

# NTPF

## Tecnifan Plug Fan

Grupos Moto-Ventiladores Centrífugos  
de Alto Rendimiento para montaje en Plenum

*High Performance centrifugal*

*Motor-Fan groups for plenum assembly*



## 1. GENERAL DESCRIPTION

Compact fans without housing, designed for clean or slightly dusty air environments to achieve maximum aerodynamic performance in ventilation and air conditioning applications, and operated directly by an electric motor.

To meet commercial and industrial requirements, it aims to provide acceptable indoor air quality with thermal comfort when installed inside an AHU. Both guaranteed by an optimized construction that includes a high efficiency metal backwards impeller with painted finish, with an aerodynamic inlet cone and a structure manufactured in galvanized steel Z-275 quality.

The NTPF Plug Fans covers diameters from 225 mm up to 800 mm, with air volume flows up to 50.000 m<sup>3</sup>/h and pressures up to 3.000 Pa. All motor-fans include a measuring air flow device. The standard design allows an operating temperature range of -20°C a + 40°C.

The impellers are statically and dynamically balanced to a grade of G=6.3 in accordance with DIN ISO 1940-1 of the DIN ISO 88215 regulation.

All the motors supplied are asynchronous, three-phase squirrel-cage of 2, 4 and 6 poles, IP55, Class F, and are in accordance with Regulation N° 640/2009 of the European Commission, series IE2 high efficiency. Usually motors have PTC gauge. On request, IE-3 motors can be supplied.

The coupling between impeller and motor is made by a Taperlock, so that, together with the constructive structure it allows to change the motor size with ease. Consequently, each NTPF size is manufactured in order to assemble the range of motors provided.

The inlet cones for the different wheel types are designed to give the best possible aerodynamic performance and high efficiency. They are all supplied with a pressure measurement device.

The front air intake has a square flange, peripherally drilled, which facilitates the union through a flexible connection to the plenum where the motor-fan group is located.

Available optionals that can be supplied: flexible connections, rubber or spring type antivibration mounts, inlet guard grills for the air intake and frequency converter devices. Also epoxy painting finish and antispark construction.

For the operation and regulation of the motor-fan groups up to power 7.5 kW (2 and 4 poles), also exists an option to couple a monobloc equipment named Motor-Converter device. The set includes a frequency converter coupled directly to the motor, which as a whole, complies with the high efficiency regulation IE2 for the motor and IP55 protection for the frequency converter in the standard version.



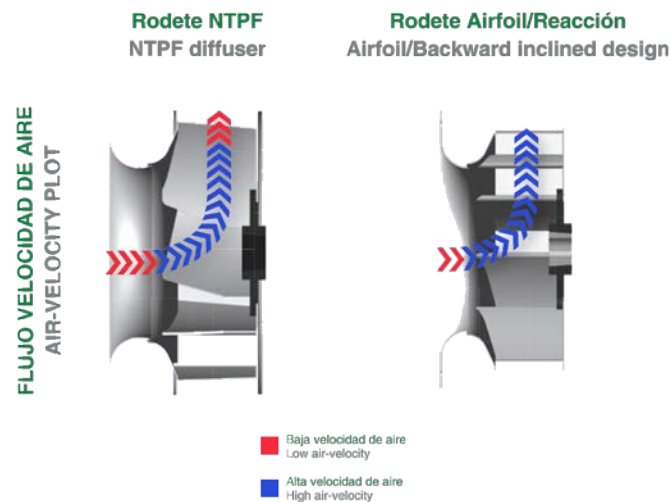
Frontal view



Side view

## MAIN ADVANTAGES::

- HIGH EFFICIENCY:** Thanks to the radial diffusion technology and the optimized design used in the new Plugfan NTPF impellers, the motor-fan achieves a noise reduction and an increased efficiency, reducing the electric power consumption, it is resulting in a reduction of the operation facility cost as well as the possibility of mounting a lower power motor that results more economical.  
 Radial diffusion technology is based on the transformation of dynamic energy into static, that is, due to the studied gradual increase the area of air passage through the impeller, the existing speed is reduced, making the dynamic pressure into static pressure, resulting in a performance increase and a noise reduction.  
 The optimized design of the impellers improves aerodynamic penetration and reduces friction resulting in a power consumption and a noise level reduction.



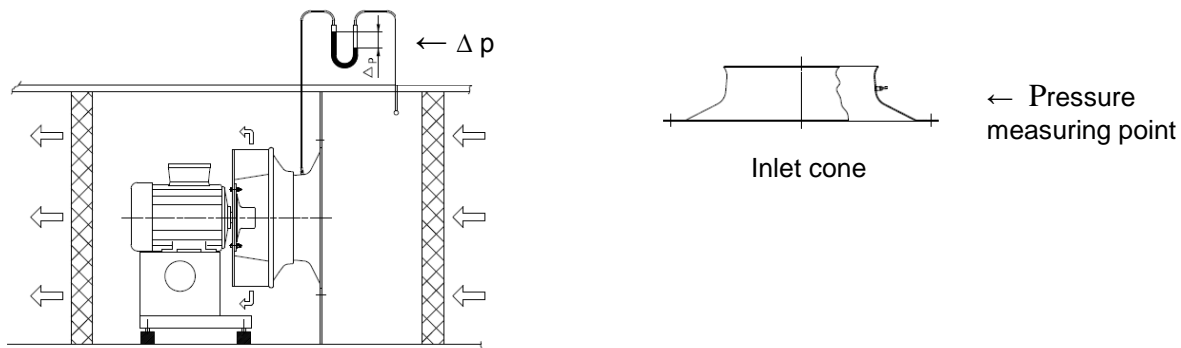
- LESS NOISE LEVEL:** The combination of both design improvements gives the new Plug Fan NTPF better performances, lower noise levels and lower acquisition and operating costs compared to other Plug Fans with backward impellers, even with Airfoil type blades.
- SPACE PROFIT:** Being more compact, they occupy less space in the fan module.
- DIFFERENT AIR PLANES:** The air that enters through the inlet cone can be supplied by five different planes within the plenum where it is located.
- HIGHER INSTALATION VERSATILITY:** Normally, the use of some non-desirable ducts and bends are removed.
- EASY MAINTENANCE:** Simplicity of maintenance as it has no transmission. Ease of access to its different components favoring the cleaning.

## 2. CHARACTERISTICS

### 2.1 Airflow Measuring Device.

All of the motor-fan group series are supplied with a pressure-measuring device in the inlet cone for the air volume flow measurement and control, with a 5 to 10% tolerance, under normal operation conditions. In order to guarantee the accuracy of the air volume flow, the measuring device has been calibrated in test laboratory.

The device consists of one static pressure measuring point, mounted directly into the inlet cone. Therefore all that is required is a single PVC tube, with an inner diameter of about 3 to 5 mm, to be connected directly to an external manometer (not included in the supply) for the differential pressure reading. ( $\Delta p$ )



The differential pressure  $\Delta p$  measured between the fan inlet of the unit and the pressure measuring device (inlet cone) can be converted to the air volume flow by the following formula:

$$V = K \sqrt{\frac{1,2}{\rho} \Delta p}$$

Tamaño del rodete		225	250	280	315	355	400	450	500	560	630	710	800
Factor de calibración	K	50	64	79	100	128	158	209	254	330	410	526	667

Where:

Air Flow ----- V [ m<sup>3</sup>/h ]

Calibration Factor depending on the size of the impeller ----- K

Air Density -----  $\rho$  [ kg/m<sup>3</sup> ]

Differential Pressure -----  $\Delta p$  [ Pa ]

## 2.2. Direction of Rotation..

All the motor-fan group series NTPF are supplied with LG direction of rotation (counter-clockwise) as viewed from the motor side.

If when put into operation the impeller moves in the opposite direction, you can easily change the direction of rotation by swapping two phases in the motor connection.

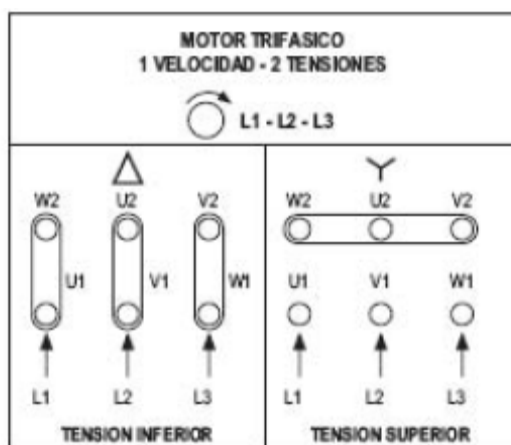
LG



## 2.3. Voltage in the Motor Supply (50/60 Hz).

Motor size  $\leq 4$  kW -> **230V  $\Delta$  / 400V Y**

Motor size  $> 4$  kW -> **400V  $\Delta$  / 690V Y**



### 3. NOMENCLATURE

The Plug Fan series NTPF are defined as follows:

<b>Type</b>	<b>NTPF</b>
<b>Size</b>	<b>225 - 250 - 280 - 315 - 355 - 400 - 450 - 500 - 560 - 630 - 710 - 800</b>
<b>Assembly</b>	<b>MH:</b> Mounted Horizontal or horizontal assembly <b>MV:</b> Mounted Vertical or vertical Assembly
<b>Motor</b>	<b>Power kW</b> Nº of Poles: <b>2 P</b> (3.000 rpm) - <b>4 P</b> (1.500 rpm) - <b>6 P</b> (1.000 rpm) <b>Efficiency:</b> IE2 (optional E3)
<b>Accesories</b>	<b>RAM:</b> Inlet Guard Mounted <b>RAD:</b> Inlet Guard Not Mounted <b>AM:</b> Antivibration Mounts Spring type <b>AC:</b> Antivibration Mounts Rubber type <b>CFM:</b> Flexible Connection Mounted <b>CFD:</b> Flexible Connection NOT Mounted <b>VF:</b> Frequency Converter <b>MVF:</b> Combined and assembled Motor + Frequency Converter <b>PE:</b> EPOXY Painting <b>MAC:</b> Anti-Spark

**Note:** Use this denomination to order.

#### Designation Examples:

<b>NTPF 710 MH (15 kW - 4 P) + AM + CFM + PE</b>				
NTPF	710	MH	15 - 4P	AM + CFM + PE
Type	Size	Assembly	Motor	Accesories

Example Description: Selecting a motor-fan Group type NTPF, size 710 with impeller series NPL, horizontal mounted, with a 15 kW motor of 4 poles (1.500 rpm), with spring type antivibration mounts, mounted flexible connection and epoxy painted finish.

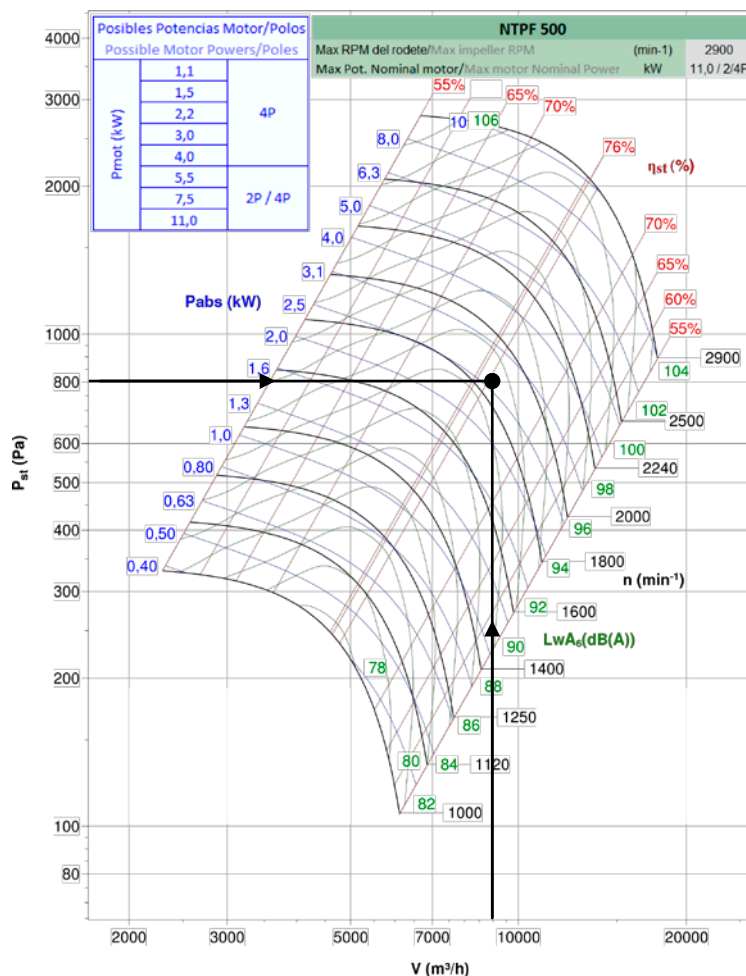
## 4. FAN PERFORMANCES

### 4.1 Selection example..

Selecting a fan for a  $(V) = 9000 \text{ m}^3/\text{h}$  airflow, with a  $(P_{st}) = 800 \text{ Pa}$  of static pressure drop, altitude above sea level  $(h) = 0 \text{ m}$  and temperature  $(t) = 20^\circ\text{C}$ . Density  $1.2 \text{ kg m}^{-3}$

For the given conditions, we could select several motor-fan sizes depending on several factors such as performance, noise level, dimensions of the available set-space, price, etc.

We select the fan for best performance and we get the NTPF 500:



NTPF 500, with the next specifications:

1. Rotation speed  $(n) = 1863 \text{ min}^{-1}$
2. Impeller static efficiency  $(\eta_{st}) = 75,1 \%$
3. Power consumption  $(P_{abs}) = 2,77 \text{ kW}$
4. Noise level emitted by free drive with guided aspiration  $(LwA_6) = 91 \text{ dB(A)}$

To determine the engine rated power, we increase the shaft absorbed power multiplying it by a "ft" factor that takes into account a safety margin to prevent motor overload:

$$ft = 1,08 \text{ (8\%)} \text{ si } P_{abs} \leq 3\text{kW}; \quad ft = 1,06 \text{ (6\%)} \text{ si } P_{abs} > 3\text{kW}$$

Thus in our case, the correct absorbed power is calculated as follows:

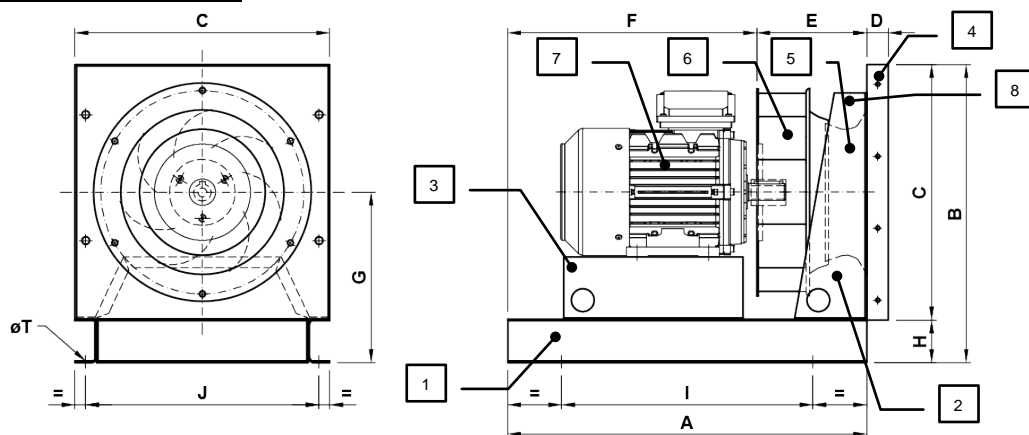
$$ft = 1,08 \text{ (8\%)} \text{ ya que la } P_{abs} = 2,77 \text{ kW} \leq 3 \text{ kW}; \quad P_{abscorr} = 2,77 \times 1,08 = 2,99 \text{ kW}$$

**So the nominal motor power we have to install is 3 kW.**



## 5. DIMENSIONS

### Horizontal Assembly - MH



NTPF Drawing

1. Motor fan group base  
5. Inlet cone

2. Adjustable angle  
6. Impeller

3. Adjustable motor support  
7. Motor IE2 (Eff. 1)

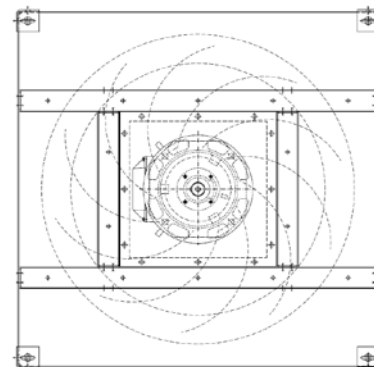
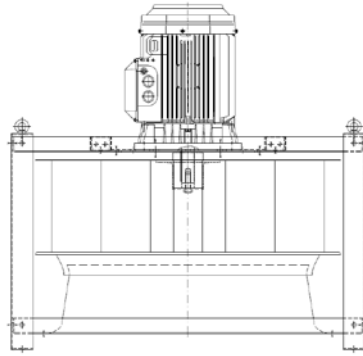
4. Adjustable Front  
8. Airflow measurement system

Ventilador Fan	A	B <sup>(*)</sup>	C	D	E	F	G <sup>(*)</sup>	H <sup>(*)</sup>	I	J	ØT	Gama de carcasas-motor previstas Motor frame range
		Min/Max					Min/Max	Min/Max				
NTPF 225	425	333/333	315	20	122	303	175/175	18/18	275	290	10	71-80-90S-90L
NTPF 250	500	396/425	355	30	136	364	218/247	41/70	350	325	10	71-80-90S-90L-100L
NTPF 280	500	440/469	400	30	161	339	240/269	40/69	350	370	10	71-80-90S-90L-100L
NTPF 315	550	480/512	450	30	180	370	255/287	30/62	400	420	10	80-90S-90L-100L-112M
NTPF 355	650	530/562	500	40	204	446	280/312	30/62	500	460	12	80-90S-90L-100L-112M
NTPF 400	650	590/632	560	40	227	423	310/352	30/72	500	520	12	90S-90L-100L-112M-132S
NTPF 450	650	670/712	630	40	255	395	355/397	40/82	500	590	12	90S-90L-100L-112M-132S
NTPF 500	750	740/810	710	40	284	466	385/455	30/100	600	670	12	90S-90L-100L-112M-132S-132M-160M
NTPF 560	1000	880/940	800	40	321	679	480/540	80/140	850	760	12	100L-112M-132S-132M-160M-160L
NTPF 630	1000	880/960	800	40	363	637	480/560	80/160	850	760	12	100L-112M-132S-132M-160M-160L-180M
NTPF 710	1100	1098/1178	1000	50	409	691	598/678	98/178	950	950	14	100L-112M-132S-132M-160M-160L-180M-180L
NTPF 800	1100	1130/1198	1000	50	457	643	630/698	130/198	950	950	14	132M-160M-160L-180M-180L-200L

Note: (\*) Variable dimensions between both values.  
Aproximate data in mm.

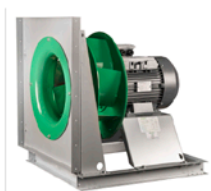
### Vertical Assembly- MV

For vertical mounting dimensions, please contact our sales department.

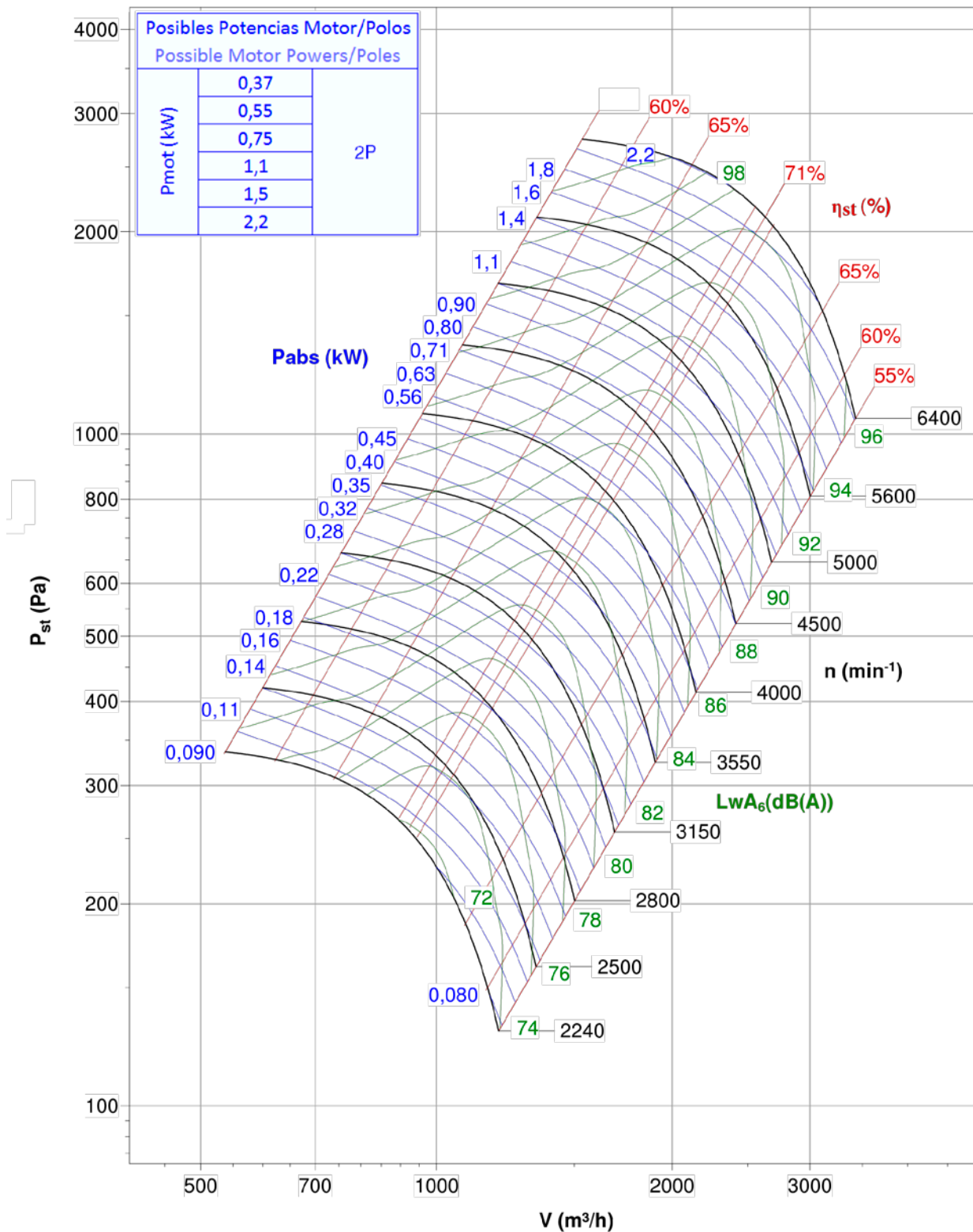


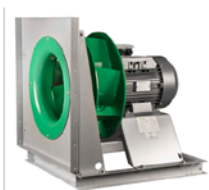


## 6. FAN PERFORMANCE CURVES NTPF SERIES

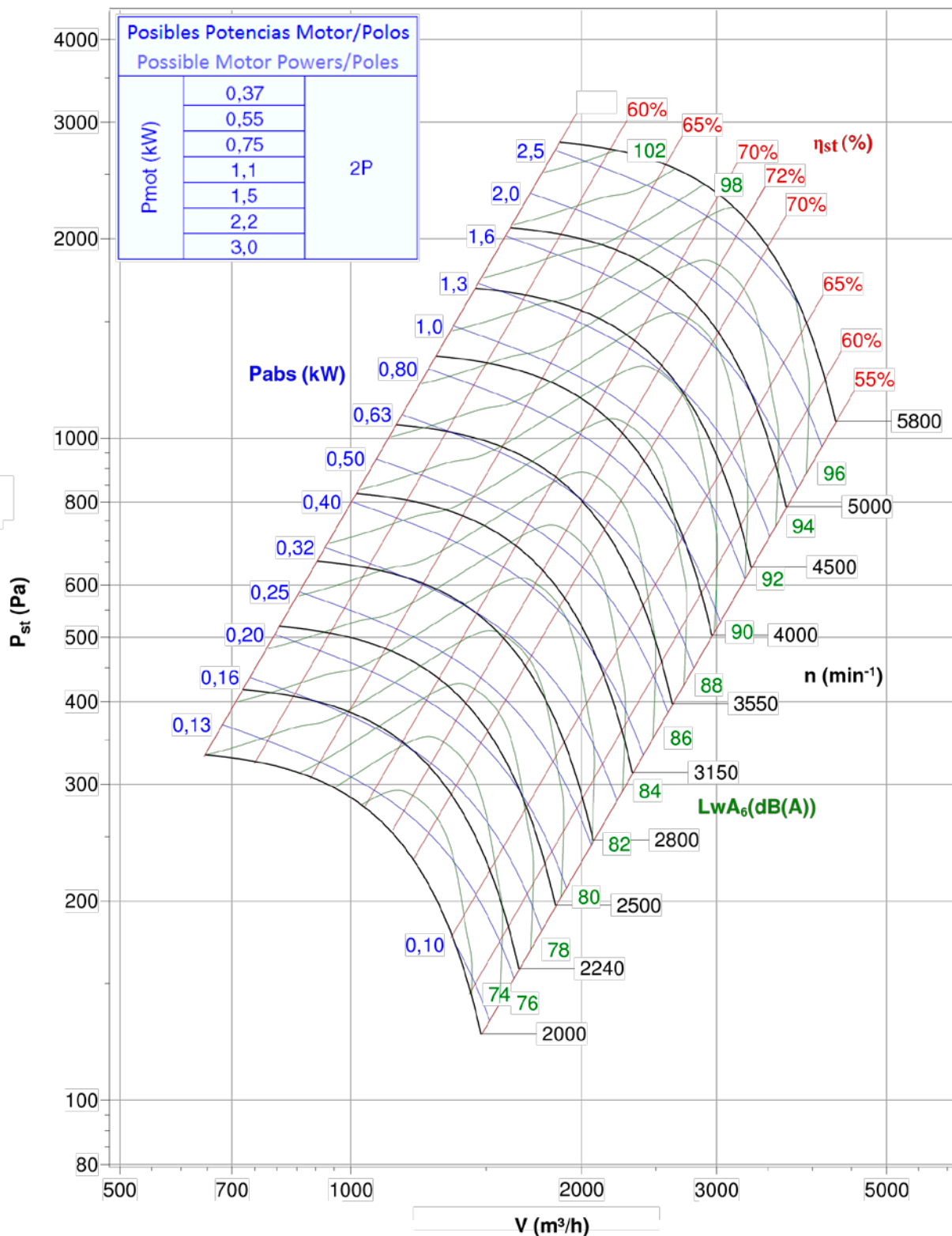


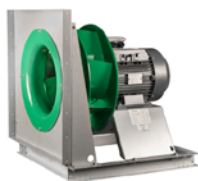
NTPF 225			
Max RPM del rodete/Max impeller RPM	(min-1)	6400	
Max Pot. Nominal motor/Max motor Nominal Power	kW	2,2 / 2P	



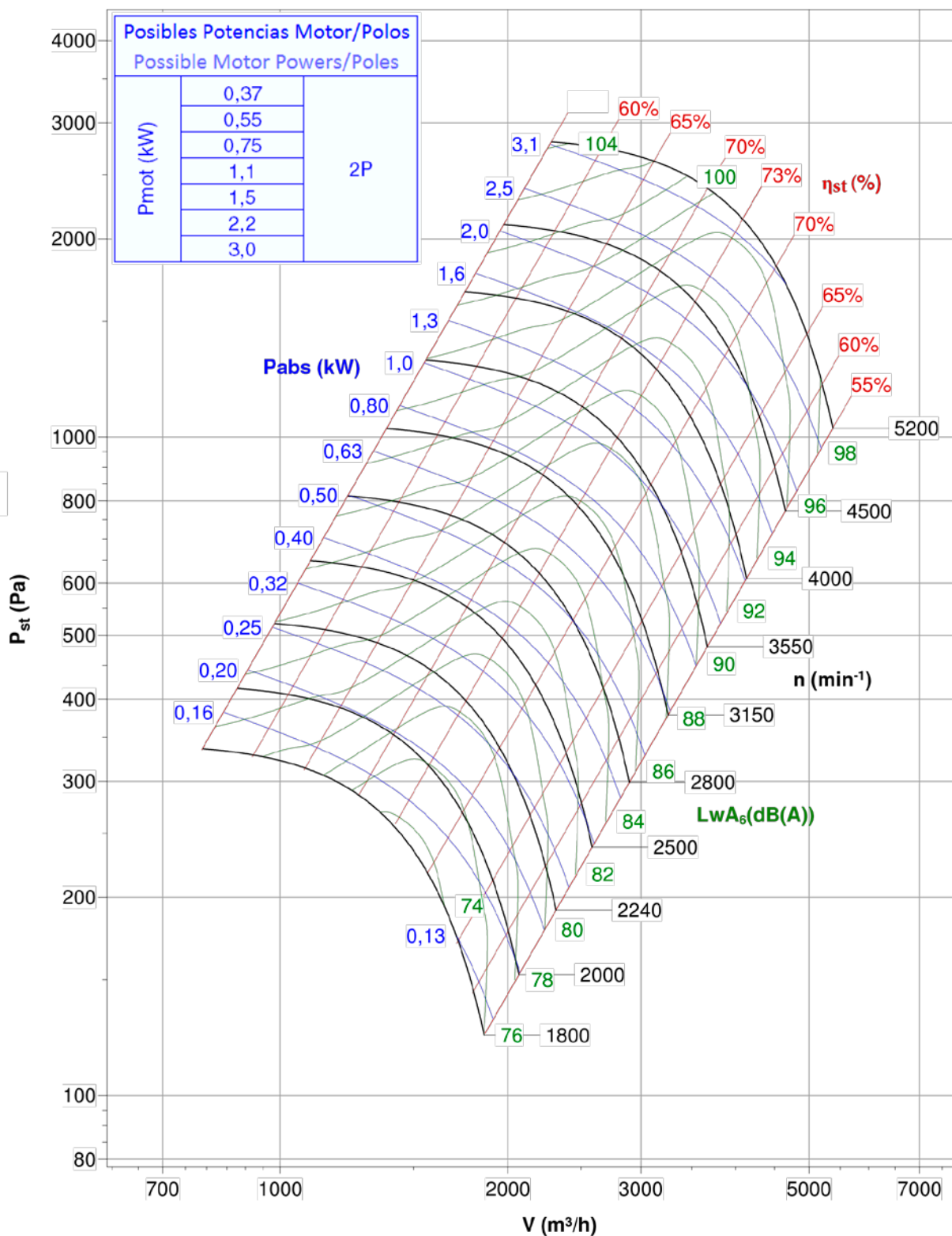


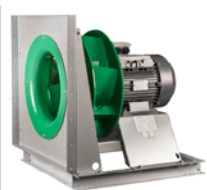
NTPF 250			
Max RPM del rodete/Max impeller RPM	(min-1)	5800	
Max Pot. Nominal motor/Max motor Nominal Power	kW	3,0 / 2P	



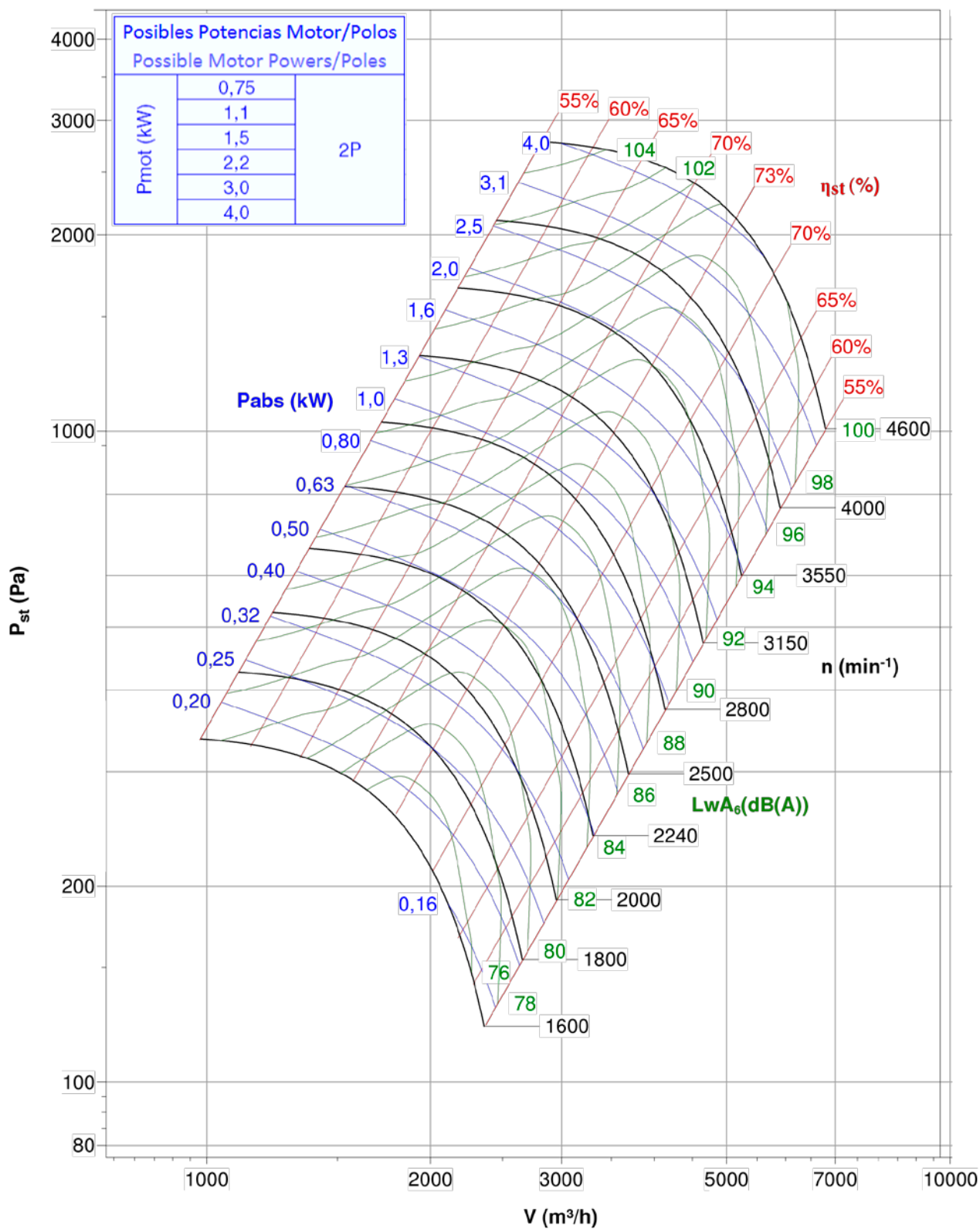


NTPF 280			
Max RPM del rodete/Max impeller RPM	(min-1)	5200	
Max Pot. Nominal motor/Max motor Nominal Power	kW	3,0 / 2P	

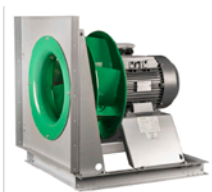




NTPF 315			
Max RPM del rodete/Max impeller RPM	(min-1)	4600	
Max Pot. Nominal motor/Max motor Nominal Power	kW	4,0 / 2P	

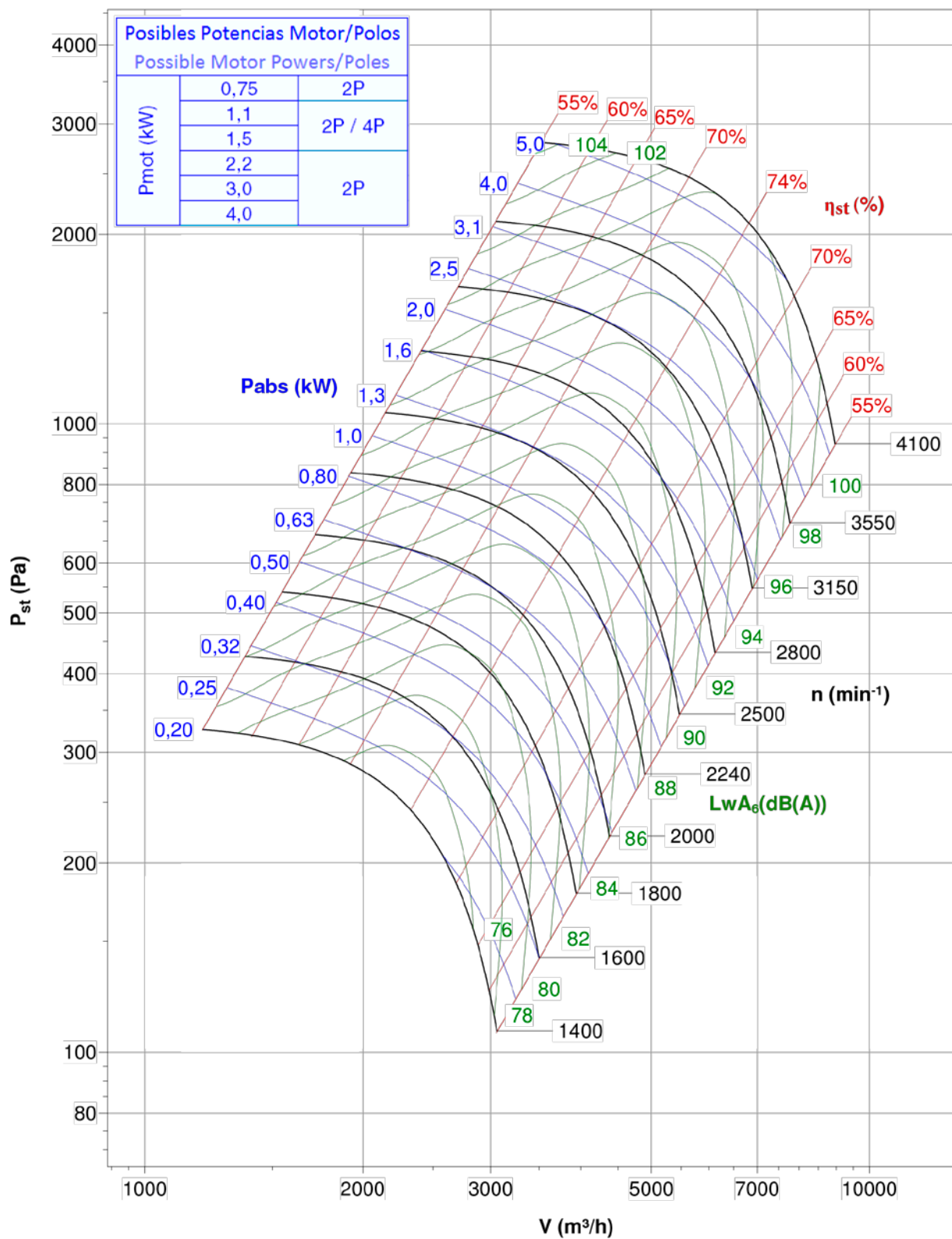


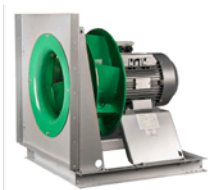




**NTPF 355**

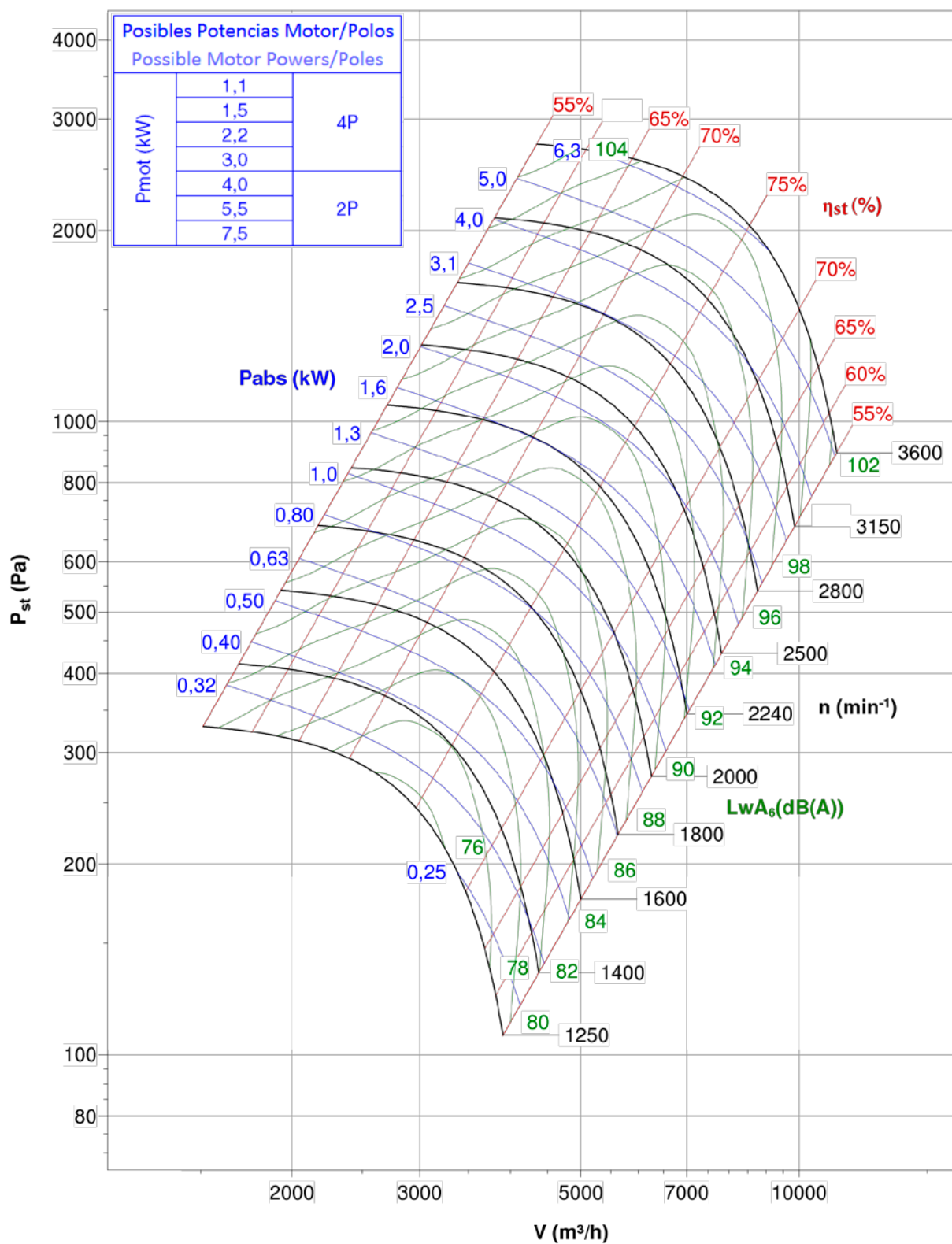
Max RPM del rodete/Max impeller RPM	(min-1)	4100
Max Pot. Nominal motor/Max motor Nominal Power	kW	4,0 / 2P



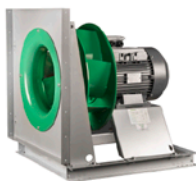


**NTPF 400**

Max RPM del rodete/Max impeller RPM	(min-1)	3600
Max Pot. Nominal motor/Max motor Nominal Power	kW	7,5 / 2P

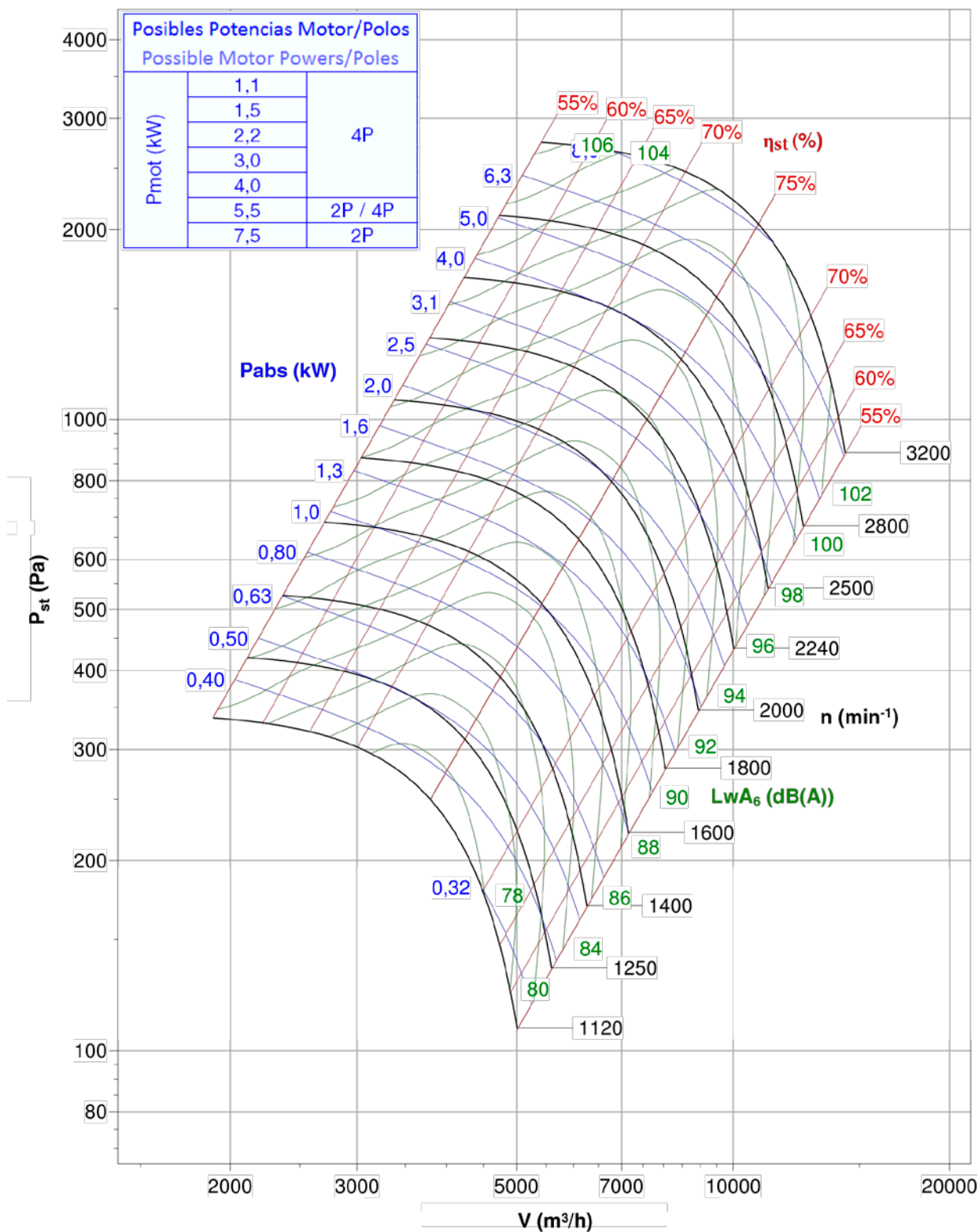


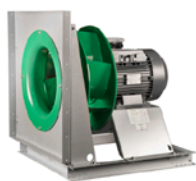




**NTPF 450**

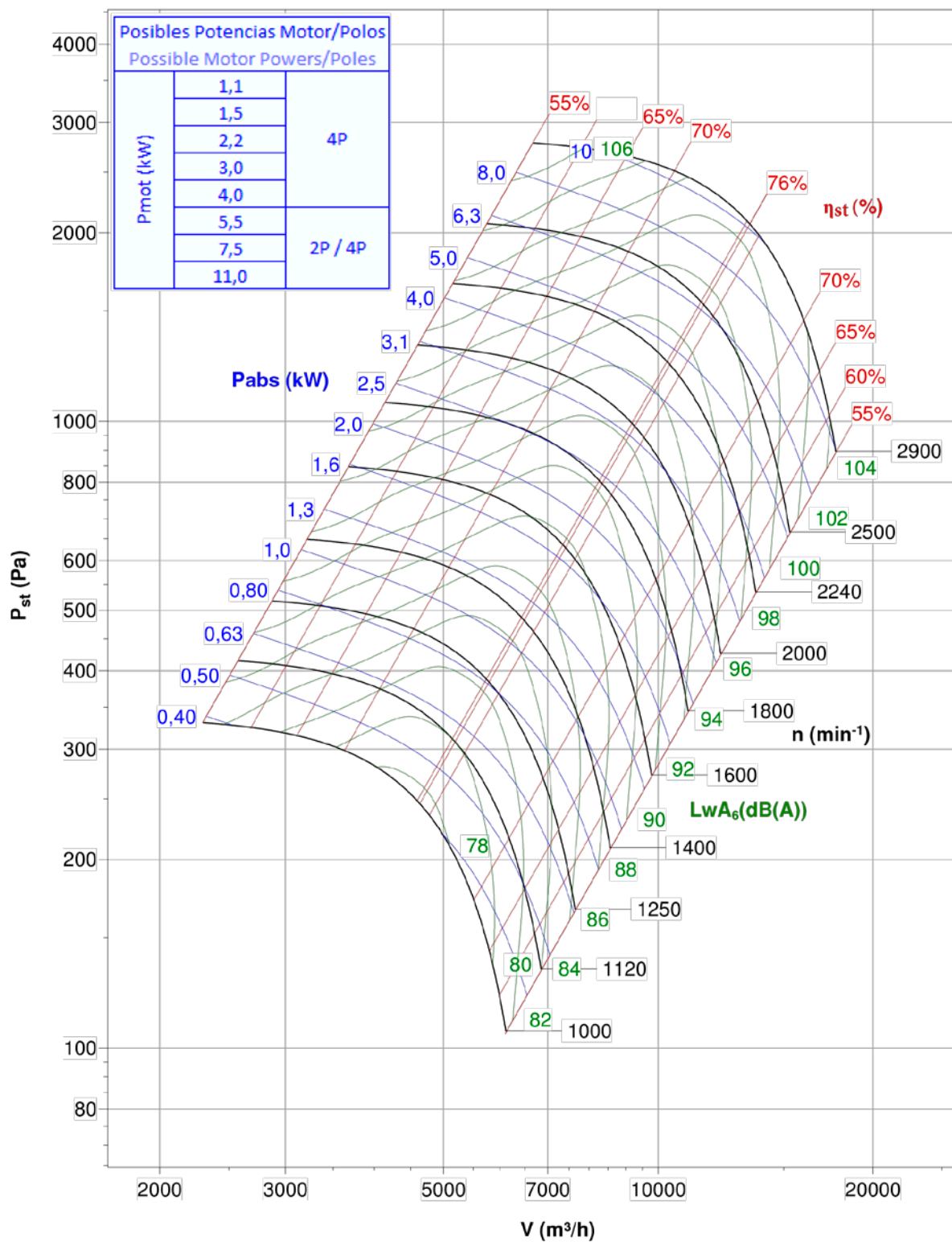
Max RPM del rodete/Max impeller RPM	(min-1)	3200
Max Pot. Nominal motor/Max motor Nominal Power	kW	7,5 / 2P

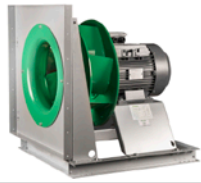




### NTPF 500

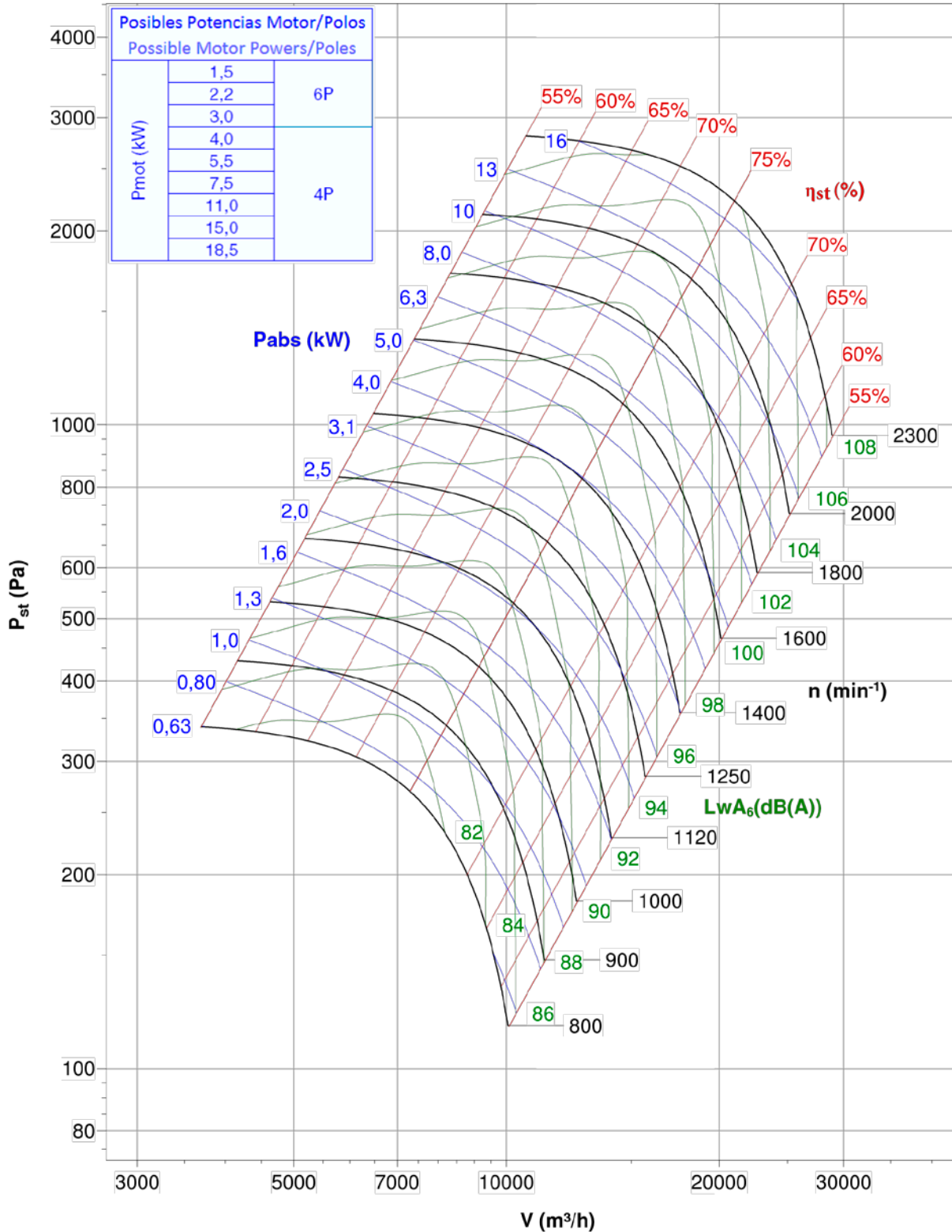
Max RPM del rodete/Max impeller RPM	(min-1)	2900
Max Pot. Nominal motor/Max motor Nominal Power	kW	11,0 / 2/4P

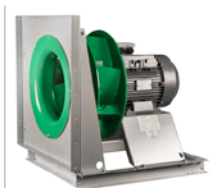




**NTPF 630**

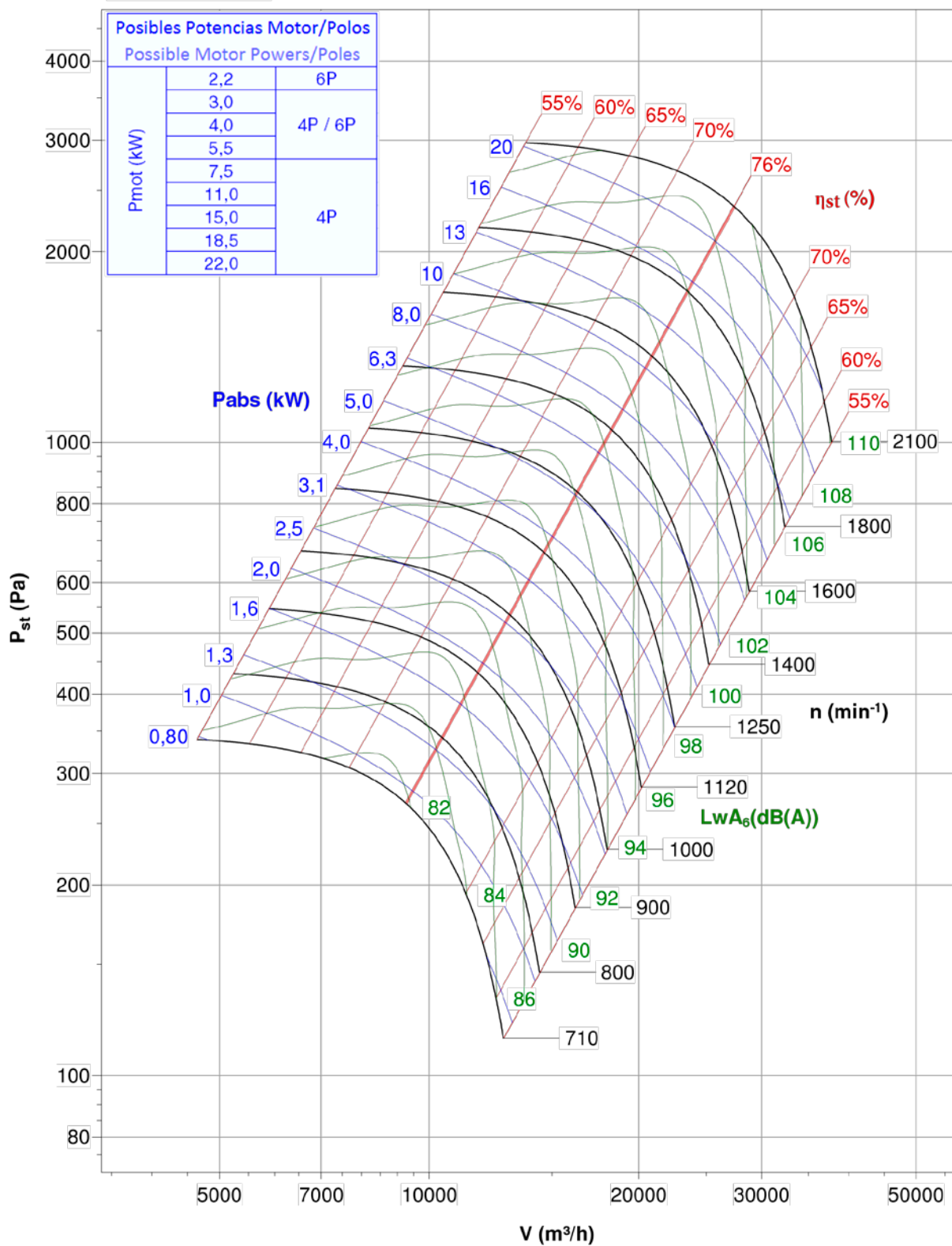
Max RPM del rodete/Max impeller RPM	(min-1)	2300
Max Pot. Nominal motor/Max motor Nominal Power	kW	18,5 / 4P

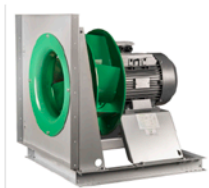




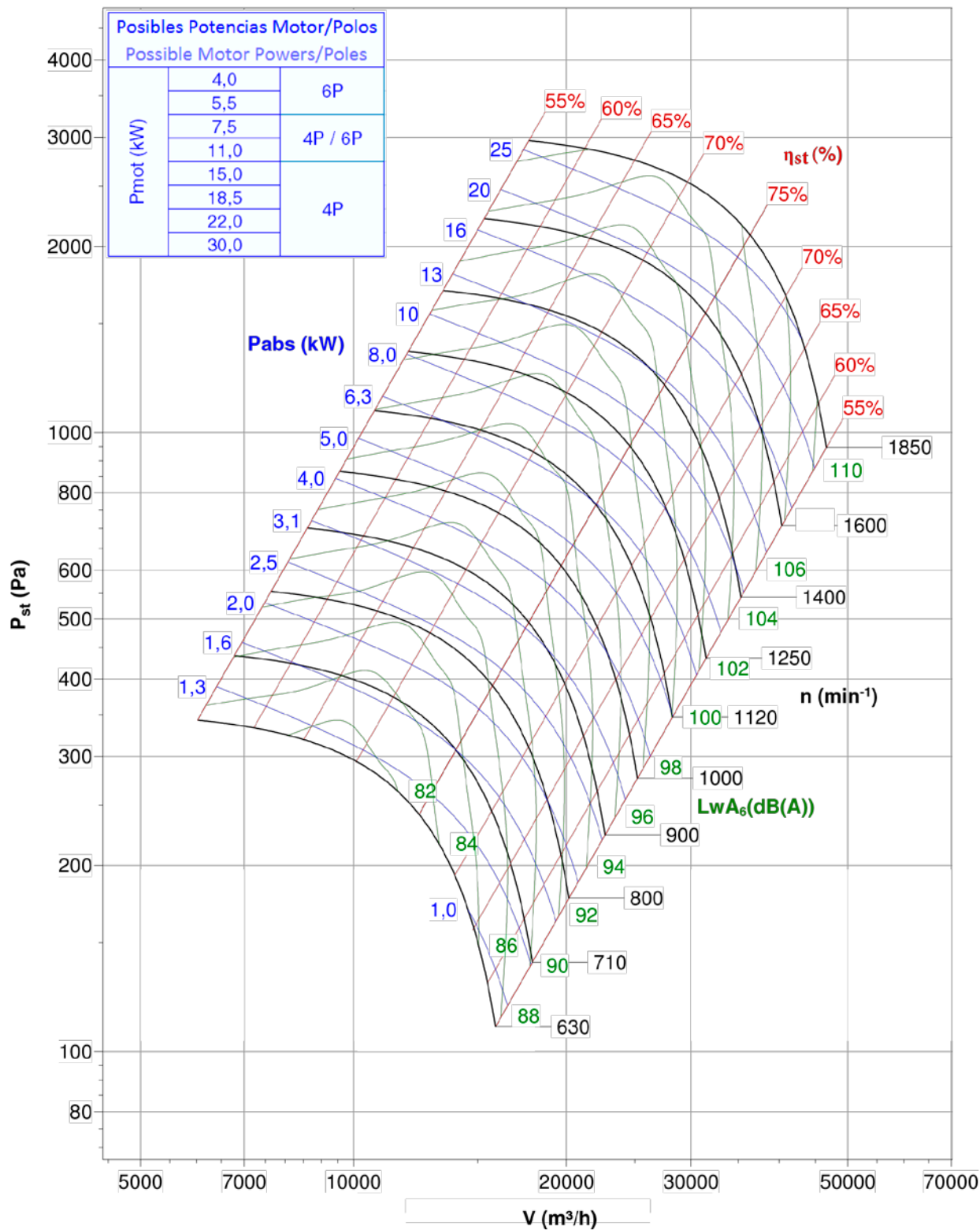
### NTPF 710

Max RPM del rodete/Max impeller RPM	(min-1)	2100
Max Pot. Nominal motor/Max motor Nominal Power	kW	22,0 / 4P





NTPF 800			
Max RPM del rodete/Max impeller RPM	(min-1)	1850	
Max Pot. Nominal motor/Max motor Nominal Power	kW	30,0 / 4P	

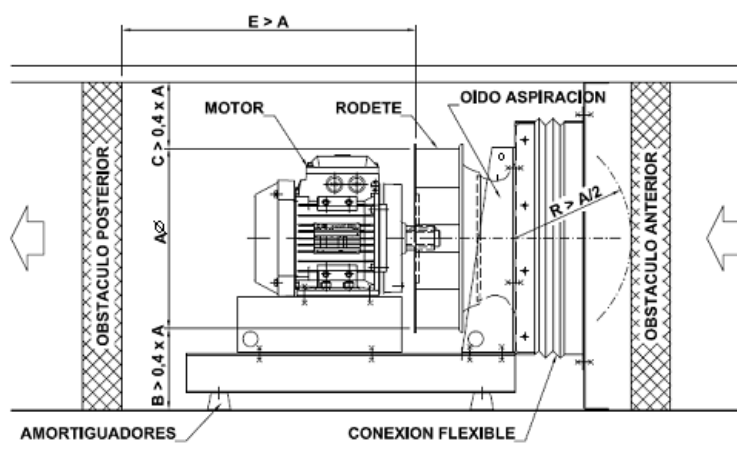




## 7. ASSEMBLY AND INSTALLATION INSTRUCTIONS

### 7.1 Minimum distances to other components according to the impeller diameter.

For a correct plug fan motor-fans NTPF installation inside the plenum unit, the following minimum distances (B; C; E; R), detailed in the figure below, must be taken into account, which are in relation to the impeller diameter (A).



IMPELLER	ØA (mm)
225	256
250	284
280	318
315	360
355	404
400	456
450	506
500	566
550	636
630	716
710	806
800	910

**B and C** = Distance to the plenum sides.

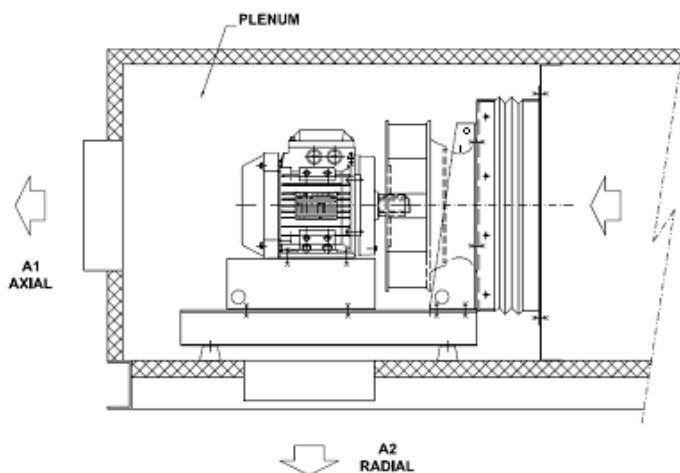
**E** = Distance to air supply side.

**R** = Distance to air intake side.

**Note:** It is recommended that the plenum has a width and height as equal as possible, ie, the cross-section as square as possible.

### 7.2 Additional losses.

If case of the NTPF motor-fan group works as suction fan and remains located in the plenum and hence the outlet cone get established in any of the five possible faces, it involves an additional pressure drop to be added to the previously calculated and required for the whole group.



- For axial ducted discharge (**AXIAL: 1 possible configuration**) the increase of static pressure to consider is:  $\Delta 1 = 2 \times P_{dc}$ .

- For radial ducted discharge (**RADIAL: 4 possible configurations**) the increase of static pressure to consider is:  $\Delta 2 = 1,5 \times P_{dc}$ .

**P<sub>dc</sub>** = dynamic pressure in the supply duct.



Therefore, an additional pressure loss must be considered due to the dynamic pressure. This loss depends both on the air speed through the discharge duct and the position of the own discharge duct. This loss will be added to the static pressure required by the system.

#### **Example:**

Calculation of the static pressure increase for a unit working with a volume flow of  $V = 34.000 \text{ m}^3/\text{h} \Leftrightarrow 9,44 \text{ m}^3/\text{s}$  and a static pressure of  $P_{\text{stat}} = 1920 \text{ Pa}$ . With a density of  $\rho = 1,2 \text{ kg/m}^3$ , a discharge duct area of  $S_f = 1 \text{ m}^2$  and perpendicular to the air flow (RADIAL).

$$P_{\text{dc}} = \frac{1}{2} \times \rho \times (V/A)^2 = \frac{1}{2} \times 1,2 \times (9,44/1)^2 = 53,5 \text{ Pa}$$

$$\Delta 2 = 1,5 \times 53,5 = 80 \text{ Pa.}$$

As a result, the Motor-Fan Group NTPF will be calculated for a flow rate of  $V=34.000 \text{ m}^3/\text{h}$  and a total static pressure of  $\Delta P_{\text{stat}}=1920+80=2.000 \text{ Pa}$ .

### **7.3 OPTIONAL ACCESSORIES AND SPECIAL FEATURES**

#### **Inlet guard grills - RA**

The Inlet guard grills are manufactured to comply with ISO 13857:2008, in relation to the safety in the use of rotating machines.

#### **Antivibration mounts; Spring type or Rubber type - AM y AC**

Antivibration mounts, both spring and rubber type, are supplied optionally together with the necessary screws for the fixing to the chassis (not mounted to the plug fan). Are selected taking into account the weight of the motor-fan group assembly and the motor and fan speed, considering the one with less rpm in the working point (most adverse rpm value).

#### **Flexible Connection - CF.**

The flexible connection manufactured in polyester canvas / PVC can be supplied mounted on the front part of the motor fan-group NTPF or dismounted. It can be fixed to the air intake front part from one side, and by means of a connection flange in the opposite side. They are suitable to work at a maximum temperature of 80°C.

#### **Frequency Converter - VF**

There is a possibility to supply a monobloc assembly Motor-Converter, up to a power of 7,5 kW both for 2 and 4 poles. The equipment includes A class filters for industrial environment, B3 assembly and IP55 protection. In this case, the wiring between the motor and converter is avoided, which reduces the possible problem of electromagnetic interferences.

For any motor power, a HVAC frequency converter can be supplied separately. These equipment's include up to 25 m of shielded motor wire, and A1 class filter for industrial environment up to 7,5 kW; and A2 class filters also for industrial environment, from 11 kW until 90 kW. This case requires an electrical power supply to the converter.

#### **Epoxy Painting - PE**

On request, the structure can be supplied in epoxy painted finish with RAL 9006 colour type.

Likewise, on request they can provide fans with constructive variants as:

- Spark proof execution in accordance with ATEX directive.
- Execution of Vertical Plug Fan (Horizontal impeller and Vertical motor (B5)).

Additional technical information and corresponding delivery date can be given for each particular case.