

# **BDB**

**DOUBLE INLET  
CENTRIFUGAL FAN  
WITH BACKWARD WHEELS**

# BDB Series

## DOUBLE INLET CENTRIFUGAL FAN with Backward Wheels



Kruger\* certifies that the **BDB Series** shown herein is 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.



\*Kruger Ventilation Industries Asia Co., Ltd.



\*Guangzhou Kruger Ventilation Co., Ltd.



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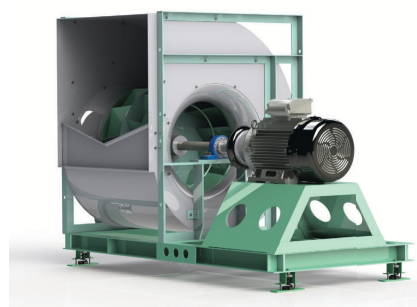
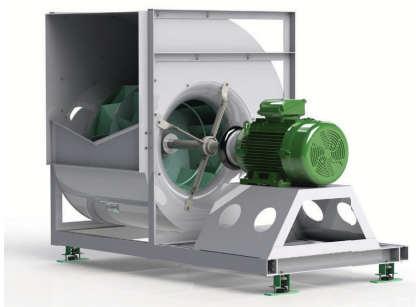
\*Kruvent Industries (M) Sdn Bhd



\*Kruger M&E Industries Corporation



\*PT Kruger Ventilation Indonesia



## BDB Series

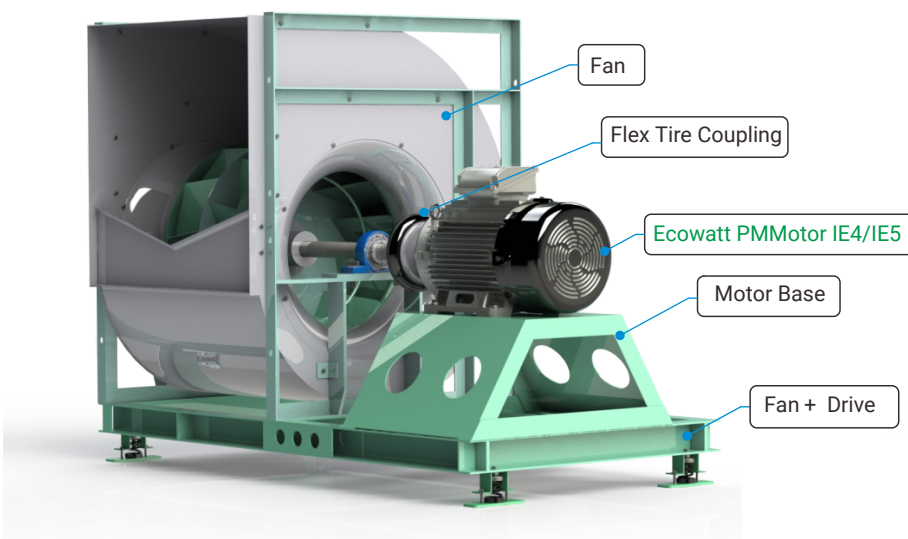
### Double Inlet Centrifugal Fans – Backward Wheels

The BDB series is DIDW centrifugal fans with high efficiency non-overloading backward curved impellers. The fans are suitable for supply or extract applications in commercial, process and industrial HVAC systems. Sizes of this series are in accordance with AMCA standard 99, section 5, R20.

## BDB Series – Direct Coupling

### Product Description

- Centrifugal fans BDB series, double inlet, direct drive through coupling with built-on AC or PM motor.
- Designed in accordance with AMCA Drive Arrangement 7 or ISO Drive Arrangement 17.
- High energy saving particularly long operating hours with Kruger's Ecowatt system (PM Motor + Drive + Controls).
- Fan and drive unit attached to a common rigid and stable steel base frame as standard with option for stainless steel base frame.
- Full range of BDB 315mm to 1400mm wheel with all fan classes.
- Optimal aerodynamics due to the large free cross section and minimal flow restriction into the impeller.
- Reliable, flexible and adaptable flex coupling for trouble free operation and installation.
- Speed regulation with Kruger approved inverter drive working together with piezometer ring for either constant airflow or constant pressure operation.
- Fully assembled fan trim balanced to ISO 14694:2003 & AMCA 204, G2.5 Standard. G1.0 Standard is available upon request.
- Not available on twin wheel.



Ecowatt Pressure/Airflow Control (TDP-PI)



Ecowatt Speed Control (REB-ECOWATT)



Piezometer Ring



Ecowatt Variable Frequency Drive

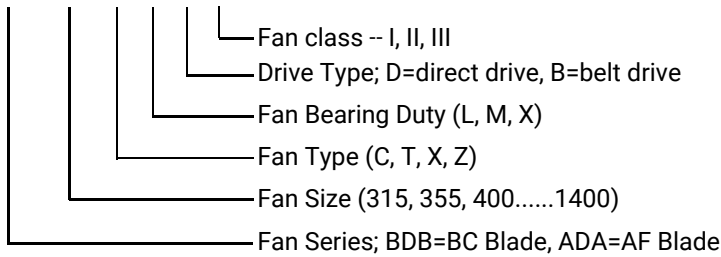
### Best Total System Efficiency

$$\eta = \text{Fan\%} \times \text{PM Motor \%} \times \text{VFD\%}$$

$$= 84\% \times 96\% \times 98\% = 79\%$$

## Nomenclature

MODEL: BDB 450 C M / D I



Model 315 to 710		Model 800 to 1400	
Type S-C	I	I	
Type T	II	II	
Type X	III	III	
Type Z		III	

Table 1

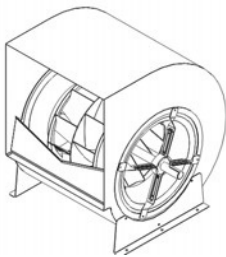
### Type / Operating Limit

Each fan type has its maximum operating speed and power due to its mechanical design.

The operating limit of ADA series - fan type is design to meet the requirement of class I, II and III limit as defined in AMCA standard 99, section 14, Fig 1.

The ADA series is available in type S, C, T, X or Z.

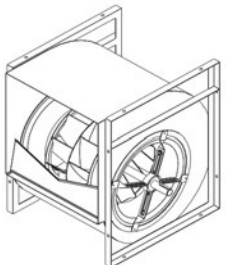
S type is not available for direct coupling.



### Type S

This type is supplied with mounting feet and can be mounted in three different orientations. The construction is mainly for OEM application which only subject to testing and approval.

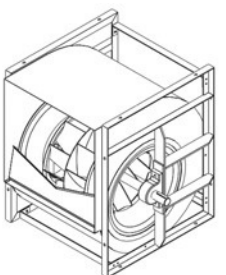
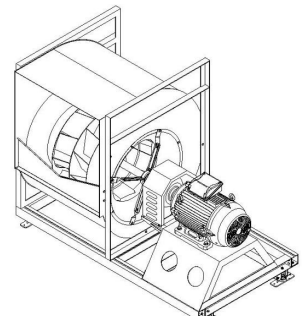
Fan Size: 315 to 710  
Volume: 1900 to 50000 m3/h  
Total Pressure: up to 2000 Pa



### Type C

This type has a frame fitted on both sides of the fan which gives Better strength and rigidity. It allows mounting in four different orientations.

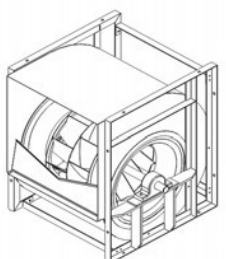
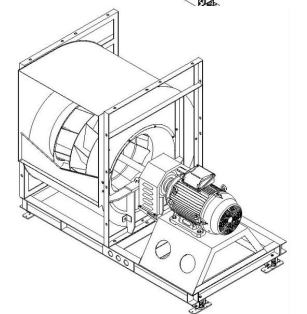
Fan Size: 315 to 710  
Volume: 1900 to 50000 m3/h  
Total Pressure: up to 2000 Pa



### Type T

This type has a welded frame giving increased stiffness and rigidity for higher operating performance.

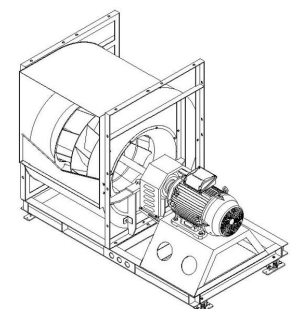
Fan Size: 315 to 1400  
Volume: 1900 to 190 000 m3/h  
Total Pressure: up to 2500 Pa



### Type X/Z

The structure is similar to type T but utilizes enhanced bearings to support higher dynamic load necessary for the increased performance.

Fan Size: 315 to 1400  
Volume: 1900 to 260 000 m3/h  
Total Pressure: up to 3200 Pa



Type Z is non-standard, for more information, please consult your nearest Kruger Office for details.

## Kruger Motor

- Reliable Induction Motor with Energy efficiency classes IE1/IE2/IE3.
- Premium Efficiency Permanent Magnet Motor IE4/IE5 are also available as standard.
- Design Standards BS 4999, BS 5000, IEC 60034, IEC 60072.
- Rated voltage 380-415 Hz/50Hz  $\pm$  10%.
- Stator Insulation; Class F Insulation; Class B Temperature Rise.
- Horizontal foot mounting or flange mounting: B3; B5, B14, B34; B35; V1.
- Standard Ambient Temperature: -20°C to 40°C; RH: <90% RH (non-condensation); Altitude < 1000m above sea level.



**Best Efficiency 96%**

## Kruger Drive

- High Performance Inverter Drive with advanced vector control technology.
- Energy saving by PID function for Demand Controlled Ventilation.
- Easy control by Analog signal 0-10V, 4-20mA and RS485 Modbus RTU.
- Various drives both AC induction motor and permanent magnet synchronous motor.
- IP54 protection rating, independent duct design (IP20) also available.
- Safety by STO (safe Torque Off) and fire overdrive function.
- Wide range of output power 2.2kW – 220kW.



**Best Efficiency 96%**

## Kruger Demand Controlled Ventilation

- Automatic close loop PID control by TDP-PI Ventilation controller
  - Constant Airflow control (with piezometer ring)
  - Constant Differential pressure control

Controller will maintain Pressure or Airflow set value by changing fan speed automatically as per actual load demand.

- Manual speed control by REB-Ecowatt
  - Adjust Fan speed by your hand with potentiometer 10k ohm



## Flex Couplings

- High quality standard SKF flex couplings are used.
- Designed to accommodate misalignment and shock loads and damper vibration levels.
- Easy to install and maintenance free.
- Natural rubber compounds for application ranging from -50°C to +50°C.
- Couplings selection based on service factor as recommended by manufacturer.
- Other types of coupling are available upon request and approve by factory.



## Why Choose Kruger Ecowatt Direct Coupling System?

- Ecowatt is high efficiency product family that utilizes a Super Premium Efficiency Motor in combination with demand-controlled ventilation to control fan performance as per actual load demand.
- Highly efficient backward curved with FEG rating from 85-90 with direct coupling reduces frictional losses and optimizes transmission and improves energy costs.
- Direct electrical energy transmission to the impeller increases the overall fan system efficiency.
- In addition, zero belt wears and break on belt improves reliability and productive run time and unnecessary maintenance.
- Overall, it means saving in total cost and long-term energy cost, extended service life and versatility in application.



## Typical applications:

- Air handling unit installations in commercial or industrial settings running on 24/7 and a low energy input is required.
- Air handling unit installations where high static pressure and high airflow in a zero-contaminant environment is required.
- Examples are AHU installations for electronics, semiconductors, pharmaceutical, life sciences, OT rooms, food industries and other manufacturing industries that requires clean/contaminant free clean rooms.
- Air handling unit installations where conventional belt driven high energy input system is to be refurbished.

### BDB Twin Fan

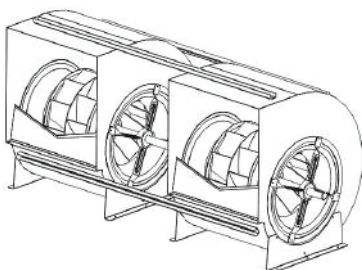
BDB series are also available in twin fan version, with two double inlet fans mounted on the same shaft.

To select for twin fans, use the curves of single fan with the following factors: -

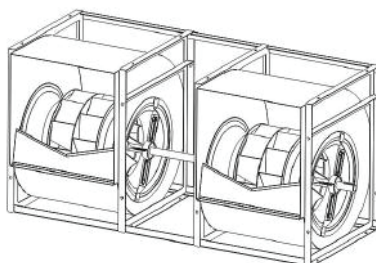
Volume	x 2
Absorbed Power	x 2.15
Speed	x 1.05
Noise	+ 3 dB

This series is available in type S2, C2 or T2

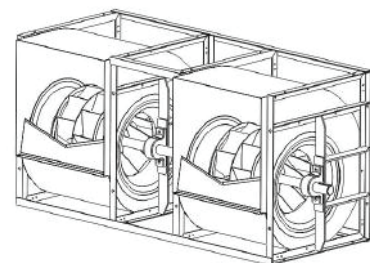
Performance of Twin fans are not AMCA licensed



**Type S2**  
Size: 355 to 630  
10000 to 80000m<sup>3</sup>/h

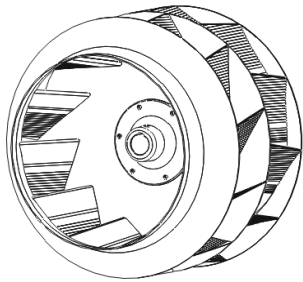


**Type C2**  
Size: 315 to 500  
5000 to 50000m<sup>3</sup>/h



**Type T2**  
Size: 315 to 500  
5000 to 50000m<sup>3</sup>/h

## TECHNICAL SPECIFICATION



### Wheel

The wheel of BDB series is made of hot rolled sheet steel backward curved blades with polyester powder coating finish. Alternative construction material in aluminum and stainless steel are available upon request. Check with Kruger for the limits of operation of these materials.

### Housing

For all sizes except 1250 and above, the housing is manufactured in galvanized sheet steel with the housing fixed to the side plates in "pittsburg lock" form system.

Housings for 1250 and 1400 are manufactured in mild steel finished with polyester powder coating.

Fully welded housings are available upon request. Stainless steel housing is also available upon request.

**Frame** The frame is manufactured with galvanized angular bars for type "C". For type "T" and "X", they are manufactured with sections of steel and finished with polyester powder coating. Stainless steel frame is available upon request.

### Shaft

Shafts are manufactured from C45 carbon steel using an automatic process for positioning and cutting of the keyways. All dimensional tolerances of the shaft are fully checked to ensure a precision fit and then coated with an anti-corrosion varnish after assembly. Stainless steel shaft is available upon request.

### Bearing

Bearings used are either deep groove ball bearing type with an adapter sleeve or spherical roller bearing type sealed at both sides for different duty application classified below:

		Mounted in a rubber housing		Mounted on cast iron supports with grease point	
Fan Type	<p><b>S</b></p>	<p><b>C</b></p>	<p><b>T</b></p>	<p><b>X</b></p>	
Bearing Duty	<p><b>SM</b> Medium Duty</p>	<p><b>CM</b> Medium Duty</p>	<p><b>TM</b> Medium Duty</p>	<p><b>XM</b> Medium Duty</p>	
	<p>eg. Model: <b>BDB 450</b></p> <p><b>CM</b></p> <ul style="list-style-type: none"> <li>— Fan Bearing Duty (L, M, X)</li> <li>— Fan Type (S, C, T, X, Z)</li> <li>— Fan Size (315, 355, 400...1400)</li> </ul>		<p><b>TX</b> Extra Heavy</p>	<p><b>XX</b> Extra Heavy</p>	

The bearings are lubricated for life and maintenance-free. If re-lubrication is necessary, it is recommended to use a lithium base grease suitable for all temperatures with the limits of operation.

**Balancing Quality**

All wheels are statically and dynamically balanced to ISO1940 and AMCA 204 – G2.5 standard.

All fans after assembly are trim-balanced to ISO1940 and AMCA 204 - G2.5 standard.

Clean room application fans with balancing grade of G1.0 are available upon request.

**ACCESSORIES**

**Casing Drain**

This option is available when fans are exposed to the atmosphere or operating in high humidity condition.

**Outlet Flanges**

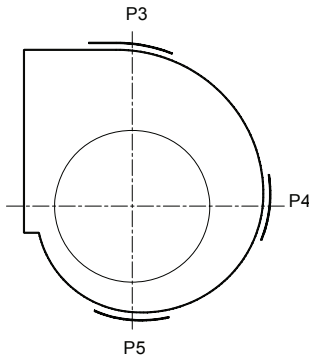
Outlet flanges are available upon request.

**Inspection Doors**

The inspection door can be supplied upon request. It can be supplied in one of the three positions (P3, P4 & P5).

**Guards**

Inlet guards, discharge guards and non-drive end shaft guards are available on request.

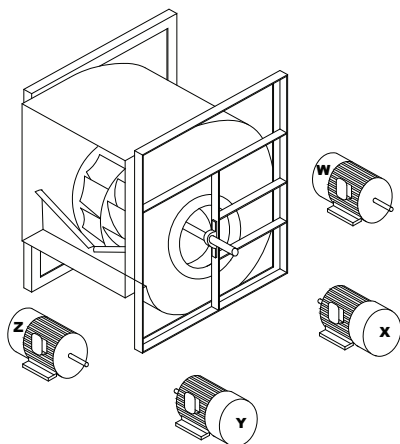
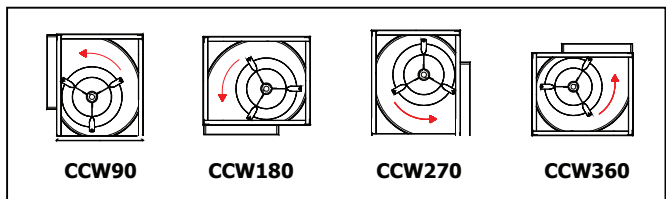
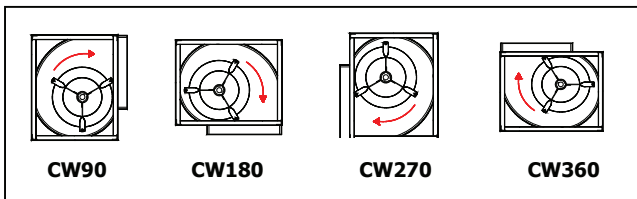


**Fan Rotation and Discharge**

The rotation and discharge of the fan is in accordance with AMCA standard 99, section 11  
The direction of rotation is determined from the drive side of the fan:

**CW - clockwise rotation**

**CCW - counter-clockwise rotation**

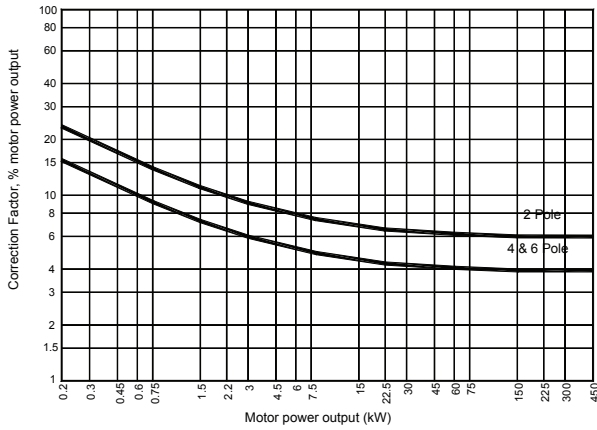


**Motor Position**

The position of the motor for belt drive centrifugal fan is in accordance with AMCA standard 99, section 12

Location of motor is determined by facing the drive side of fan and designated by letters W, X, Y, or Z.



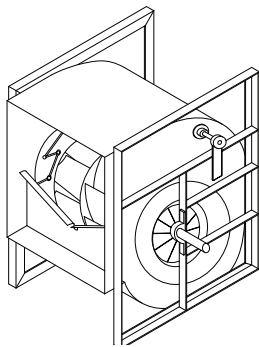


### Motor Selection

The power curves shown on each performance graph represent the absorbed power at the shaft of the fan measured in kW.

To determine the power of the motor to be installed, a correction factor should be applied to compensate for transmission losses.

For conversion to horsepower (HP), use multiplying factor 1.34.



### Inlet Vane Control

The inlet vane control enables energy saving that varies according to the vane control methods compared to traditional volume control methods.

Fig.1 shows the volume reduction corresponding to the vane position.

- with vane fully open (Pos 90°) the volume will be 3% less than the catalogue performance.
- with vane fully closed (Pos 0°) the volume will be reduced by 75%.

Performance of Inlet vane control is not AMCA licensed.

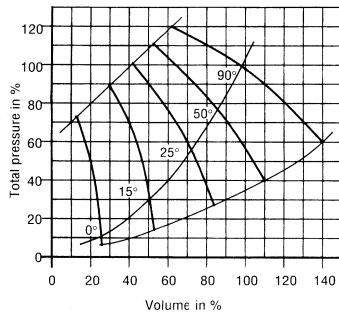


Fig. 1

### IVC orientation and accessories

The standard orientation and lever position for the IVC is indicated in Fig.2. When ordering a complete fan with IVC and accessories, please specify as follow:

Fan orientation e.g. CCW270  
lever position e.g. Pos. 45°

Example : Fan Model – CCW270/P45

Orientation	90	180	270	360
IVC Level Position	225° 	315° 	45° 	135° 
	315° 	45° 	135° 	225° 

Fig. 2 - IVC Orientation and Level Position

## Dynamic Pressure

Both dynamic pressure and outlet air velocity values shown on each graph are calculated base on the full discharge area, i.e. ducted outlet condition.

With free outlet condition the velocity pressure is higher. To determine this new value multiply the velocity pressure of the ducted outlet obtained from the fan curve by the following correction factor "K".

$$K = 1.67$$

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

## Performance

The performance data shown on each graph is derived from tests conducted in accordance to AMCA Standard 210 – Fig 12 – installation type B (free inlet and ducted outlet condition).

Ratings refer to the standard air density with the total pressure as a function of the air volume, using logarithmic scale.

It is essential that the same installation type and test standards are used at all times when comparing fan performance.

## Noise

The noise levels shown on each graph refer to the "A-weighted" sound power values and the data on the inlet side has been measured in accordance with AMCA Standard 300 diag. 2 - configuration "B". The noise levels of fans are determined as follow :

- Sound power level - ("A" scale):  $L_w(A)$  as catalogue
- Octave band spectrum:  $L_w = L_w(A) + L_w \text{ rel. dB}$  [refer to Kruger for more details]
- Sound pressure level:
  - a) free field
    - =  $L_w(A) - (20\log_{10}d) - 11$
  - b) room conditions
    - =  $L_w(A) - (20\log_{10}d) - 8$

where d = distance from fan (m)

## Example of Selection

Air Volume  $Q = 14760 \text{ m}^3/\text{h}$

Outlet Velocity  $V = 10.07 \text{ m/s}$

Dynamic Pressure  $P_d = 62 \text{ Pa}$

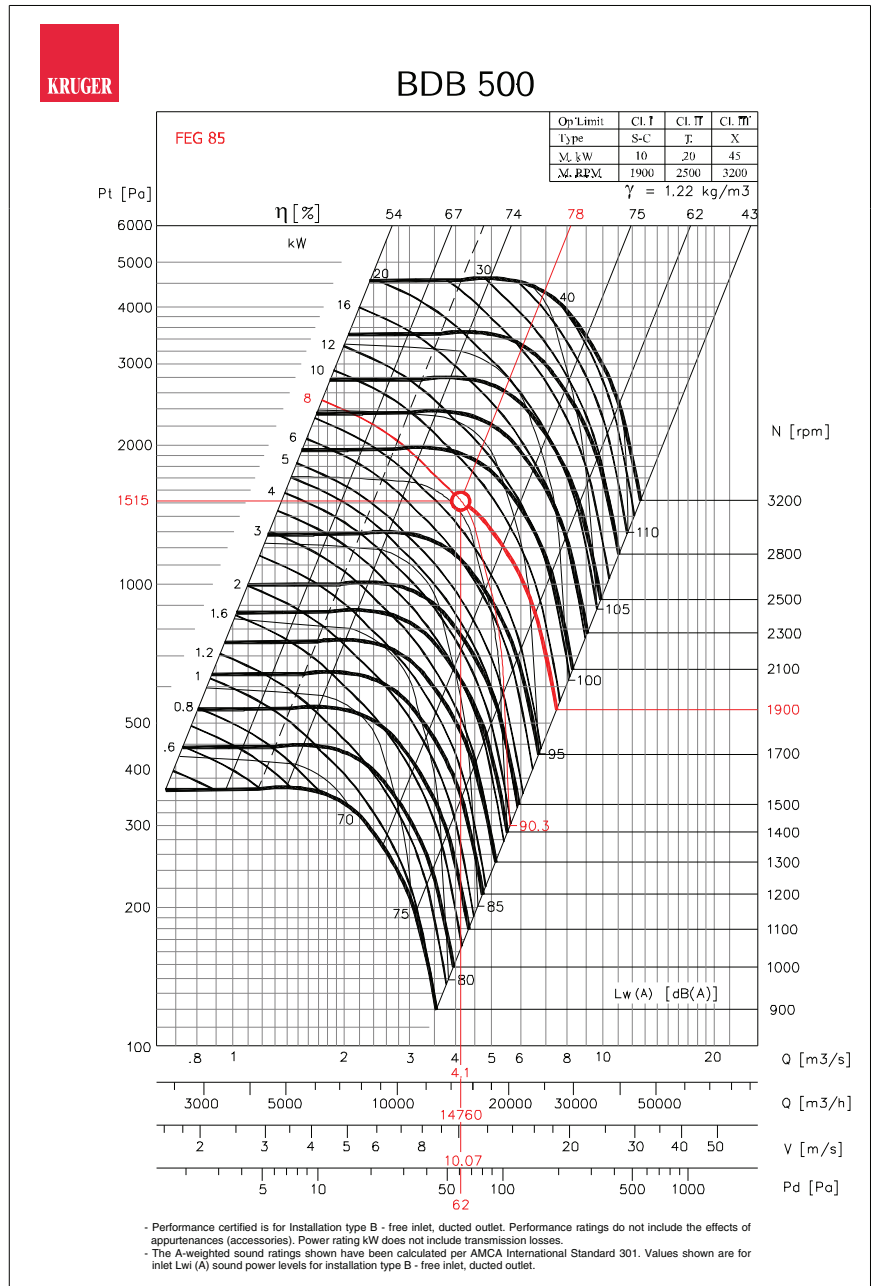
Total Pressure  $P_t = 1515 \text{ Pa}$

Fan Speed  $N = 1900 \text{ rpm}$

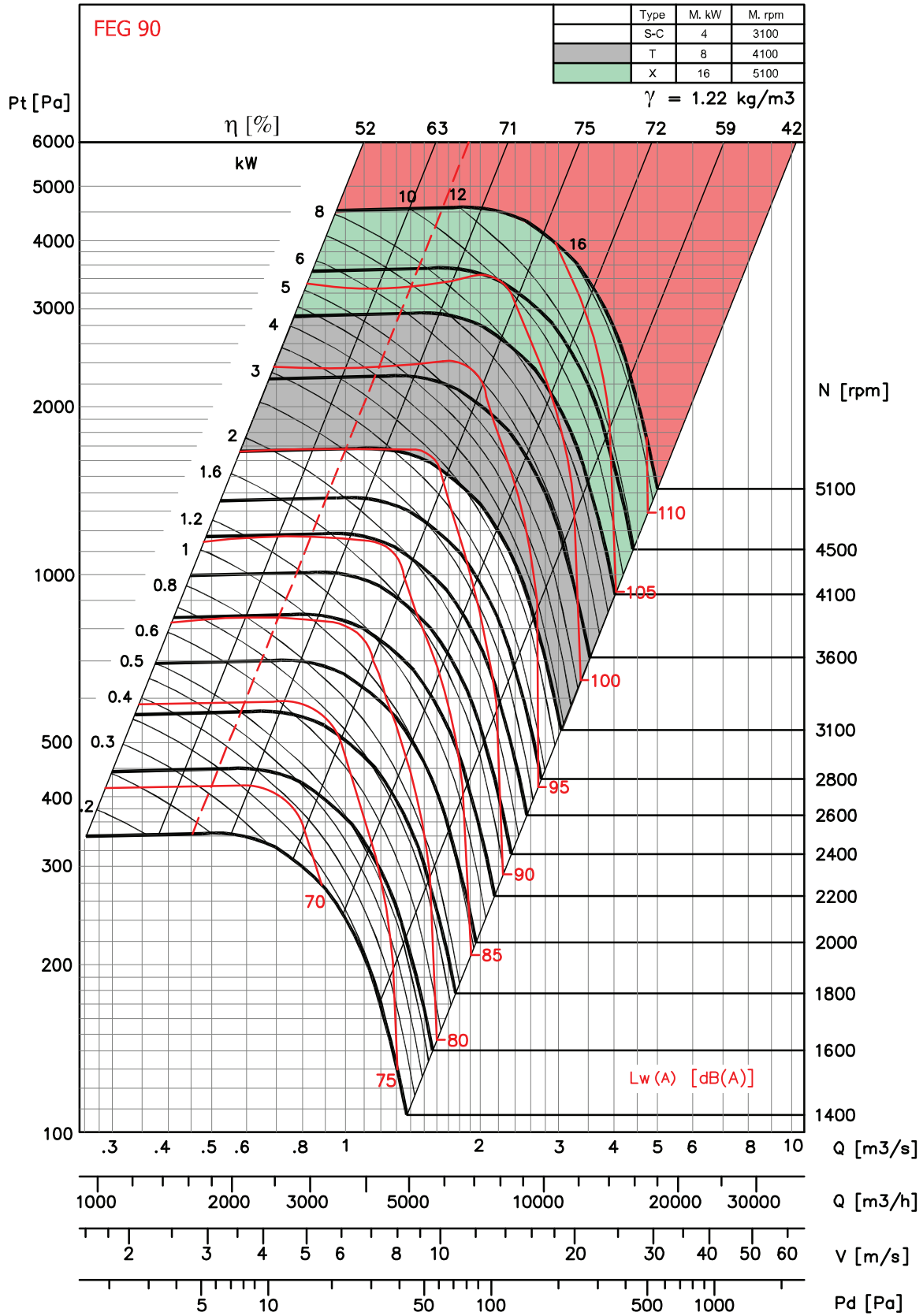
Absorbed Power  $W = 8 \text{ kW}$

Total Efficiency  $\eta = 78 \%$

Sound Power Level  $L_w(A) = 90.3 \text{ dB(A)}$

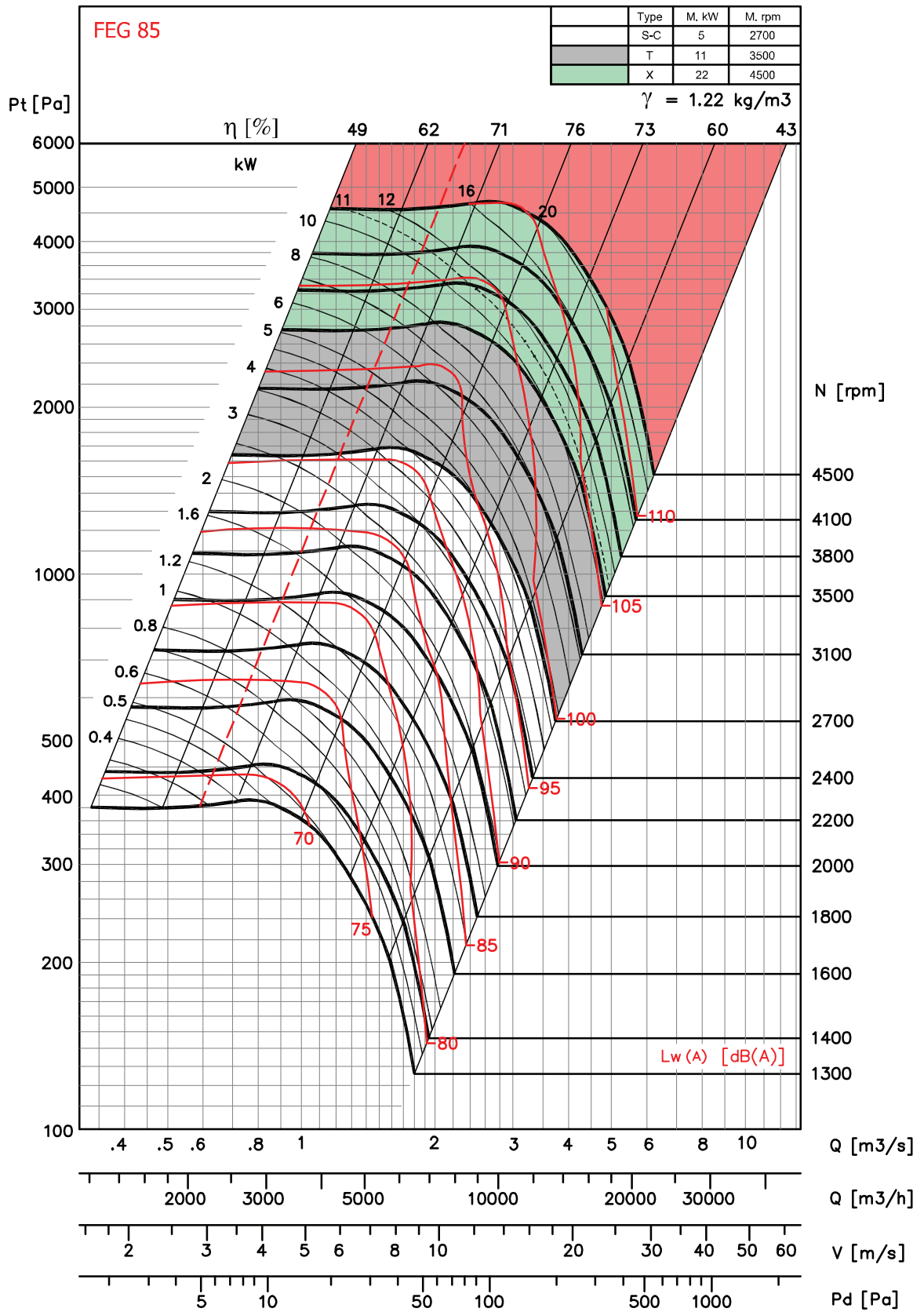


## BDB 315



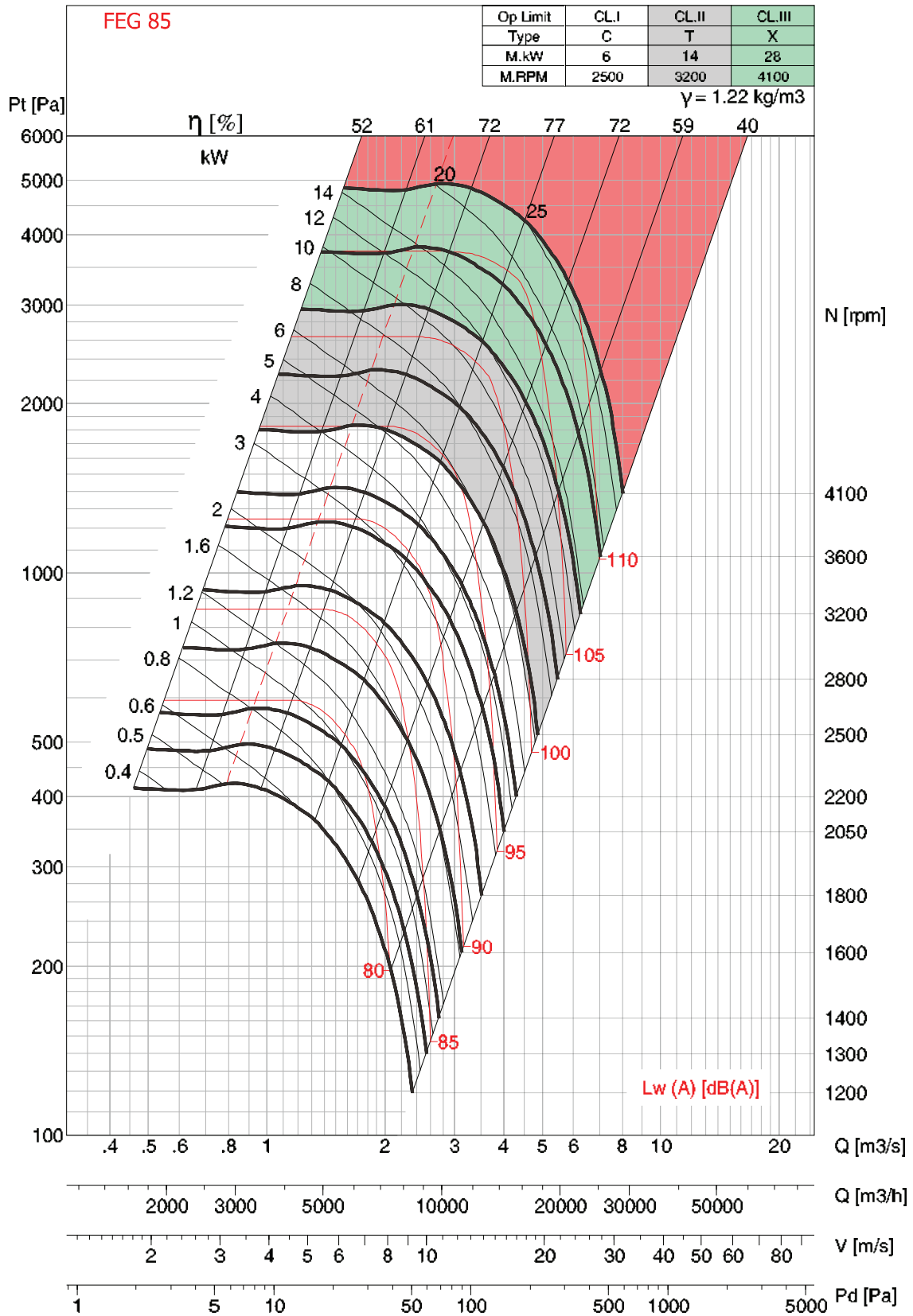
- Performance certified is for Installation type B - free inlet, ducted outlet. Performance ratings do not include the effects of appurtenances (accessories). Power rating kW does not include transmission losses.  
 - The A-weighted sound ratings shown have been calculated per AMCA International Standard 301. Values shown are for inlet Lwi (A) sound power levels for installation type B - free inlet, ducted outlet.

## BDB 355



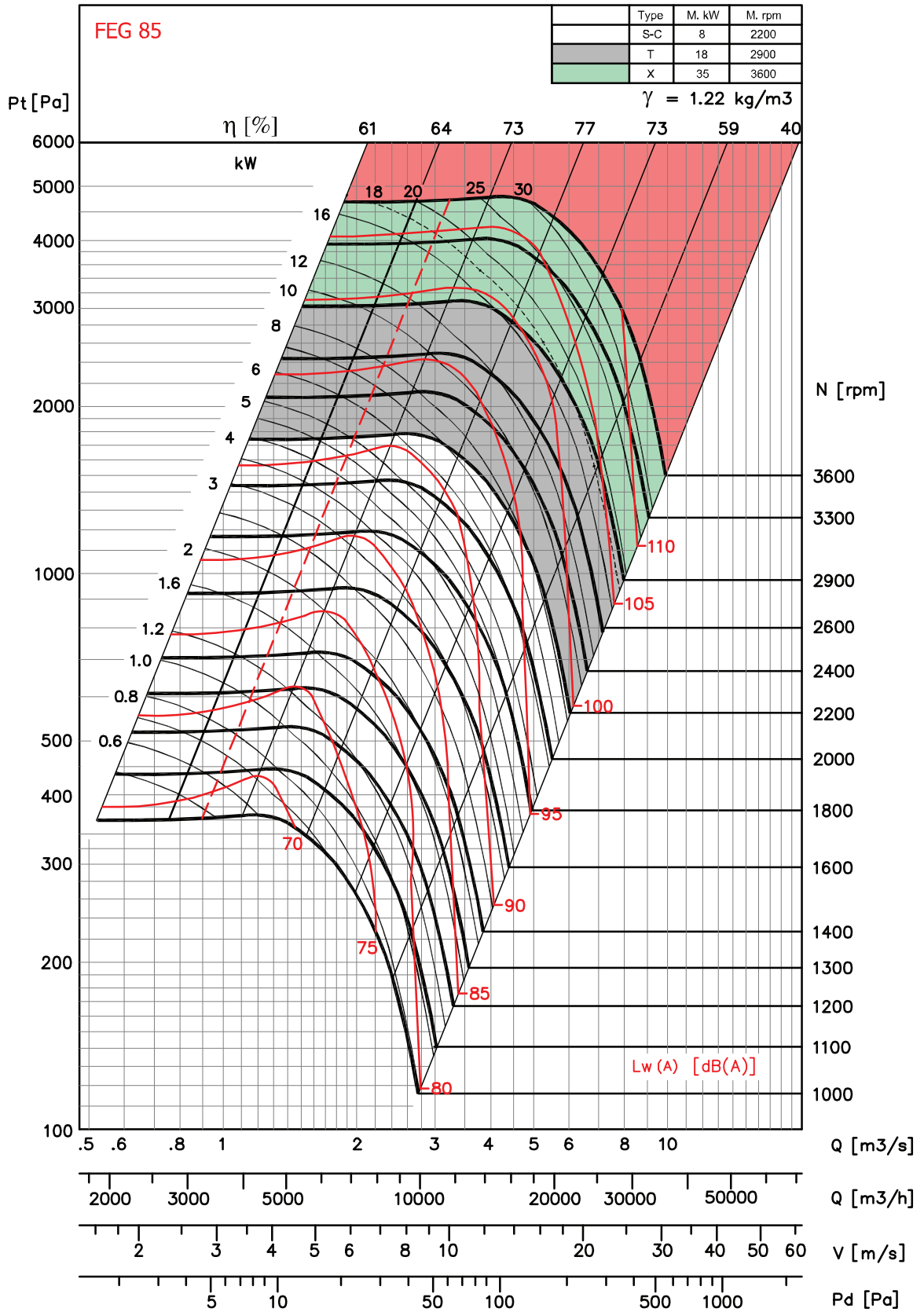
- Performance certified is for Installation type B - free inlet, ducted outlet. Performance ratings do not include the effects of appurtenances (accessories). Power rating kW does not include transmission losses.  
 - The A-weighted sound ratings shown have been calculated per AMCA International Standard 301. Values shown are for inlet Lwi (A) sound power levels for installation type B - free inlet, ducted outlet.

## BDB 400



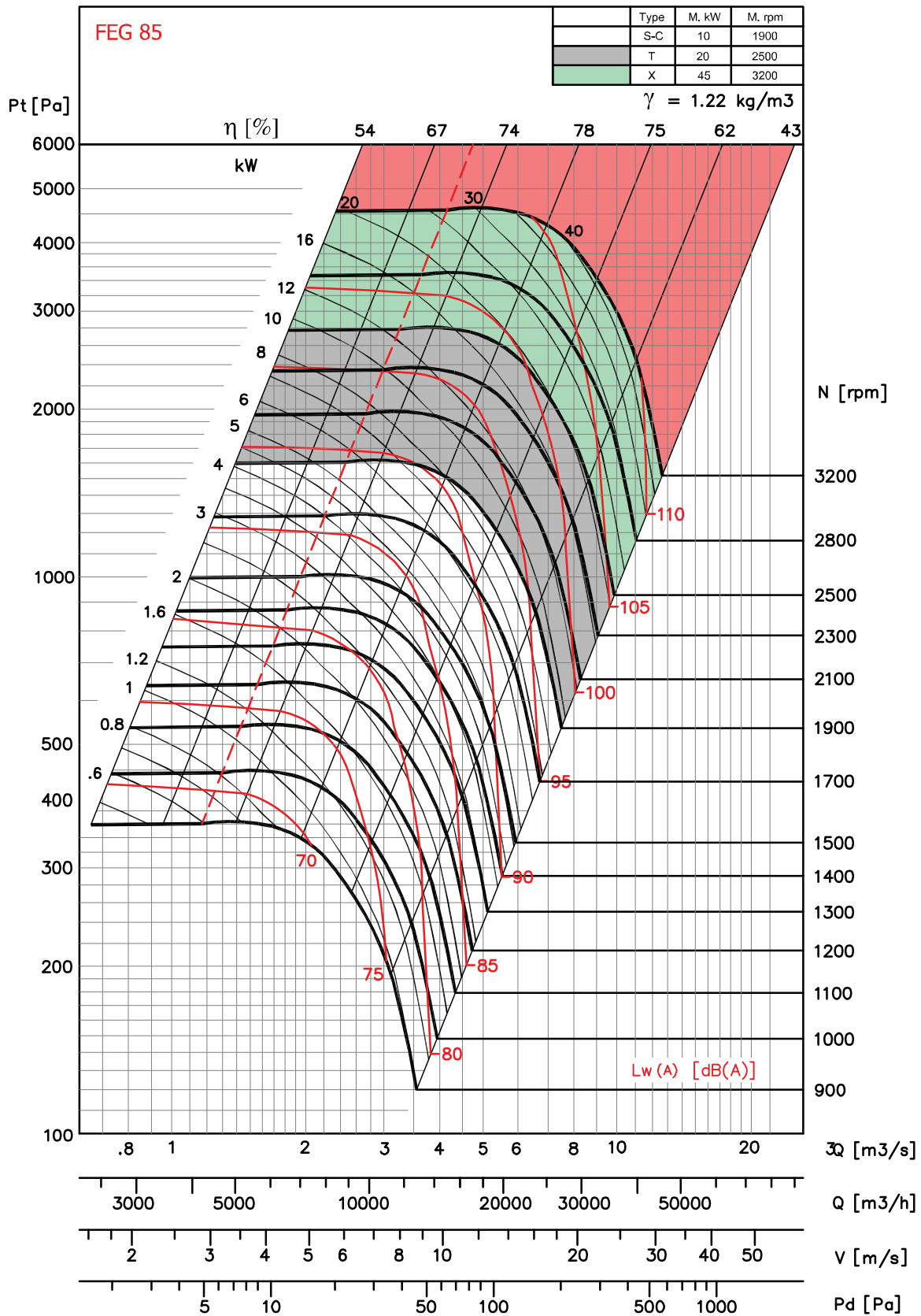
- Performance certified is for Installation type B - free inlet, ducted outlet. Performance ratings do not include the effects of appurtenances (accessories). Power rating kW does not include transmission losses.
- The A-weighted sound ratings shown have been calculated per AMCA International Standard 301. Values shown are for inlet Lwi (A) sound power levels for installation type B - free inlet, ducted outlet.

## BDB 450



- Performance certified is for Installation type B - free inlet, ducted outlet. Performance ratings do not include the effects of appurtenances (accessories). Power rating kW does not include transmission losses.  
 - The A-weighted sound ratings shown have been calculated per AMCA International Standard 301. Values shown are for inlet Lwi (A) sound power levels for installation type B - free inlet, ducted outlet.

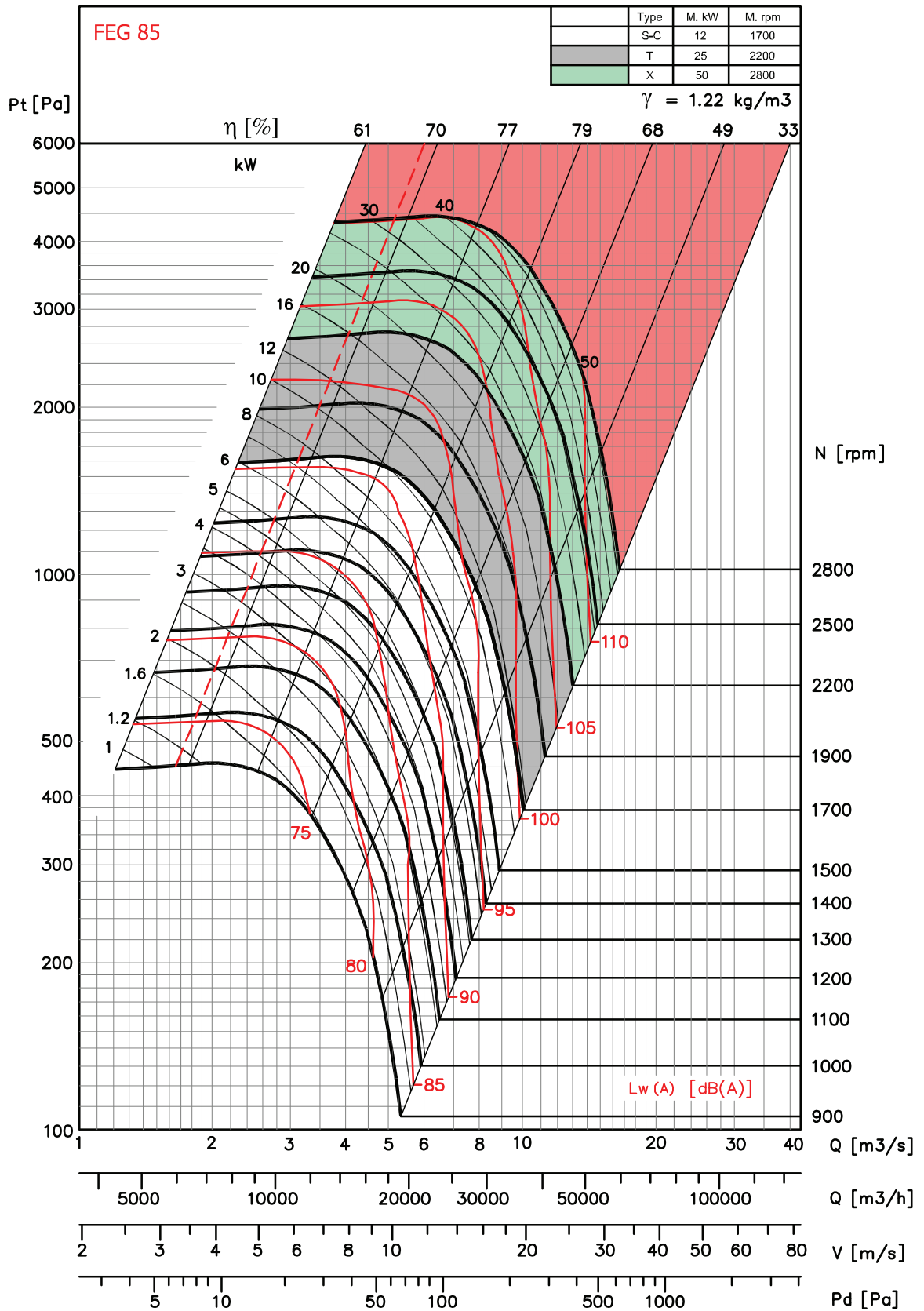
## BDB 500



- Performance certified is for Installation type B - free inlet, ducted outlet. Performance ratings do not include the effects of appurtenances (accessories). Power rating kW does not include transmission losses.  
 - The A-weighted sound ratings shown have been calculated per AMCA International Standard 301. Values shown are for inlet  $L_{wi}(A)$  sound power levels for installation type B - free inlet, ducted outlet.

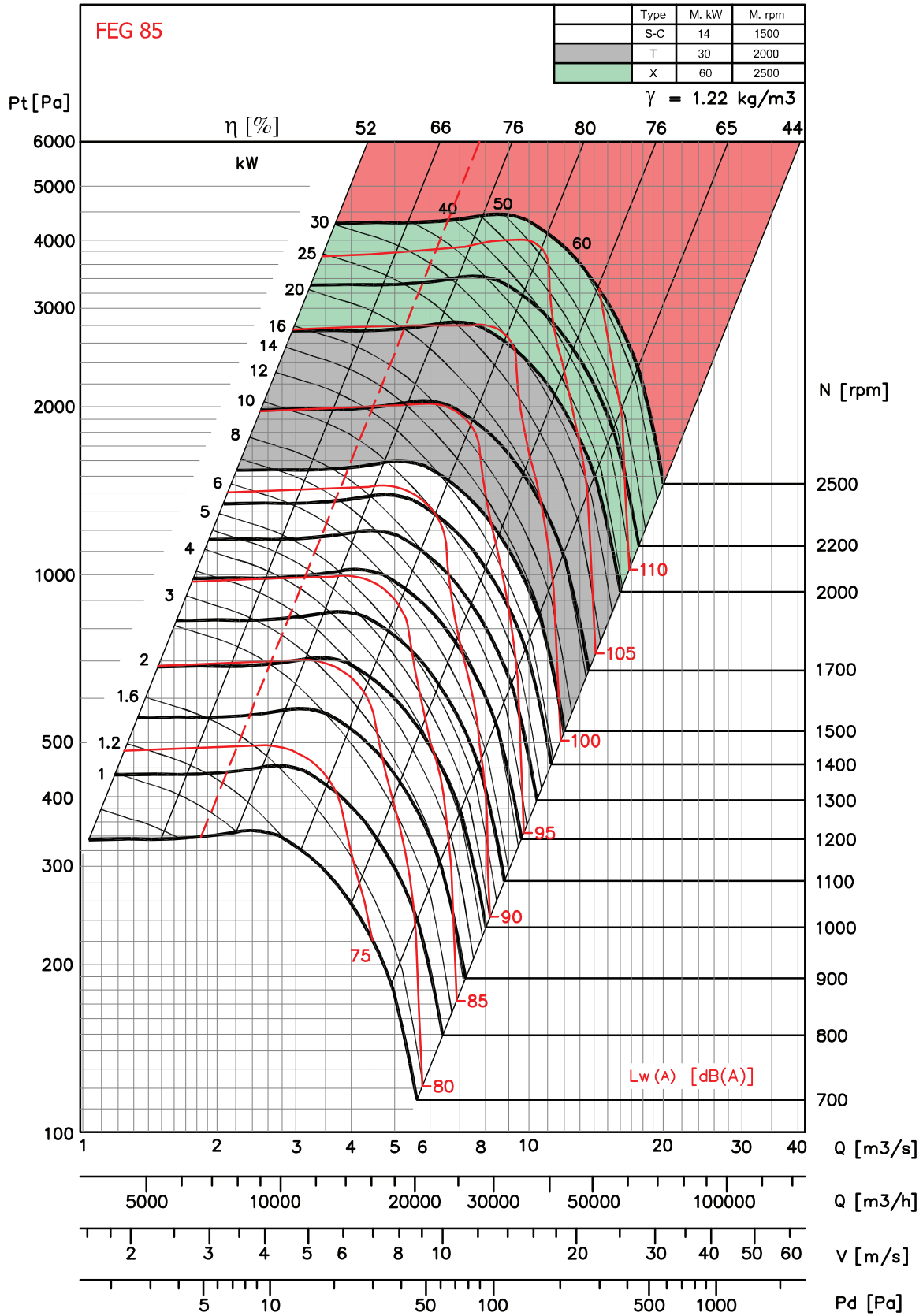


## BDB 560



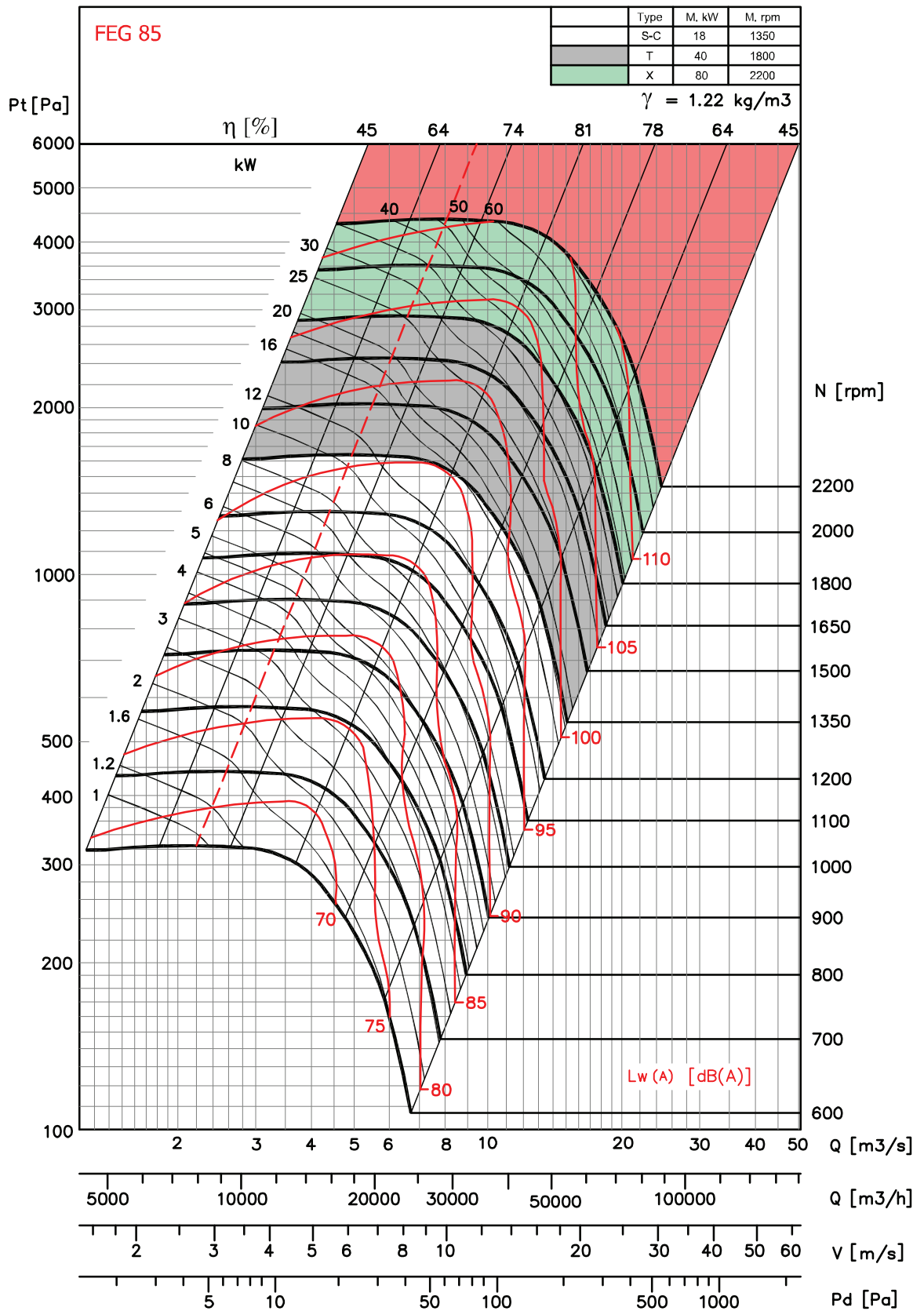
- Performance certified is for Installation type B - free inlet, ducted outlet. Performance ratings do not include the effects of appurtenances (accessories). Power rating kW does not include transmission losses.  
 - The A-weighted sound ratings shown have been calculated per AMCA International Standard 301. Values shown are for inlet Lwi (A) sound power levels for installation type B - free inlet, ducted outlet.

## BDB 630



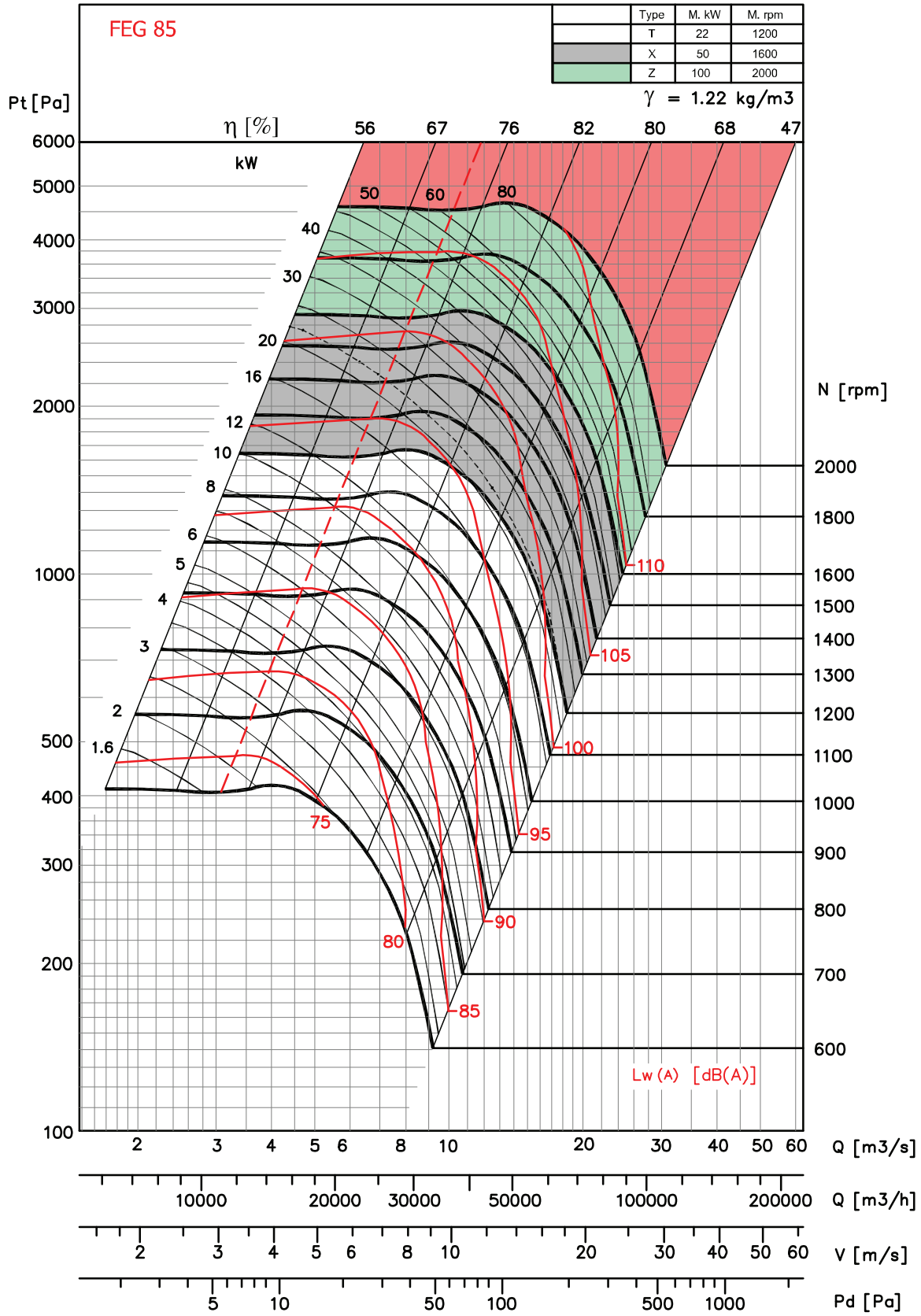
- Performance certified is for Installation type B - free inlet, ducted outlet. Performance ratings do not include the effects of appurtenances (accessories). Power rating kW does not include transmission losses.  
 - The A-weighted sound ratings shown have been calculated per AMCA International Standard 301. Values shown are for inlet Lwi (A) sound power levels for installation type B - free inlet, ducted outlet.

## BDB 710



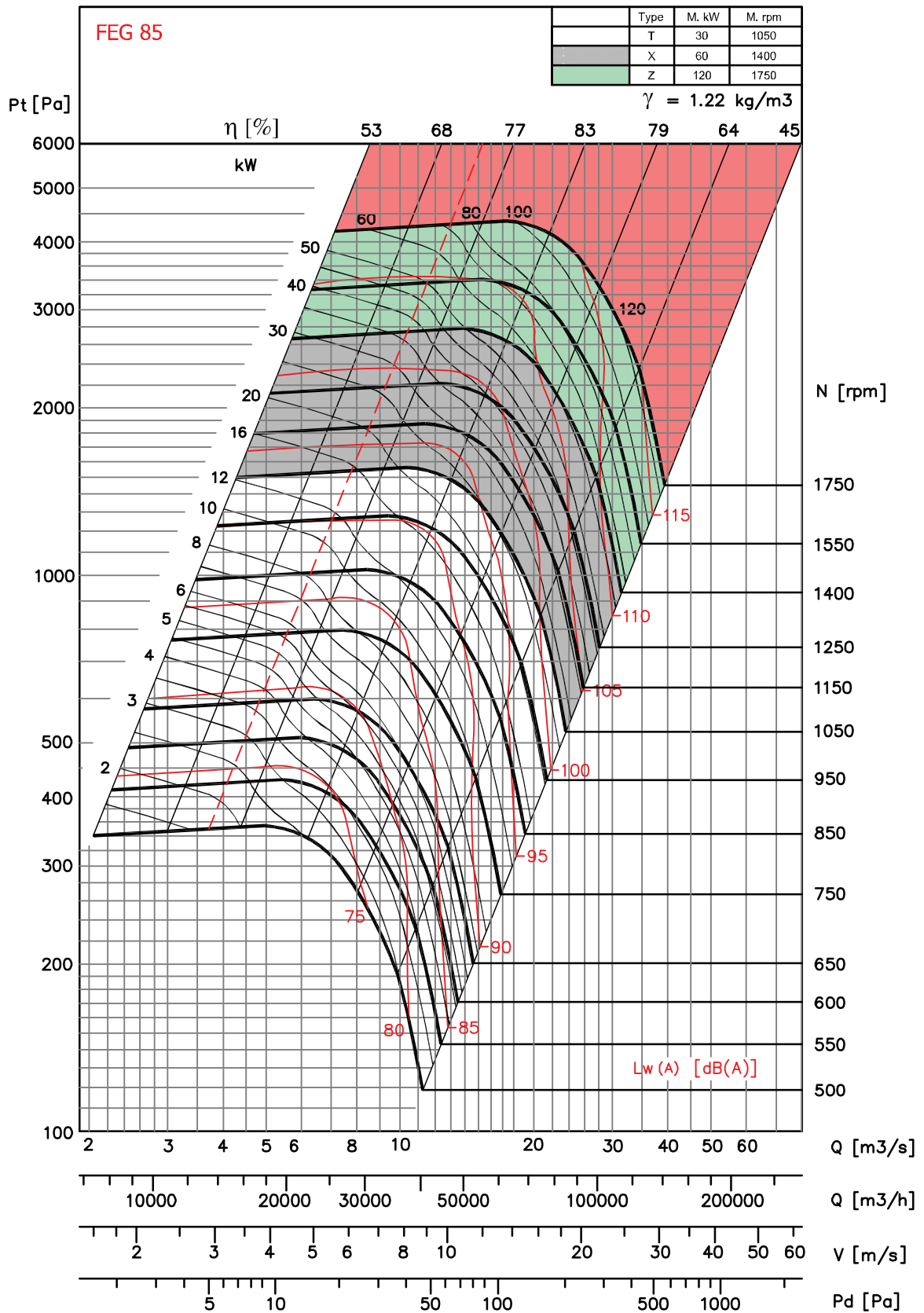
- Performance certified is for Installation type B - free inlet, ducted outlet. Performance ratings do not include the effects of appurtenances (accessories). Power rating kW does not include transmission losses.  
 - The A-weighted sound ratings shown have been calculated per AMCA International Standard 301. Values shown are for inlet Lwi (A) sound power levels for installation type B - free inlet, ducted outlet.

## BDB 800



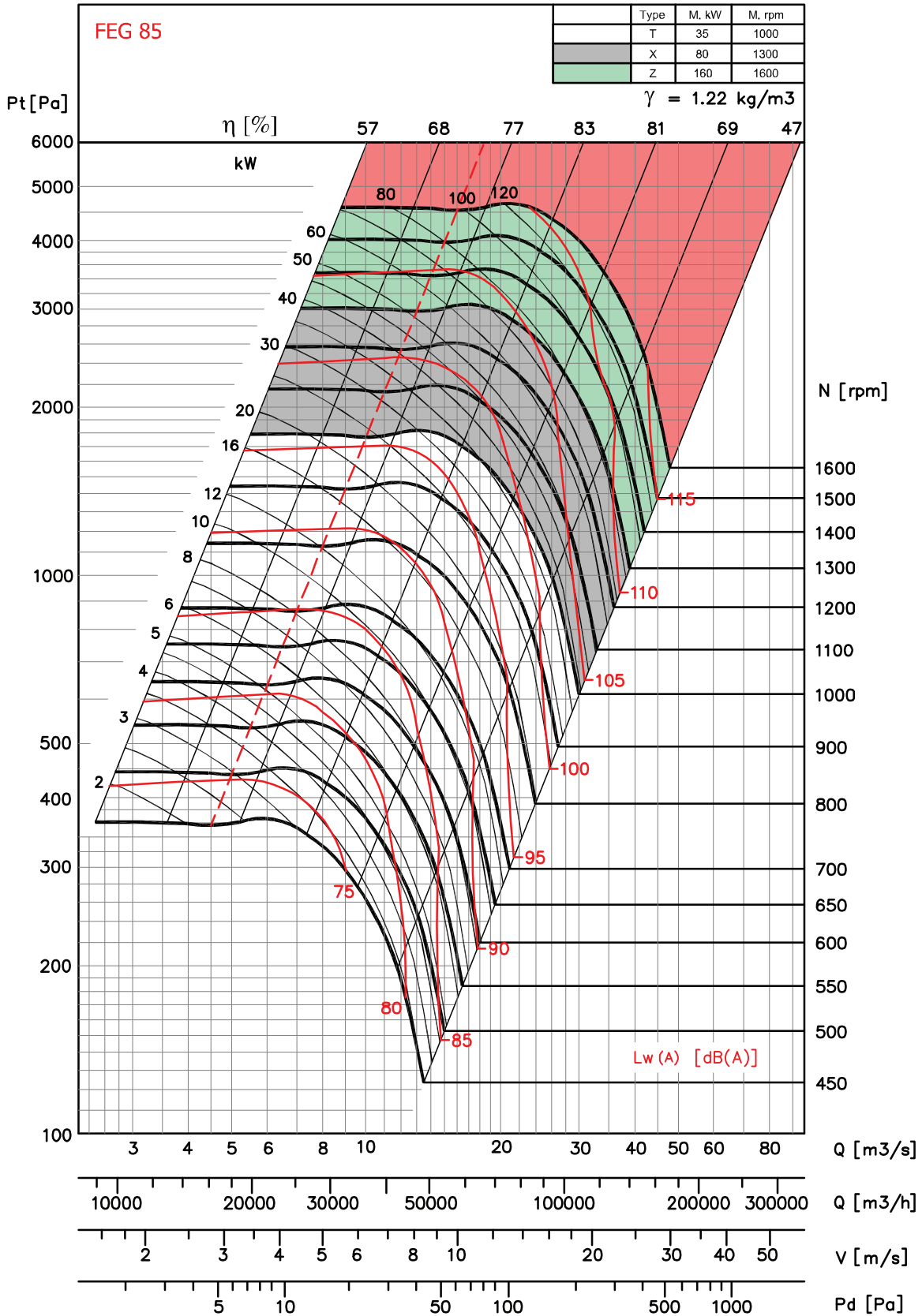
- Performance certified is for Installation type B - free inlet, ducted outlet. Performance ratings do not include the effects of appurtenances (accessories). Power rating kW does not include transmission losses.  
 - The A-weighted sound ratings shown have been calculated per AMCA International Standard 301. Values shown are for inlet Lwi (A) sound power levels for installation type B - free inlet, ducted outlet.

## BDB 900



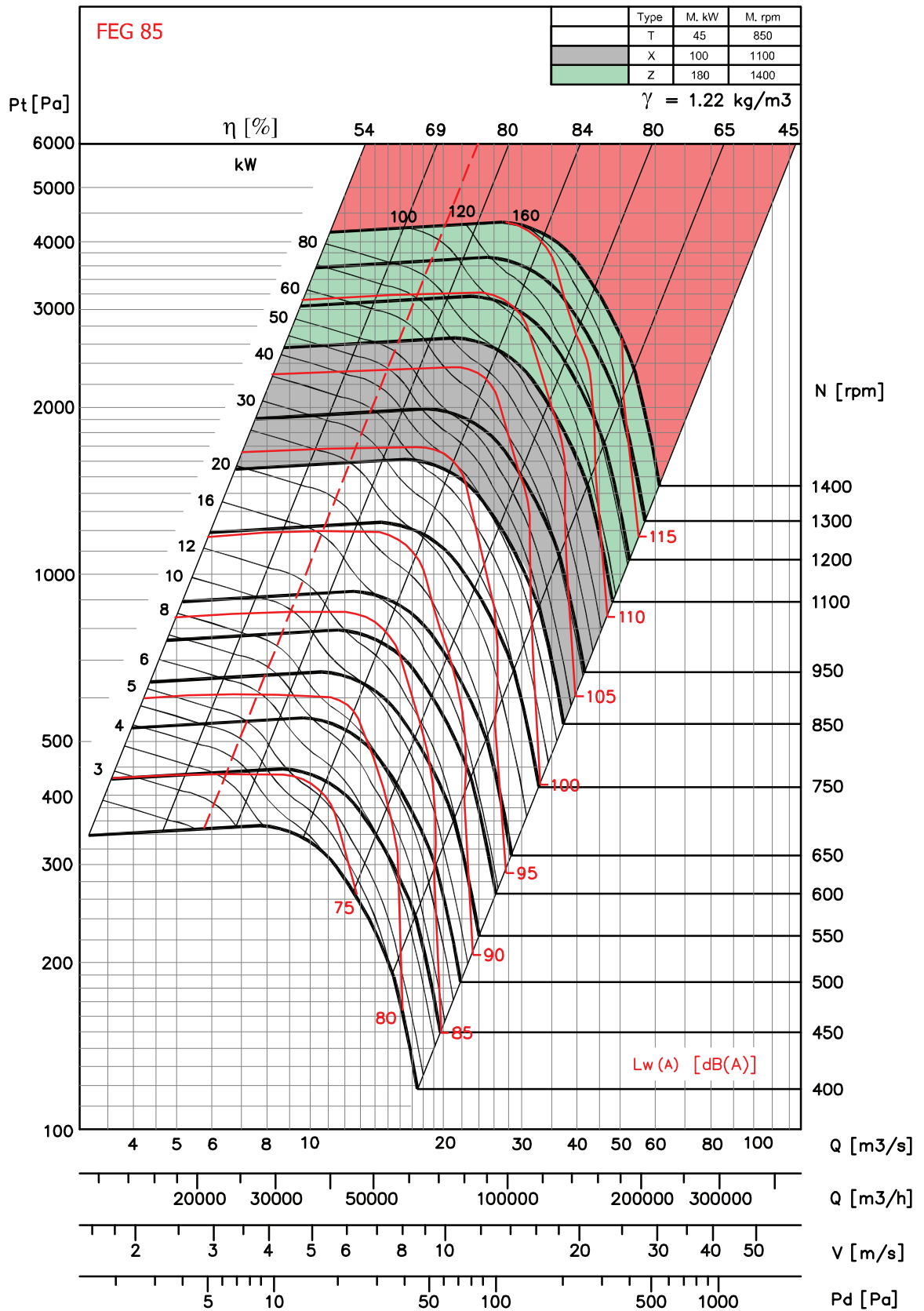
- Performance certified is for Installation type B - free inlet, ducted outlet. Performance ratings do not include the effects of appurtenances (accessories). Power rating kW does not include transmission losses.  
 - The A-weighted sound ratings shown have been calculated per AMCA International Standard 301. Values shown are for inlet Lwi (A) sound power levels for installation type B - free inlet, ducted outlet.

## BDB 1000



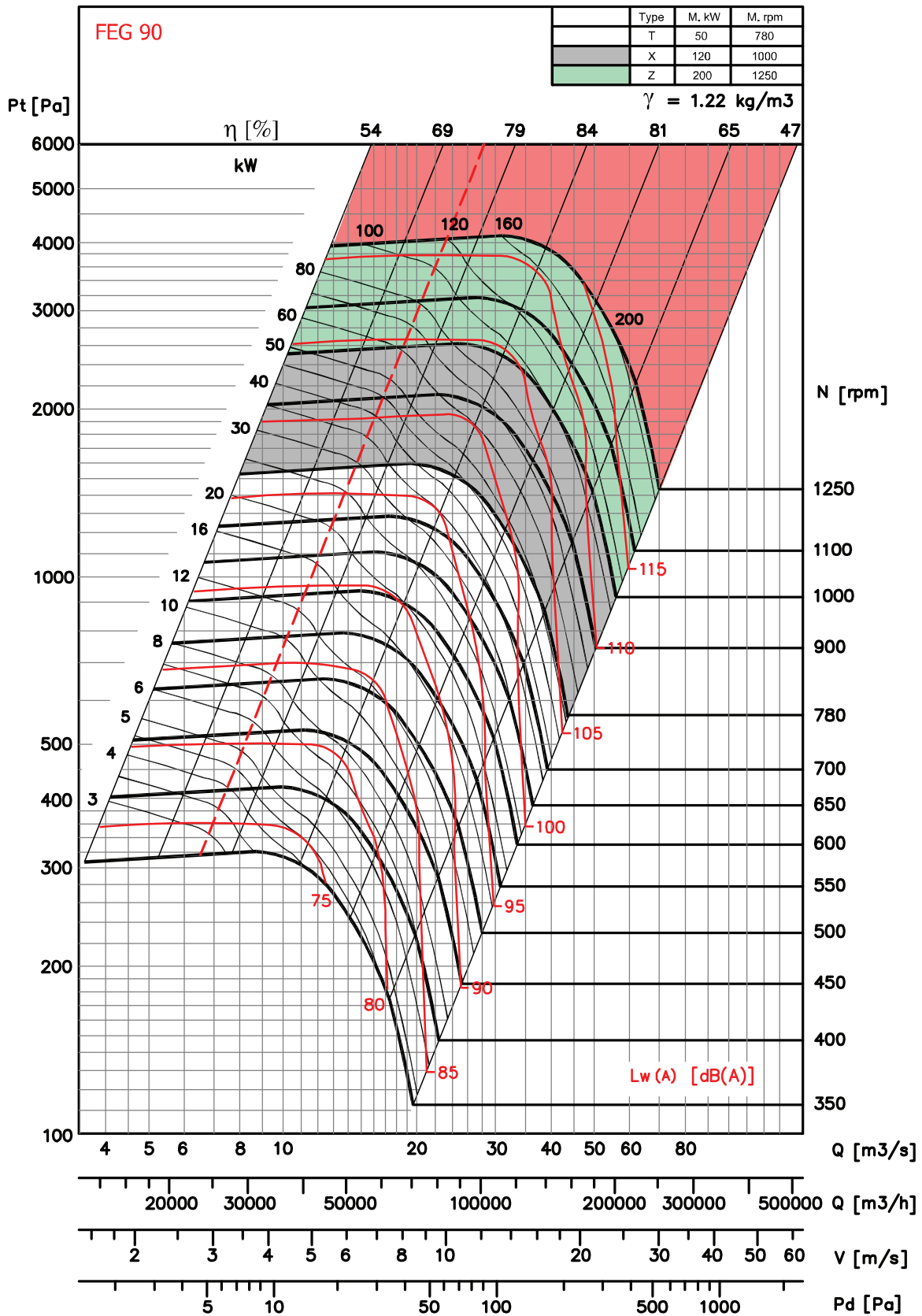
- Performance certified is for Installation type B - free inlet, ducted outlet. Performance ratings do not include the effects of appurtenances (accessories). Power rating kW does not include transmission losses.
- The A-weighted sound ratings shown have been calculated per AMCA International Standard 301. Values shown are for inlet  $L_{wi}(A)$  sound power levels for installation type B - free inlet, ducted outlet.

## BDB 1120



- Performance certified is for Installation type B - free inlet, ducted outlet. Performance ratings do not include the effects of appurtenances (accessories). Power rating kW does not include transmission losses.  
 - The A-weighted sound ratings shown have been calculated per AMCA International Standard 301. Values shown are for inlet  $L_{wi}$  (A) sound power levels for installation type B - free inlet, ducted outlet.

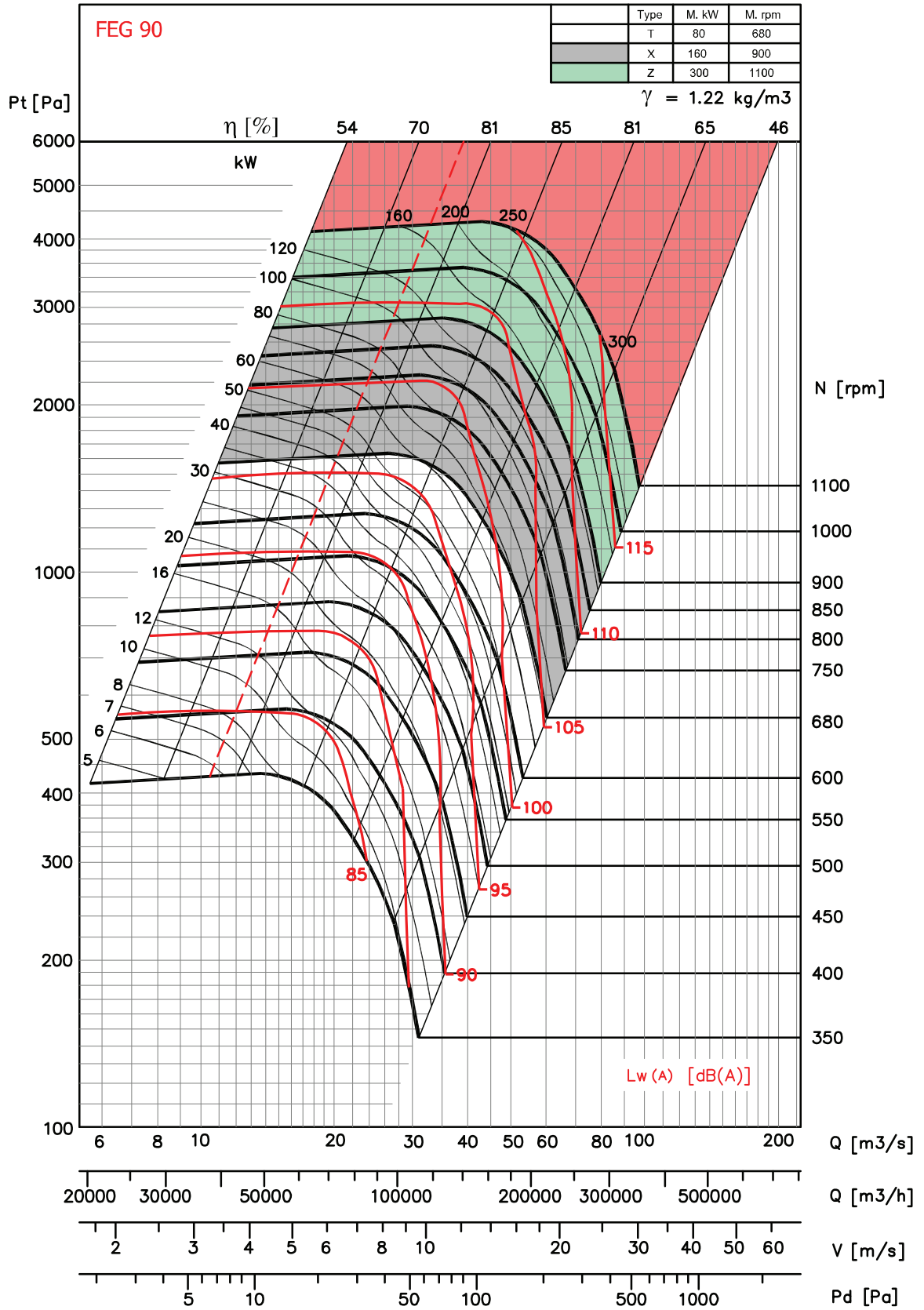
## BDB 1250



- Performance certified is for Installation type B - free inlet, ducted outlet. Performance ratings do not include the effects of appurtenances (accessories). Power rating kW does not include transmission losses.  
 - The A-weighted sound ratings shown have been calculated per AMCA International Standard 301. Values shown are for inlet Lwi (A) sound power levels for installation type B - free inlet, ducted outlet.

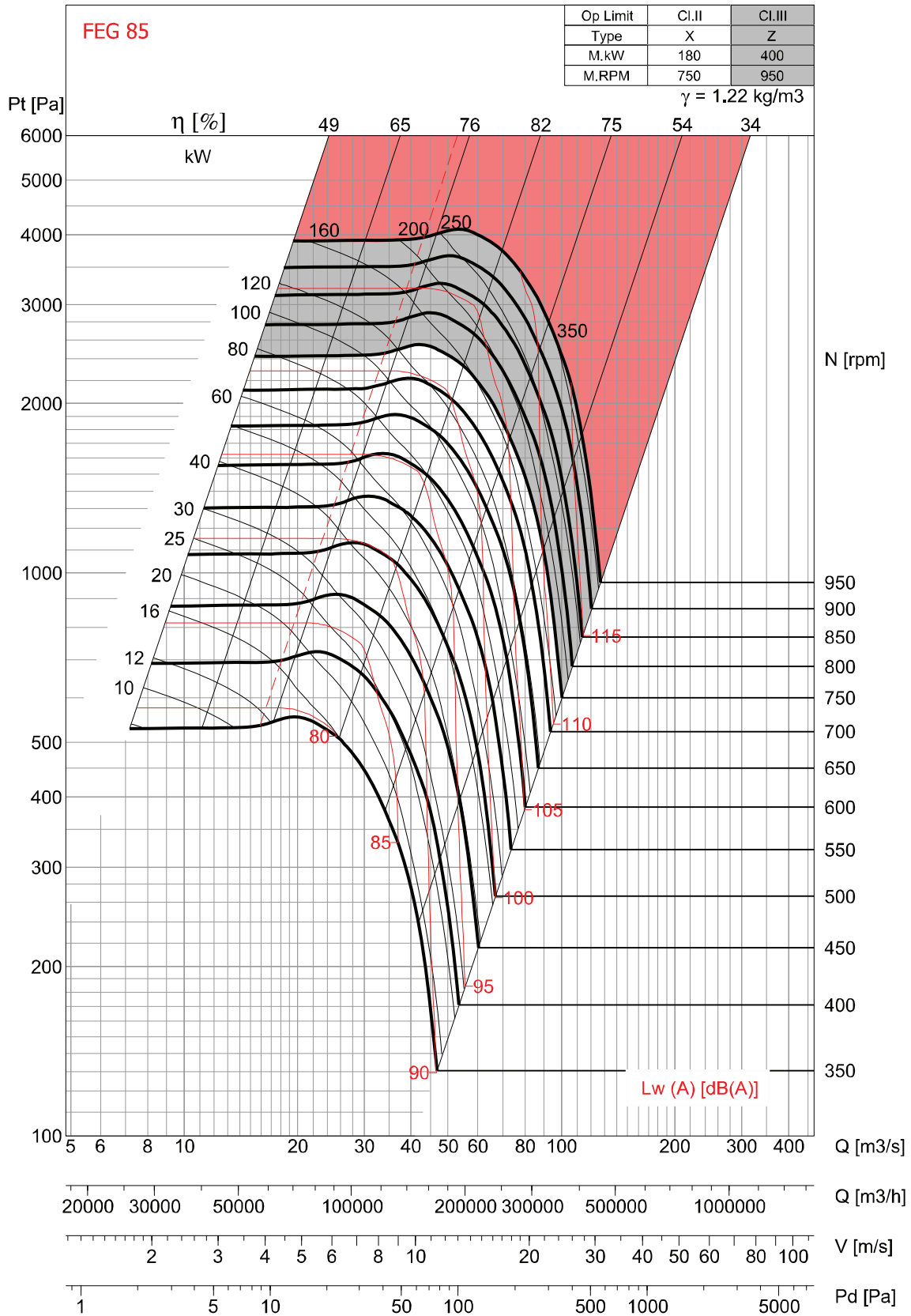


## BDB 1400



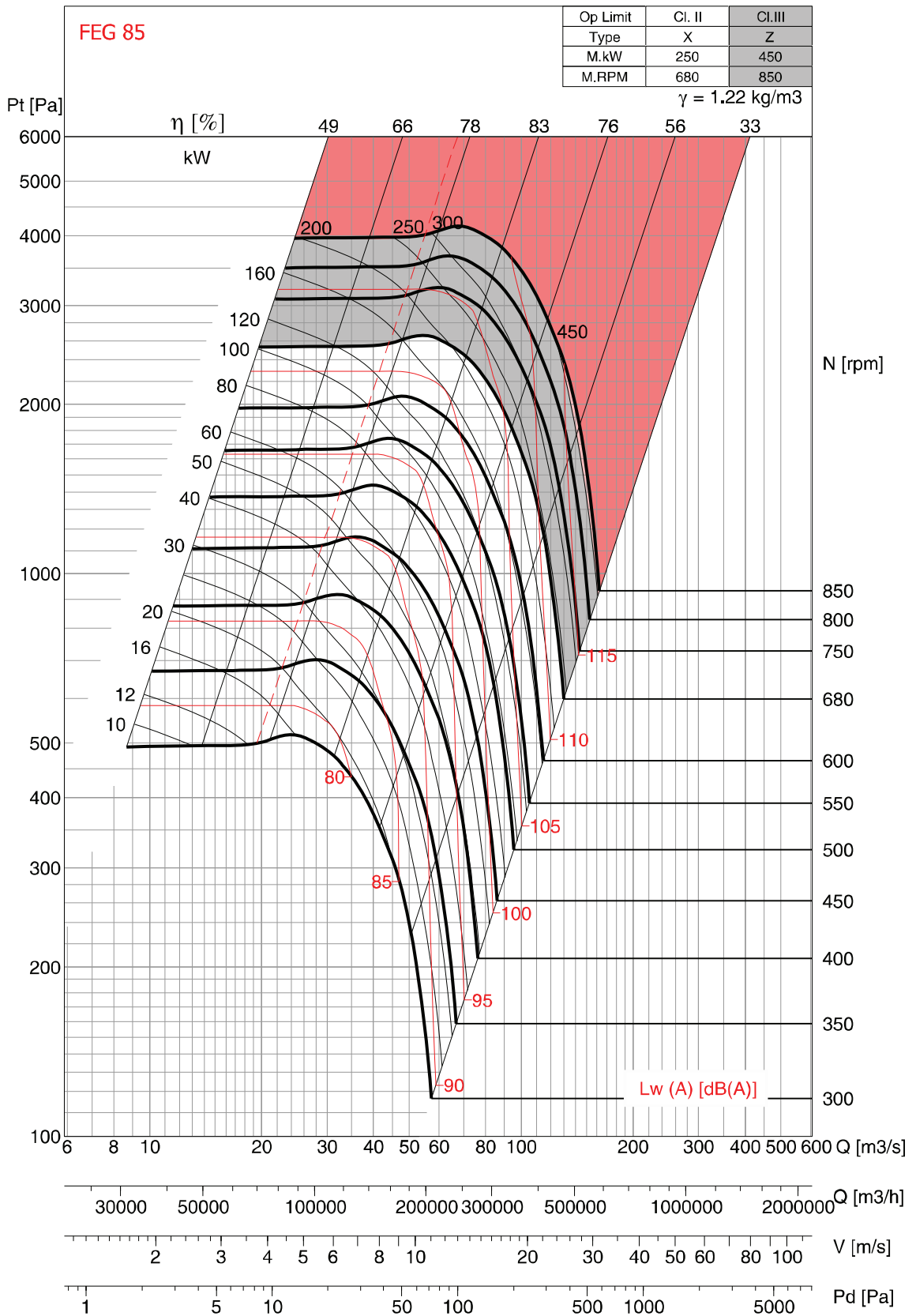
- Performance certified is for Installation type B - free inlet, ducted outlet. Performance ratings do not include the effects of appurtenances (accessories). Power rating kW does not include transmission losses.  
 - The A-weighted sound ratings shown have been calculated per AMCA International Standard 301. Values shown are for inlet  $L_{wi}(A)$  sound power levels for installation type B - free inlet, ducted outlet.

## BDB 1600



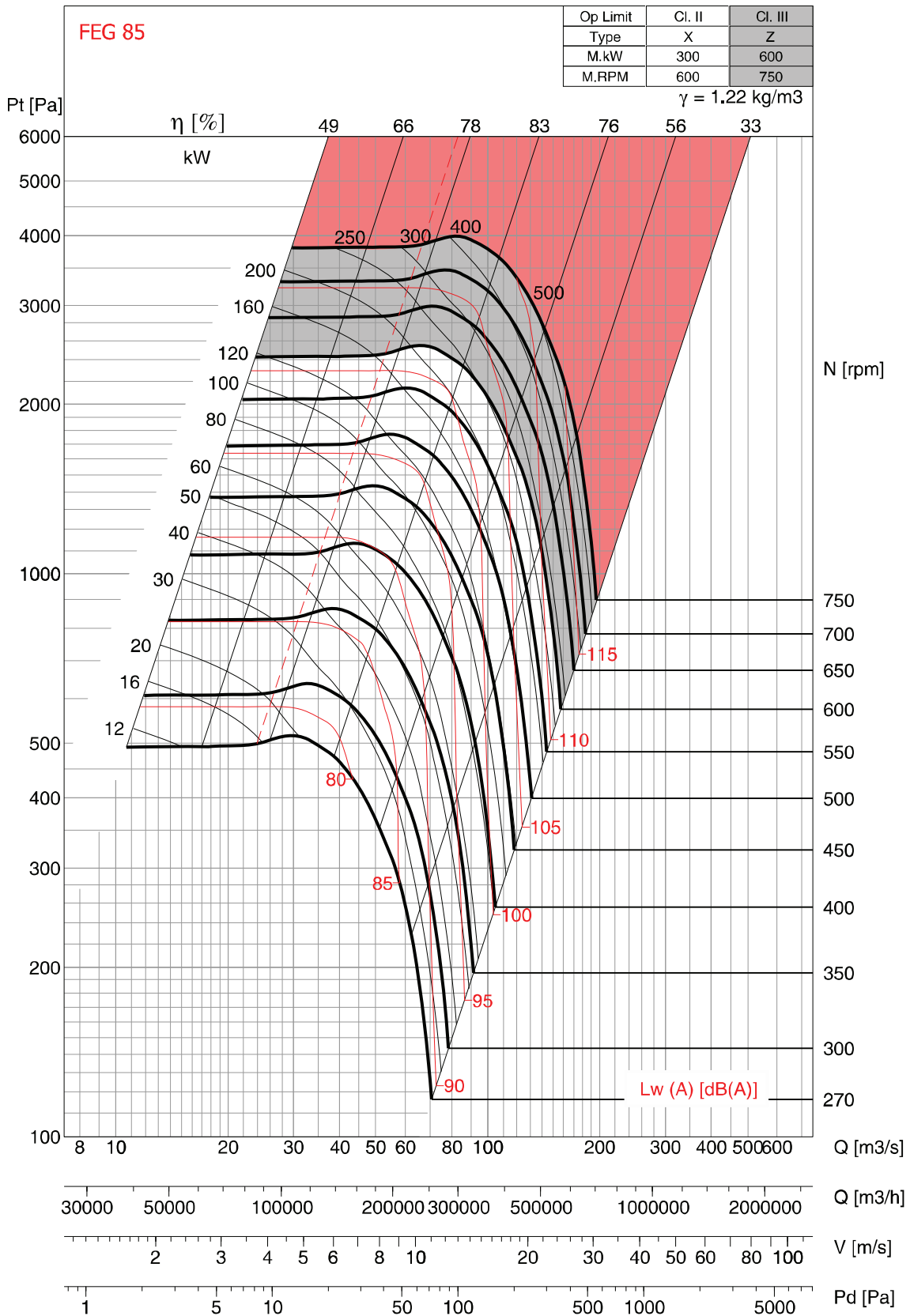
- Performance certified is for Installation type B - free inlet, ducted outlet. Performance ratings do not include the effects of appurtenances (accessories). Power rating kW does not include transmission losses.  
 - The A-weighted sound ratings shown have been calculated per AMCA International Standard 301. Values shown are for inlet Lwi (A) sound power levels for installation type B - free inlet, ducted outlet.

## BDB 1800



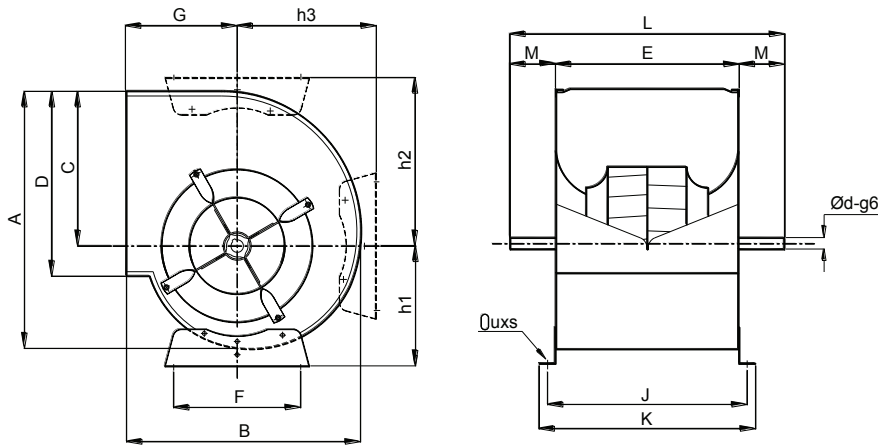
- Performance certified is for Installation type B - free inlet, ducted outlet. Performance ratings do not include the effects of appurtenances (accessories). Power rating kW does not include transmission losses.  
 - The A-weighted sound ratings shown have been calculated per AMCA International Standard 301. Values shown are for inlet Lwi (A) sound power levels for installation type B - free inlet, ducted outlet.

## BDB 2000



- Performance certified is for Installation type B - free inlet, ducted outlet. Performance ratings do not include the effects of appurtenances (accessories). Power rating kW does not include transmission losses.  
 - The A-weighted sound ratings shown have been calculated per AMCA International Standard 301. Values shown are for inlet Lwi (A) sound power levels for installation type B - free inlet, ducted outlet.

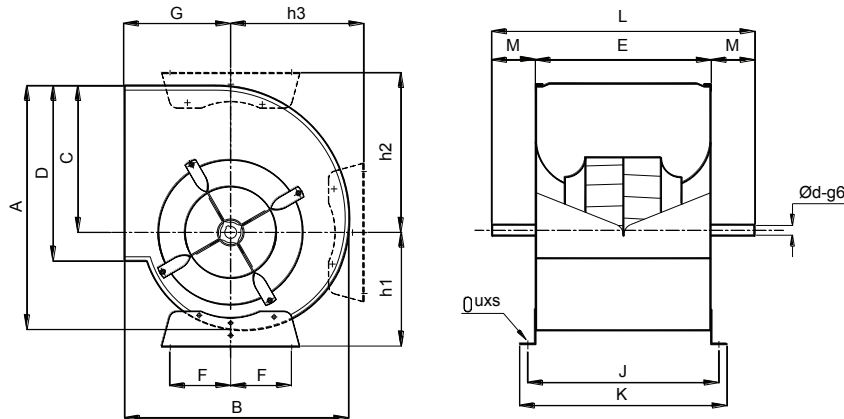
**BDB 315-400 'S'**



Model	A	B	C	D	E	F	G	J	K	L	M	h1	h2	h3	Ød		uxs
															SL	SM	
315	572	516	340	404	404	280	236	434	464	600	98	261	370	283	25	25	11x16
355	644	576	383	452	452	315	260	492	532	672	110	274	411	320	30	30	11x16
400	724	644	432	506	506	355	290	546	586	726	110	302	462	359	30	30	11x16

All Dimensions in mm.

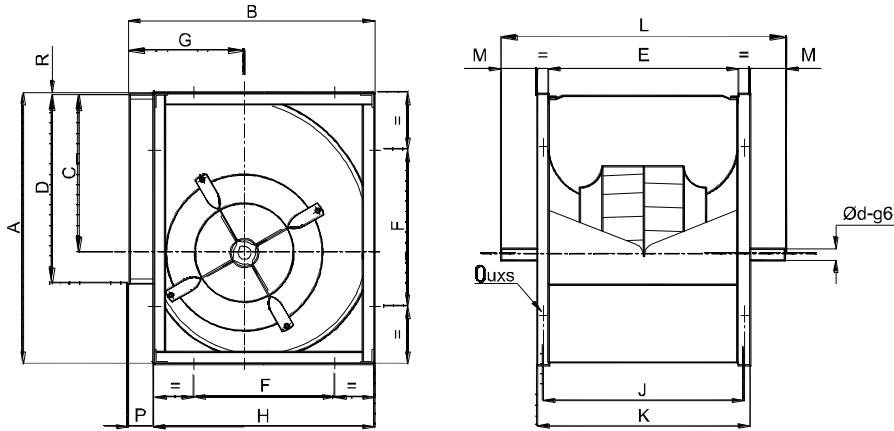
**BDB 450-710 'S'**



Model	A	B	C	D	E	F	G	J	K	L	M	h1	h2	h3	Ød		uxs
															SL	SM	
450	816	722	486	568	568	200	322	608	648	814	123	336	518	407	35	35	13x18
500	906	794	538	638	638	225	352	678	718	924	143	375	568	448	35	35	13x18
560	1016	886	603	714	714	250	390	764	814	1000	143	416	634	502	40	40	13x18
630	1142	992	679	800	800	280	434	850	900	1092	146	468	707	571	40	45	13x18
710	1286	1114	765	898	898	315	484	948	998	1234	168	531	797	636	50	50	13x18

All Dimensions in mm.

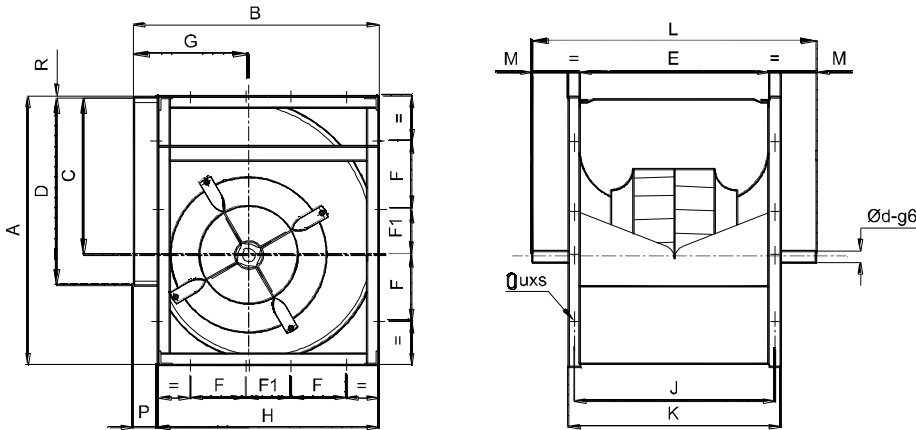
**BDB 315-400 'C'**



Model	A	B	C	D	E	F	G	H	J	K	L	M	P	R	Ød		uxs
															CL	CM	
315	578	518	340	404	404	330	236	480	434	464	600	68	38	3	25	25	13x18
355	654	578	383	452	452	368	260	548	492	532	672	70	30	6	30	30	13x18
400	736	650	432	506	506	402	290	612	546	586	726	70	38	5	30	30	13x18

All Dimensions in mm.

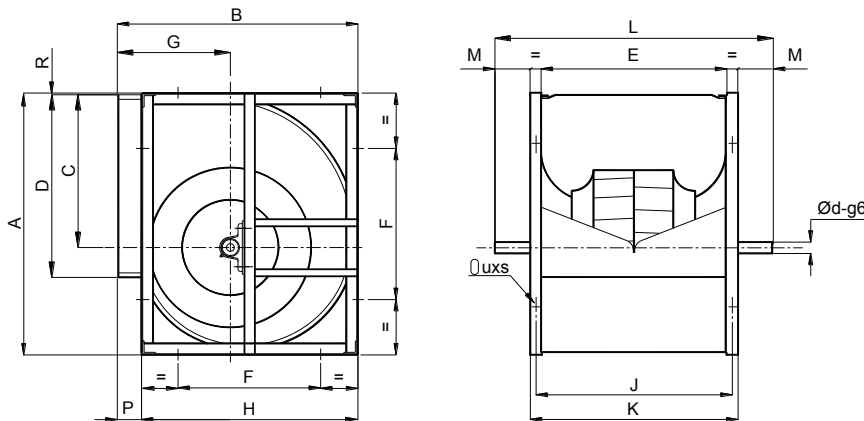
**BDB 450-710 'C'**



Model	A	B	C	D	E	F	F1	G	H	J	K	L	M	P	R	Ød		uxs
																CL	CM	
450	827	726	486	568	568	200	111	322	681	608	648	814	83	45	5	35	35	13x18
500	918	800	538	638	638	245	120	352	750	678	718	924	103	50	5	35	35	13x18
560	1030	892	603	714	714	280	125	390	844	764	814	1000	93	48	7	40	40	13x18
630	1157	998	679	800	800	328	110	434	945	850	900	1092	96	53	6	40	45	13x18
710	1302	1120	765	898	898	360	150	484	1057	948	998	1234	118	63	7	50	50	17x22

All Dimensions in mm.

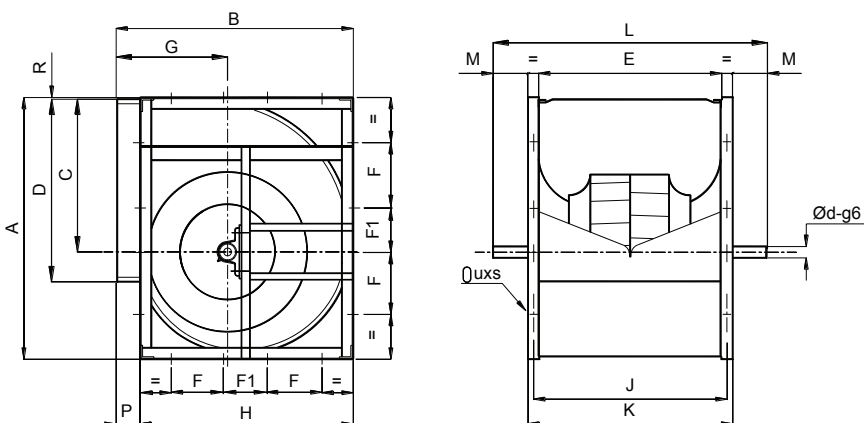
**BDB 315-400 'T'**



Model	A	B	C	D	E	F	G	H	J	K	L	M	P	R	Ød		uxs
															TL	TM	
315	578	518	340	404	404	330	236	480	434	464	632	84	38	3	30	30	13x18
355	654	578	383	452	452	368	260	548	492	532	718	93	30	6	35	35	13x18
400	736	650	432	506	506	402	290	612	546	586	772	93	38	5	35	35	13x18

All Dimensions in mm.

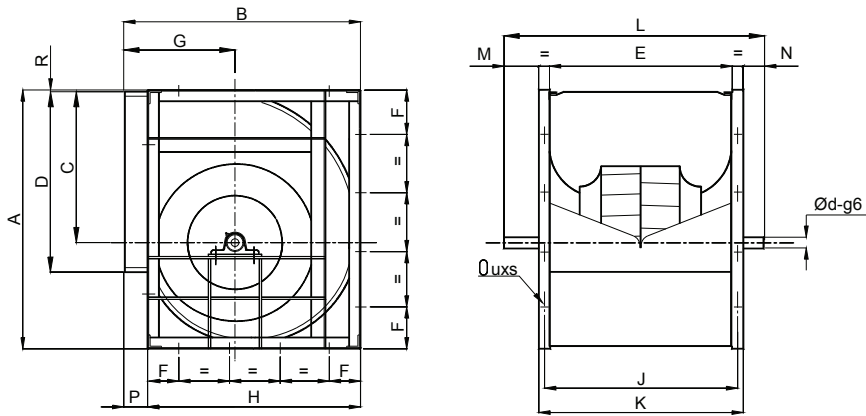
**BDB 450-1000 'T'**



Model	A	B	C	D	E	F	F1	G	H	J	K	L	M	P	R	Ød		uxs
																TL	TM	
450	827	726	486	568	568	200	111	322	681	608	648	878	115	45	5	40	40	13x18
500	918	800	538	638	638	245	120	352	750	678	718	956	119	50	5	40	45	13x18
560	1030	892	603	714	714	280	125	390	844	764	814	1080	133	48	7	45	45	13x18
630	1157	998	679	800	800	328	110	434	945	850	900	1166	133	53	6	50	50	13x18
710	1302	1120	765	898	898	360	150	484	1057	948	998	1280	141	63	7	50	55	17x22
800	1468	1254	862	1006	1006	405	171	540	1180	1056	1106	1388	141	74	7	55	55	17x22
900	1648	1408	971	1130	1130	455	189	604	1319	1180	1230	1566	168	89	7	60	60	17x22
1000	1810	1540	1066	1266	1266	500	200	656	1450	1316	1366	1724	179	90	9	60	70	17x22

All Dimensions in mm.

BDB 1120-1400 'T'

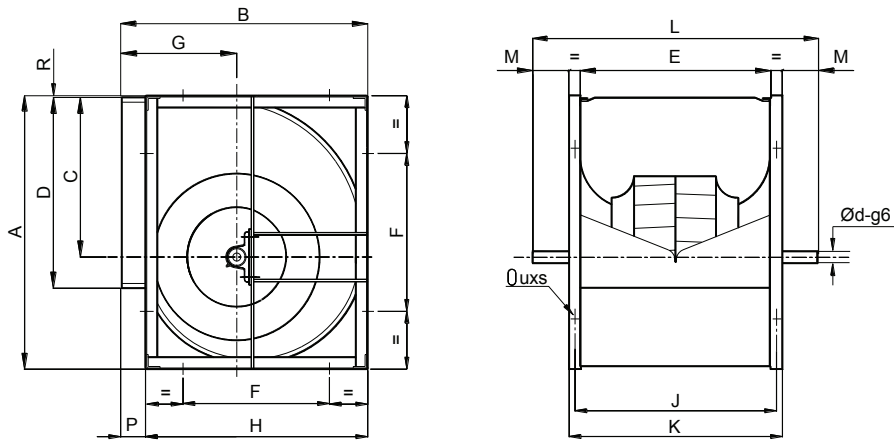


Model	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	Ød		uxs
																TL	TM	
1120	2033	1725	1200	1422	1422	290	748	1630	1482	1548	1800	193	59	95	9	-	75	17x22
1250	2285	1930	1353	1524	1524	300	830	1831	1599	1674	1975	220	81	99	9	-	80	17x22
1400	2568	2170	1515	1794	1794	310	963	2057	1869	1944	2260	227	89	113	13	-	80	17x22

All Dimensions in mm.



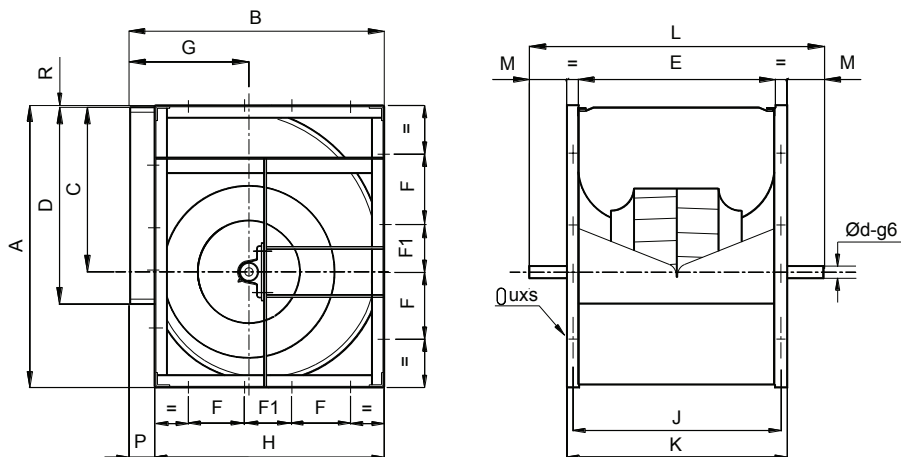
**BDB 315-400 'XM'**



Model	A	B	C	D	E	F	G	H	J	K	L	M	P	R	Ød	uxs
315	578	518	340	404	404	330	236	480	434	464	732	134	38	3	35	13x18
355	654	578	383	452	452	368	260	548	492	532	822	145	30	6	40	13x18
400	736	650	432	506	506	402	290	612	546	586	876	145	38	5	40	13x18

All Dimensions in mm.

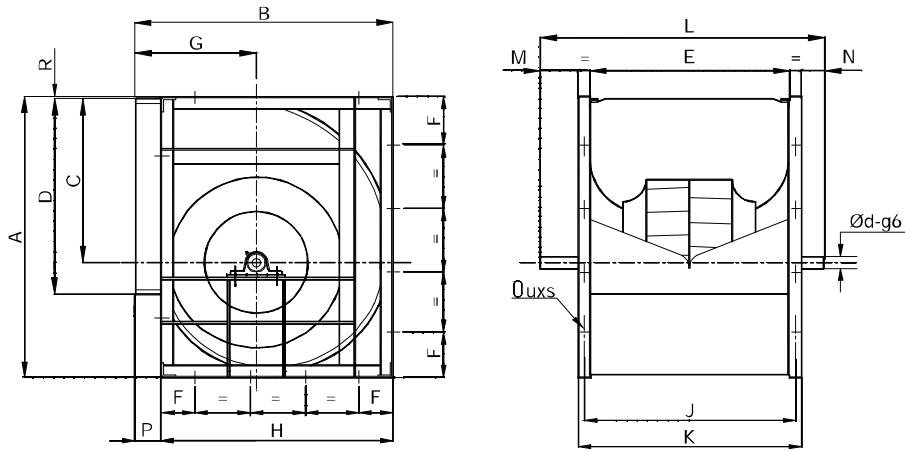
**BDB 450-1000 'XM'**



Model	A	B	C	D	E	F	F1	G	H	J	K	L	M	P	R	Ød	uxs
450	827	726	486	568	568	200	111	322	681	608	648	946	149	45	5	45	13x18
500	918	800	538	638	638	245	120	352	750	678	718	1066	174	50	5	50	13x18
560	1030	892	603	714	714	280	125	390	844	764	814	1138	162	48	7	55	13x18
630	1157	998	679	800	800	328	110	434	945	850	900	1286	193	53	6	60	13x18
710	1302	1120	765	898	898	360	150	484	1057	948	998	1390	196	63	7	65	17x22
800	1468	1254	862	1006	1006	405	171	540	1180	1056	1106	1498	196	74	7	65	17x22
900	1648	1408	971	1130	1130	455	189	604	1319	1180	1230	1660	215	89	7	70	17x22
1000	1810	1540	1066	1266	1266	500	200	656	1450	1316	1366	1845	239.5	90	9	80	17x22

All Dimensions in mm.

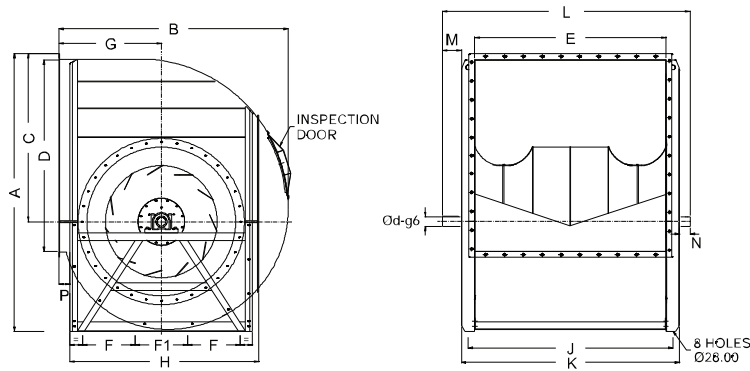
## BDB 1120-1400 'XX'



Model	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	Ød	uxs
1120	2033	1725	1200	1422	1422	290	748	1630	1482	1548	1916	266	102	95	9	80	17x22
1250	2285	1930	1353	1524	1524	300	830	1831	1599	1674	2035	265	96	99	9	85	17x22
1400	2568	2170	1515	1794	1794	310	963	2057	1869	1944	2295	256	95	113	13	90	17x22

All Dimensions in mm.

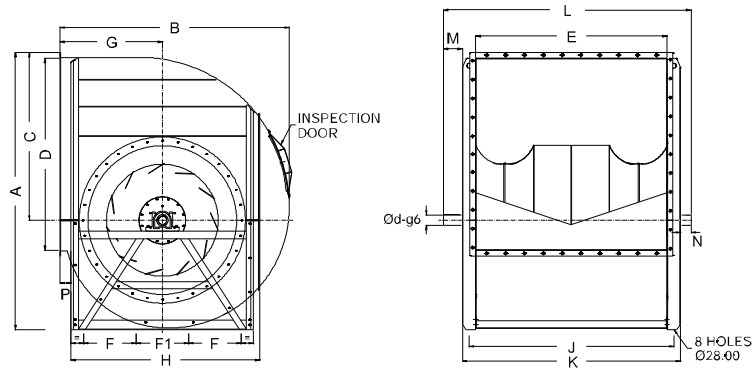
## BDB 1600-2000 'X'



Model	A	B	C	D	E	F	F1	G	H	J	K	L	M	N	P	Ød
1600	2950	2486	1790	2185	2025	550	600	1086	2132	2175	2325	2550	190	35	116	90
1800	3310	2798	2000	2438	2278	620	630	1220	2380	2458	2638	2890	220	32	135	110
2000	3715	3142	2246	2725	2530	700	710	1375	2690	2745	2925	3230	250	55	150	115

All Dimensions in mm.

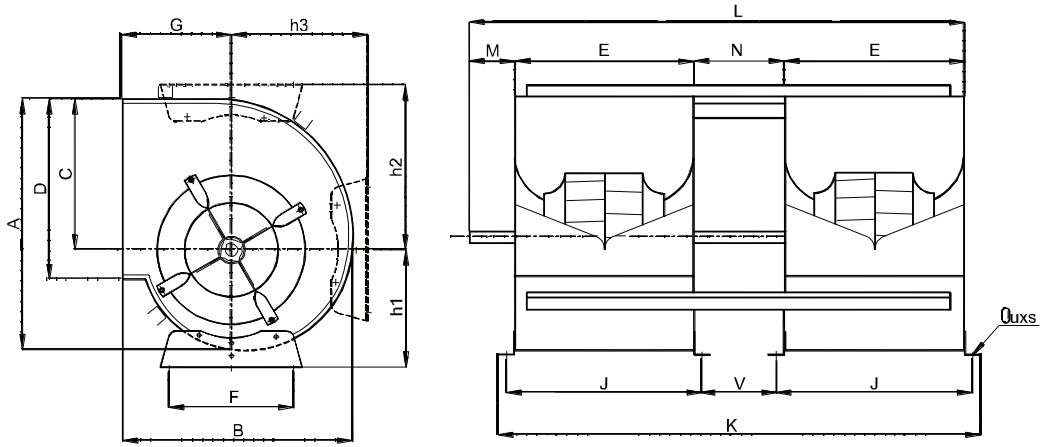
## BDB 1600-2000'Z'



Model	A	B	C	D	E	F	F1	G	H	J	K	L	M	N	P	Ød
1600	2950	2486	1790	2185	2025	550	600	1086	2132	2175	2325	2550	190	35	116	110
1800	3310	2798	2000	2438	2278	620	630	1220	2380	2458	2638	2890	220	32	135	125
2000	3715	3142	2246	2725	2530	700	710	1375	2690	2745	2925	3230	250	55	150	135

All Dimensions in mm.

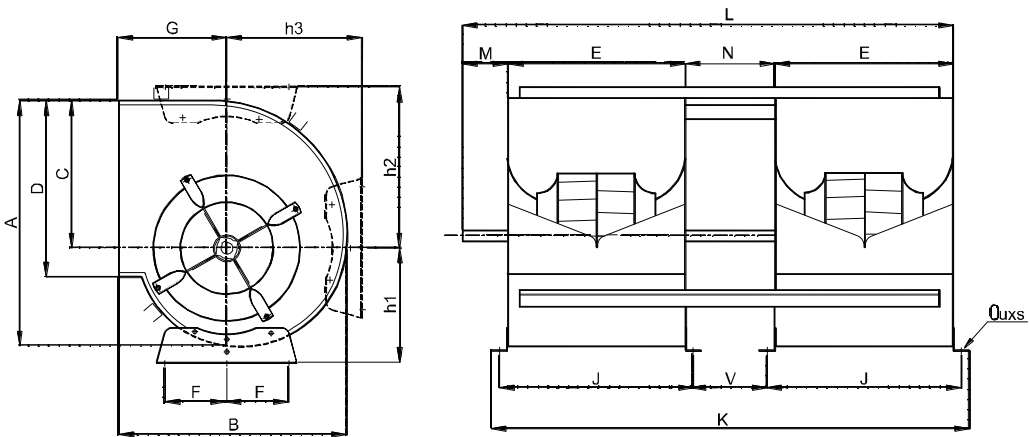
**BDB 315-400 'S2M'**



Model	A	B	C	D	E	F	G	J	K	L	M	V	X	h1	h2	h3	Ød	uxs
315	572	516	340	404	404	280	236	434	1183	1233	110	285	315	261	370	283	30	11x16
355	644	576	383	452	452	315	260	492	1339	1389	130	315	355	274	411	320	35	11x16
400	724	644	432	506	506	355	290	546	1492	1542	130	360	400	302	462	359	35	11x16

All Dimensions in mm.

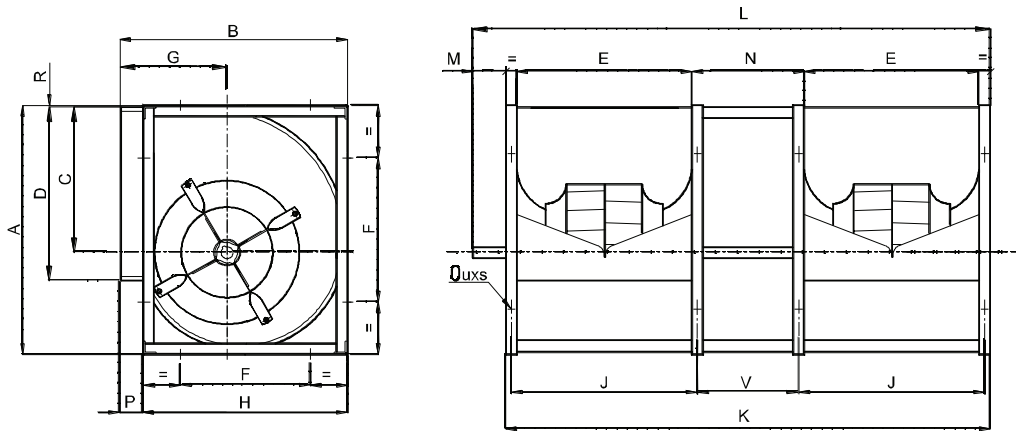
**BDB 450-500 'S2M'**



Model	A	B	C	D	E	F	G	J	K	L	M	V	X	h1	h2	h3	Ød	uxs
450	816	722	486	568	568	200	322	608	1666	1726	140	410	450	336	518	407	40	13x18
500	906	794	538	638	638	225	352	678	1856	1916	140	460	500	375	568	448	40	13x18

All Dimensions in mm.

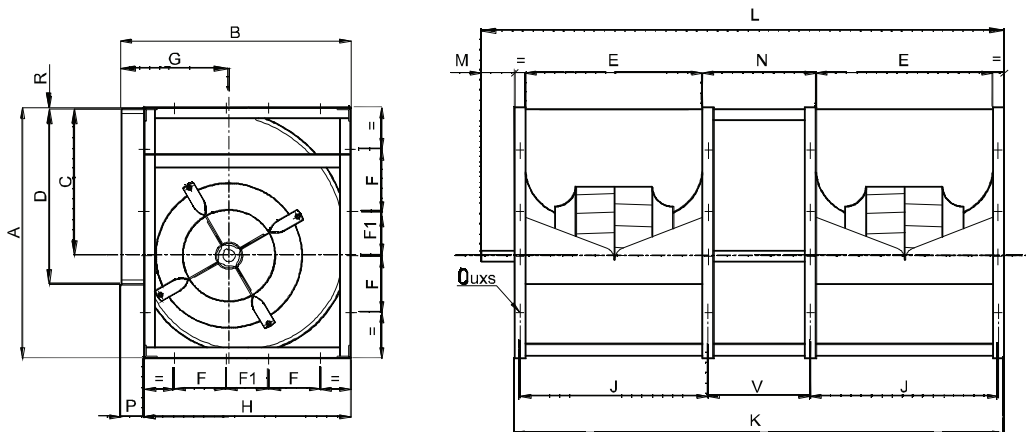
**BDB 315-400 'C2M'**



Model	A	B	C	D	E	F	G	H	J	K	L	M	P	R	V	X	Ød	uxs
315	578	518	340	404	404	330	236	480	434	1183	1263	80	38	3	285	315	30	13x18
355	654	578	383	452	452	368	260	548	492	1339	1429	90	30	6	315	355	35	13x18
400	736	650	432	506	506	402	290	612	546	1492	1582	90	38	5	360	400	35	13x18

All Dimensions in mm.

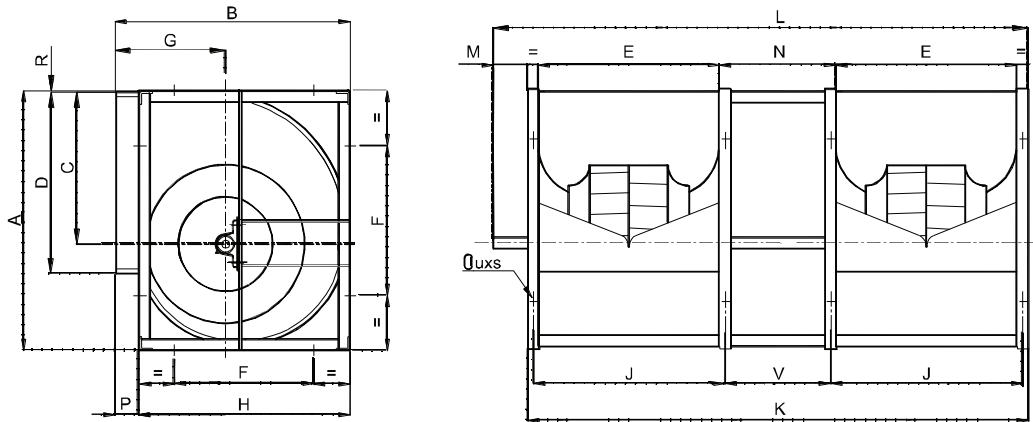
**BDB 450-500 'C2M'**



Model	A	B	C	D	E	F	F1	G	H	J	K	L	M	P	R	V	X	Ød	uxs
450	827	726	486	568	568	200	111	322	681	608	1666	1766	100	45	5	410	450	40	13x18
500	918	800	538	638	638	245	120	352	750	678	1856	1956	100	50	5	460	500	40	13x18

All Dimensions in mm.

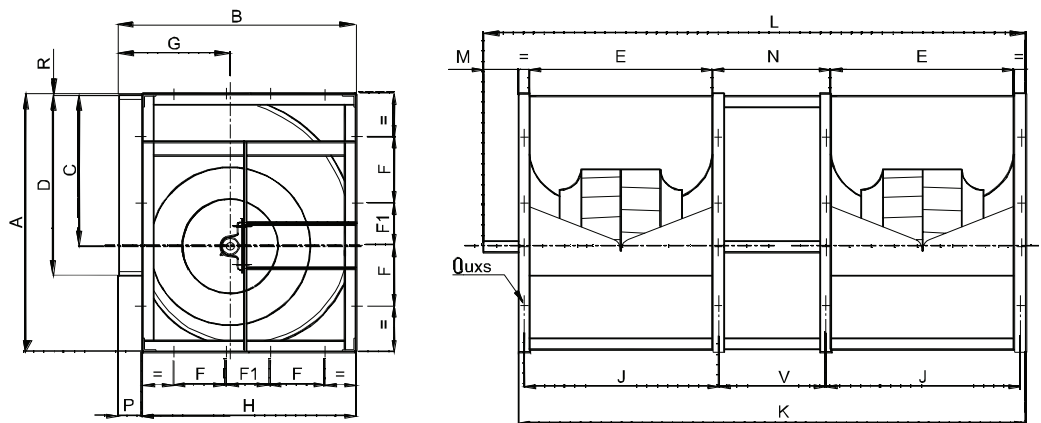
**BDB 355-400 'T2M'**



Model	A	B	C	D	E	F	G	H	J	K	L	M	P	R	V	X	Ød	uxs
355	654	578	383	452	452	368	260	548	492	1339	1449	110	30	6	315	355	40	13x18
400	736	650	432	506	506	402	290	612	546	1492	1627	135	38	5	360	400	45	13x18

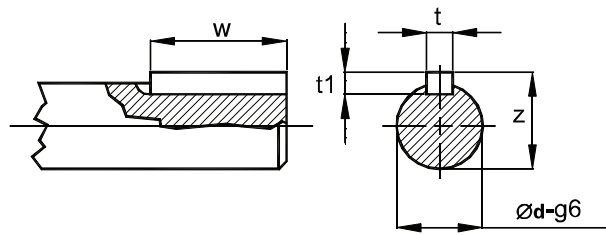
All Dimensions in mm.

**BDB 450-630 'T2M'**



Model	A	B	C	D	E	F	F1	G	H	J	K	L	M	P	R	V	X	Ød	uxs
450	827	726	486	568	568	200	111	322	681	608	1666	1801	135	45	5	410	450	50	13x18
500	918	800	538	638	638	245	120	352	750	678	1856	1991	135	50	5	460	500	55	13x18
560	1030	892	603	714	714	280	125	390	844	764	2088	2228	140	48	7	510	560	55	13x18
630	1157	998	679	800	800	328	110	434	945	850	2330	2470	140	53	6	580	630	60	13x18

All Dimensions in mm.



Ød	t	t1	w	z
25	8	7	40	28
30	8	7	40	33
35	10	8	50	38
40	12	8	70	43
45	14	9	70	48,5
50	14	9	90	53,5
55	16	10	90	59
60	18	11	90	64
70	20	12	110	74,5
75	20	12	110	79,9
80	22	14	110	85
85	22	14	110	90
90	25	14	140	95
110	28	16	160	116
115	32	18	160	122
125	32	18	180	132
135	36	20	180	143

All Dimensions in mm.