BLOWTECH
we make air move

Double Inlet Centrifugal Fans
(Backward Curved)

BBD Series
(Square Outlet Metric Size)

www.blowtech.in

Blowtech Air Devices Pvt. Ltd. was founded in 1988 and quickly established itself as a leading manufacturer and exporter of HVAC fans and ventilation products in India. The company has excelled in the design, development and manufacture of the following high quality product line for a wide range of HVAC&R applications:

- Centrifugal and Axial Flow Fans and Impellers
- Inline Duct Fans
- Cabinet Fans
- Commercial Kitchen Ventilation Fans
- Fan Filter Units
- Evaporative Coolers & Scrubbers
- Energy Recovery Ventilators (ERVs)
- Air to Air Plate Type Heat Exchangers

Blowtech's Fan Test Lab as per AMCA210

The company's 30,000 sq. ft., state of the art manufacturing facility near New Delhi (India) incorporates the most modern equipment & machines, a skilled workforce & over twenty-two years of rich experience. The production process is supported by a complete in house design and development facility and a full fledged tool room. All tools, jigs, fixtures and special purpose machines (SPMs) are designed and developed in house. All fan components are manufactured exclusively with the aid of precision tools and dies. This ensures inbuilt quality and consistency in fan performance fan after fan, year after year.

Blowtech passed ISO-9001 QMS certification in 2003 and is a member of the Air Movement and Control Association, Inc. (AMCA). Consistent with its objectives of designing for optimum quality and performance, the company has its own Fan Test Laboratory which houses a Multiple Nozzle Test Chamber in accordance with AMCA Standard 210.The line of products including centrifugal fans, tube axial fans, kitchen exhaust fans, cabinet fans, direct driven fans, fan blades and impellers are tested in this in-house laboratory for performance evaluation and design validation.

Blowtech's 30,000 Sq. Ft. state of the art manufacturing plant near New Delhi (India)

To ensure long life and vibration-free operation, each impeller is first checked for eccentricity and run-out. Only after passing this quality check, the impeller is ready for balancing on computerized dynamic balancing machines. Balancing is done as per balance quality grade G 4.0 of the International Standard ISO 1940.

On the basis of advanced management ideas and perfect quality systems, Blowtech constantly strives to absorb and adopt latest technologies, precisely control the quality in each of its working processes and actively promote its products to keep it at the leading position in the HVAC&R industry in India. Our stakeholders' and affiliate relationship networks ensure that we remain at the forefront of industry knowledge and future technology trends. Our skills, infrastructure and experience are trusted by our customers to optimize performance, minimize costs and increase efficiencies of their products. Our people ensure the success of our company, bringing the best in commercial understanding, technical capabilities and market know-how to bear on our customers' business.

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BBD Series

Double Inlet Centrifugal Fans with Backward Curved Wheels

(Square Outlet Metric Size)

Blowtech Air Devices Pvt. Ltd. certifies that the **BBD Series Fan Models 315 to 1250** 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 AMCA Publication 311 and comply with the requirements of the AMCA Certified Ratings Program.

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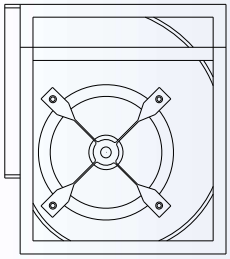
BBD Series-Double Inlet Backward Curved Centrifugal Fans

The BBD Series is made of Double Inlet Double Width (DIDW) Centrifugal Fans with Backward Curved Impellers. These fans are suitable for supply and exhaust applications in commercial and industrial heating, ventilation and air-conditioning (HVAC) systems. Typical applications include evaporative cooling units, air handling units, indoor units of packaged air-conditioners, fresh air supply units, exhaust units and general ventilation and pressurization. The superior design of the Blowtech BBD series fans – optimum blade profile , width and angle, aerodynamically shaped inlets, matching of the inlets to the wheel and optimum design of cut-off – has resulted in them being one of the most efficient fans (in their category) available in the world today. The BBD series is an economic choice for medium to high pressure range applications in heating, ventilation & air-conditioning.

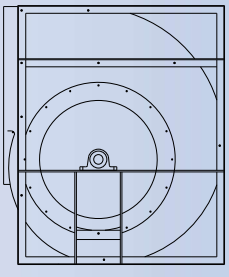
BBD Series fans are available in 15 sizes from wheel diameter of 250mm to 1250mm. The sizes are as per AMCA standard 99-0098-76 R20. The Air Volume capacity of BBD fans ranges from 3000 m3/h to 175000 m3/h. The performance of sizes 250mm to 280mm are not licensed by AMCA International.

The BBD series is available in type R and K as shown below.



Type R has rectangular side frames made from Galvanized Steel sheets which are bolted to the Fan Housing. This improves rigidity and strength and allows easy mounting of the fan in various orientations. The wheel-shaft assembly is supported in bearings which are mounted to the fan housing using specially designed brackets

Type K has side frames made of welded heavy gauge mild steel sections. The Wheel Shaft assembly is supported in self-aligning bearing pillow blocks which are mounted on the steel side frames.



Fan Construction Specifications

Impeller (Wheel)

The WHEEL of BBD series is made in mild steel with welded backward curved blades and coated with polyester powder paint.

A large die cast aluminium hub with a precisely machined bore and a key way is fitted to the wheel backplate. Use of precision tooling for the punching forming and assembling of wheel components results in extremely low levels of eccentricity and run out. The wheel is statically and dynamically balanced on computerised dynamic balancing machines to balance quality grade G 4.0 of ISO 1940 and AMCA 204 standard.

Housing

The FAN HOUSING is made from high quality rust resistant galvanized sheet steel with the housing wrapper fixed to the side plates using 'Pittsburg Lock'. This method of locking is superior to spot welding as it is leak proof and provides better rigidity. Side plate profiles are cut on precision machines which results in proper centering of the Impeller – Shaft assembly and precise overall fan dimensions for quiet performance. Aerodynamically shaped inlet venturies are made from mild steel (polyester powder coated) and are attached to the housing side plate with bolts maintaining concentricity with the impeller. The design of the ventury profile is extremely crucial to provide loss- less flow into the impeller and yield high efficiency.

Shaft

The FAN SHAFT is manufactured from high quality EN9 carbon steel with keyways at both ends (for pulleys) and at the centre (for wheel hub) and is ground to close tolerance for precision fit.

Bearings

The WHEEL – SHAFT ASSEMBLY is supported at both ends in imported pre-greased permanently sealed ball bearings with an eccentric locking collar.

For Fan type R, Each bearing sits inside a moulded rubber housing which in turn is mounted on to the fan housing using a set of 4 specially designed die - formed sheet steel brackets on each side. In Fan Types K, the shaft is supported in self-aligning bearing pillow blocks which are mounted on the steel side frames.

Frames

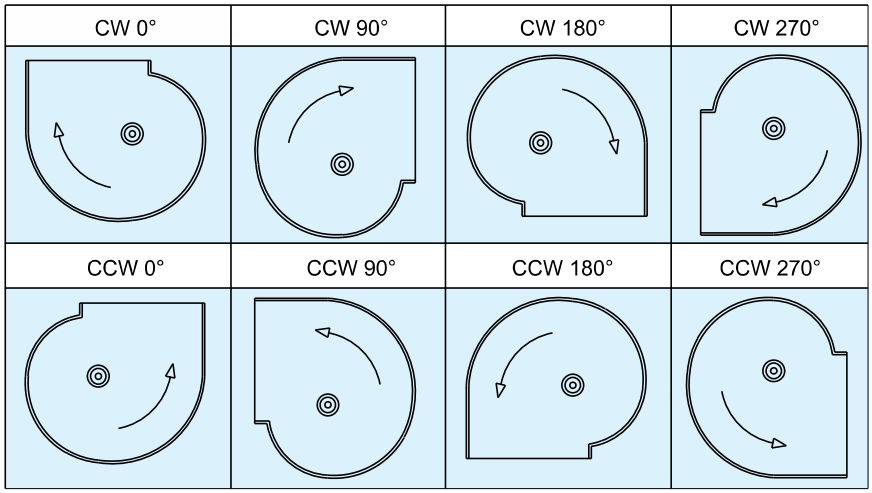
The frame is manufactured in Galvanized Steel sheets in type 'R'.

For Type 'K', side frames are made of welded heavy gauge mild steel sections.

Accessories such as Casing Drain Plug, Outlet Flange, Inspection Door and inlet and discharge guards are optional and can be supplied on request.

Fan Rotation and Orientation

Standard fans are supplied with both shaft ends prepared to fit a pulley. They can be used with either Clockwise (CW) or Counter Clockwise (CCW) rotation. All BBD Series fans can be easily turned to install them in any one of the four orientations 0^{o}, 90^{o}, 180^{o} and 270^{o} as shown below. The direction of rotation (CW or CCW) is specified looking at the wheel from the motor end.



Motor Selection

The shaft power (H) lines shown on each performance curve indicates the input power at the fan shaft in kW.

To determine the minimum motor power required to drive the fan, this fan shaft power H has to be multiplied by a safety coefficient which accounts for power losses in belt drives and a reasonable safety margin. The recommended values for the safety coefficient are as under:

Safety Coefficient = 1.20 for $H \leq 3kW$
1.15 for $3kW < H \leq 10$ kW
1.10 for $H > 10$ kW

The reasonable safety margin mentioned above takes care of any small change in the operating point or fan speed, which may be due to possible minor inaccuracies in calculation of system pressure drop or a pulley ratio slightly different from the design value.

For conversion to horsepower (hp), 1 hp = 0.746 kW.

With motors larger than 7.5 kW (10 hp), the use of a star/delta (Y/Δ) starter is highly recommended.

Fan Pressure under Free Outlet Conditions

The outlet velocity V and velocity pressure Pv shown on each performance curve has been determined under ducted outlet conditions, i.e. with an outlet duct having a cross section area equal to fan outlet area. When operating under "free outlet" conditions (no outlet duct connected), the outlet velocity and the resulting velocity pressure is higher (due to a smaller outlet area produced by the presence of the cut-off baffle). Thus the available static pressure, which is the difference between fan total pressure and fan velocity pressure, will be lower under "free outlet" conditions.

The velocity pressure under free outlet conditions can be reasonably estimated by multiplying the velocity pressure Pv from the performance curves by the following correction factor Kv.

$$\mathbf{Kv = 1.67}$$

Fan performance calculated with this correction factor is not licensed by AMCA International.

Interpretation of Fan Sound Power Levels

The sound power levels Lwi(A) shown on the performance charts are at fan inlet for installation type "free inlet ducted outlet" in accordance with AMCA standard 301. The single total A-weighted value has been calculated by summing the measurements over the 8 octave bands using the following A-weighting correction factors:

Octave band mid-frequency (Hz)	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
A-weighting correction (dB)	-26.2	-16.1	-8.6	-3.2	0	+1.2	+1	-1.1

Since what humans hear are sound pressure levels (and not power levels), an approximate value of the Sound Pressure Level Lpi(A) can be obtained from the power levels Lwi(A) shown on the curves using the following formulae :

a) **In spherical free field :** $\mathbf{Lpi(A) = Lwi(A) - 20 \cdot \log_{10}(d) - 11}$

b) **In room conditions :** $\mathbf{Lpi(A) = Lwi(A) - 20 \cdot \log_{10}(d) - 7}$

where d = distance between the fan and the microphone in meters.

It should be noted that the sound power level of a fan, as installed in practice, could be significantly higher than that measured in laboratory conditions, due to a host of factors such as vibrations in the drive motor, stiffness of fan installation, air leakage through the connections, or turbulence produced by guards, diffuser grids or transition pieces. Also the above equations to estimate sound pressure levels must be used with extreme caution. The sound pressure level depends not only on the distance 'd' but also on the acoustic properties of the enclosure in which the fan is installed. The above equations are only valid for theoretical acoustic environments. In real life situations, the actual pressure levels may be significantly different.

Example of BBD Fan Selection using the Performance Charts :

Ideally, for a given duty (flow rate and system pressure drop) a fan should be selected so as to operate near the point of maximum efficiency. This will result in the lowest energy cost to operate the fan and also lead to acceptable noise levels.

The selection process consists of 2 steps:

1. To determine the right size of the fan and
2. To determine the operating parameters e.g speed (RPM), shaft power, outlet velocity, efficiency, velocity pressure and sound power level.

Most designers limit the outlet velocity of a fan within a band usually from 8m/s – 12 m/s. The size of a fan for a given duty can be narrowed down to 2 or 3 sizes to suit this requirement. Once a size is chosen, one can go to the performance chart for this size to determine the operating parameters.

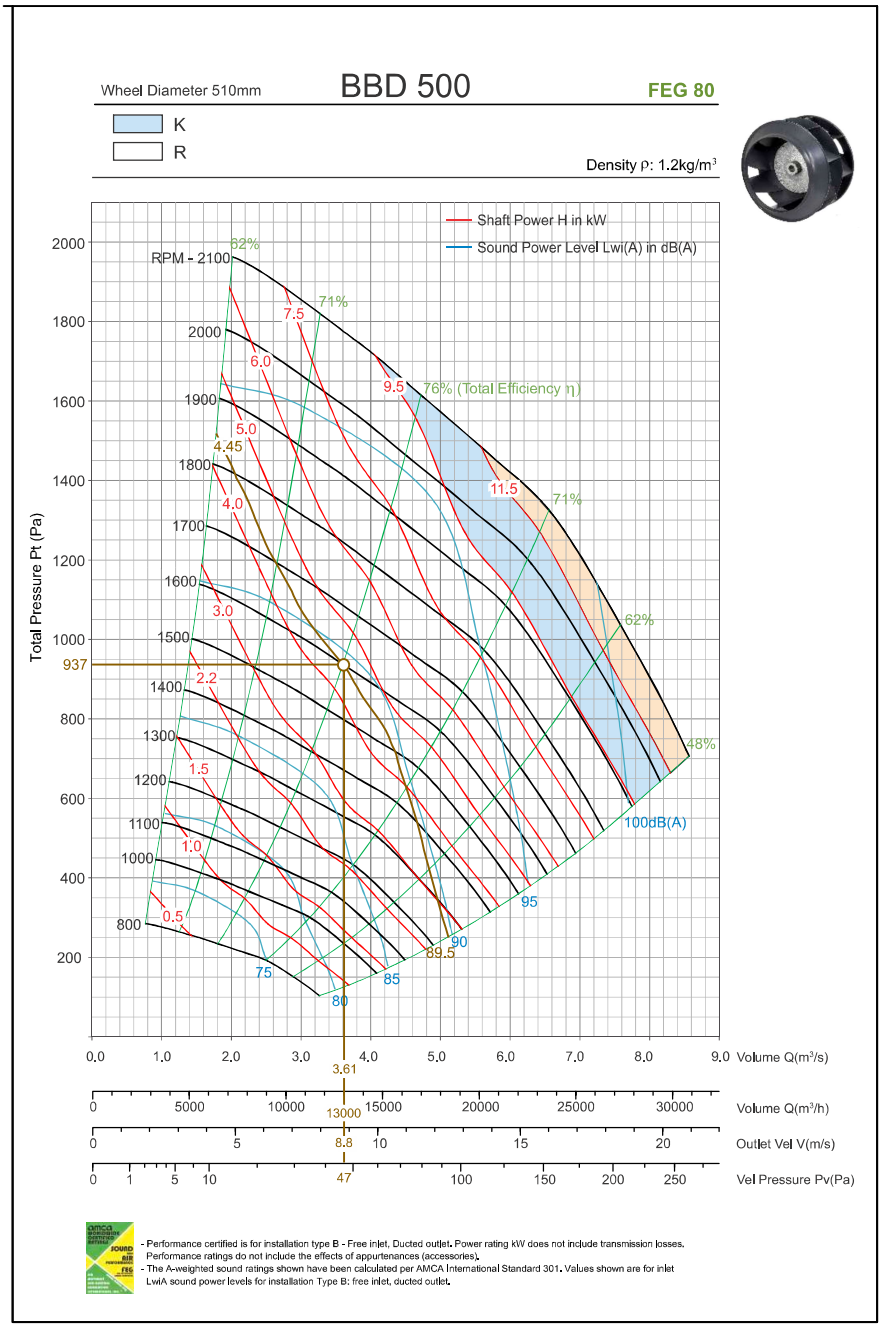
Example

Required:

Volume Flow Rate 'Q'	=	13000 m^3/h
Static Pressure Drop (Ps)	=	890 Pa
Air Density (ρ)	=	1.2 kg/m^3

Determine:

Fan Size	=	BBD550
Outlet Velocity (V)	=	8.8m/s
Velocity Pressure (Pv)	=	47 Pa
Total Pressure (Pt)	=	890+47Pa
	=	937 Pa
Fan Speed (N)	=	1600 RPM
Shaft Power (H)	=	4.45 kW
Sound Power Level (Lwi(A))	=	89.5 dB(A)
Total Efficiency (ή)	=	76%

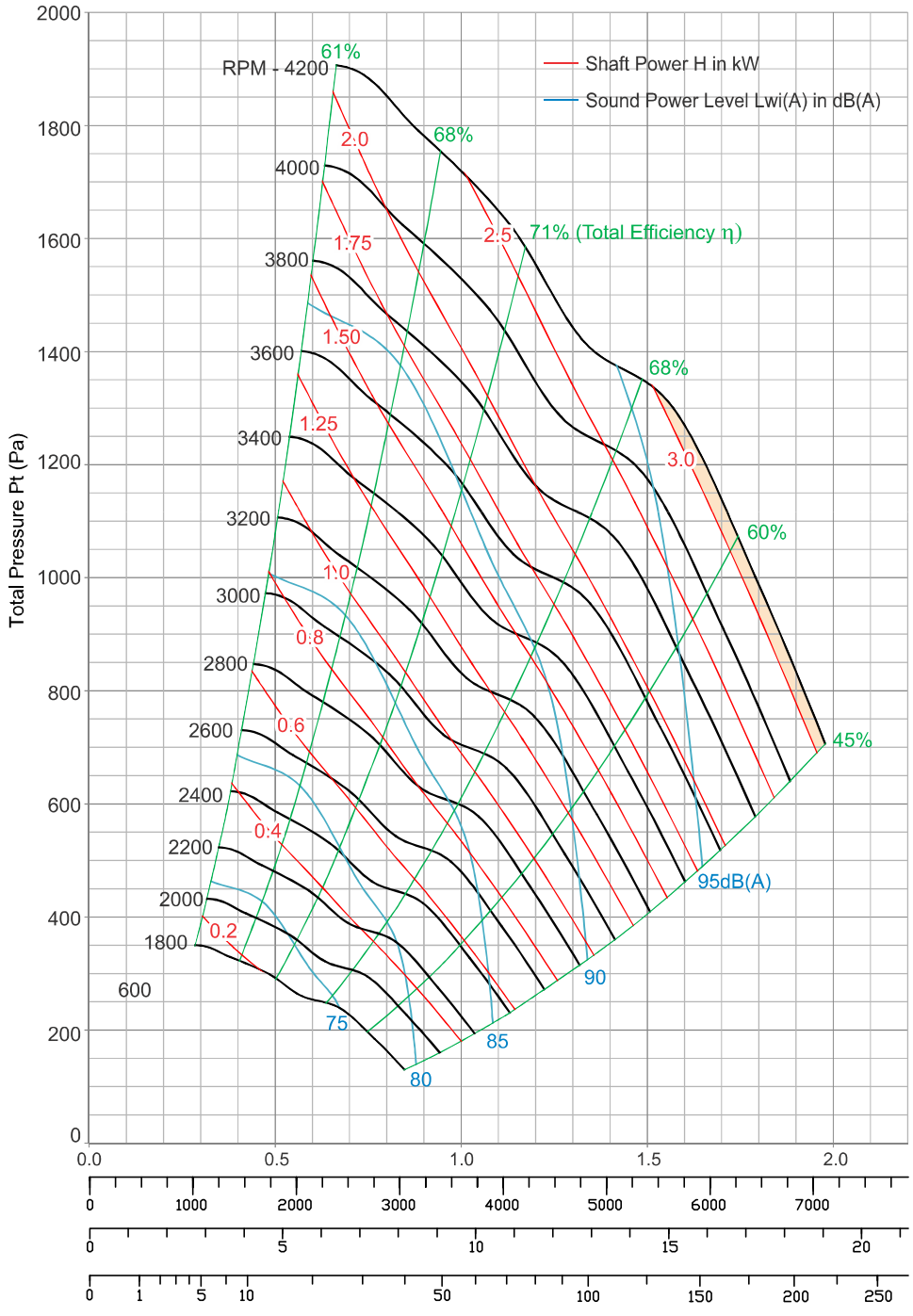


Wheel Diameter 256mm

BBD 250

R

Density ρ: 1.2kg/m³



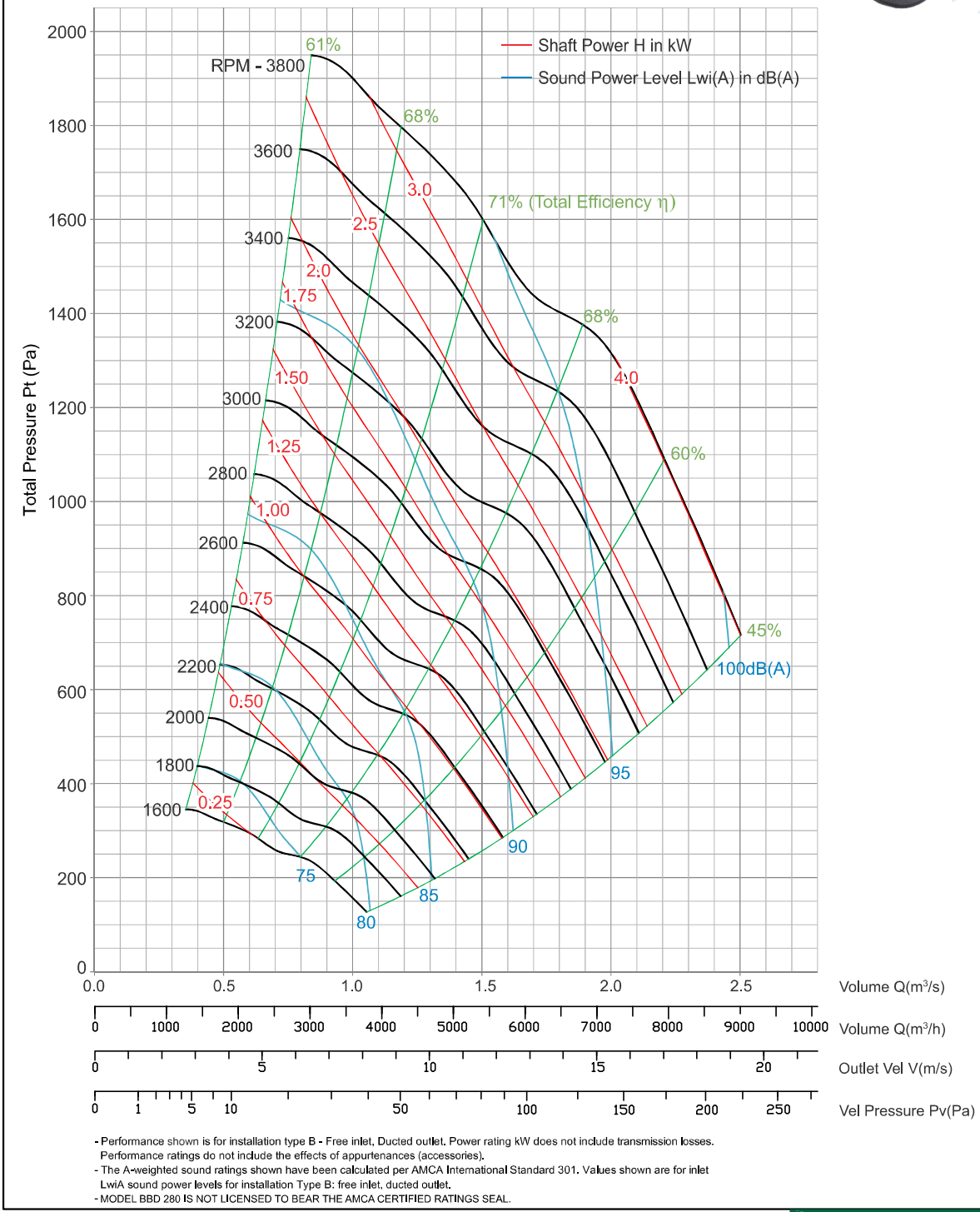
- Performance shown is for installation type B - Free inlet, Ducted outlet. Power rating kW does not include transmission losses. Performance ratings do not include the effects of appurtenances (accessories).
- The A-weighted sound ratings shown have been calculated per AMCA International Standard 301. Values shown are for inlet LwiA sound power levels for installation Type B: free inlet, ducted outlet.
- MODEL BBD 250 IS NOT LICENSED TO BEAR THE AMCA CERTIFIED RATINGS SEAL.

Wheel Diameter 286mm

BBD 280

☐ R

Density ρ: 1.2kg/m³



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- MODEL BBD 280 IS NOT LICENSED TO BEAR THE AMCA CERTIFIED RATINGS SEAL.

Wheel Diameter 322mm

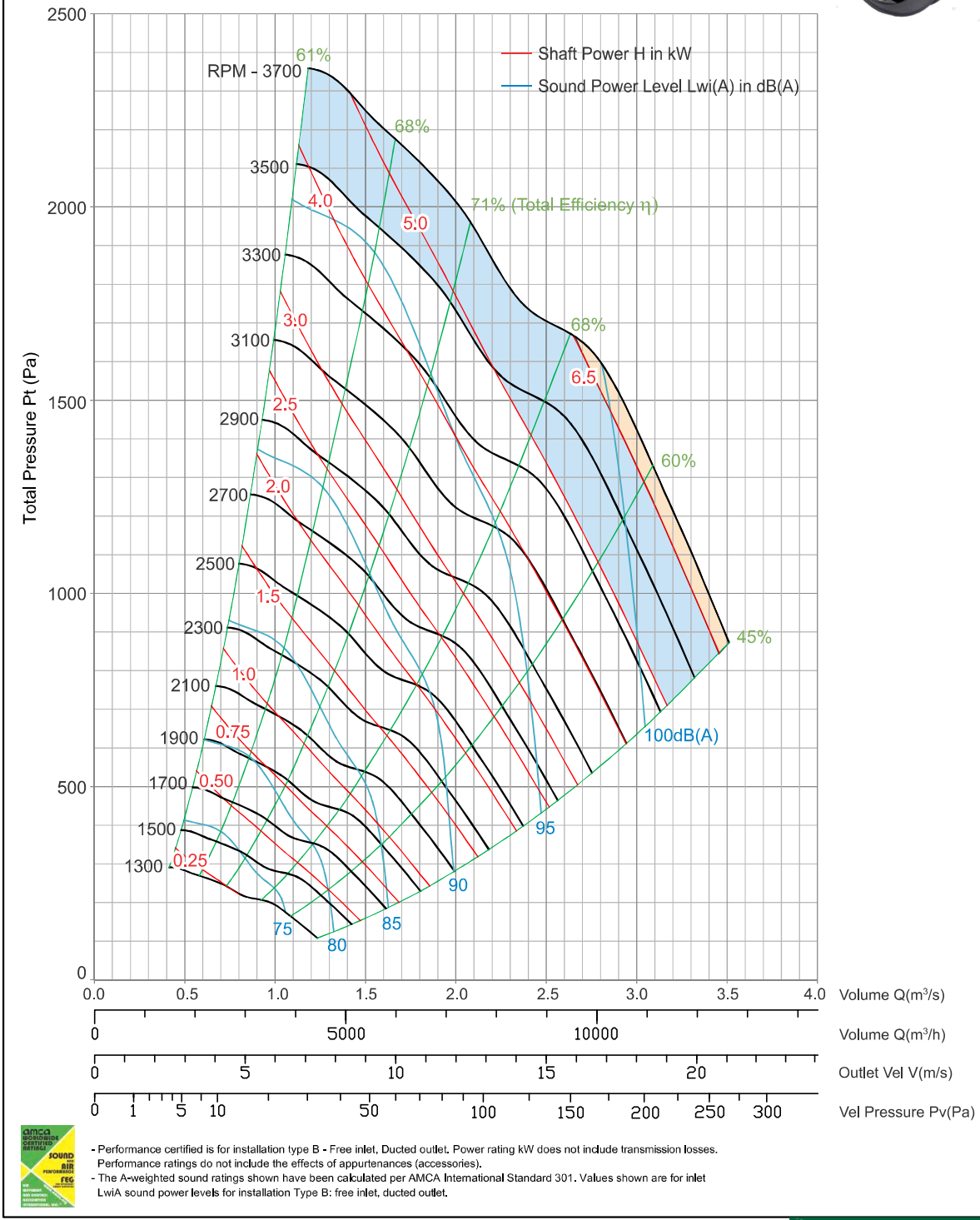
BBD 315

FEG 85

K

R

Density ρ: 1.2kg/m³



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Wheel Diameter 362mm

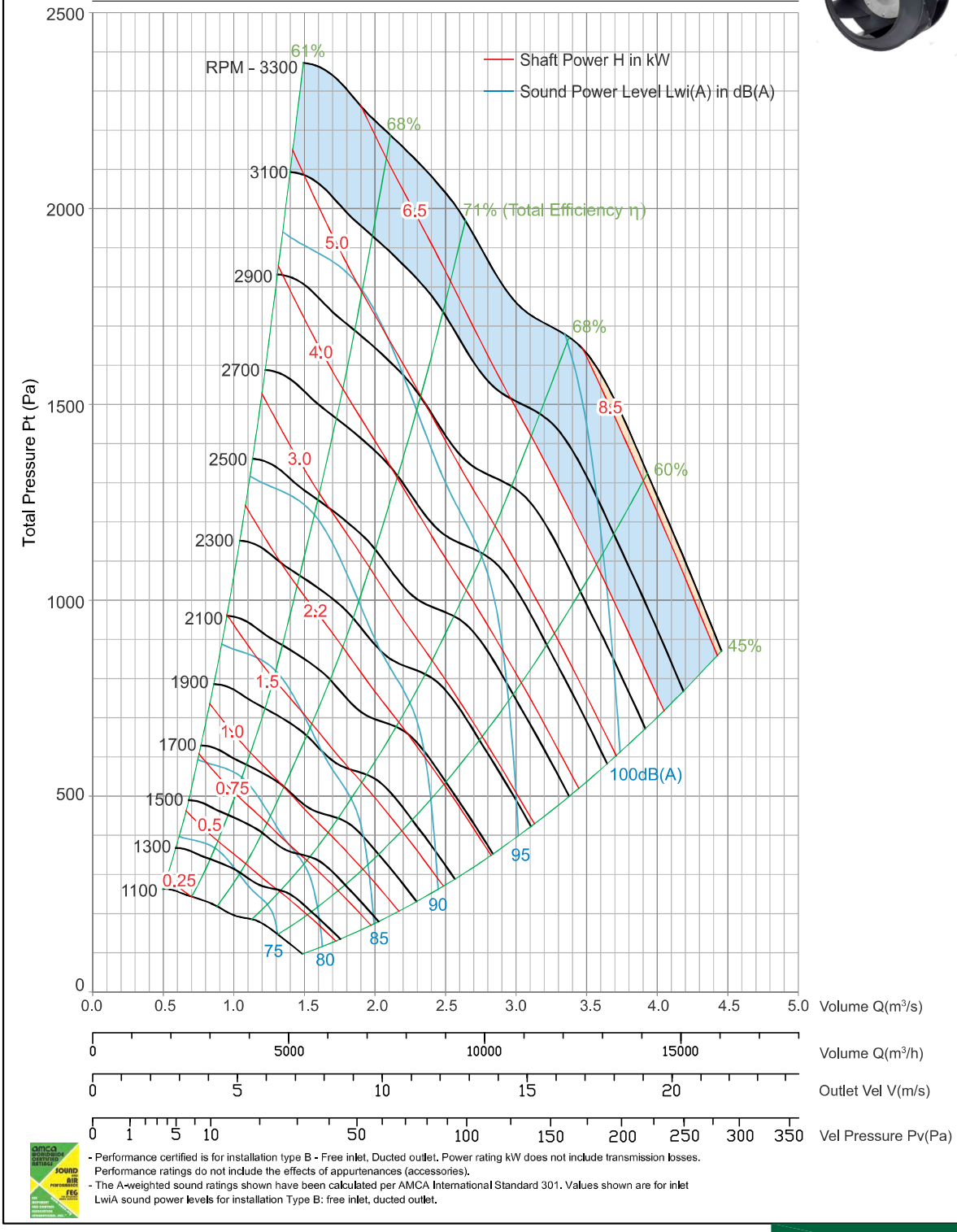
BBD 355

FEG 80

K

R

Density ρ: 1.2kg/m³



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Wheel Diameter 408mm

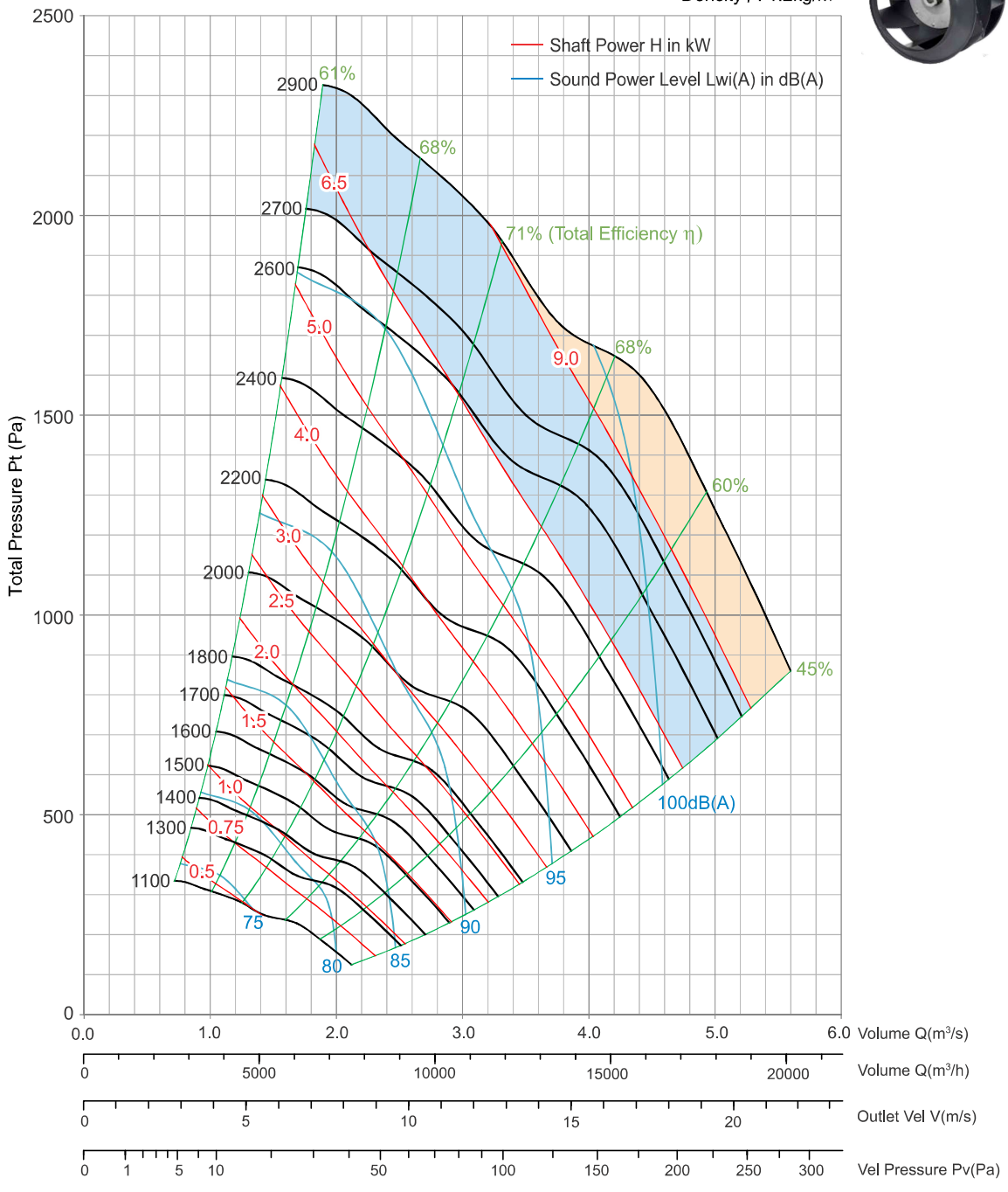
BBD 400

FEG 80

K

R

Density ρ: 1.2kg/m³



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Wheel Diameter 458mm

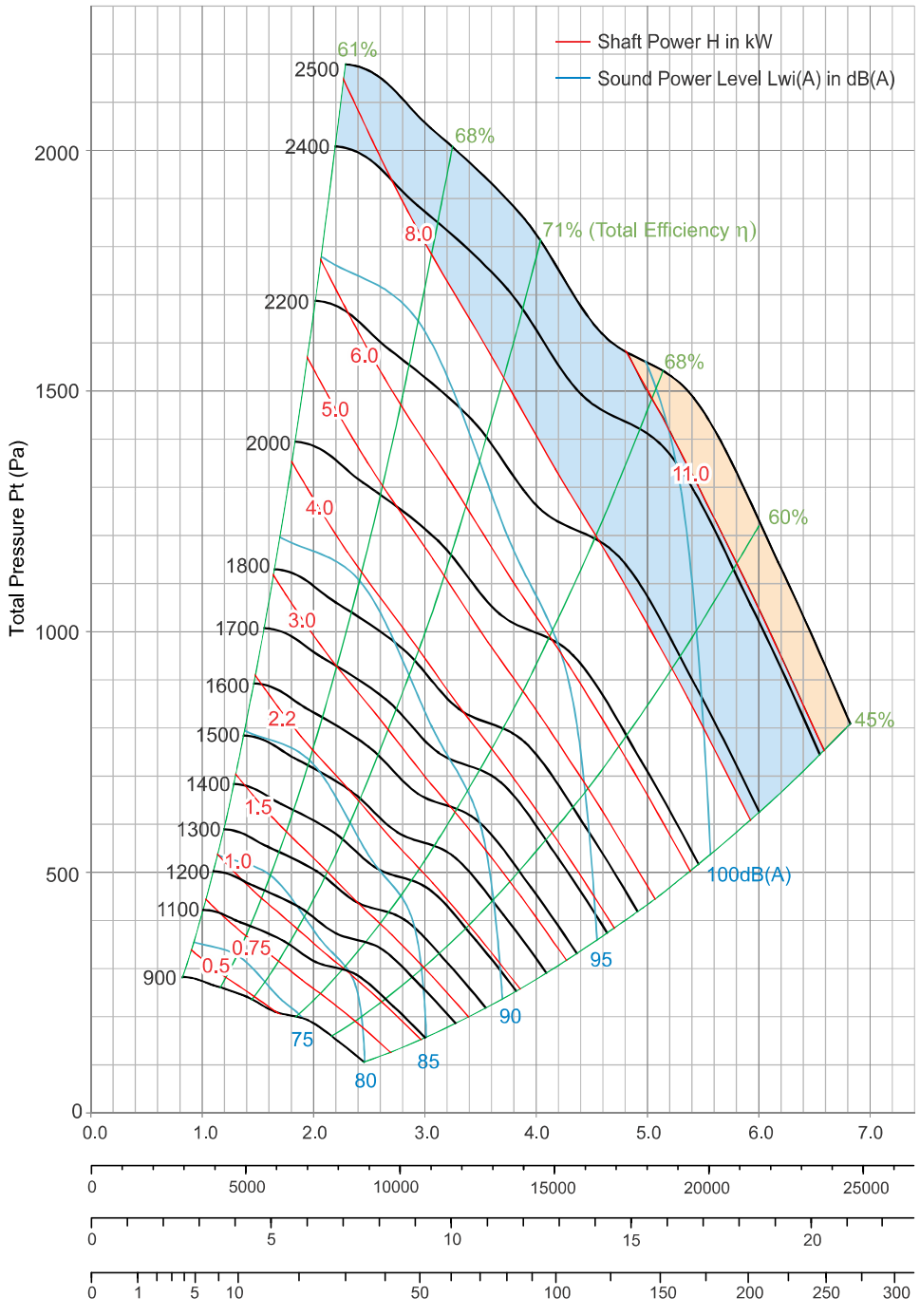
BBD 450

FEG 75

K

R

Density ρ: 1.2kg/m³



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Wheel Diameter 510mm

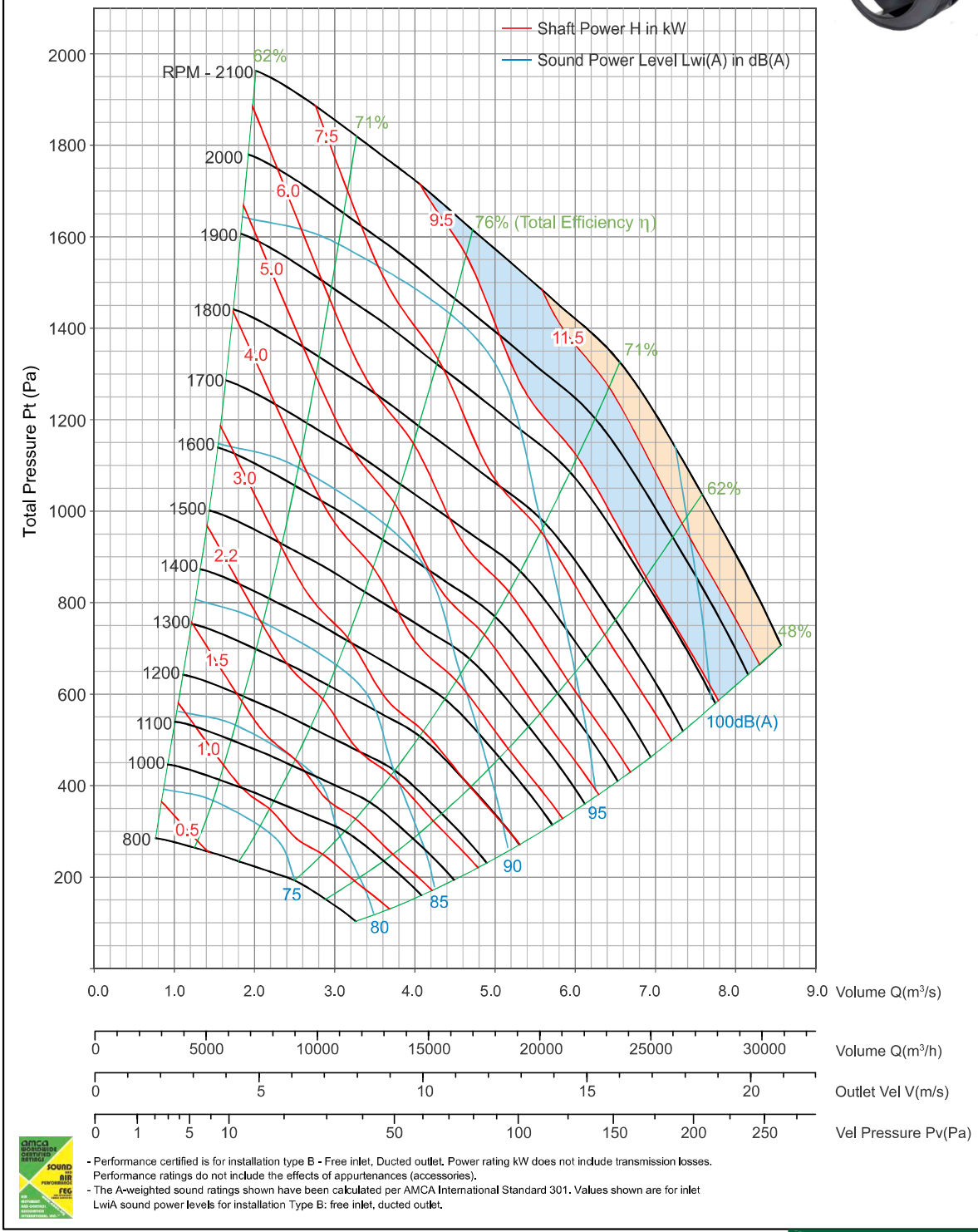
BBD 500

FEG 80

K

R

Density ρ: 1.2kg/m³



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Wheel Diameter 572 mm

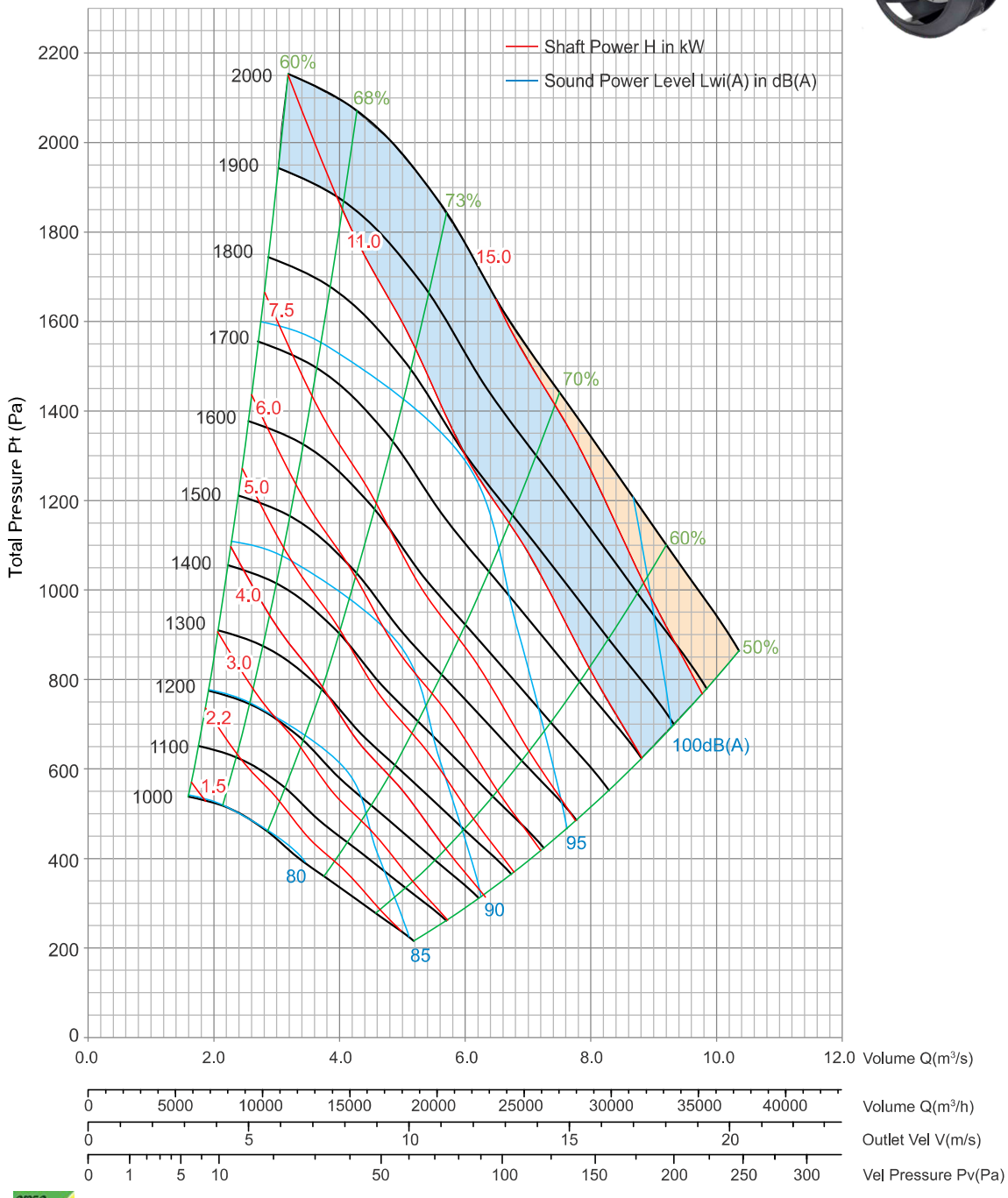
BBD 560

FEG 75

K

R

Density ρ: 1.2kg/m³



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Wheel Diameter 639mm

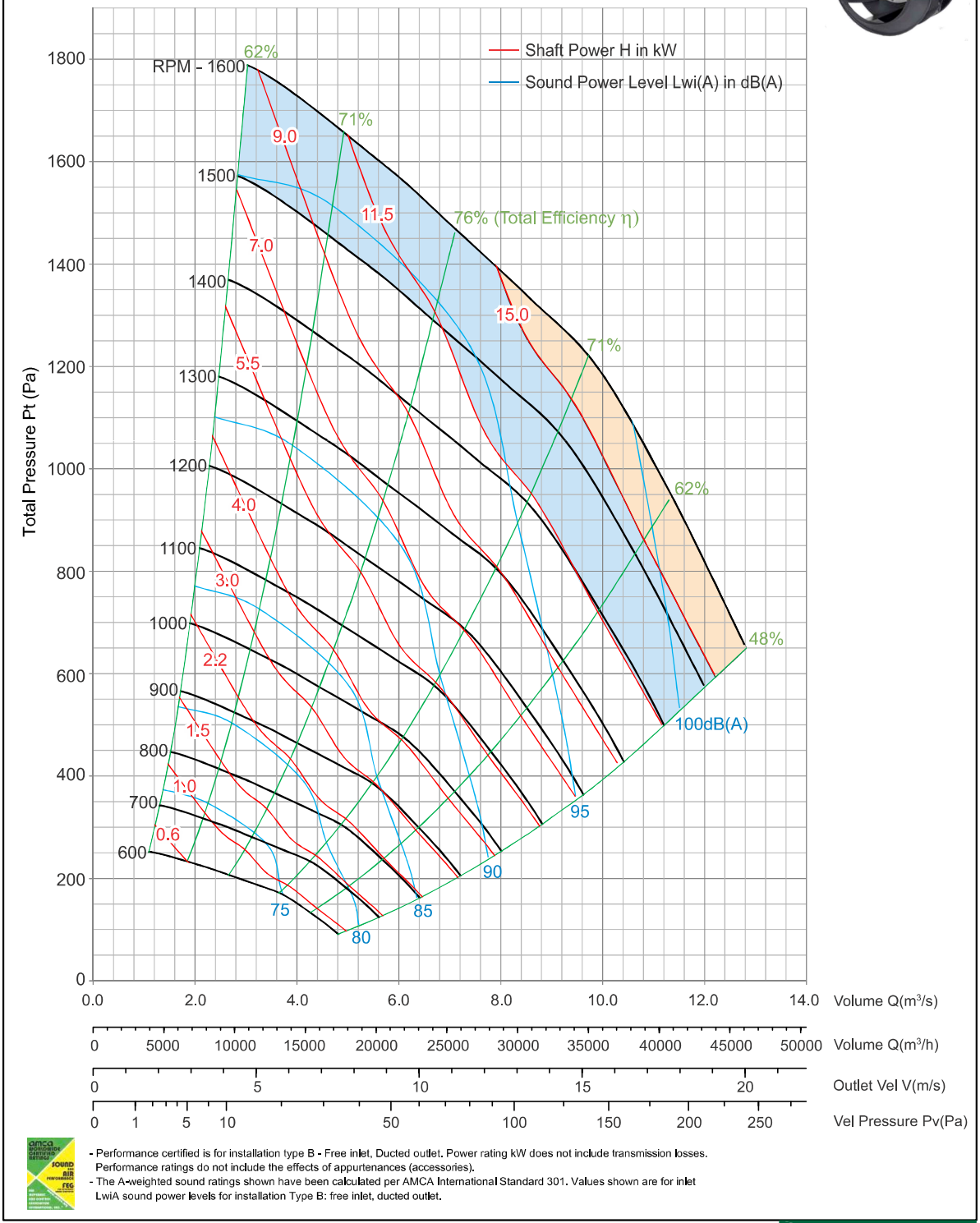
BBD 630

FEG 80

K

R

Density ρ: 1.2kg/m³



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Wheel Diameter 718mm

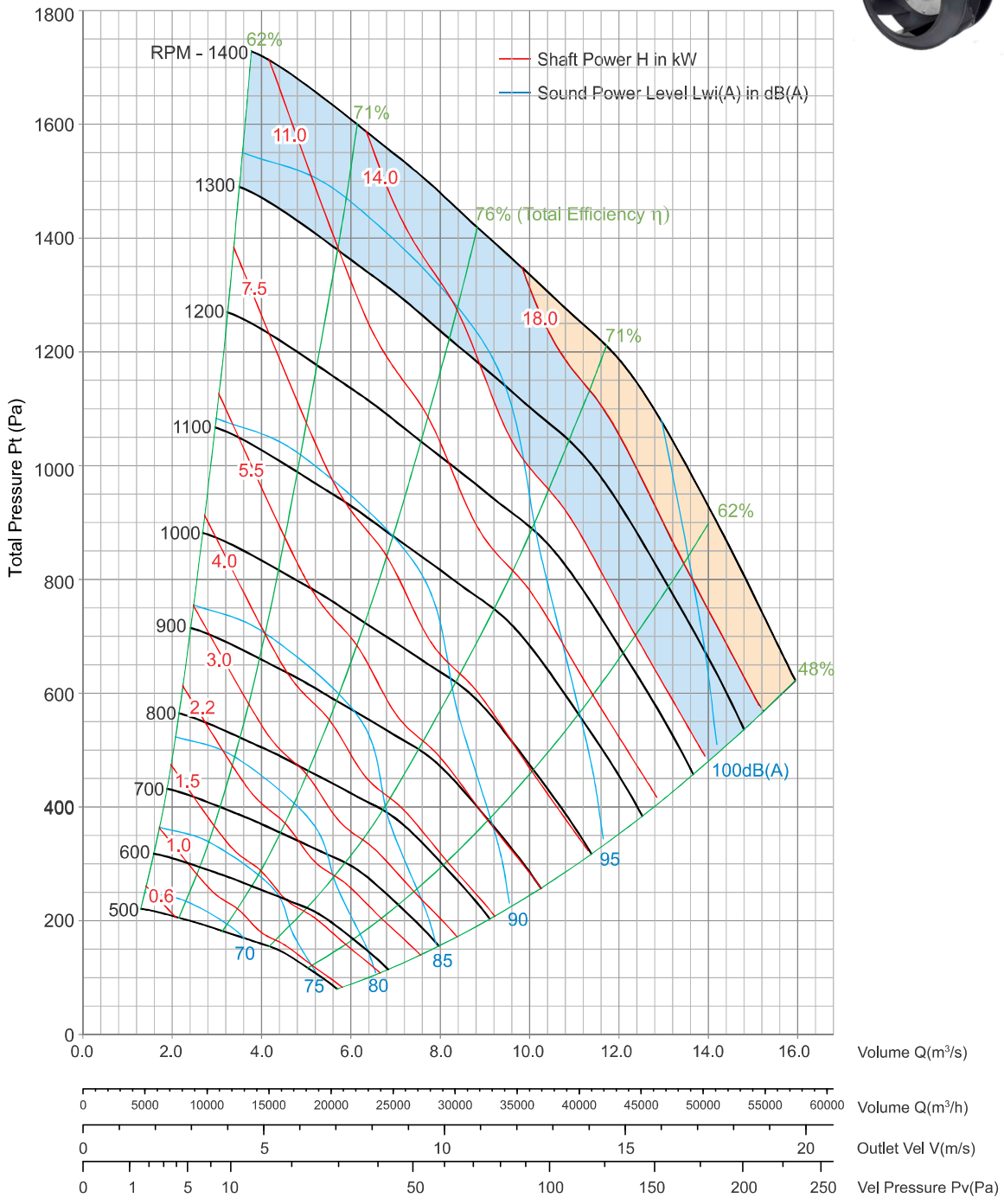
BBD 710

FEG 80

K

R

Density ρ: 1.2kg/m³



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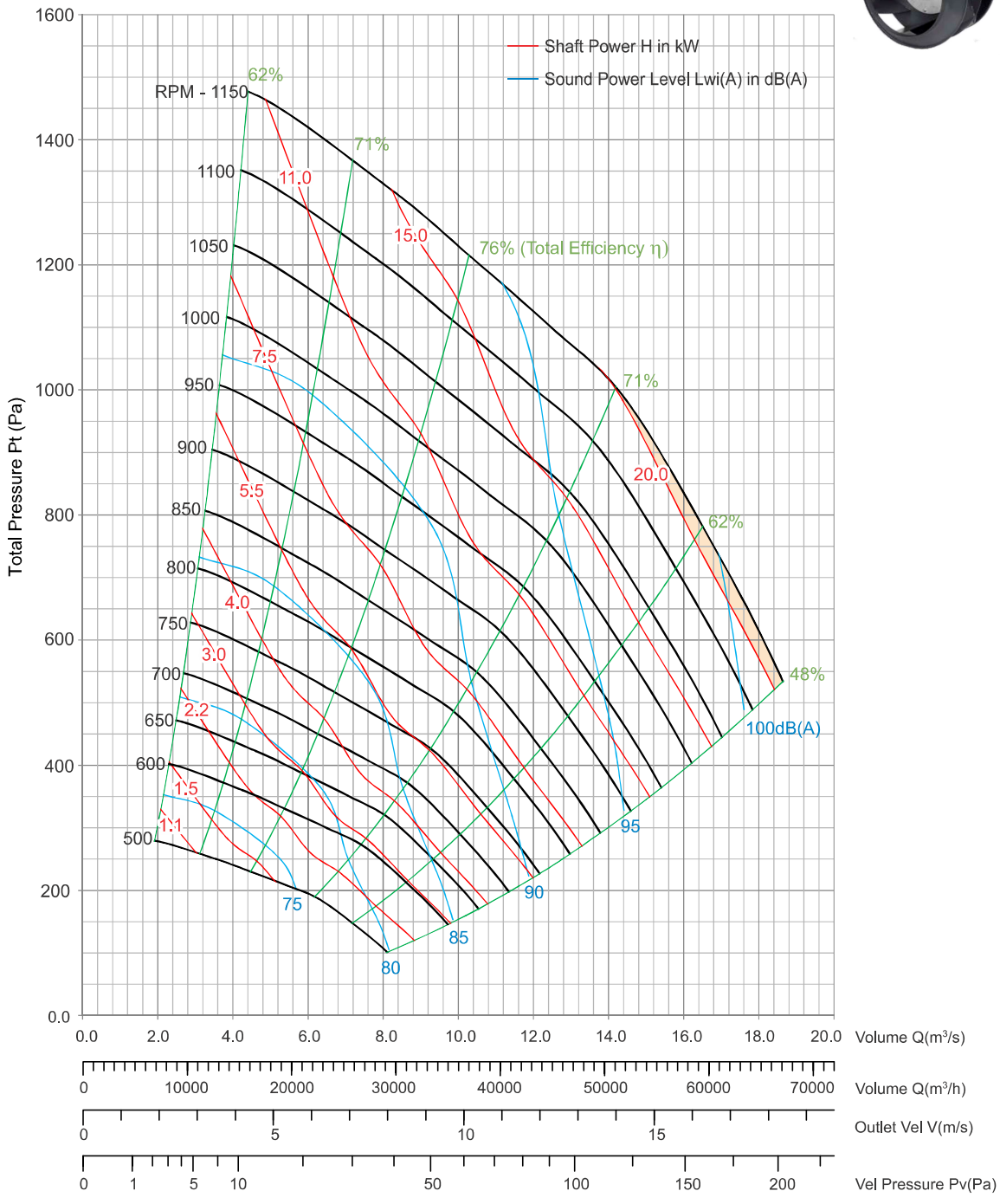
Wheel Diameter 808mm

BBD 800

FEG 80

K

Density ρ: 1.2kg/m³



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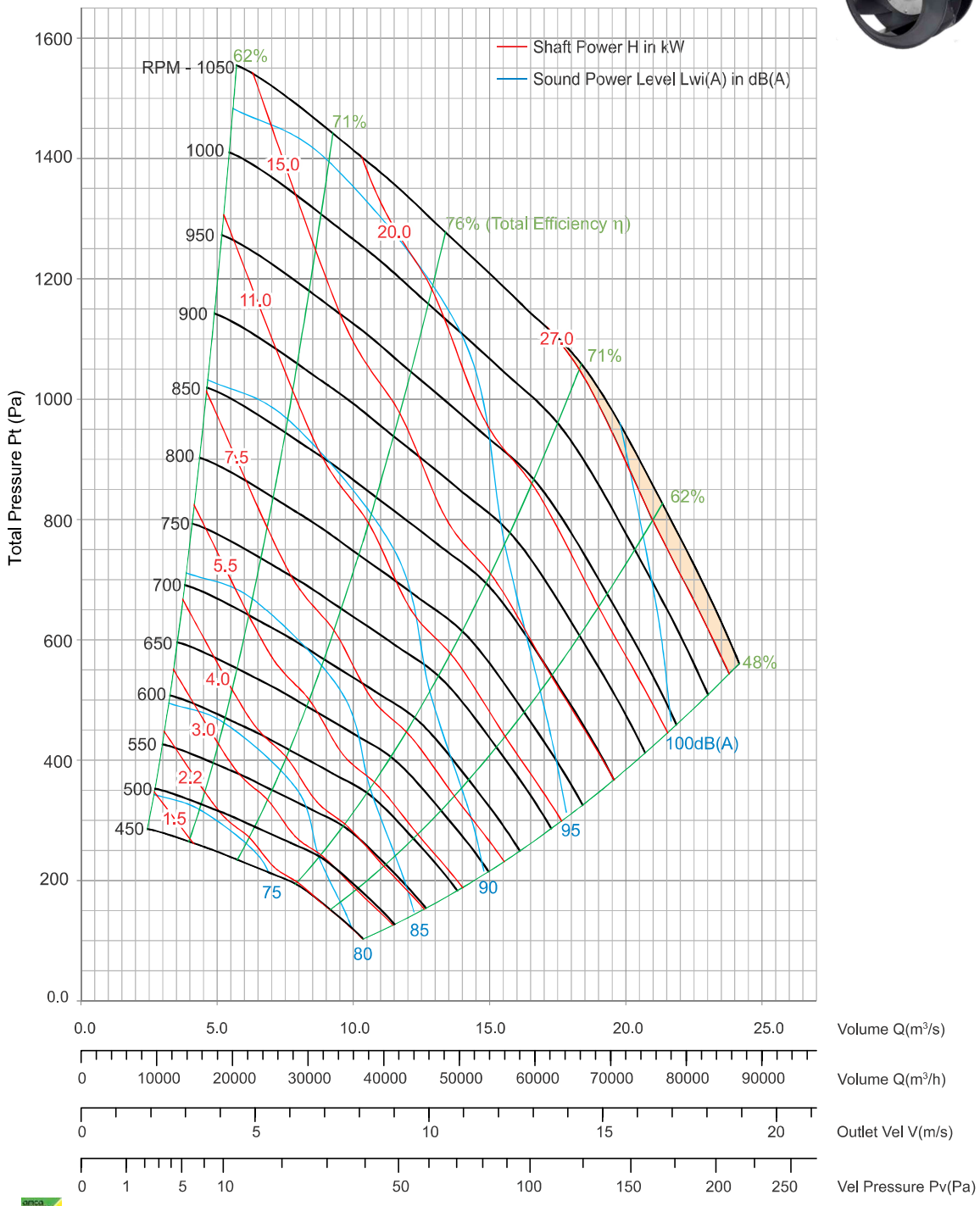
Wheel Diameter 908mm

BBD 900

FEG 80

K

Density ρ: 1.2kg/m³



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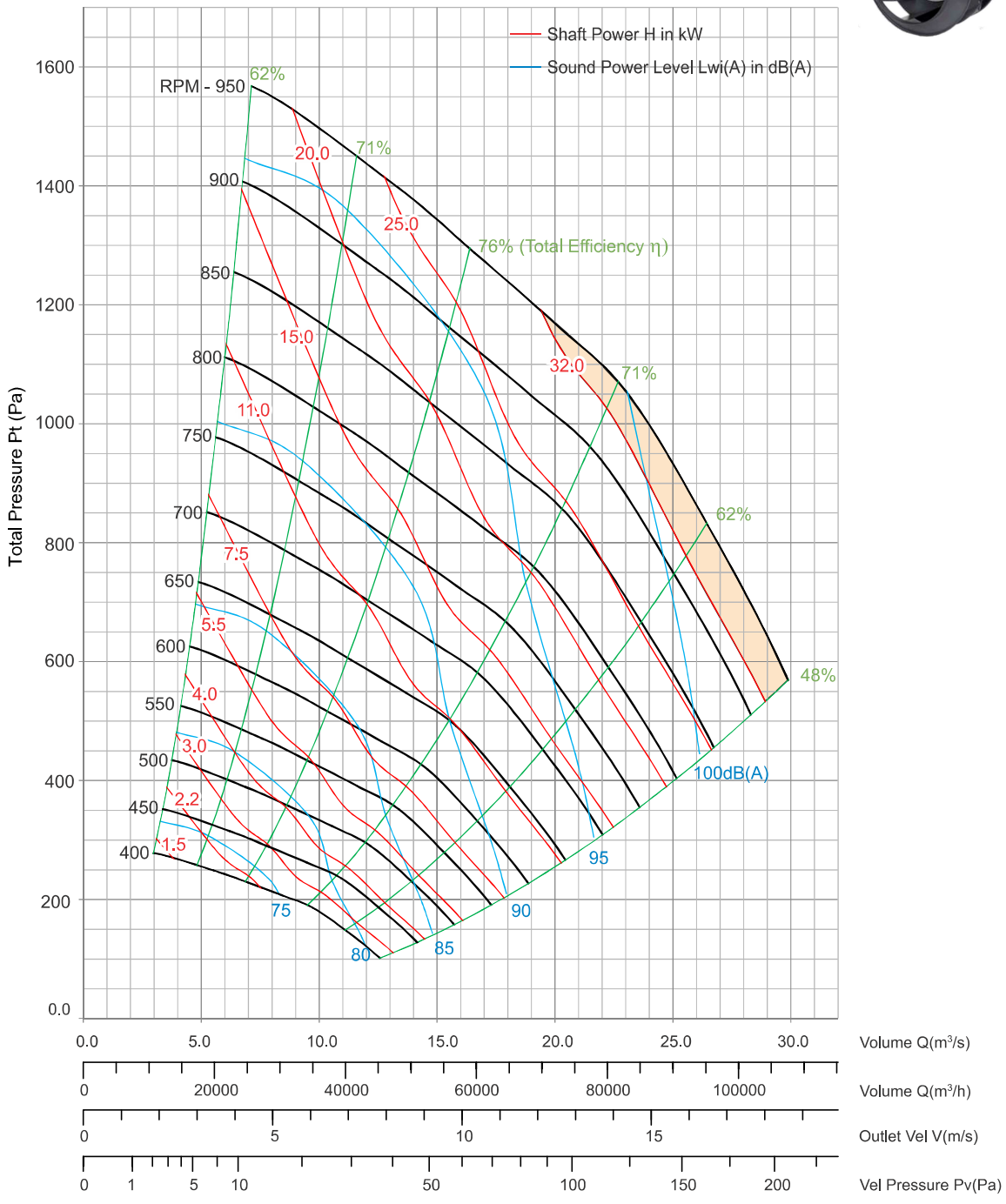
Wheel Diameter 1008mm

BBD 1000

FEG 80

K

Density ρ: 1.2kg/m³



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Wheel Diameter 1128mm

BBD 1120

FEG 80

K

Density ρ: 1.2kg/m³

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- The A-weighted sound ratings shown have been calculated per AMCA International Standard 301. Values shown are for inlet LwiA sound power levels for installation Type B: free inlet, ducted outlet.

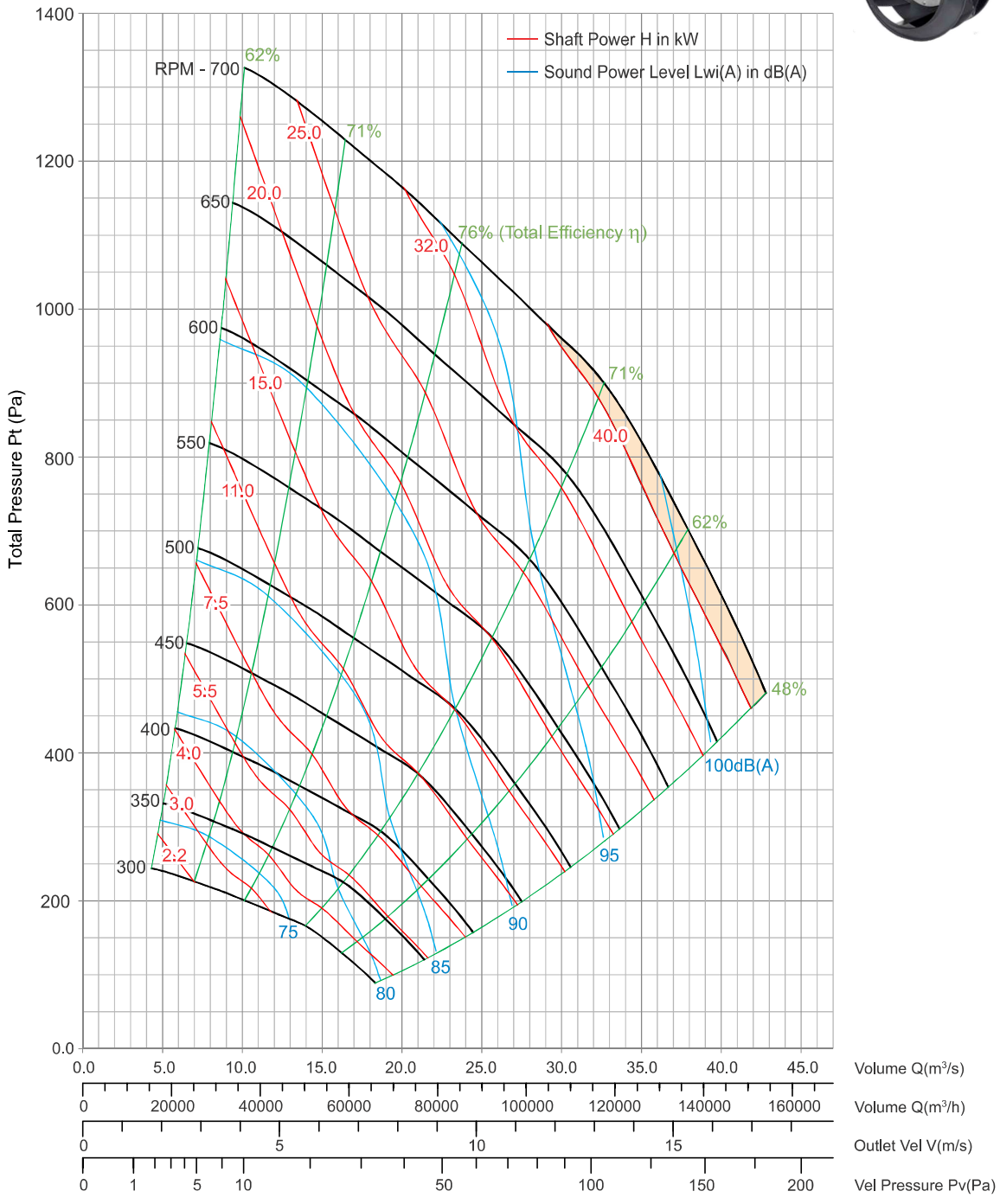
Wheel Diameter 1258mm

BBD 1250

FEG 80

☐ K

Density ρ: 1.2kg/m³



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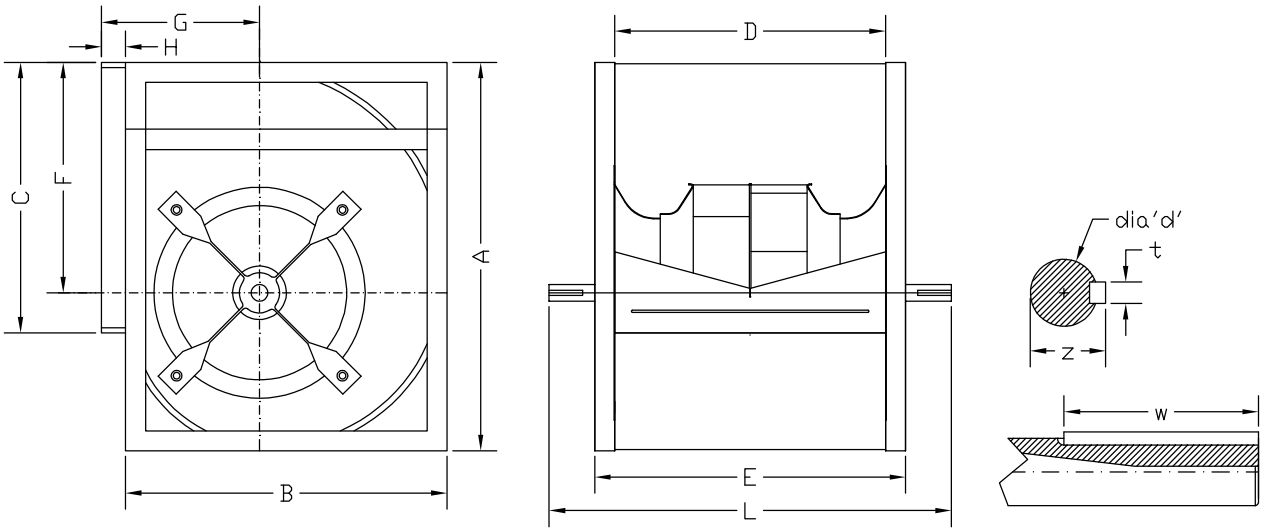
Dimensions :

BBD 250 - 710 'R'



Model	A	B	C	D	E	F	G	H	L	d	t	z	w
250	460	383	322	322	372	270	194	37	485	20	6	22.5	30
280	518	433	361	361	421	302	215	37	555	25	8	28	40
315	580	480	404	404	464	342	236	38	600	25	8	28	40
355	654	542	453	453	534	385	261	36	665	30	8	33	50
400	730	606	506	506	586	432	290	40	725	30	8	33	50
450	830	680	569	569	649	487	322	45	815	35	10	38	60
500	918	750	638	638	718	540	352	50	875	35	10	38	60
560	1030	845	715	715	815	605	390	48	1000	40	12	43	70
630	1158	946	800	800	900	680	434	53	1090	40	12	43	70
710	1303	1061	898	898	998	765	485	60	1255	50	14	53.5	90

All dimensions are in mm.

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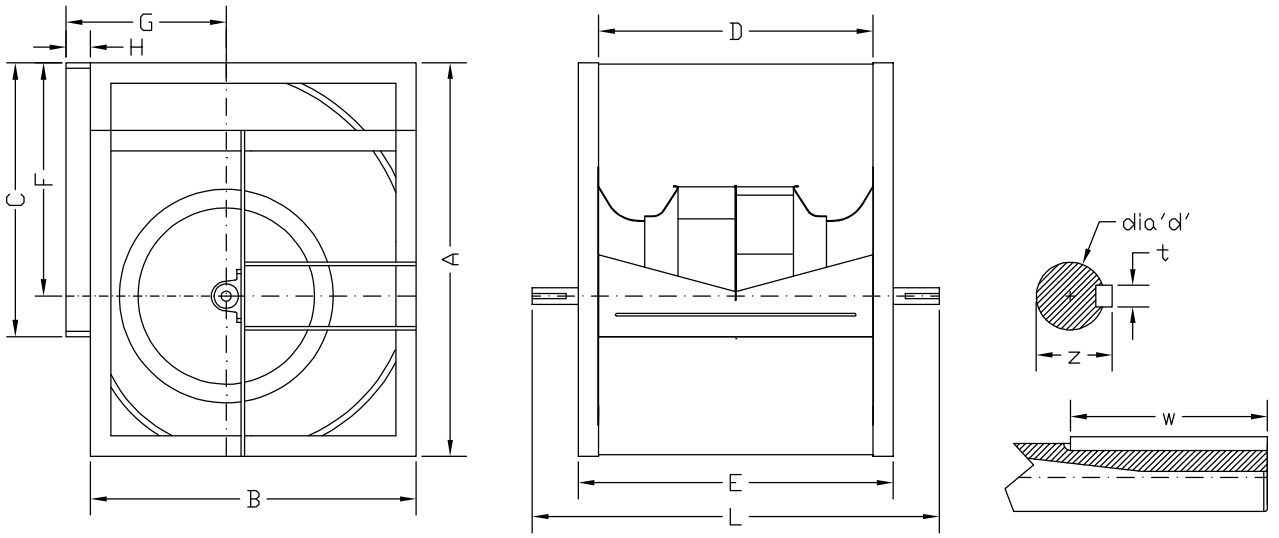
Dimensions :

BBD 315 - 1250 'K'



Model	A	B	C	D	E	F	G	H	L	d	t	z	w
315	580	480	404	404	464	342	236	38	600	25	8	28	40
355	654	542	453	453	534	385	261	36	665	30	8	33	50
400	730	606	506	506	586	432	290	40	725	30	8	33	50
450	830	680	569	569	649	487	322	45	815	35	10	38	60
500	918	750	638	638	718	540	352	50	875	35	10	38	60
560	1030	845	715	715	815	605	390	48	1000	40	12	43	70
630	1158	946	800	800	900	680	434	53	1090	40	12	43	70
710	1303	1061	898	898	998	765	485	60	1255	50	14	53.5	90
800	1468	1181	1007	1007	1107	862	540	74	1350	50	14	53.5	90
900	1648	1311	1130	1130	1230	971	604	97	1520	60	18	64	90
1000	1810	1450	1267	1267	1367	1066	657	90	1660	60	18	64	90
1120	2025	1625	1420	1420	1540	1194	745	100	1880	65	18	69	110
1250	2260	1815	1570	1570	1690	1332	832	112	2040	70	20	74.5	110

All dimensions are in mm.

Operational Limits - BBD Series

Model ➞			250	280	315	355	400	450	500	560	630	710	800	900	1000	1120	1250
Maximum Fan Speed	rpm	R	4200	3800	3500	3100	2700	2400	2100	1900	1500	1300					
		K			3700	3300	2900	2500	2100	2000	1600	1400	1150	1050	950	800	700
Maximum Shaft Power	kW	R	3.0	4.0	5.0	6.5	6.5	8.0	9.5	11.0	11.5	14.0					
		K			6.5	8.5	9.0	11.0	11.5	15.0	15.0	18.0	20	27	32	35	40
Maximum Temperature (Minimum -20^{0}C)	^{0}C		85	85	85	85	85	85	85	85	85	85	85	85	85	85	85
Fan Weight	kg	R	15	19	24	32	41	53	70	94	115	152					
		K			30	41	54	68	85	115	140	190	230	300	350	560	700

BLOWTECH
we make air move

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