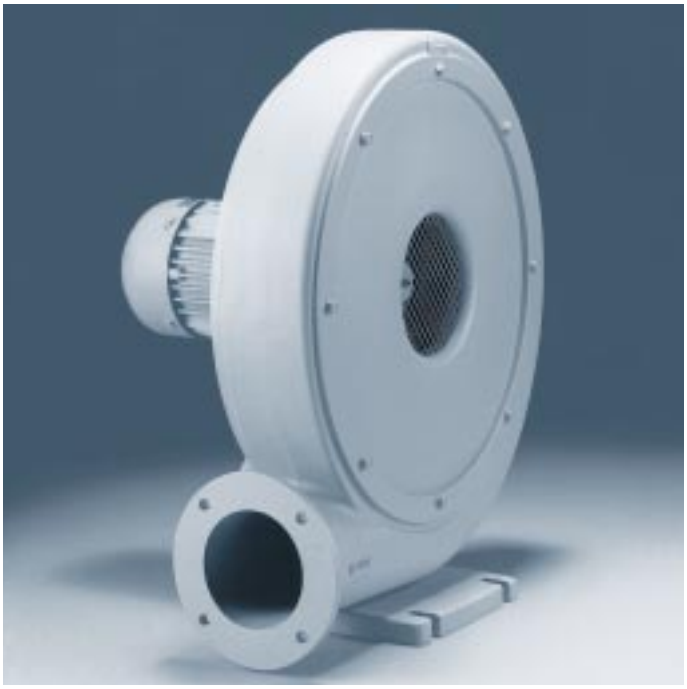
50 Hz

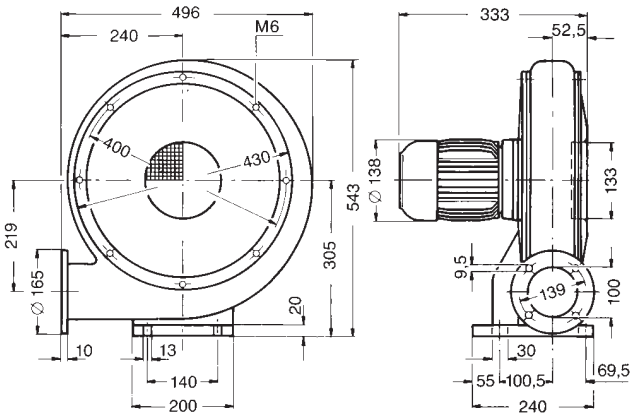


60 Hz



RD 5, RE 5

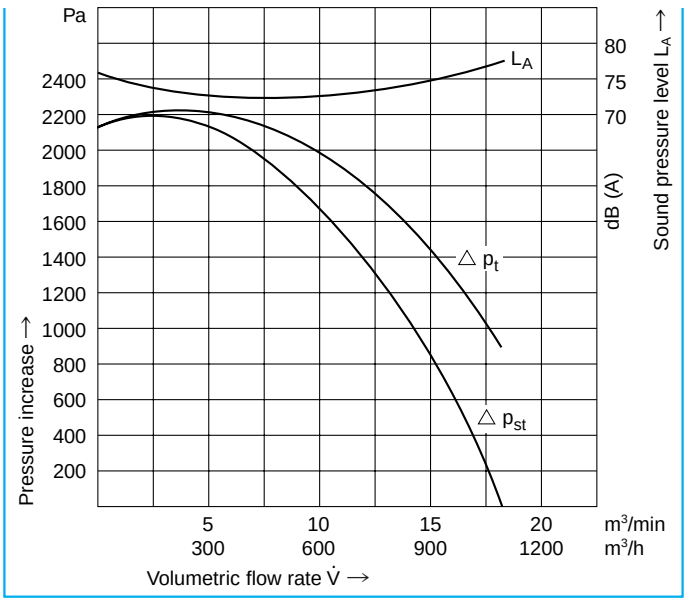




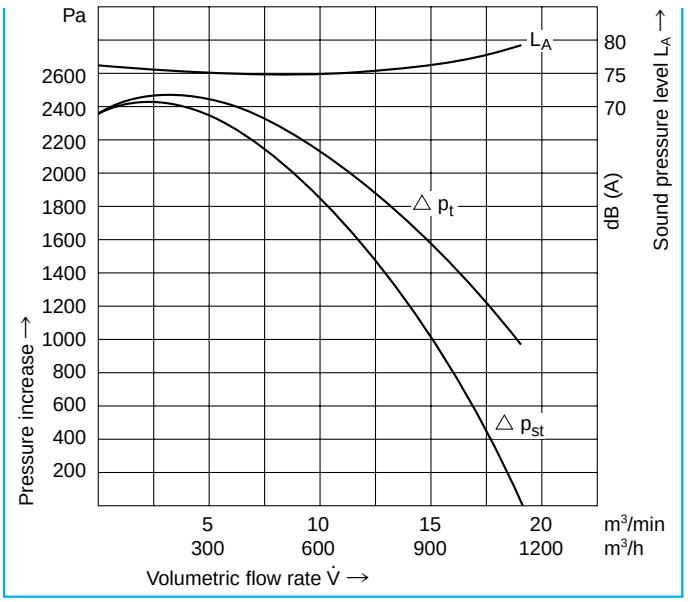
Dimensions in mm – subject to modifications

Type	Volumetric flow rate	Total pressure difference	Voltage	Frequency	Current consumption	Number of revolutions	Motor rating	Capacitor	Weight
	m^3/min	Pa	V	Hz	A	min^{-1}	kW	µF/V	kg
RD 5	18	2100	230/400	50	3,0/1,7	2850	0,52	–	24,0
RD 5	19	2300	277/480	60	2,95/1,70	3500	0,60	–	24,0
RE 5	18	2100	230	50	3,8	2800	0,52	16/450	24,8
RE 5	19	2200	230	50	4,0	3420	0,58	16/450	24,8

50 Hz

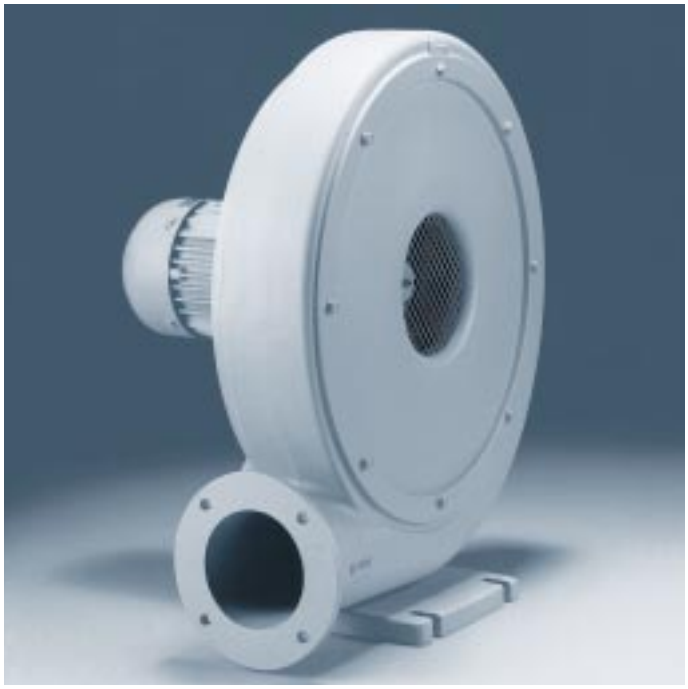


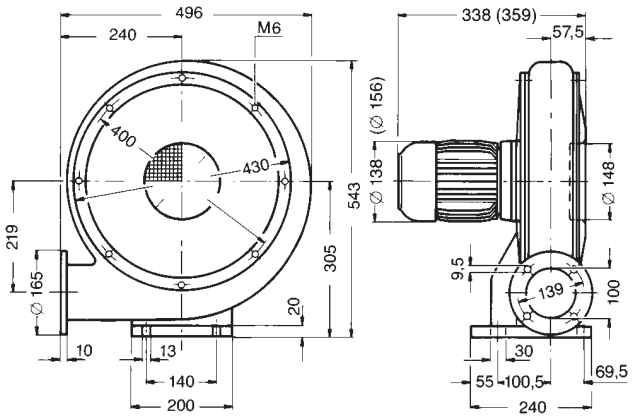
60 Hz



Elektror

RD 6, RE 6



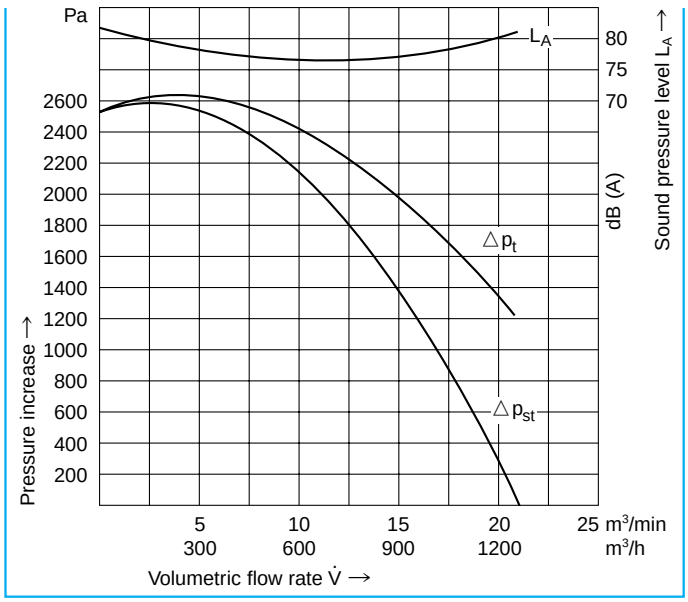


(RE 6)

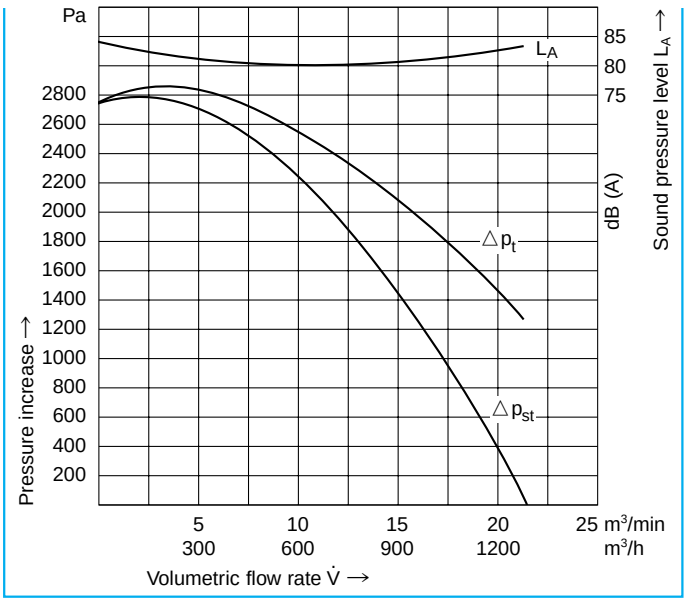
Dimensions in mm – subject to modifications

Type	Volumetric flow rate	Total pressure difference	Voltage	Frequency	Current consumption	Number of revolutions	Motor rating	Capacitor	Weight
	m^3/min	Pa	V	Hz	A	min^{-1}	kW	µF/V	kg
RD 6	21,0	2500	230/400	50	3,1/1,8	2750	0,75	–	24
RD 6	21,5	2700	277/480	60	3,1/1,8	3420	0,80	–	24
RE 6	21,0	2500	230	50	5,0	2770	0,75	20/450	26,5
RE 6	21,5	2700	230	60	5,5	3430	0,80	20/450	26,5

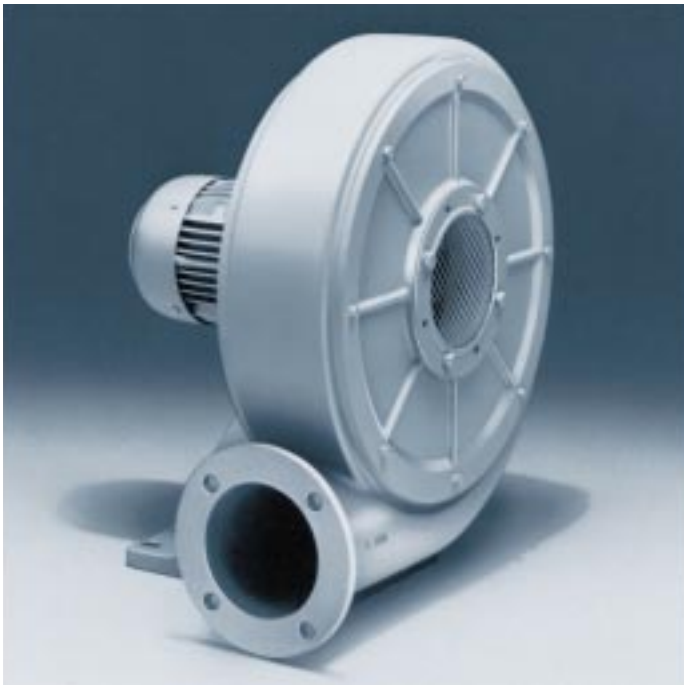
50 Hz

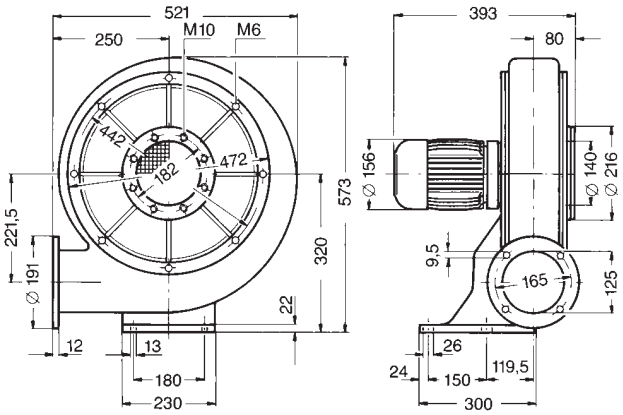


60 Hz



RD 62

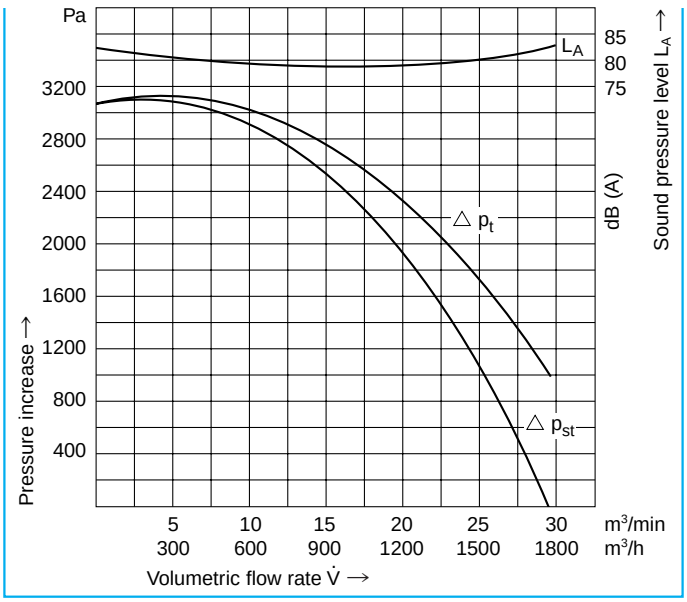




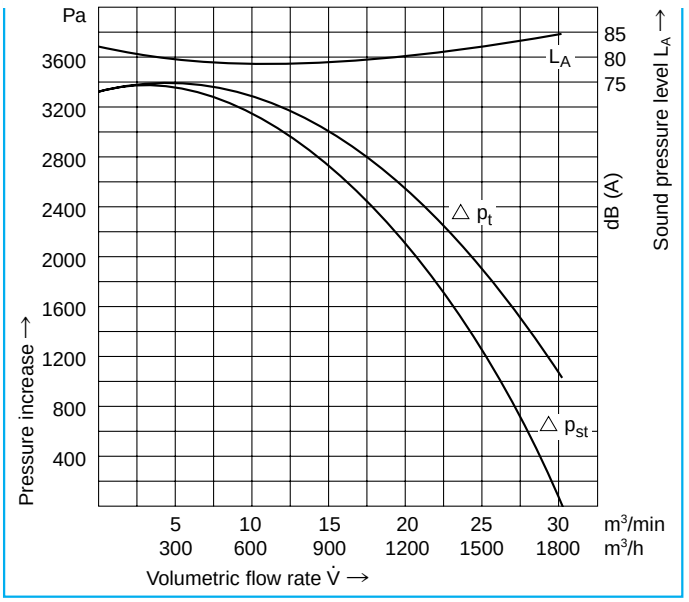
Dimensions in mm – subject to modifications

Type	Volumetric flow rate	Total pressure difference	Voltage	Frequency	Current consumption	Number of revolutions	Motor rating	Weight
	m^3/min	Pa	V	Hz	A	min^{-1}	kW	kg
RD 62	30	3000	230/400	50	5,5/3,2	2830	1,2	33
RE 62	30	3300	277/480	60	5,55/3,20	3440	1,5	33

50 Hz

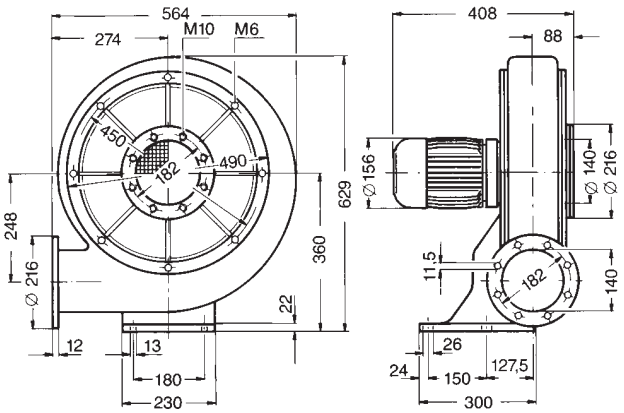


60 Hz



Elektror

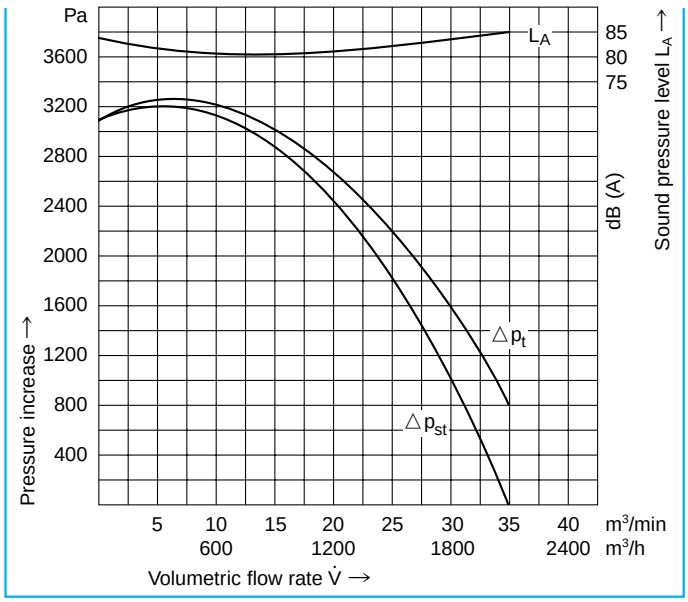
RD 64



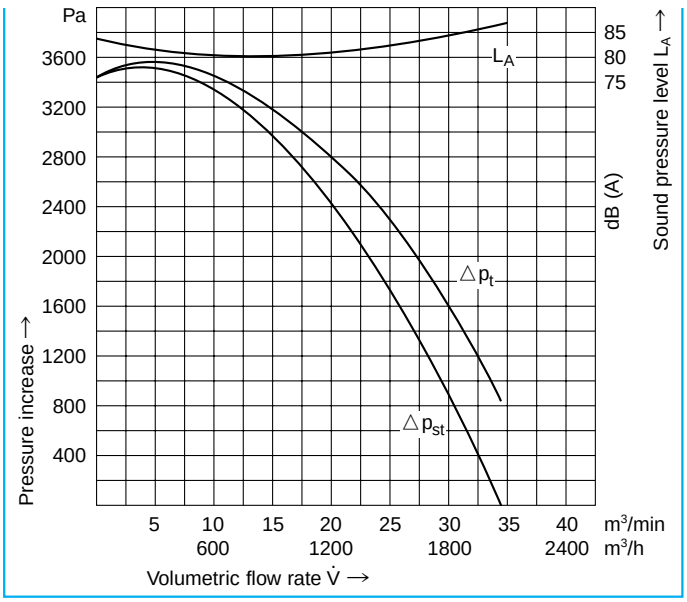
Dimensions in mm – subject to modifications

Type	Volumetric flow rate	Total pressure difference	Voltage	Frequency	Current consumption	Number of revolutions	Motor rating	Weight
	m^3/min	Pa	V	Hz	A	min^{-1}	kW	kg
RD 64	35	3100	230/400	50	5,7/3,3	2770	1,4	36
RD 64	35	3400	277/480	60	5,5/3,2	3420	1,5	36

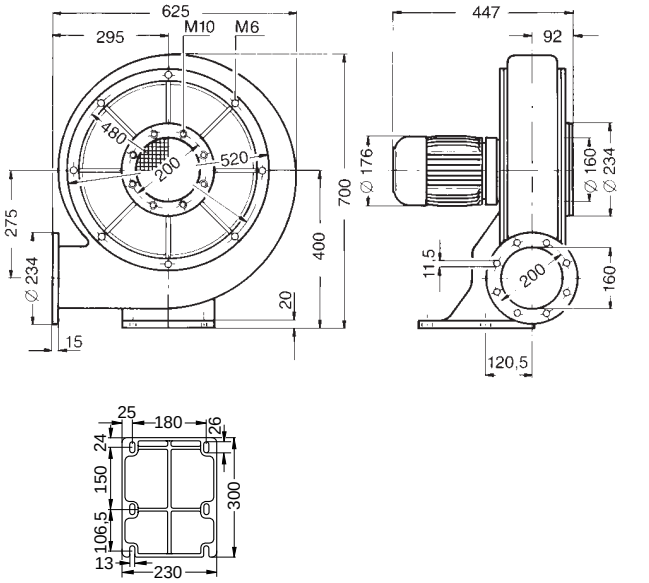
50 Hz



60 Hz



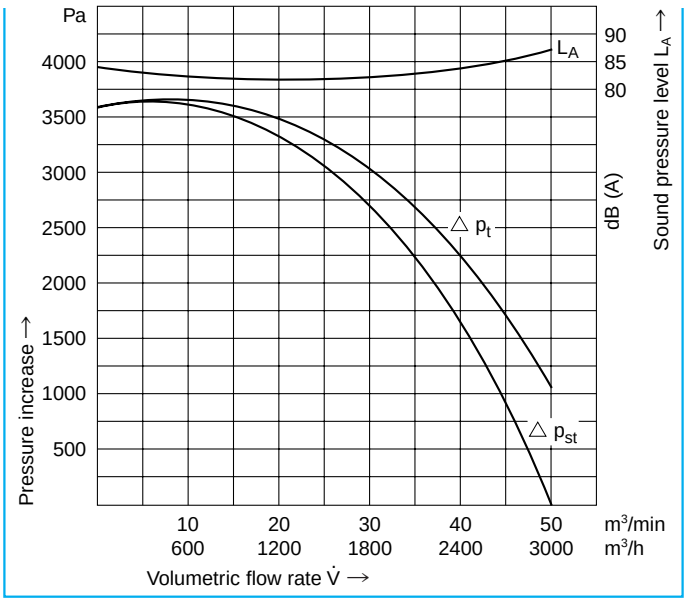
RD 7



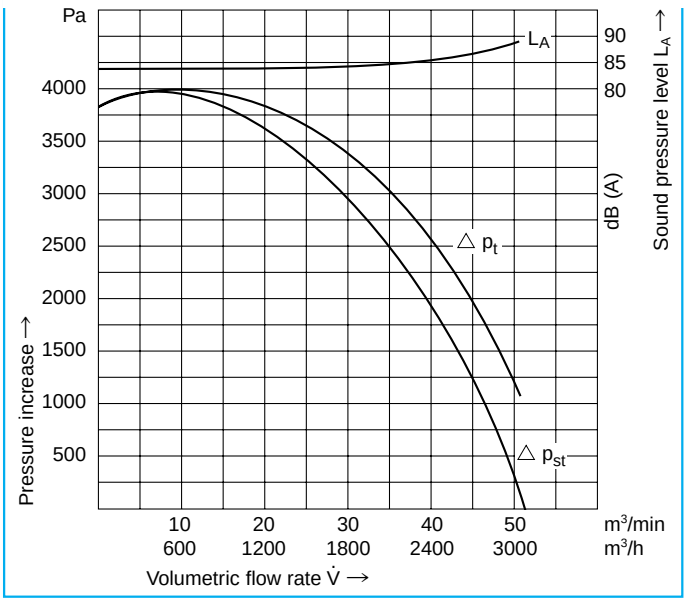
Dimensions in mm – subject to modifications

Type	Volumetric flow rate	Total pressure difference	Voltage	Frequency	Current consumption	Number of revolutions	Motor rating	Weight
	m^3/min	Pa	V	Hz	A	min^{-1}	kW	kg
RD 7	50	3600	230/400	50	9,0/5,2	2900	2,2	44
RE 7	51	3800	277/480	60	9,7/5,6	3500	2,4	44

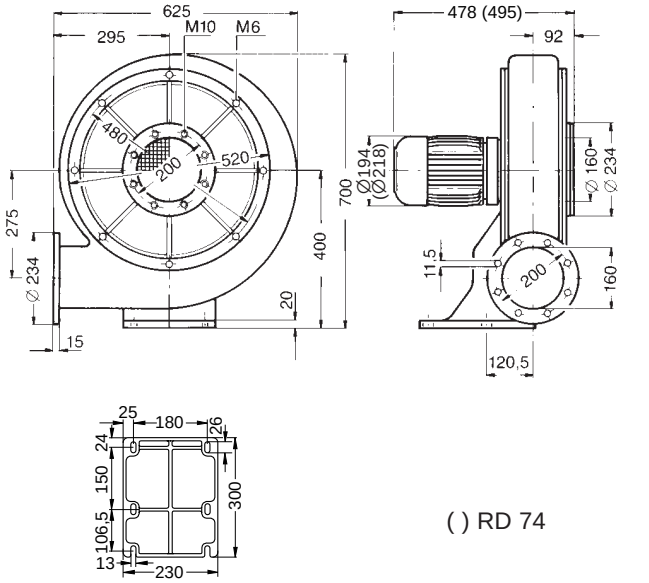
50 Hz



60 Hz



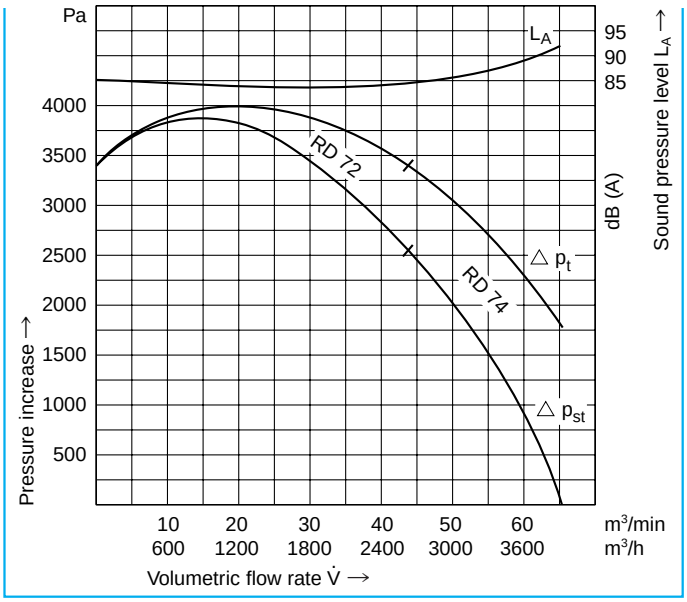
RD 72, RD 74



Dimensions in mm – subject to modifications

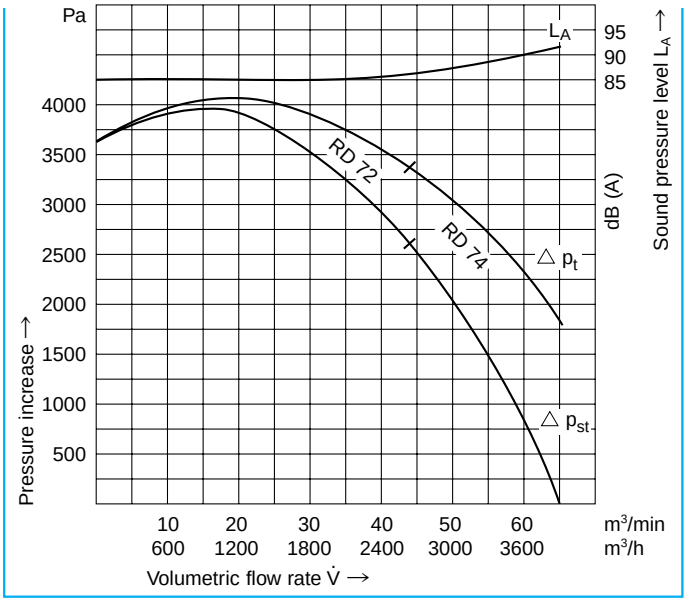
Type	Volumetric flow rate	Total pressure difference	Voltage	Frequency	Current consumption	Number of revolutions	Motor rating	Weight
	m^3/min	Pa	V	Hz	A	min^{-1}	kW	kg
RD 72	44	3500	230/400	50	11,8/6,8	2830	3,1	47,5
RD 72	44	3600	277/480	60	9,7/5,6	3470	3,3	47,5
RD 74	65	3500	400 △	50	9,6	2900	4,3	59,5
RD 74	65	3600	480 △	60	8,5	3500	4,4	59,5

50 Hz



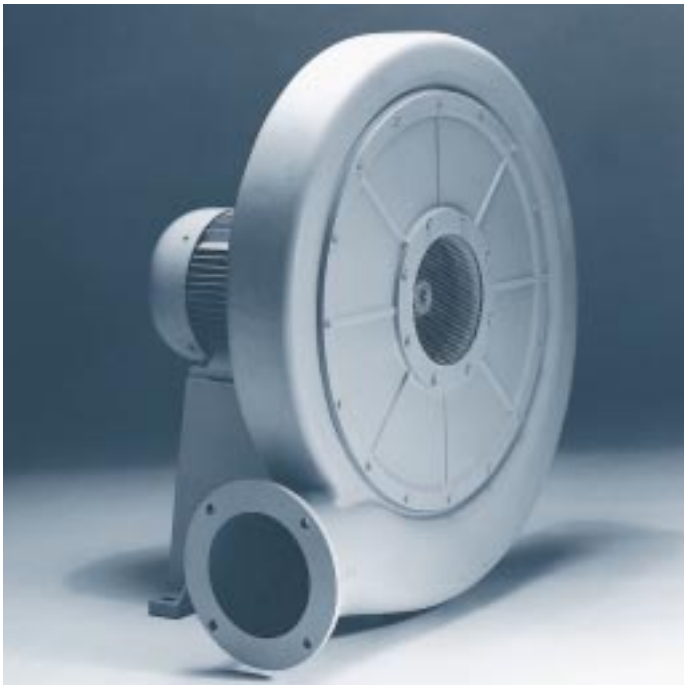
RD 72 not to be operated with free discharge.

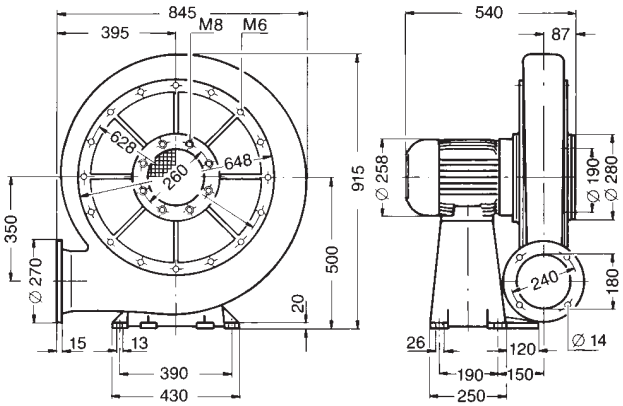
60 Hz



RD 72 not to be operated with free discharge.

RD 8, RD 82

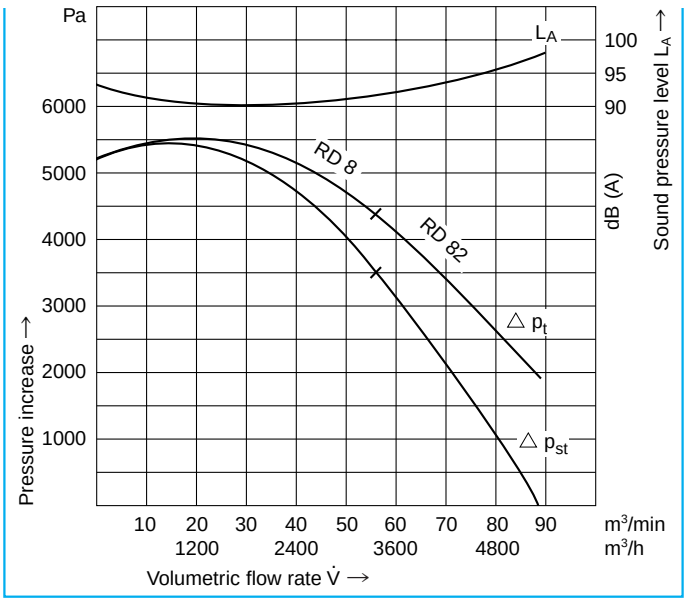




Dimensions in mm – subject to modifications

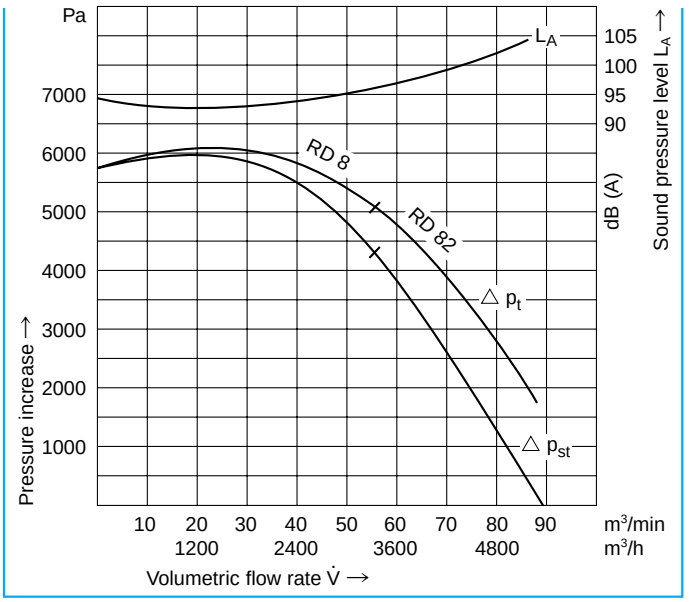
Type	Volumetric flow rate	Total pressure difference	Voltage	Frequency	Current consumption	Number of revolutions	Motor rating	Weight
	m^3/min	Pa	V	Hz	A	min^{-1}	kW	kg
RD 8	55	5200	400 △	50	11,8	2880	5,5	95
RD 8	55	5700	480 △	60	10,5	3500	6,0	95
RD 82	88	5200	400 △	50	16,0	2880	7,5	106
RD 82	88	5700	480 △	60	15,0	3520	8,0	106

50 Hz



RD 8 not to be operated with free discharge.

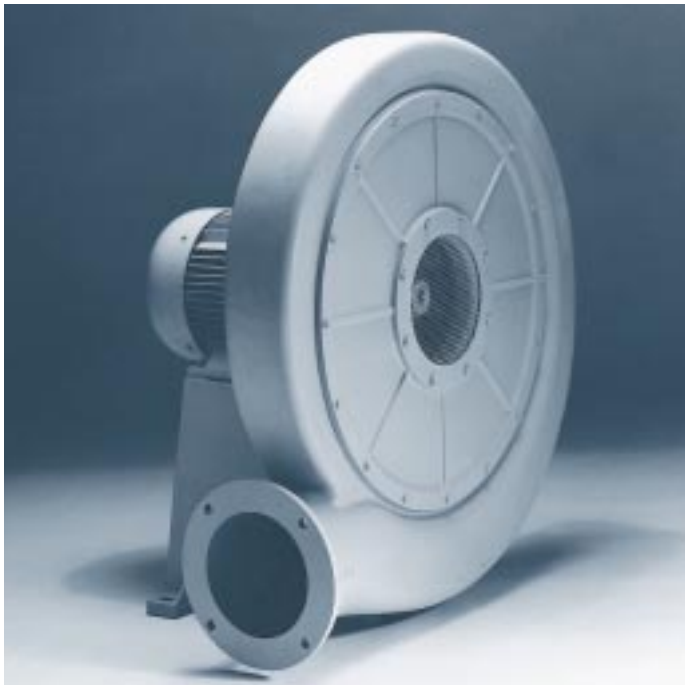
60 Hz

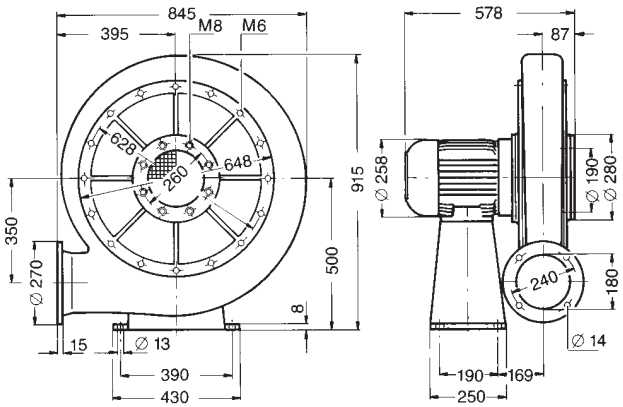


RD 8 not to be operated with free discharge.

Elektror

RD 84

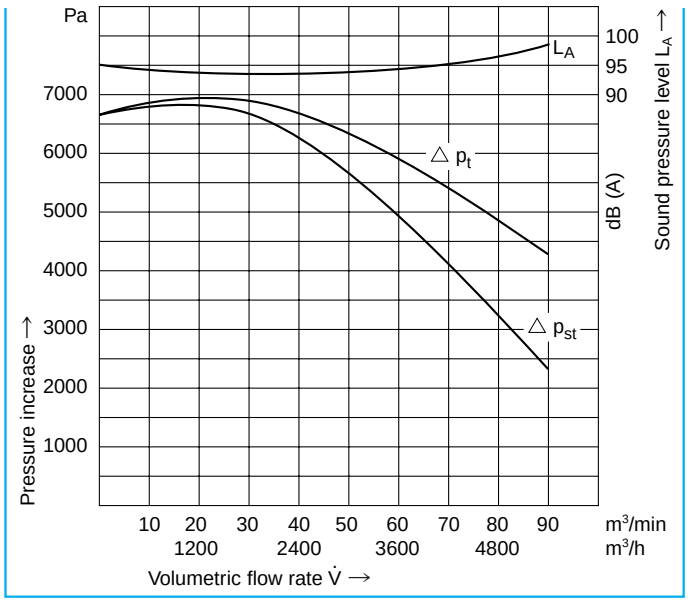




Dimensions in mm – subject to modifications

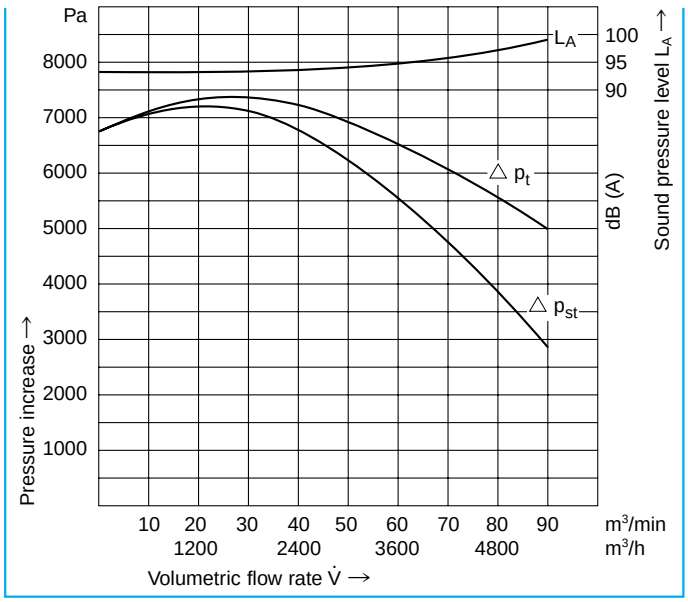
Type	Volumetric flow rate	Total pressure difference	Voltage	Frequency	Current consumption	Number of revolutions	Motor rating	Weight
	m^3/min	Pa	V	Hz	A	min^{-1}	kW	kg
RD 84	90	6800	400 △	50	22,0	2930	10,5	127
RD 84	90	6900	480 △	60	19,0	3540	11,0	127

50 Hz



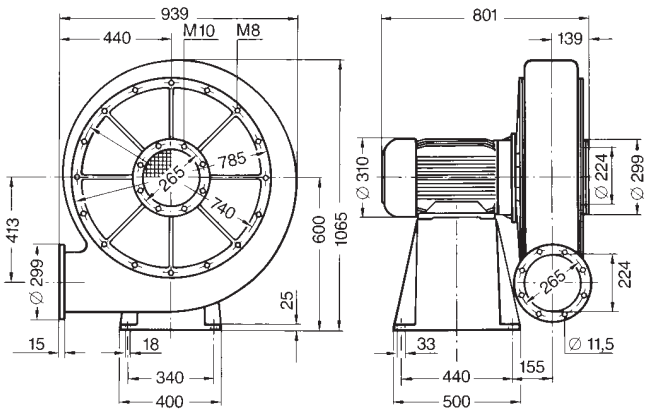
Blower not to be operated with free discharge.

60 Hz



Blower not to be operated with free discharge.

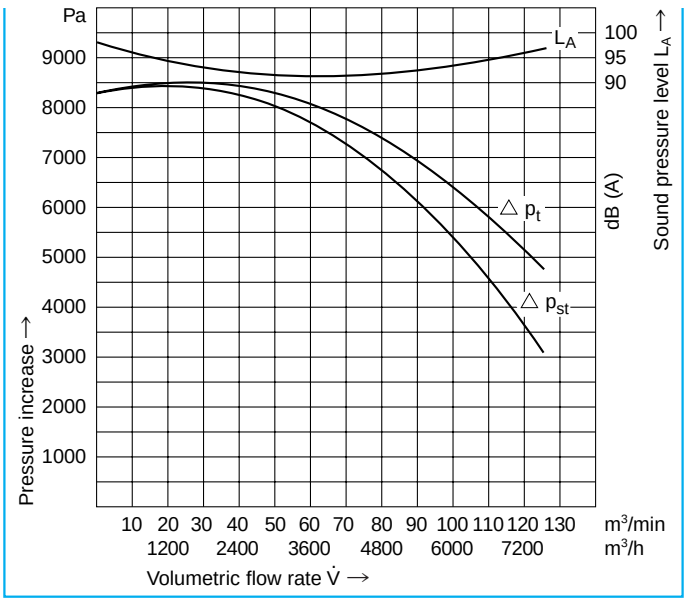
RD 92



Dimensions in mm – subject to modifications

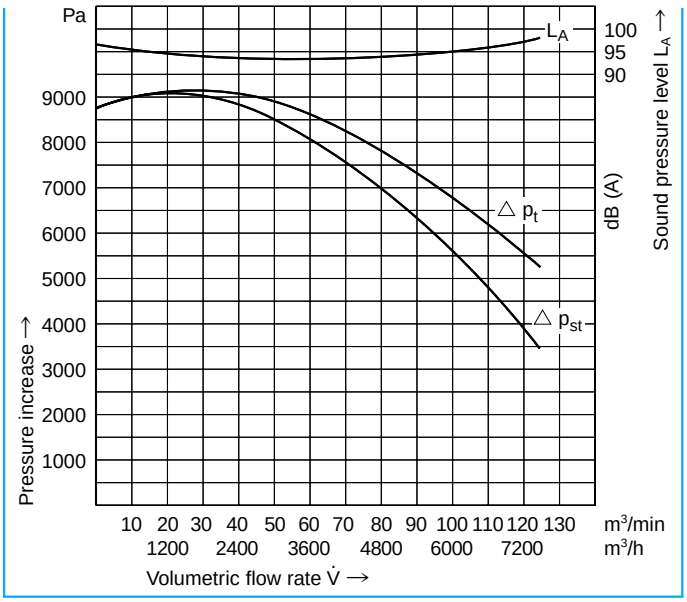
Type	Volumetric flow rate	Total pressure difference	Voltage	Frequency	Current consumption	Number of revolutions	Motor rating	Weight
	m^3/min	Pa	V	Hz	A	min^{-1}	kW	kg
RD 92	125	8300	400 △	50	29	2950	15	203
RD 92	125	8800	480 △	60	26	3550	16	203

50 Hz



Blower not to be operated with free discharge.

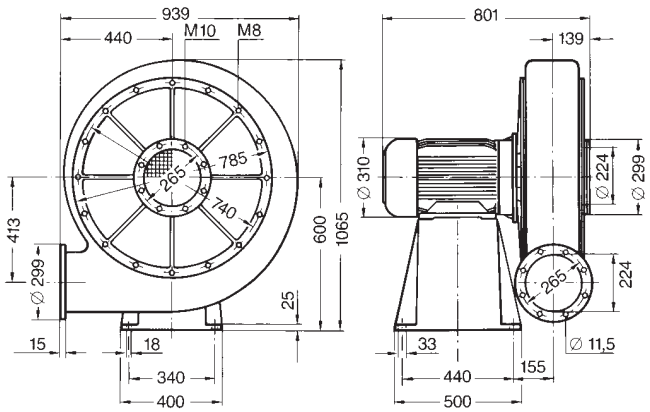
60 Hz



Blower not to be operated with free discharge.

Elektror

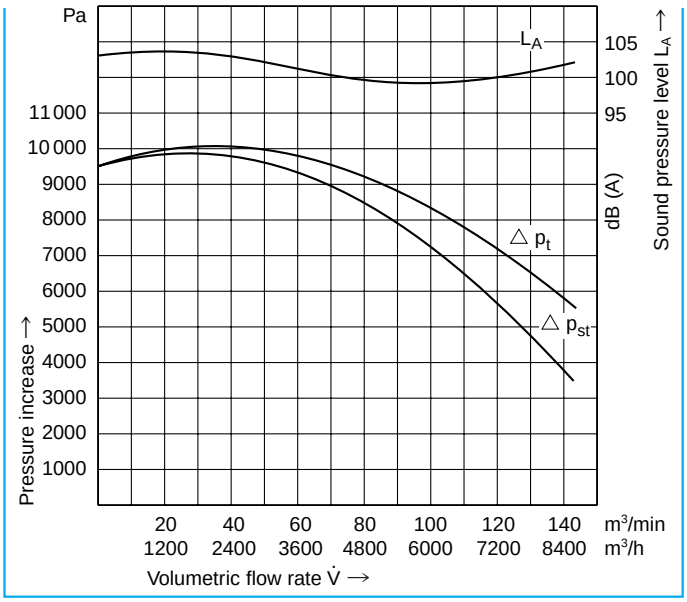
RD 94



Dimensions in mm – subject to modifications

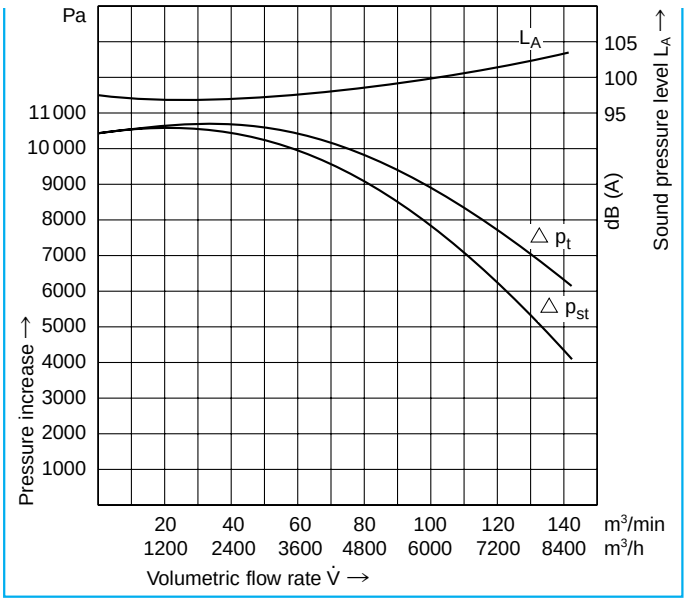
Type	Volumetric flow rate	Total pressure difference	Voltage	Frequency	Current consumption	Number of revolutions	Motor rating	Weight
	m^3/min	Pa	V	Hz	A	min^{-1}	kW	kg
RD 94	142	9600	400 △	50	48	2950	25	240
RD 94	142	10200	480 △	60	42	3550	27	240

50 Hz



Blower not to be operated with free discharge.

60 Hz



Blower not to be operated with free discharge.