Golden

箱型多翼式風機

BOX TYPE SIROCCO FAN

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G-02

國祥冷凍機械公司承製

離心型風扇運用于——系統中

當風扇用于一系統中（參考圖1），其在某一特定點運轉時設特性曲線爲P_1，容量V_1及壓力Ht_1，然而由於壓力之落差，基於某種理由，在此系統中的阻力減少，速度保持常數，譬如將氣體開關打開，此時工作點的曲線由P_1轉至P_2（如圖二所示），這系統中的性能曲線依照摩擦阻力特性而變化，因爲一般氣流在管道運動時是亂流的方式，並無一定的方式，我們可以假想壓力落差的發生是因爲產生阻力的結果，依據速度的平方數來變化，而速度與容量又有平方數之關係，因此我們可以明顯的知道，容量與速度有正比之關係，它所代表是一種拋物線曲線的系統，且爲軸之最高峯點，有經驗的設計家在計算確實的壓力落差時，是將一特定點固定在此拋物線上，從那個點曲線可以推定出來，假如容量以V表示，壓力落差以Ht表示

[illegible]公式如下：

$$\frac{Ht_1}{Ht} = \left(\frac{V_1}{V}\right)^2$$

假如在一個氣體壓力落差爲50mm水柱高，其容量2400立方公尺／小時，則容量在3000立方公尺／小時其落差爲

$$\left(\frac{3000}{2400}\right)^2 \times 50 = 78\text{厘米c.d.a.}$$

Fig. 1

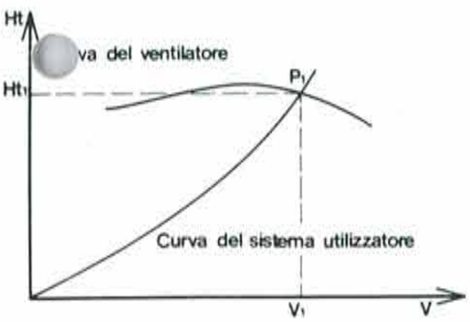
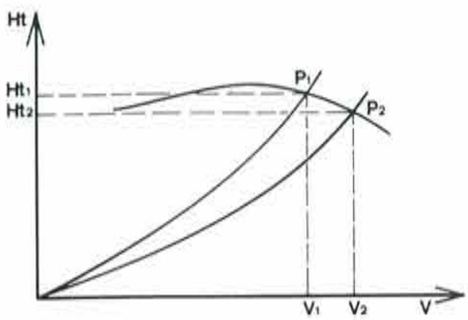


Fig. 2



the insertion of the centrifugal fan into a system

When a fan is inserted into a system fig. 1, it works at a specific point on its characteristic curve "P_1", to which capacity "V_1" and pressure "Ht_1" correspond. Particularly the pressure corresponds exactly with the head loss presented by the system for that capacity. If, for some reason, the resistance in the system decreases, the fan speed remaining constant, for instance owing to the opening of an air lock, the working point "P_1" on the characteristic curve changes to "P_2", as shown Fig. 2. The curves of the system vary, depending of the nature of the resistance for friction. Because the movement in the ducts normally is turbulent, we can assume with sufficient approximation that the head losses due to the resistance, vary with the square of the velocity, that is with the square of the capacity, as obviously the capacity is proportional to the velocity, and consequently the representative curve of the system is a parabolic branch, having the apex in the origin of the axis.

The experienced designer, calculating exactly the head losses, for a certain capacity, fixes a point on such a parabola and from that point the curve can be completely determined as, if "V" is the capacity and "Ht" the head loss, this gives for any other point:

$$\frac{Ht_1}{Ht} = \left(\frac{V_1}{V}\right)^2$$

For instance, in a system where the head loss of the airflow corresponding to the capacity of 2400 m^3/h is equal to 500 Pa, what will the head loss become for a volume of

$$\left(\frac{3000}{2400}\right)^2 \times 500 = 780 \text{ Pa}$$

靜壓、動壓與總壓

如前面所提，對於風壓及測量方法付諸以更多的注意是正確的。

氣流總壓（Ht)是靜壓與動壓的總和，是將壓力計連在管道上分別以平行插入氣流通道中，及與氣流逆向之通道中。

氣流靜壓（Hst)是一種表面積之力量，不管任何速度及方向，以流體壓力計與管道連結之孔測得靜壓，孔的中心線必須與氣流方向垂直，否則由於氣體之亂流而發生動壓，如此所測得之數據將會有偏差。

氣流動壓（Hd)是一種將功能轉變成壓能的表面積的力量。

$$Hd = \tfrac{1}{2}\, r/g\, C^2 (kg/m^2)$$

g= 重力加速度 9.8 米\平方秒

r= 1.22 空氣比重

C= 氣流速度

static, dynamic and total pressure

As stated previously, we think it correct to pay attention to the pressures of the fan (total, static and dynamic) and the methods of measurement.
The **total pressure** (Ht) of a gaseous current is the sum of its static pressure and its dynamic pressure. It is measured with a manometer, connected at a tube which is inserted into the duct with the axis parallel to the flow and the opening in a counter-flow direction.
The **static pressure** (Hst) of a gaseous current is the force per surface area exercised in all directions, irrespective of the direction of the velocity. It is measured with a manometer, connected at a hole. The axis of the hole must be perpendicular to the gas flow to avoid the dynamic pressure effect produced by the gas movement in the duct itself being added. The **dynamic pressure** (Hd) of a gaseous current is the force per surface area equivalent to the transformation of the kinetic energy into pressure energy.

$$Hd = \frac{1}{2}\frac{\gamma}{g}c^2 \;(Kg/m^2)$$

where:
g = acceleration of gravity 9,8 m/s^2
γ = 1.22 specific weight of the air
c = velocity of the air

噪音度標準

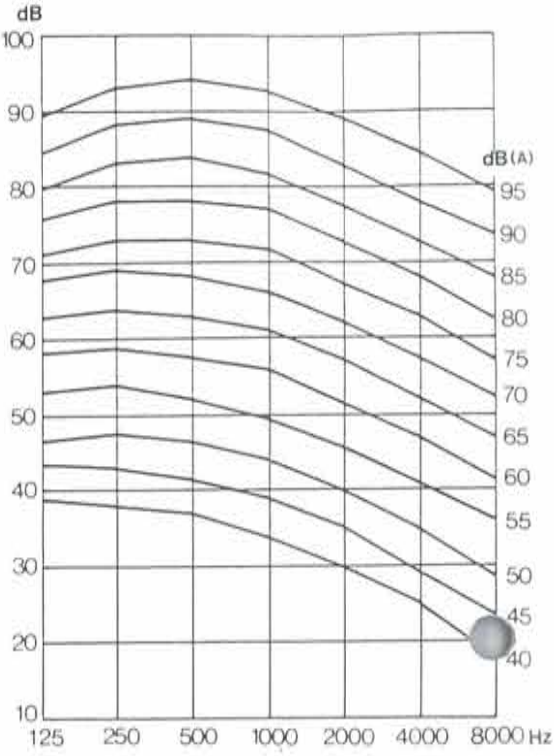
在各種風機的性能圖表裡，除了將速度考慮爲常數，同時也將噪音度訂在標準的範圍，以上述二種情形，在壓力曲線上得知相對的容量與壓力，噪音的測量是將A表以45°方式接近工作物一公尺，衆所皆知，這種將風扇加一噪音度之說明是非常必要的，不管使用那一個噪音錶A.B或C他們都有不同的規定，聲音的頻率傳送此等測試錶後產生一種信號。得知音量之分貝數，對於噪音減弱最適當的解決辦法，我們可待將風扇放入工廠後，來加以說明，因爲由於風管接頭對廠房及整體系統的頻率之影響，我們可得知這種與各種頻率的曲線不同的運動狀況，我們的各種噪音標準的老種頻率曲線圖，以如下圖所示。

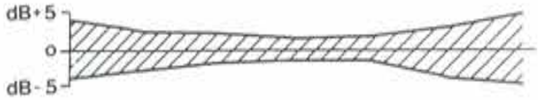
範例：

如果我們選定GBF型12／12之風扇，其轉數爲900轉，壓力水柱高40厘米，容量每小時6000立方公尺，以圖表可得知相對的噪音度，即使用A表時爲75分貝，表示的頻率範圍從125至8000週率，由此可知2000週率時爲66分貝。

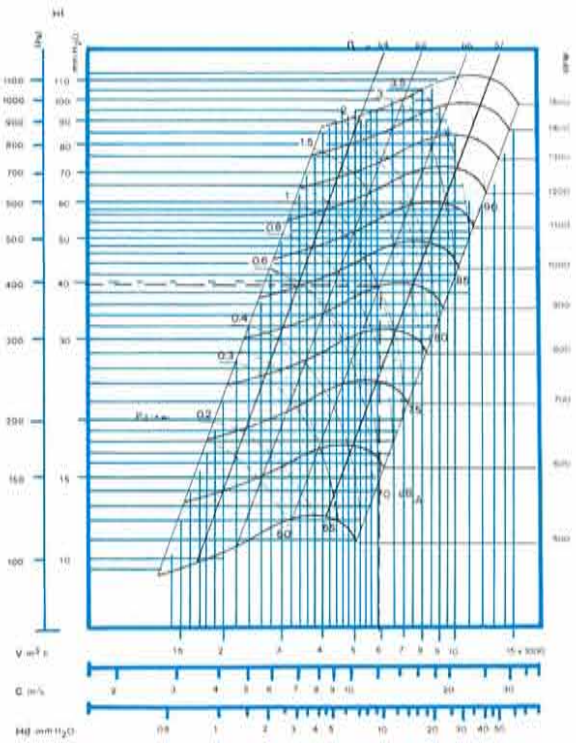
sound level

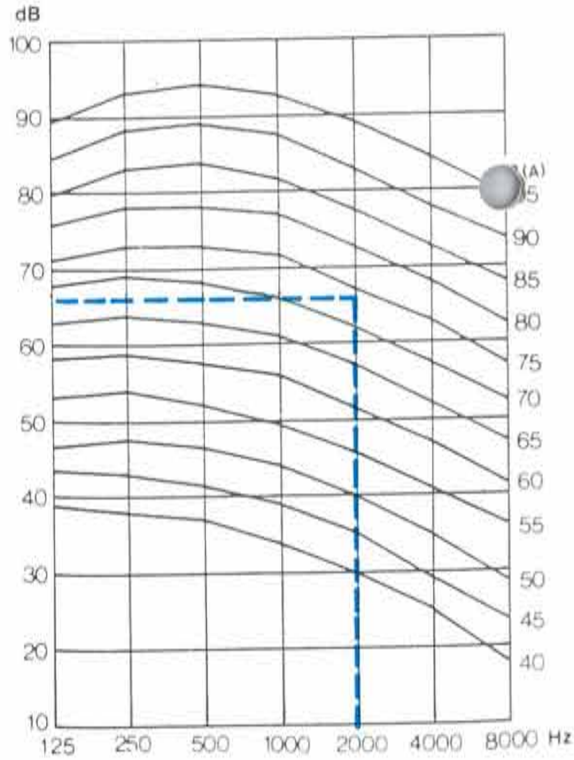
On the performance charts for our blowers, in addition to the pressure curves as a function of volume and power curves as a function of volume at constant rpm's, we have also transcribed curves at constant sound level.
The sound level measurements were performed at one metre from the pressure opening at an angle of 45° using the A scale of the sound meter.
This remark concerning the scale used is necessary because, as is known, the response of a sound meter and hence the reading in decibels at a given sound signal depends on its frequency in accordance with a law which is different according to whether scale A, B or C which the meter is equipped with, is used.
The most appropriate solution to noise damping can be studied after having effectuated the remarks on the working fan inserted in the plant, because owing to the influence of the duct fittings to the reflecting of the plant's room and to the frequency of the entire system, a movement different from the curve of the frequency spectrums will be obtained.
The convertion of the Sound Pressure Level (LPS) to Sound Power Level (LWS) is made by adding 7 dB to the LPS value.
We have shown below the frequency spectra of the sound levels shown on the charts.
Example: suppose that on the basis of the performance charts we select blower GBF 12/12 per 6000 mc/h - 400 Pa - 900 rpm it can be seen from the charts that these data correspond to a sound level of 75 decibels, scale A.
On the 75 decibel curve of the spectrum chart the sound levels in decibels for all frequencies from 125 to 8000 Hz can be read.
Thus, for 2000 Hz we read 66 dB.

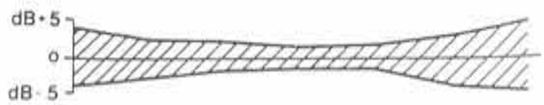




GBF 12-12







承受功率及安置功率

在各種曲線圖的表示裡，均是以風扇軸的承受功率來代表，並冠以千瓦的單位，在實務上一般使用者比較注重馬達的功率，因避免馬達過熱或傳送的損失，除此之外，也由於計算之錯誤及其他可預測之原因，諸如在不同的使用狀況，平均而言，其功率之損失約達15－20百分點，因此通常使用較大功率的馬達。另外爲了選擇最適當的馬達，精確的計算而使得風扇的工作點能處在最有效率的狀態中，是一件非常有益的事，愈接近此一安全因數則確實的工作點亦必愈接近理論計算出來的工作點，如要決定安裝馬達的功率若干，我們可以風扇之承受功率值乘上1.2。

Pm(仟瓦)＝Pa×1.2

Pm＝馬力數

Pa＝風扇軸承受動率

1.2＝安全因數

若要以馬力(Hp)作標準可再乘上1.34

[illegible]是Pm(Hp)＝Pm(kw)×1.34

風扇檢測

從前述各項所提及，風扇之特性曲線的重要性是非常明顯，同時這些曲線也是提供選擇設備的基本參攷資料，因此曲線必須正確，由於此種要求，在試驗室必須裝有最新最先進的各種檢驗設備，此外所採用的試驗室及管制儀器，其標準必爲製造廠商及使用者共同來接受，當然這些使用的儀器，當通過極爲嚴格的檢查標準，同時最好由有技術根底的人員來進行檢測工作。

各種壓力下容量測定的的要點：

將隔膜E插入試驗之風管內，氣流通過之管徑定爲d，從壓力表M上得知靜壓差爲h，稍後分別在上游及下游插入隔膜，則依下列公式可算出體積容量。$\alpha\pi\delta_1/_4\sqrt{2gh/r}$ "α"代表排[illegible]係數。"r"代表空氣比重。從圖上表示的[illegible]A-B-C，爲風量出口，轉成椎形部份及下游部分的壓力，"F"代表爲改變容量的裝置。

absorbed power and installed power

The power curve shown on every diagram represents the absorbed power at the shaft of the fan, measured in kilo watts. Practically the user is interested in the motor power, which is always higher, as overheating of the motor has to be avoided, transmission losses have to be calculated and one has to take precautions against an increased absorption which can occur when – owing to a calculation error or an unforeseen variation in the resistance of the system – the fan will be working at a different point to that designed. These losses are generally 15% ÷ 20%.
Furthermore, it is useful that every designer values the accuracy of his own calculations in the decision of the working point of the fan, in order to choose the most appropriate motor. The nearer to unity the safety factor to be introduced, the nearer the true working point will be to the theoretically calculated one.
To determine the power of the motor to be installed, just multiply the value of the fan absorbed power indicated on the diagram, by 1.2:

Pm (in k.w.) = Pv x 1.2

in which : 經

Pm = motor power

Pv = absorbed power at the fan shaft

1.2 = multiplying factor

To obtain the motor power in H.P. the power in kilo watts is to be multiplied by 1.34:

Pm (H.P.) = Pm (K.w.) x 1.34

fan testing

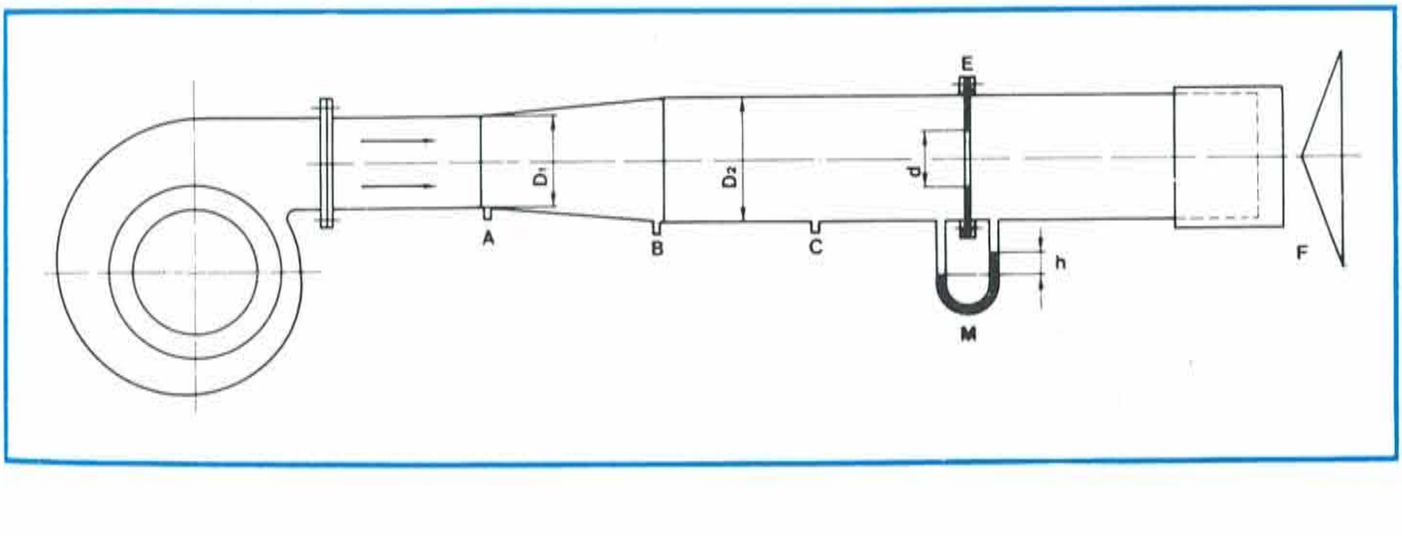
From what has been stated, the importance of the characteristic curves of the fans is evident. Also, because these curves provide the basis for the equipment selection, they have to be correct.
This requires tha availability of a well-equipped testing room, according to the most advanced technical requirements.
Furthermore, the testing room and the control apparatus used have to correspond to the standards accepted by manufacturers and users, that the instruments will be tested rigorously according to the abovementioned standards and last, but not least, that the technical personnel to execute the tests will be highly qualified.

Instruments for capacity measurement under the various pressures

When diaphragm E is inserted into the test duct, having a clear passage diameter "d" and reading the static differential pressure "h" with gauge M, the latter having two branches inserted upstream and downstream of the diaphragm itself, the volumetric capacity is given by.

$$\alpha\,\pi\,\frac{d^2}{4}\sqrt{\frac{2gh}{\gamma}}$$

in which "α" is the discharge coefficient (table UNI 10023) and "γ" is the specific weight of the air.
The letters A-B-C indicate where to measure the pressure at the fan outlet, at the end of the truncated cone union and in duct upstream the diaphragm;
F indicates the device for changing the capacity.



有關離心風扇之公式

一般最適當的風扇選擇，必須根據工作狀況的特性選擇適當的系統，當然它也可以根據基本的原則，按類似系列相同的葉片角度以尺寸成比例的風扇表加以考慮，假定：

V＝容量　立方公尺／小時（M^3／Hr)
Ht＝總壓力（厘米）　水柱高（m／m)
Pa＝負荷功率（KW）
n＝速度 R.P.M.
D＝葉片直徑

以1及2表示兩個風扇，以1既知的數據，得知2的情形，可參攷下列各項公式：

容量$V_2=V_1n_2/n_1$容量與速度成正比
壓力$Ht_2=Ht_1(n_2/n_1)^2$總壓力與速度之平方成正比
負荷功率$Pa_2=Pa(n_2/n_1)^3$負荷功率與速度比之立方成正比

如果不同空氣的密度下（由於受到海拔高度或溫度之影響）

容量$V_1=V_2$，容量不變
負荷功率$Pa_2=Pa_1r_2/r_1$，在容量不變下，負荷功率與空氣密度成正比
總壓力$Ht_2=Ht_1r_2/r_1$，在容量不變下，總壓力與空氣密度成正比

至於在同一情況之風扇可參攷下列公式。

$V_2=V_1(D_2/D_1)^3$容量與葉片直徑立方成正比
$Ht_2=Ht_1(D_2/D_1)^2$，總壓力與葉直經平方成正比
$Pa_2=Pa_1(D_2/D_1)^5$，負荷功率與葉片直徑五次方成正比

負荷功率與風扇葉直徑比之5次方成正比，實際上其使用狀況高於水平面，高度　氣溫及各種變動的使用環境，都會使得結果變化，因此必須加以考慮校正之因數，因此在已知的壓力下，產生穩定容量的風扇，除此校正因數，故一般所謂在"標準"狀況下，風扇應可承受所輸入的功力，而有某一程度的壓力，然而實際工作上，所接受的功力較低，因此相對的，標準狀況下所發生的功力還需乘上校正因數。

例子：

如果一個風扇壓力在35mm水柱高約產生每小時6000立方公尺的風量（溫度66°C，海拔高度1000公尺）按表所示其校正因數爲0.77，因此我們要選定在標準壓力下而能產生6000立方公尺風量時即爲35：0.77＝45mm水柱高，然而總壓力在實際工作狀況時所接受的壓力還必須乘上0.77的變動因素。

在這裡我們通常所言在高溫狀況下使用但亦不排除在低溫狀況下使用（一般在開始起動時）馬達必須加以適當選擇，同時加以額外安全馬力以避免發生過熱的現象。

formulas relative to the centrifugal fans

Generally for optimum fan selection, it is necessary to vary the working characteristics to suit the system. It is possible by applying the essential rules of fans and the homothety law, based on which the fans of the same "series" or with the same blade angle and all the geometric dimensions varying in the same proportions, are also proportional as to their working characteristics.

We assume:
V = capacity in m^3/h
Ht = total pressure in Pa (N/m^2)
Pv = absorbed power in Kw
n = speed in r.p.m.
D = diameter of impeller in mm.

Indicating by 1 the fan taken into consideration and by 2 the fan of which the parameter will be varied.

Referring to a fan for which only the speed has to be changed

$$V_2 = V_1 \frac{n_2}{n_1}$$

The capacity is proportional to the speed.

$$Ht_2 = Ht_1 \left(\frac{n_2}{n_1}\right)^2$$

The total pressure is proportional to the square of the speed, (and so is the static and dynamic pressure).

$$Pv_2 = Pv_1 \left(\frac{n_2}{n_1}\right)^3$$

The absorbed power is proportional to the cube of the speed. Referring to a fan with differing air density (as an effect on the height above sea-level or as a temperature effect):

$$V_1 = V_2$$

The capacity remains unchanged.

$$Pv_2 = Pv_1 \frac{\gamma_2}{\gamma_1}$$

The absorbed power is proportional to the density, capacity remaining unchanged

$$Ht_2 = Ht_1 \frac{\gamma_2}{\gamma_1}$$

The total pressure is proportional to the density, capacity remaining unchanged (and so is the static and dynamic pressure)

Referring to a series of homothetic fans:

$$V_2 = V_1 \left(\frac{D_2}{D_1}\right)^3$$

The capacity is proportional to the cube of the impeller diameter.

$$Ht_2 = Ht_1 \left(\frac{D_2}{D_1}\right)^2$$

The pressure is proportional to the square of the impeller diameter.

$$Pv_2 = Pv_1 \left(\frac{D_2}{D_1}\right)^5$$

The absorbed power is proportional to the 5th power of the impeller diameter. Practically, when the height above sea-level, or the air temperature, or even both parameters vary, the table of correction factors has to be considered (under the unit). In this way a fan is used to provide a stabilised capacity with the required pressure, furthermore divided by the correction factor.

In "standard" circumstances a fan will absorb a given power and will have a certain total pressure, whereas in real working conditions it will absorb a lower power, which will correspond to the "standard" one multiplied by the correction factor; so its total pressure will correspond to the standard figure times that factor.

Example: A fan provides 6000 m^3/h with a pressure of 350 Pa water column, air temperature 66°C in a site 1000 m. above sea-level. The correction factor shown on the table is 0.77.

Now we have to choose a fan that gives 6000 m^3/h with a pressure of 350 : 0.77 = 450 Pa water column.

However, in effective working conditions the total pressure and consequently the absorbed power have to be multiplied by 0.77.

Where we are talking about a fan working regularly at a high temperature, but which must also work at cold (which happens regularly at the start), a motor should be selected with adequate power to cover the increased absorption, in order to avoid overheating.

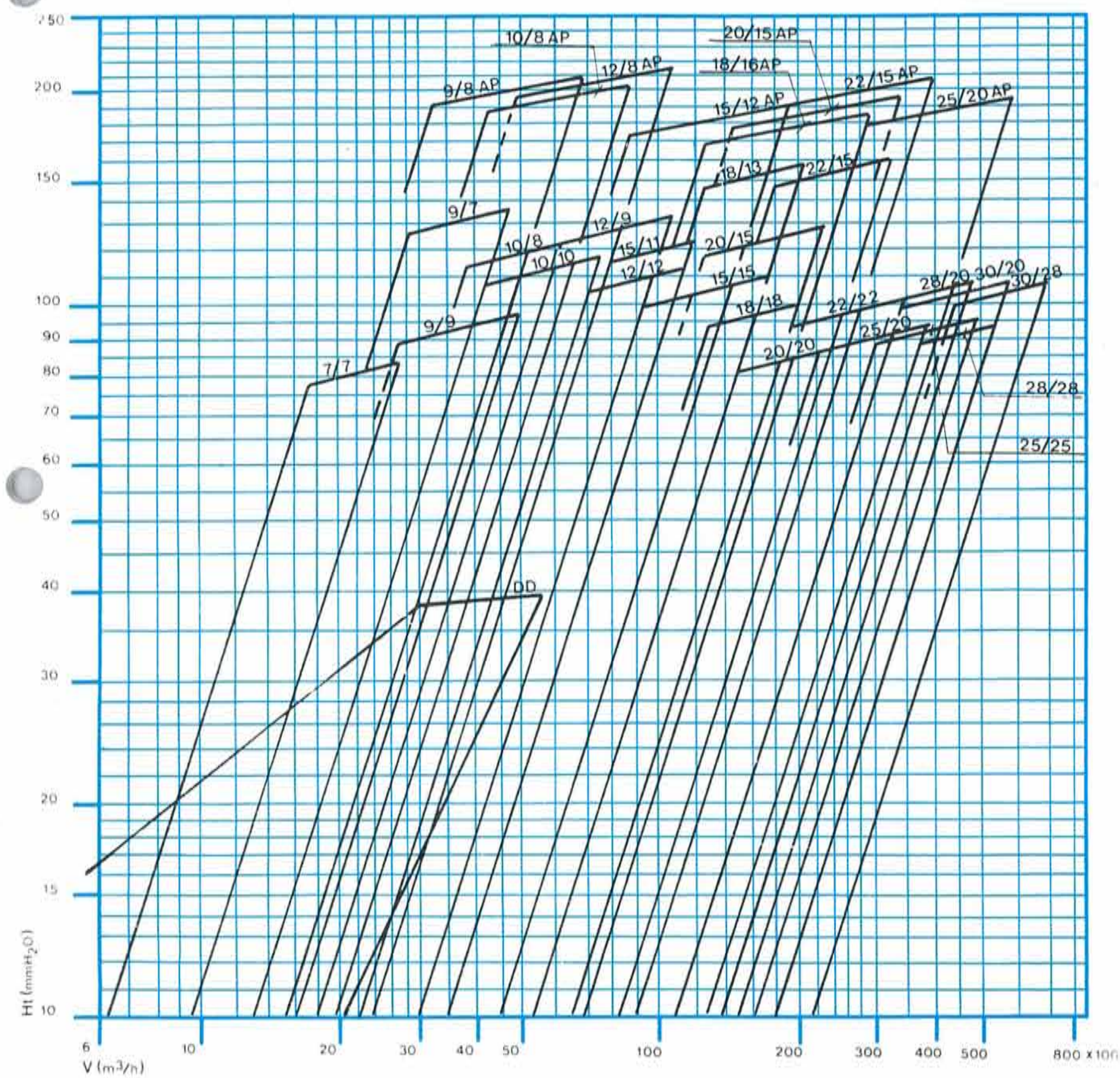
Air Temperature	Height in meters above sealevel						
	0	333	666	1000	1333	1666	2000
	Barometric pressure in mm. Hg.						
°C	760	735	708	682	657	632	609
21	1,000	0,964	0,930	0,896	0,864	0,832	0,801
38	0,946	0,912	0,880	0,848	0,818	0,787	0,758
66	0,869	0,838	0,808	0,770	0,751	0,723	0,696
93	0,803	0,774	0,747	0,720	0,694	0,668	0,643
121	0,747	0,720	0,694	0,669	0,645	0,622	0,598
148	0,697	0,672	0,648	0,624	0,604	0,580	0,558
177	0,654	0,631	0,608	0,586	0,565	0,544	0,524
204	0,616	0,594	0,573	0,552	0,532	0,513	0,493
232	0,582	0,561	0,542	0,522	0,503	0,484	0,466

風扇之選擇

在如下表所表示的，爲各種型式之大概性能曲線圖，對於各種性能正確之數據及工作使用狀況容後討論，風扇之性能係依照在清潔空氣爲基礎，參照表7，如果一個風扇的使用狀況未能依照表列，談及任何性能之保證及使用壽命都沒有意義，我們銷售工程師將很樂意告訴您如何正確選用風機，在更複雜的狀況時候，如果對於風扇的選用有困難，歡迎客戶使用我們特殊的人員、檢驗室來鑑定並解決你實際或理論性的問題。

fan choice

The diagrams shown below indicate approximately the performance of the different models.
Exact data on performances and working conditions are shown by the curve of each fan, given later in this study.
The fan function is based on the operation with clean air, within the limits indicated by Tables Nr. 12-13. If the working conditions of a fan do not meet with those required in this Table, any guarantee on performance and life of the fan will automatically become void.
Our technical-commercial staff will be pleased to give any requested clarification and indication concerning the choice of a fan.
For more complex cases, where it is difficult to decide if in a particular application a certain fan choice is right, the customer can make use of our specialised personnel and the modern equipment of our testing and inspection laboratory to verify and resolve the problem, not just on a theoretical but also on a practical basis.



結構特性 Construction particulars

捲型箱

捲型板可使用光亮鋼板或鍍鋅鋼板來製造，而後者即鍍鋅鋼板則爲一般生產者所樂用，在邊板之製作則依空氣進入方式爲首先考慮，將鉄板裁斷後再予以補強之沖床加工，至於在邊板上之蓋架亦使用同樣的材料並以點焊的方式與邊板相連，氣動型之阻流板是固定在捲型箱之出氣口，藉以限制渦流之形成，在大型捲型箱裝有以鋁製之進氣環，此進氣環以不用其他材料特殊銲條直接與邊板連結起來，如果不與機架相固定之捲型箱，其轉軸之軸承則固定在使用一種堅固的中心臂，此臂之上面需盡可能減少截面，期以減低氣流之摩擦損失。

在邊板上所預先打成之孔，係要將捲型箱以兩支固定脚固定在邊板上，及固定馬達支座用，其孔共有12個，4個供捲型箱固定脚用，8個供馬達固定座用。

SCROLL

For the scroll manufacture hot dip galvanised (Sendzimir) sheet steel is used. The side plates of an aero-dynamic profile to suit the corresponding air inlet size, are sheared in a single piece pressed and have ribs formed in one operation to give the necessary rigidity at critical points. The wrap, made of the same material, is fixed to the side plates by means of electric spot welding.

An aero-dynamically shaped baffle is fitted in the scroll outlet to limit the formation of whirls in the cutflow; the largest size scrolls have the air inlet rings made of aluminium, welded directly on the side plates, using special electrodes and without the use of additional material.

If the scroll is mounted without a frame the shaft bearings are fixed to the side plates using a rigid system of self-centring arms with a minimal frontal section to reduce the airflow friction losses.

A series of holes previously formed in the side plates, enable the scroll to be fitted with two mounting feet and a motor mounting bracket. 4 positions can be selected for the feet and 8 for the motor mounting bracket.

葉 片

葉片之構造是前曲形葉片，經過特殊成型，藉以得到最高效率及低噪音之效果。

從7吋到18吋之風扇機種，葉片之轉角係以抽拉方式製造，其操作係以自動加工方式藉以得到起碼的堅固性，及精確性，但絕不可發生打斷，其材料可使用平鋼板或鍍鋅鋼板。然而在20吋以上直徑葉片，葉片經四次鉚釘方式將其固定在中心板上及進氣環上，期以得到強固的結合及得到最大的輸出功能，這些以鍍鋅鋼板製成的大輪子，與經特殊調整穩定桿相固定獲得最大之堅固性，準確中心度並防止突發的變形，這些穩定桿在我們工廠，經由專門人員施以靜態及動態平衡測試後均加有註記。

在本公司風扇產品中的特點，我們願強調如下：

- 葉片爲連續製造中間沒有接口或縫隙
- 進氣口無旋轉臂
- 雙氣動型之中心板葉片
- 葉片完全由冷作完成
- 不加焊接，沒有斷裂之可能
- 葉片以三點方式固定，不彎曲

IMPELLERS

The impellers are constructed with forward-curved blades, specially profiled in order to obtain a maximum efficiency and low noise level.

From 7" up to 18" models, the blades have been spun on both peripheries; this operation is carried out by a fully automatic process that ensures the necessary rigidity and accuracy, but does not cause stresses.

The material used is galvanised sheet steel (Sendzimir). For impellers of 20" diameter or more, the blades are fixed to the centre-plate and to the inlet rings by means of quadruple riveting giving a more robust joint for continuous use at maximum output.

These larger diameter wheels, made of galvanised sheet steel, are also fitted with special adjustable stay rods giving maximum rigidity and concentricity and preventing accidental deformation. These stay rods are calibrated in our works during static and dynamic balancing operations by our specially trained staff, and we advise against any further adjustment by incompetent staff.

Among the characteristic of the NICOTRA fans we would emphasise:

- continuous blades without a central break.
- absence of rotating arms on the air inlets.
- double impeller centre-plate of aero-dynamic profile.
- impellers completely cold-assembled.
- absence of welding and, consequently, no possibility of fractures.
- blades fixed rigidly at three points preventing flexing.

機 架

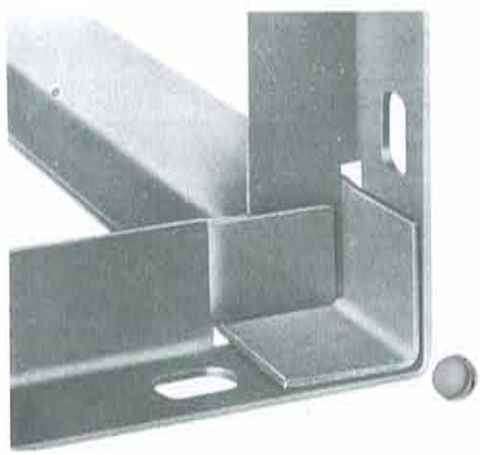
機架係由鍍鋅角鉄與方體籠相互連結構成，機架各部份的組件，均經過剪切，彎曲，焊接等工作，以半自動特製模板之製作方法，乃是期以得到更精確及更堅固之結構，在機架之每一邊均留有4個孔，俾易於固定安裝，至於那些將軸承裝置在其本身機架裡頭的風扇，是爲了避免由於在飛輪轉動或因皮帶牽伸而發生捲曲之情形。

FRAME

This consists of galvanized angular bars, joined in a cube-form cage.

The components for the frame are sheared, bent and welded in a way to obtain the necessary accurate dimensions and maximum rigidity, this in a cycle of semi-automatic operations with the aid of special templates.

Each side of the frame has 4 holes for easy fixing. In those fans having a frame the bearing mountings are fixed inside the frame itself in order to free the scroll completely from any reactions on the supports due to the wheel rotation or belt tensions.



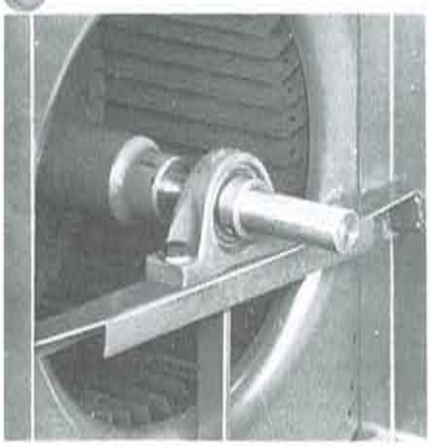
結構特性 Construction particulars

軸　承

除了風扇以外，所有的軸承乃是使用球狀軸承，比等軸爲安全密閉，並事先加以潤滑油，而與軸自行作密切之配合的軸承，在18" 以下的風扇其軸承可裝置在橡皮墊上，而較大的風扇組則裝置在鑄鐵的支架上，所有本公司產製風扇的軸承均採用最高品質，且低噪音的軸承，一般在常負載的狀況下，可使用本身就具有潤滑油之軸承，但在大型的風扇，也就是軸承固定在鑄鐵支架上的軸承，則必須加設加油孔，軸承之裝卸均應請專門受過訓練的人員來處理，並依照軸承公司所提供組合要領來施行。

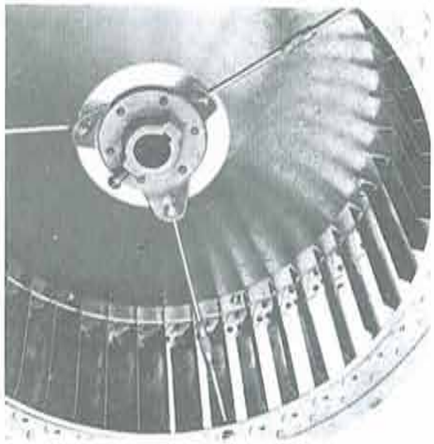
BEARING

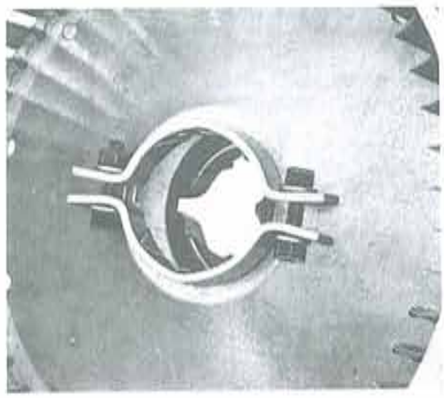
With the exclusion of the electro-fans, all units have ball race type shaft bearings, which are hermetically sealed, pre-greased and self-aligning. Up to 18" fan size these are mounted on rubber and for the larger units they are mounted on cast iron supports.
All bearings used on the fans are of top quality and are selected for a low noise level. The grease reserve of the pre-packed bearings allows for service free use under normal duties, but those mounted on cast iron supports are equipped with the grease point.
The dismantling of the bearings should be carried out only by trained personnel, following the specific assembly directions supplied on demand by the bearing manufacturer



轂

葉片與主軸之聯結係靠法蘭轂來結合，這些法蘭轂不管大小如何，係用鍛造方式製成，以適於長期運轉，鉚釘方式或滾珠方式將轂與葉片相互結合
至於轂與主軸聯結則將軸銑出鍵槽打入鍵使得轂與軸緊緊結合，但主軸太大或使用中空軸時，與葉片之連結係採用特殊之套環來連接，以得到較好之連結，除此之外這種方式還可以避免較重的鋼轂使用，但這種方式在大量生產並不理想。





HUBS

The impeller-shaft connection is ensured by a flanged hub, manufactured in drop-forged steel both for the small diameters and for the larger models. The hub is fixed to the impeller by a riveted joint or by a knurled beading, a method which guarantees a secure connection over a long period of use.
The hub-to-shaft connection is made by a full length key and keyway. When the shaft exceeds a certain diameter and in particular when it is hollow, the connection to the impeller is made by the use of special collars ensuring a sound connection and making it possible to avoid the heavier steel hubs, which would be unadvisable due to the large mass.

主　軸

材料選用C40碳鋼以自動方式加工，在軸之端點銑出平式鍵，防銹處理。
至於軸之尺寸及公差，參看附表，每一根主軸在加工完成之前後，均需加以對公差精密度加以檢測，如果使用中空軸，則對防銹處理，必須愼重，是否內部之噴漆厚度適當同時選用最新全自動加工機器是非常必要的，如此方能確保在大量生產狀況下的品質。

SHAFTS

These are made of C-40 steel by an automatic process which positions and cuts the keyways and the flats at the end of the shafts, which are then being coated.
For shaft dimensions and tolerances, see Table.
Each shaft is individually inspected before and after the galvanising process to check the accuracy of tolerances.
Where hollow shafts are used, they are guaranteed rust-proof, a special paint of suitable thickness being used.
The use of the most modern machines and their automatic control to carry out the various phases of the working cycle, guarantee a constant quality in the production of large batches.

安 裝

風扇經檢試後即等待加以安裝，在 Simplex（簡單型），可加一對底座支架，風扇機體可固定在平的底座上， 以固定螺絲及防震橡皮固定，可確保風扇之穩定性，至於Cubik及TITAN兩型，由於可用他們本身機架固定，可將1至3個風扇機體同時固定，只需有適當安裝孔即可，不需要任何附件，一般而言馬達在0.75KW以下可以裝設在機架上，馬達2.6KW以上時，可另行加裝一分離架根據安裝要領固定，使馬達與風扇之連結強固，而達到最大之馬力即可。

馬達之飛輪與風扇軸之中心位置相當重要，不可偏心，使得馬力喪失，對於風扇軸與馬達出力軸相互垂直之安裝方法本公司將隨時接受用戶之洽詢，在裝置馬達時，必須鑑別出電源相數，迴轉數是否正確，同時接地是否良好。

MOUNTING

Every fan is supplied tested and ready for mounting.
For the AT-SIMPLEX Range a pair of base-supports can be added, which allows the casing to be fixed on a flat base, giving four possible discharge outlet positions. The base plates are supplied complete with fixing screws and anti-vibration rubbers.
The AT-CUBIK and AT-TITAN Fan Range, fixed singly or in pairs or triplicate, do not need any accessories, as they can be fixed using the existing frame, which is equipped with appropriate holes allowing **four air discharge positions.**
The electric motor can be mounted on the casing of the fan up to a power of 0,75 Kw, on it's frame up to 2,6 Kw, or on a separate frame, but only if rigidity coupled to the fan, up to a maximum power, as indicated in the instructions.
The importance of aligning the motor pulley with the fan shaft pulley, must be emphasised, maintaining the belt at right angles to the fan shaft, to avoid side loading.
We would advise against mountig any type of fan with the shaft in the vertical axis.
The electro-fans are equipped with a terminal board for mains connection. Before connection, verify the correct phase sequence, the fan rotation, and ensure a good earthing.

表面處理

所有風扇均能完全以鍍鋅鋼板處理，在加工組合之前以整浸鍍鋅方式或以烤漆，這種表面處理方式己爲人們所熟知，至於以烤漆方式處理者我們願將其略予敍述：

一首先將鋼板以達到最優良長期防銹之效果。

一表面塗裝，均勻劃一，強度易於控制。

一在邊或角之部份，由於被烤漆覆蓋，可減少鋒利之情形。同時使得在運轉時可以更無噪音之發生

一由於烤爐之溫度在200°C，金屬只在這種溫度經過30分鐘後可以增加其強度亦使油漆能以最大的可能附着於鉄板上。

FINISH

All fans can be made entirely of galvanized steel sheet (Sendzimir), that is hot dip zinc coated before machining, or entirely of electrophoretically painted steel sheet.
The advantages of galvanized steel being well known, we will describe those offered by the electrophoretical coating:

- previous treatment of the sheet by washing with a jet of phosphatizing water. Excellent long lasting protection against corrosion.
- total covering of any part, including the less accessible ones with a uniform coat of paint rigidly controlled.
- paint deposit in a way to lessen the sharpness of edges and corners, allowing the unit to run more quietly.
- baking in a furnace at 200°C for 30 minutes, giving strong surface hardening and maximum anchorage of the paint to the sheet.

管制與測試

爲維持大量生產出來的成品品質，對於在製程中及完成品有必要加以嚴格檢測，以技術性而言，風扇算是一種簡單的機器，然而在這種測試所需的技術人員及用心程度，確很令人吃驚，確保操作性能及運轉壽命，是品質上最基本的要求，一般在生產過程中有多種不同的檢查手續必需實施，區分如下：

(1)原物料品質及尺寸檢測（如鋼板、型鋼、鋁條、馬達及軸承）。
(2)半成品之樣品品管（如軸，葉片，支座，轂）。
(3)葉片之動態及靜態平衡測試。
(4)不定期對加工工具之效率測試。
(5)完成裝配工作後對每一葉片之品管。
(6)對於風扇直接與馬達聯結者，則對其聯結效果加以測試。
(7)在生產線上任意選取樣品實施破壞測試（包括浸蝕、壽命、負荷等）。
(8)在不同運轉條件下做不定期的性能測試。

CONTROLS AND TESTS

To maintain the necessary quality level in continous production of thousands of pieces a week, the introduction and maintenance of severe tests is required, both during production itself and on the finished product.
Technically and technologically the fan may be a very simple machine, but one is surprised by the intensive care and the employment of skills necessary for these tests and inspections, in order to guarantee performance and life, which are the basic qualities of these products.
During production, 8 different types of test inspections are carried out, divided as follow:
1) - Quality and dimension controls on the raw materials when these are not of our own production, (sheet steel, profiles, aluminium strips, motors, bearings etc.).
2) - Quality controls on sample units on the semi-finished products before storing, (shafts, blades, supports, hubs, etc.).
3) - Static and dynamic balancing of all the produced impellers.
4) - Periodic controls on the efficiency of the tools after a pre-established number of working hours.
5) - Quality controls on every impeller at the end of the assembly line.
6) - Tests on the working fan for the types directly coupled to an electric motor.
7) - Destruction tests, to include corrosion, life and overload, on the samples selected from the production line.
8) - Periodical checks of the true performances in various working conditions in the "testing tunnel".
The importance of the checks reserved for all our produced impellers is duly underlined:
After an initial inspection of the hub fixing, every impeller is trued in respect of its own axis with the aid of a positively constructed template, and after this it passes on to the actual balancing, carried out by various well equipped machines, (the most suitable is chosen, on the basis of the fan weight).
All fans are balanced in accordance with ISO Norms 1940 Standard.

example of characteristics curve-reading

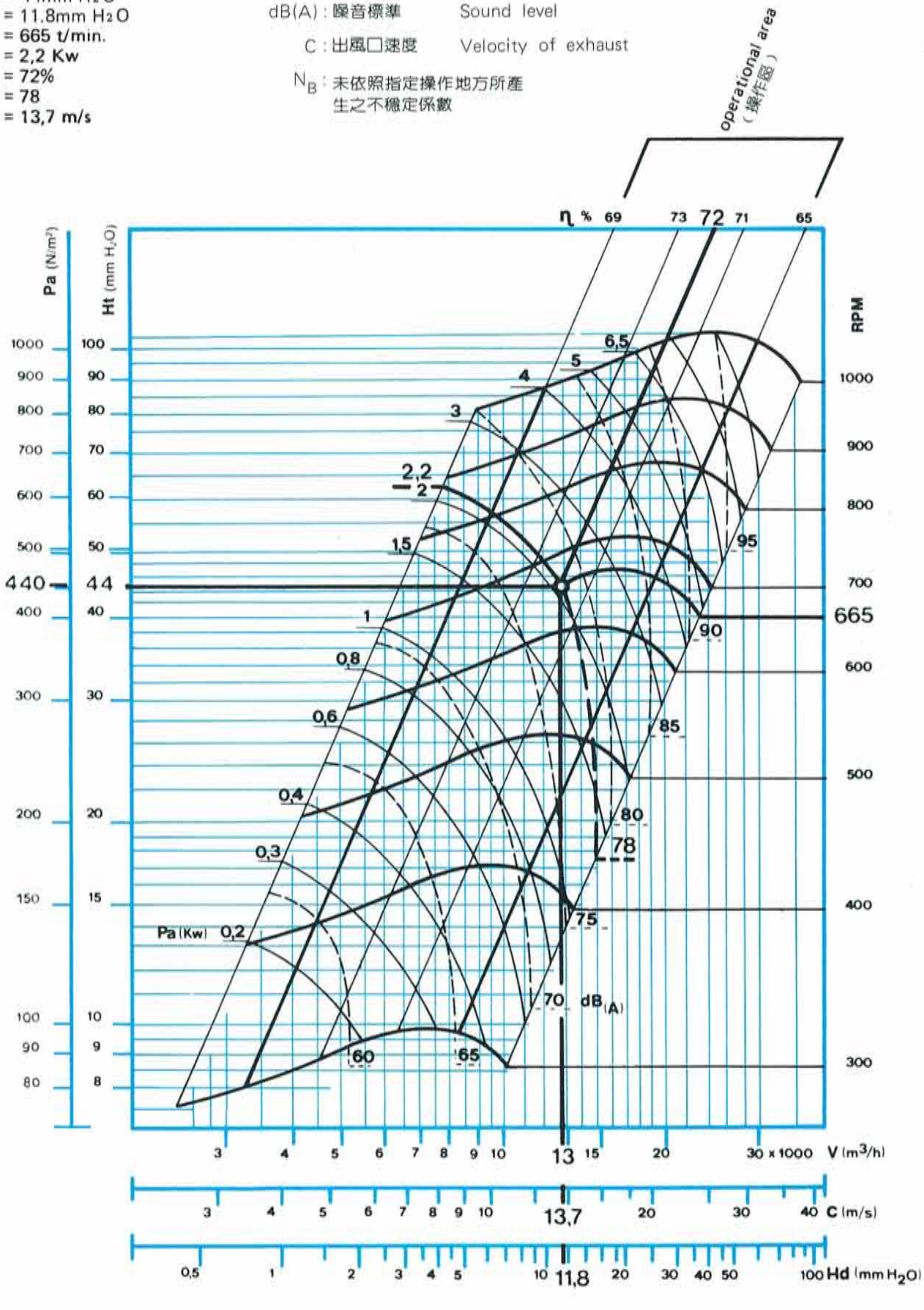
特性曲線閱讀範例

Ht：壓力總和		Total pressure
V：容量		Capacity
Hd：動壓		Dynamic pressure
n：葉片轉數		r.p.m. of the impeller
η：效率		Efficiency
Pa：負荷馬力		Absorbed power
dB(A)：噪音標準		Sound level
C：出風口速度		Velocity of exhaust

N_B：未依照指定操作地方所產生之不穩定係數

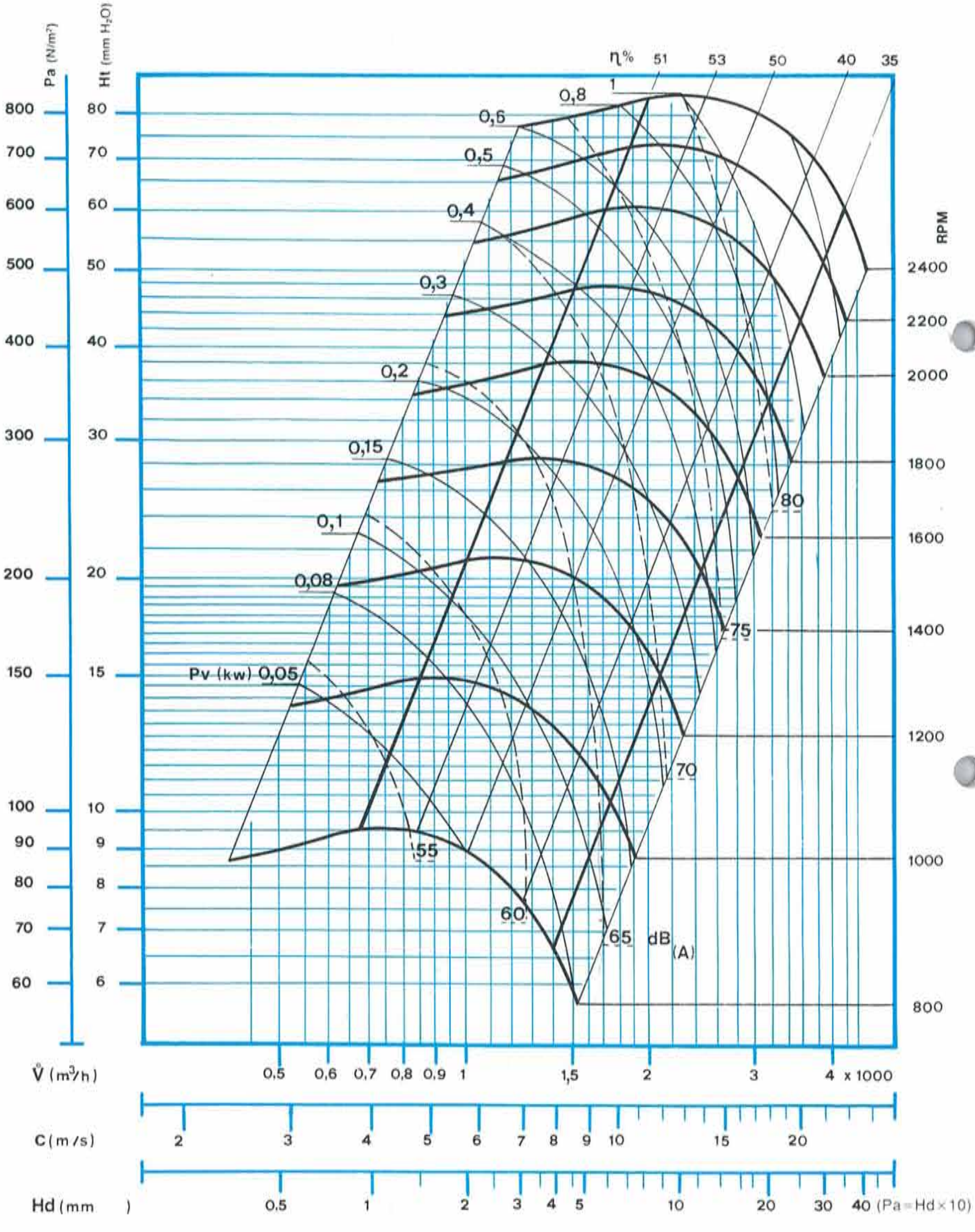
NB.
Outside the suggested operational area instability factors in the fan performance can appear.

V	= 13.000 m³/h
Ht	= 44mm H_2O
Hd	= 11.8mm H_2O
n	= 665 t/min.
Pa	= 2,2 Kw
η	= 72%
dB(A)	= 78
c	= 13,7 m/s



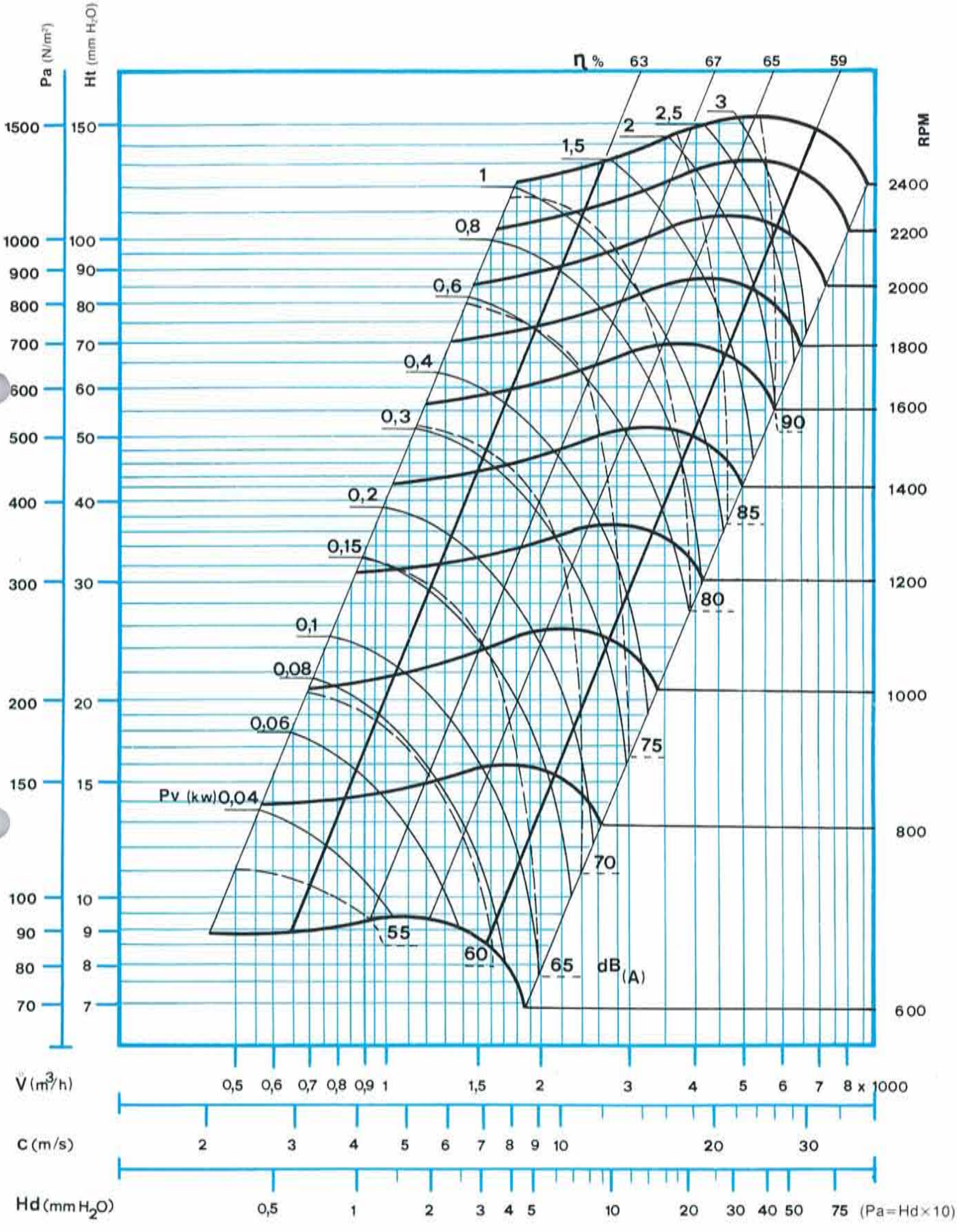
Golden

GBF-180

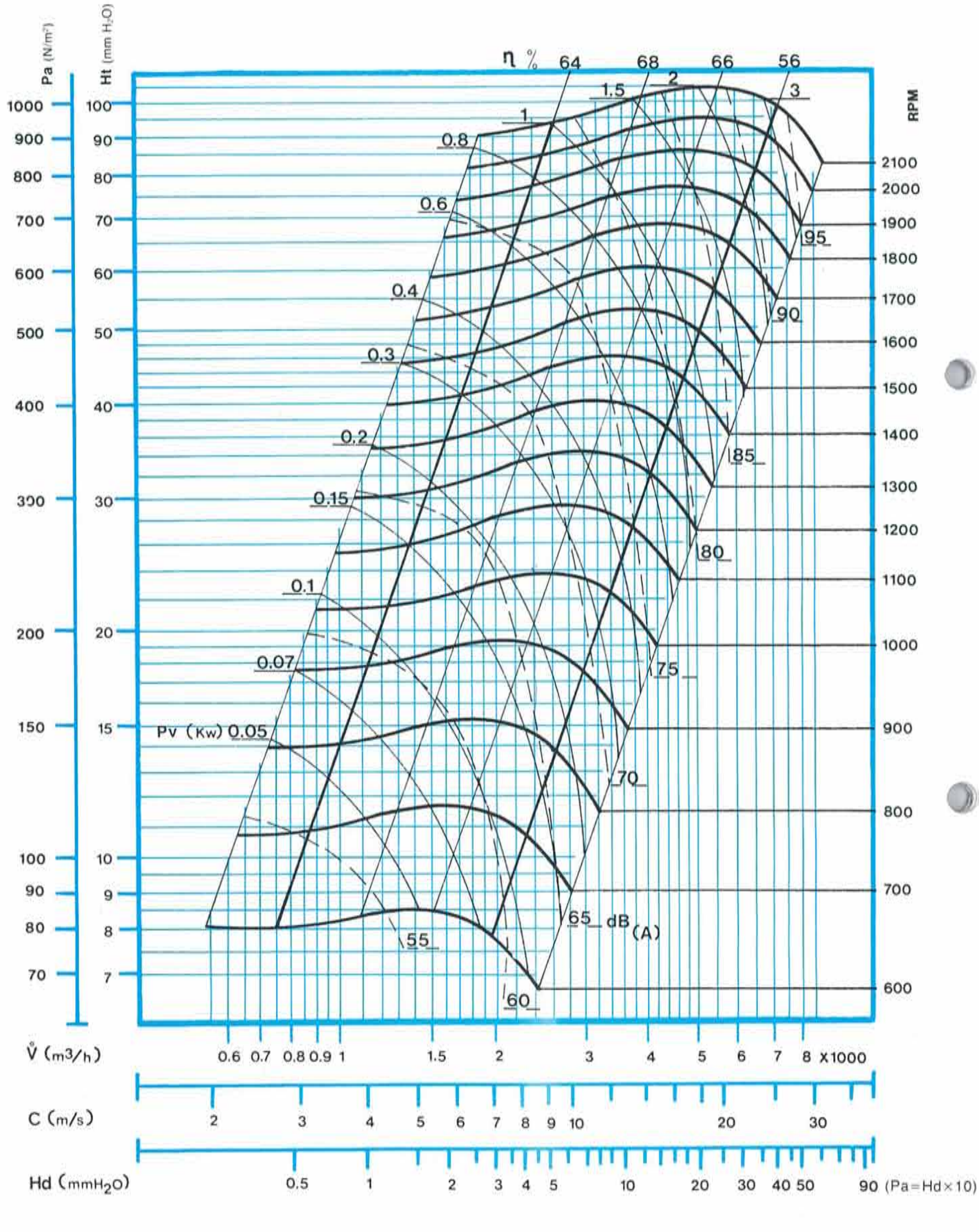


Golden

GBF-225a

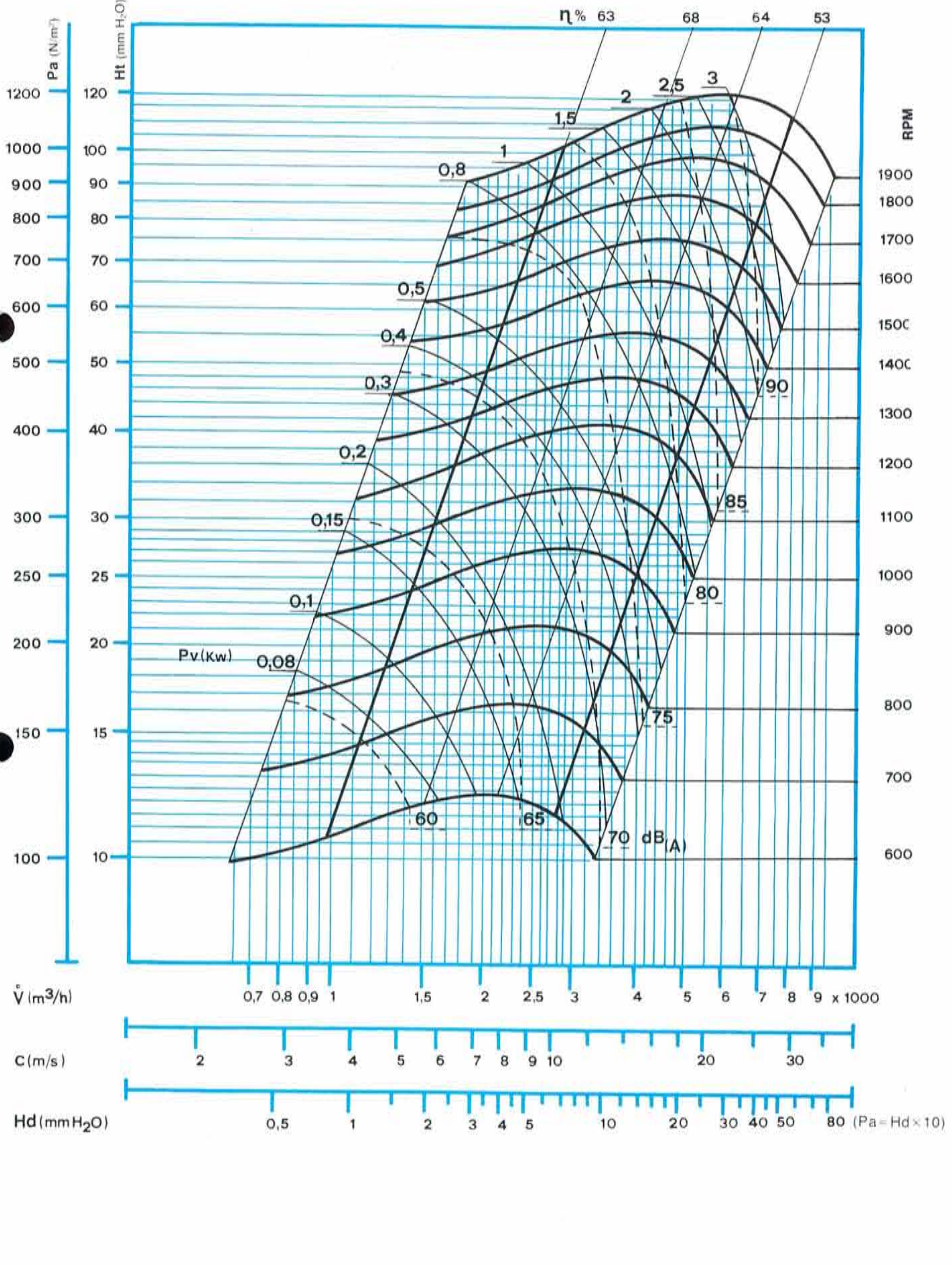


GBF-225


Pa (N/m²)
Ht (mm H₂O)
η %
64
68
66
56
RPM
1000 100
900 90
800 80
700 70
600 60
500 50
400 40
300 30
200 20
150 15
100 10
90 9
80 8
70 7
Pv (Kw) 0.05
0.07
0.1
0.15
0.2
0.3
0.4
0.6
0.8
1
1.5
2
3
2100
2000
1900
1800
1700
1600
1500
1400
1300
1200
1100
1000
900
800
700
600
95
90
85
80
75
70
65 dB (A)
55
60
V̊ (m3/h)
0.6 0.7 0.8 0.9 1 1.5 2 3 4 5 6 7 8 X1000
C (m/s)
2 3 4 5 6 7 8 9 10 20 30
Hd (mmH₂O)
0.5 1 2 3 4 5 10 20 30 40 50 90 (Pa=Hd×10)

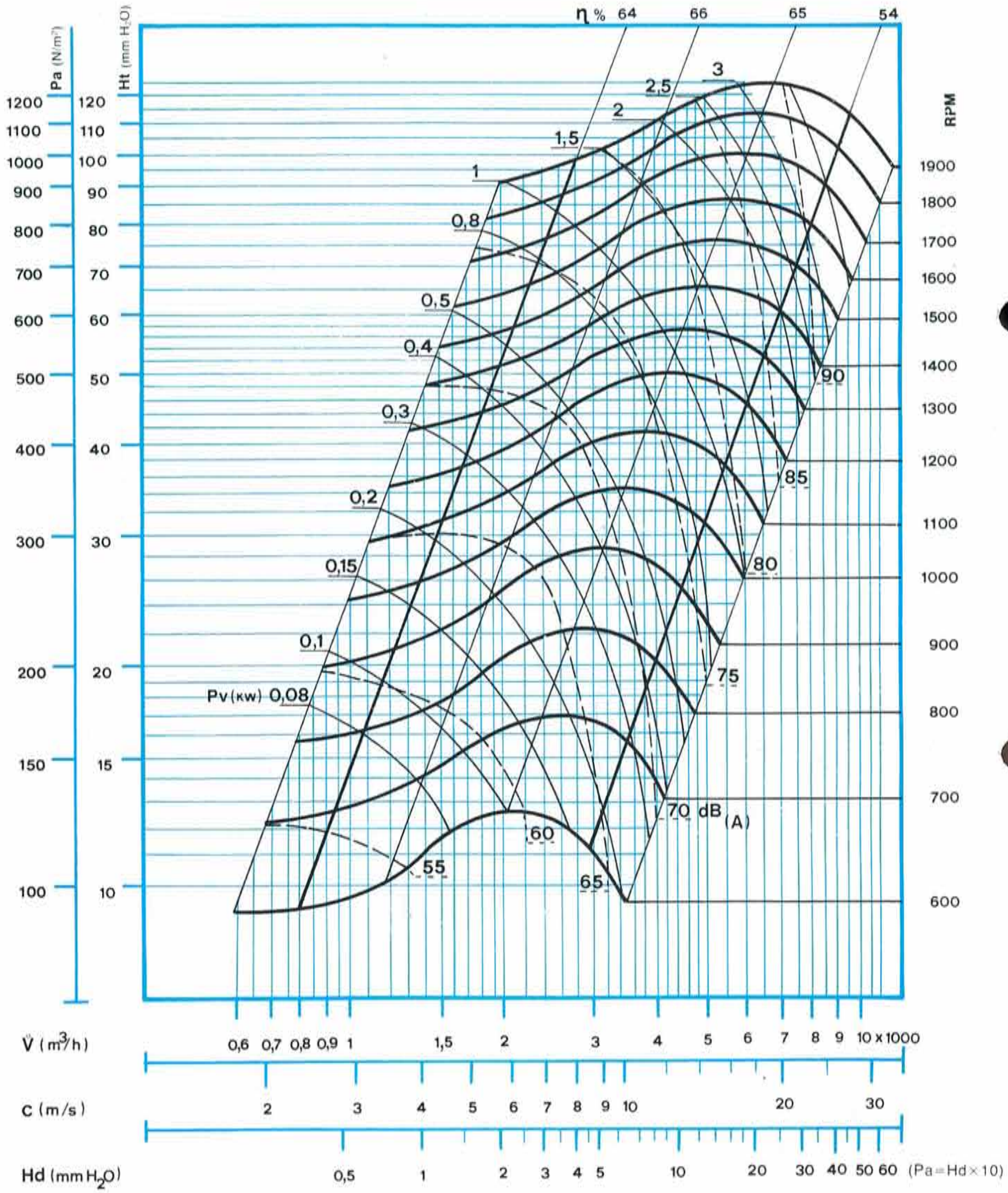
Golden

KAT(S)-250a



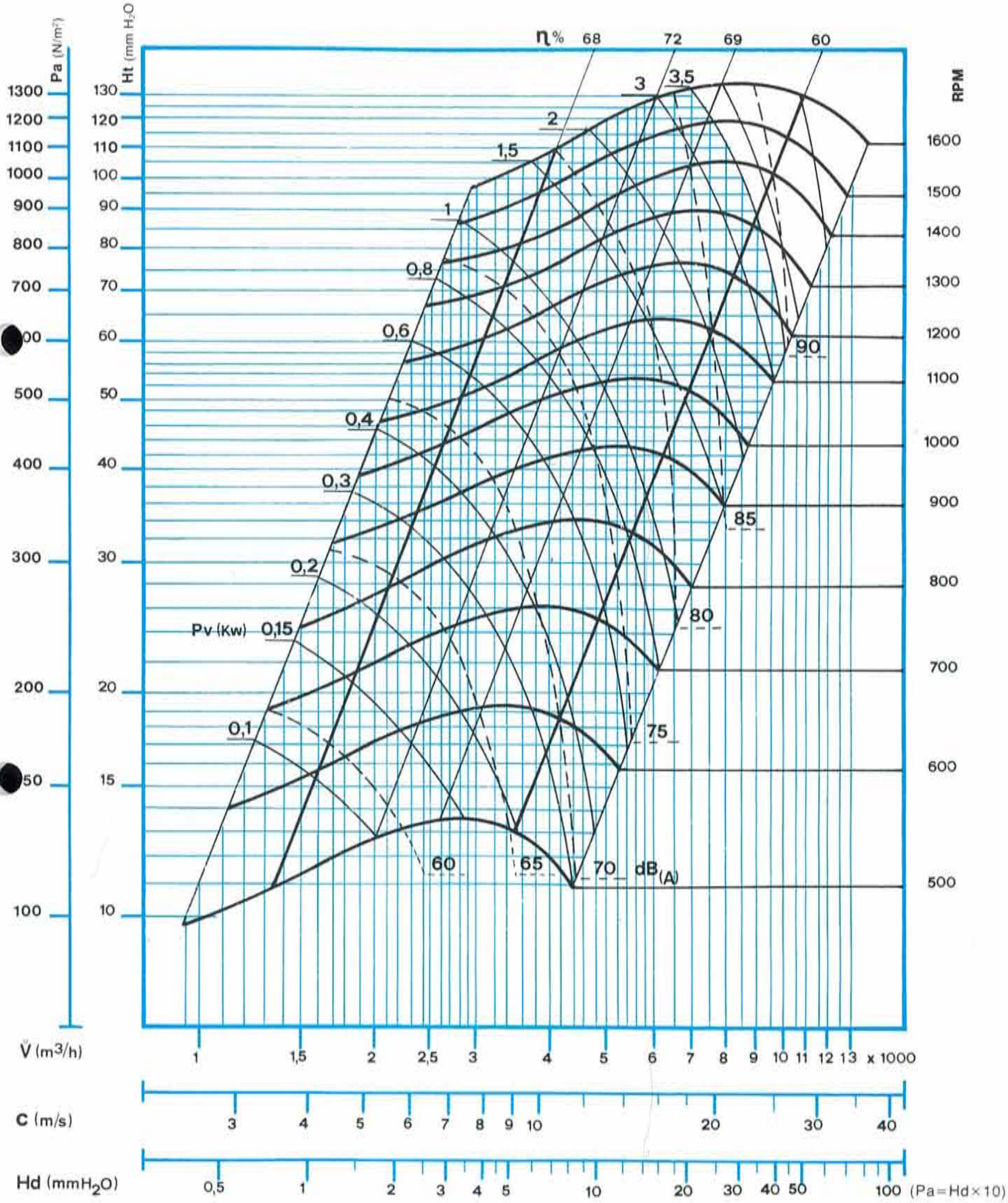
Golden

KAT(S)-250



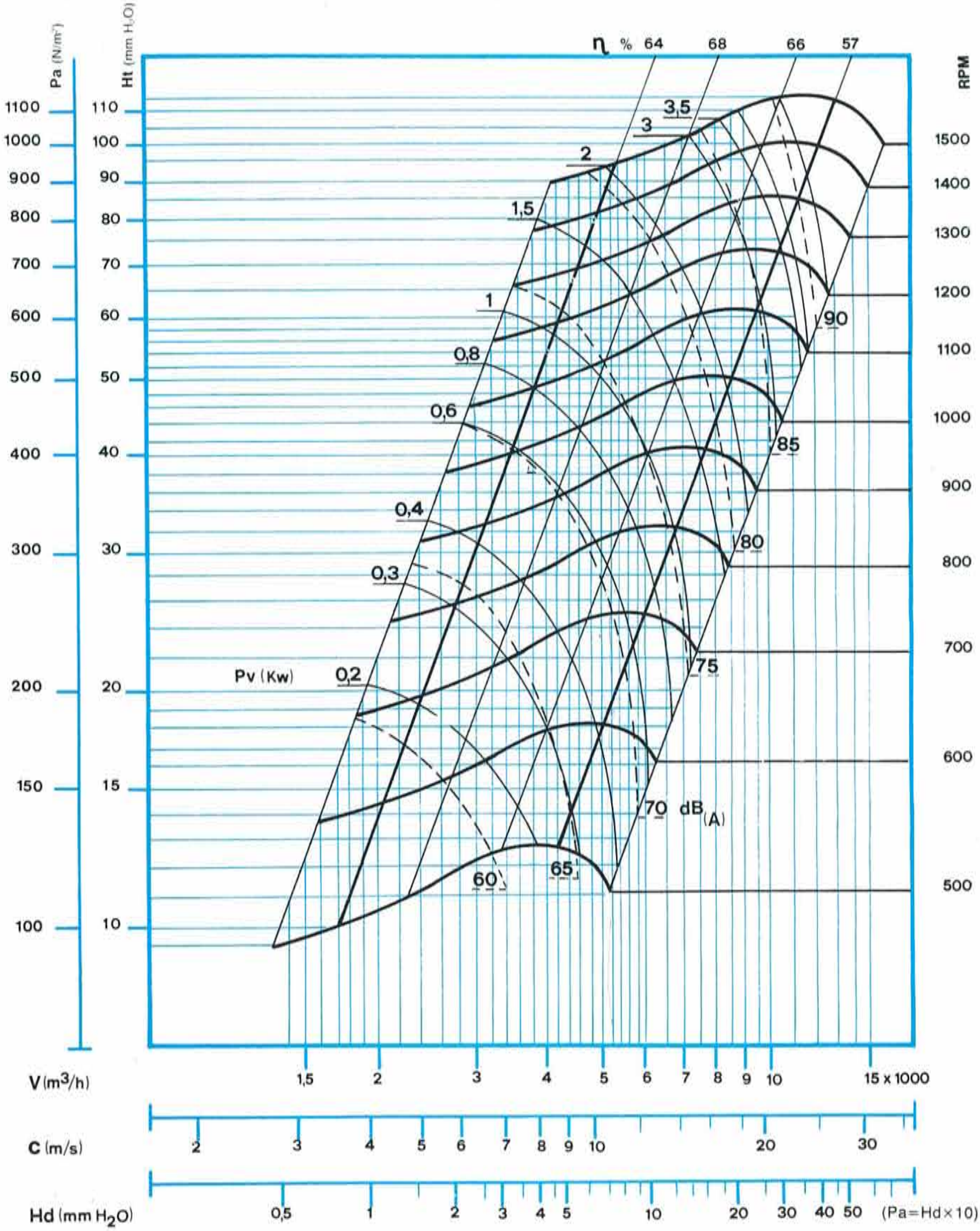
Golden

KAT(S)-280



Golden

KAT(S)-310



Golden

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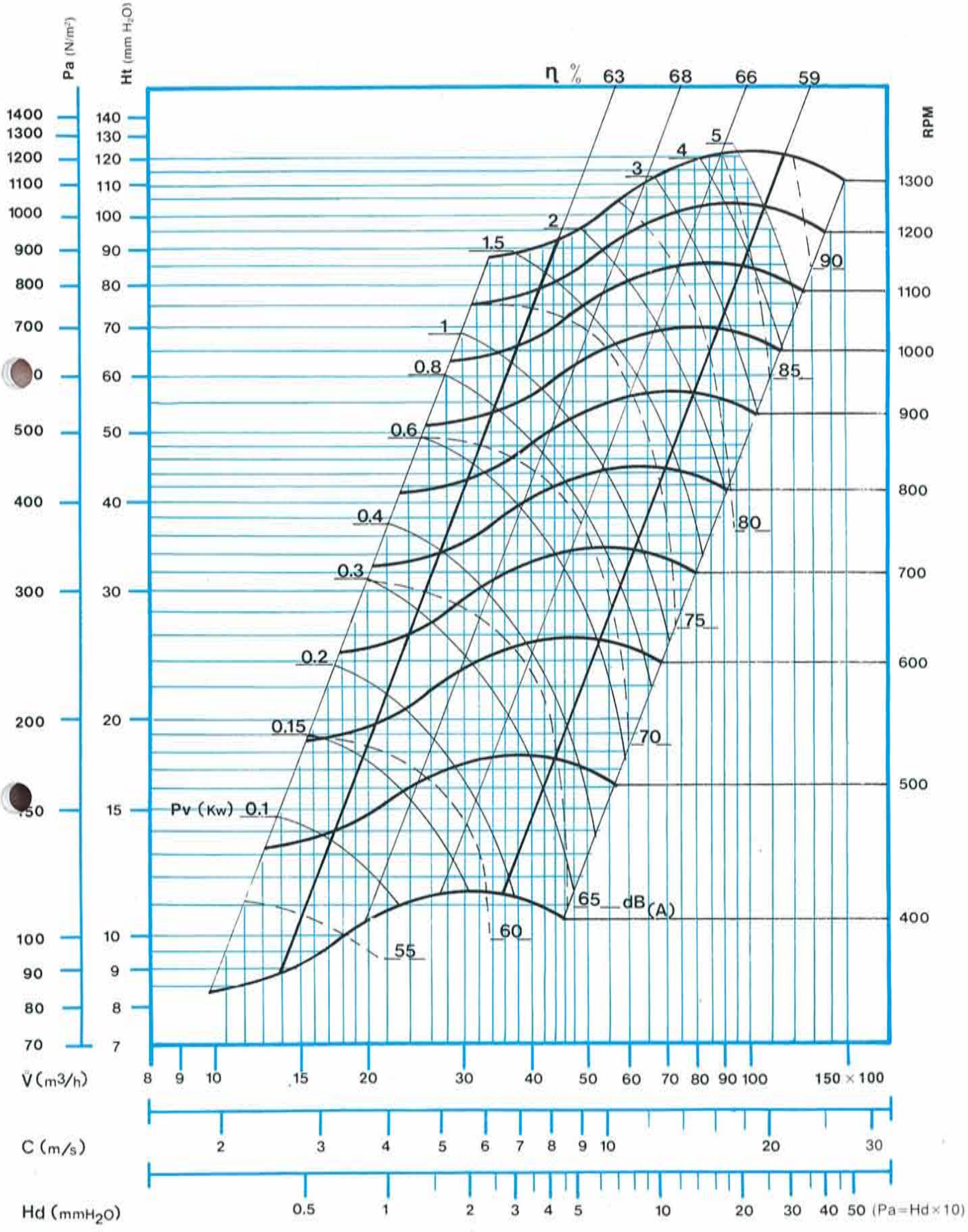
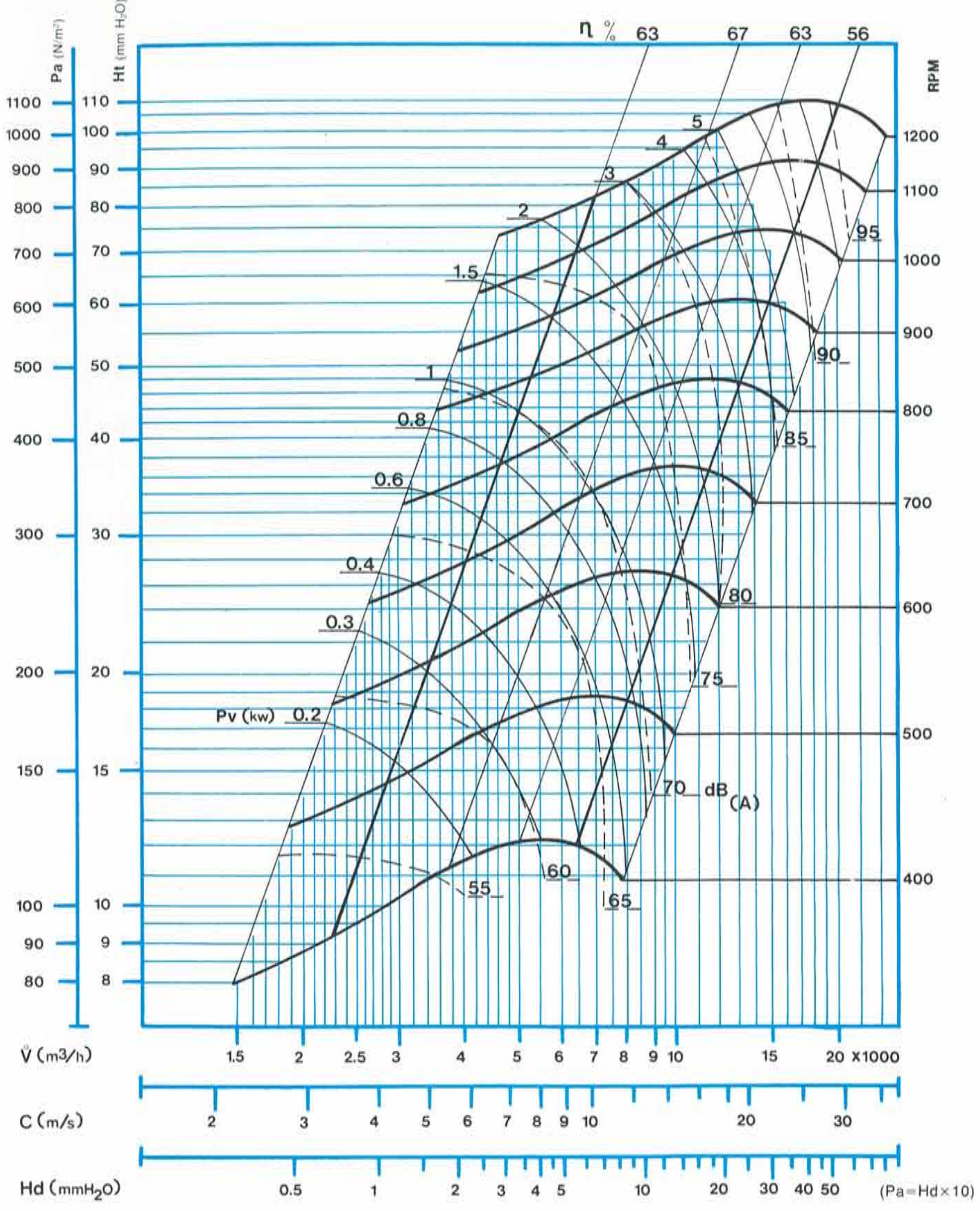


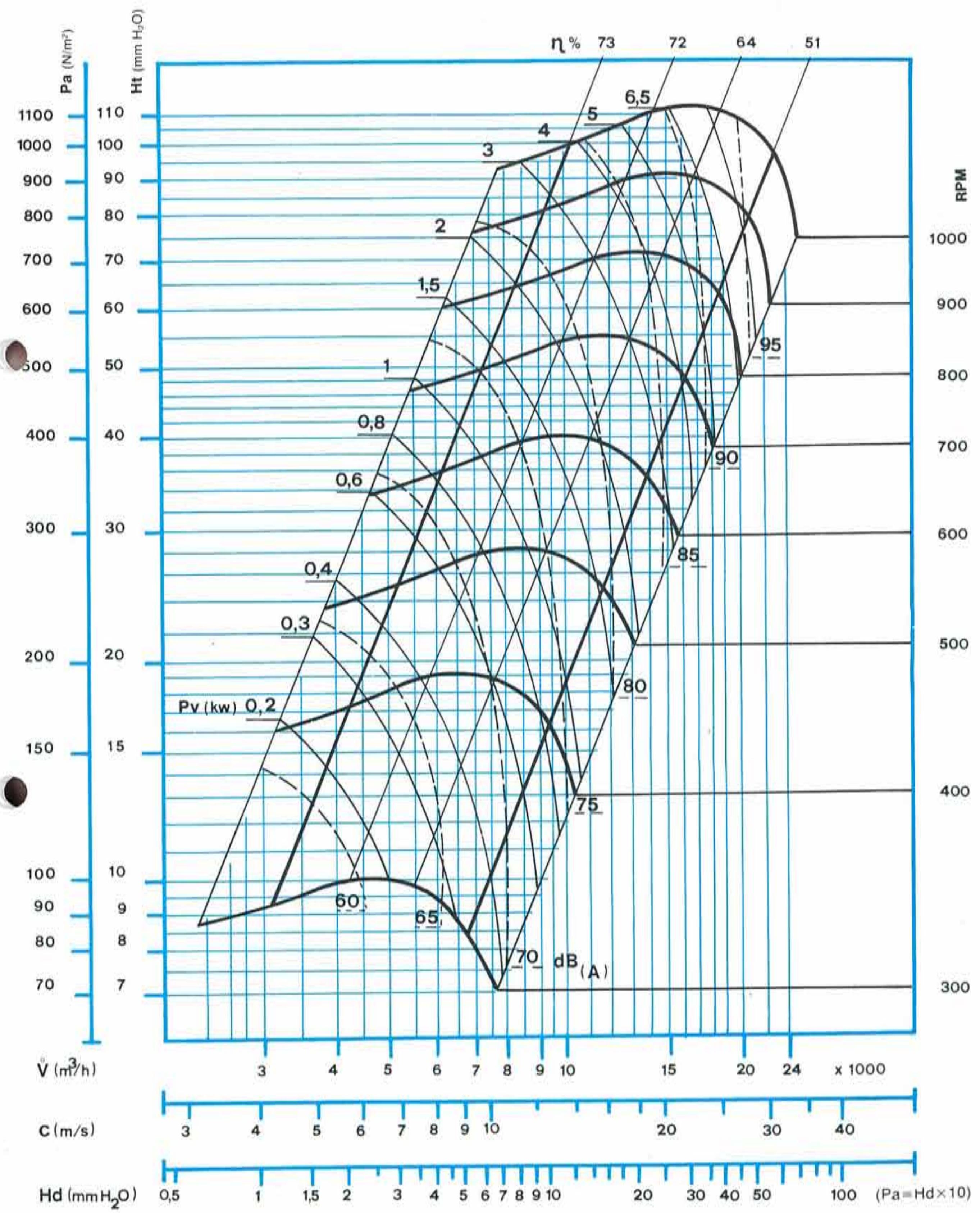
Golden

KAT(S)-400



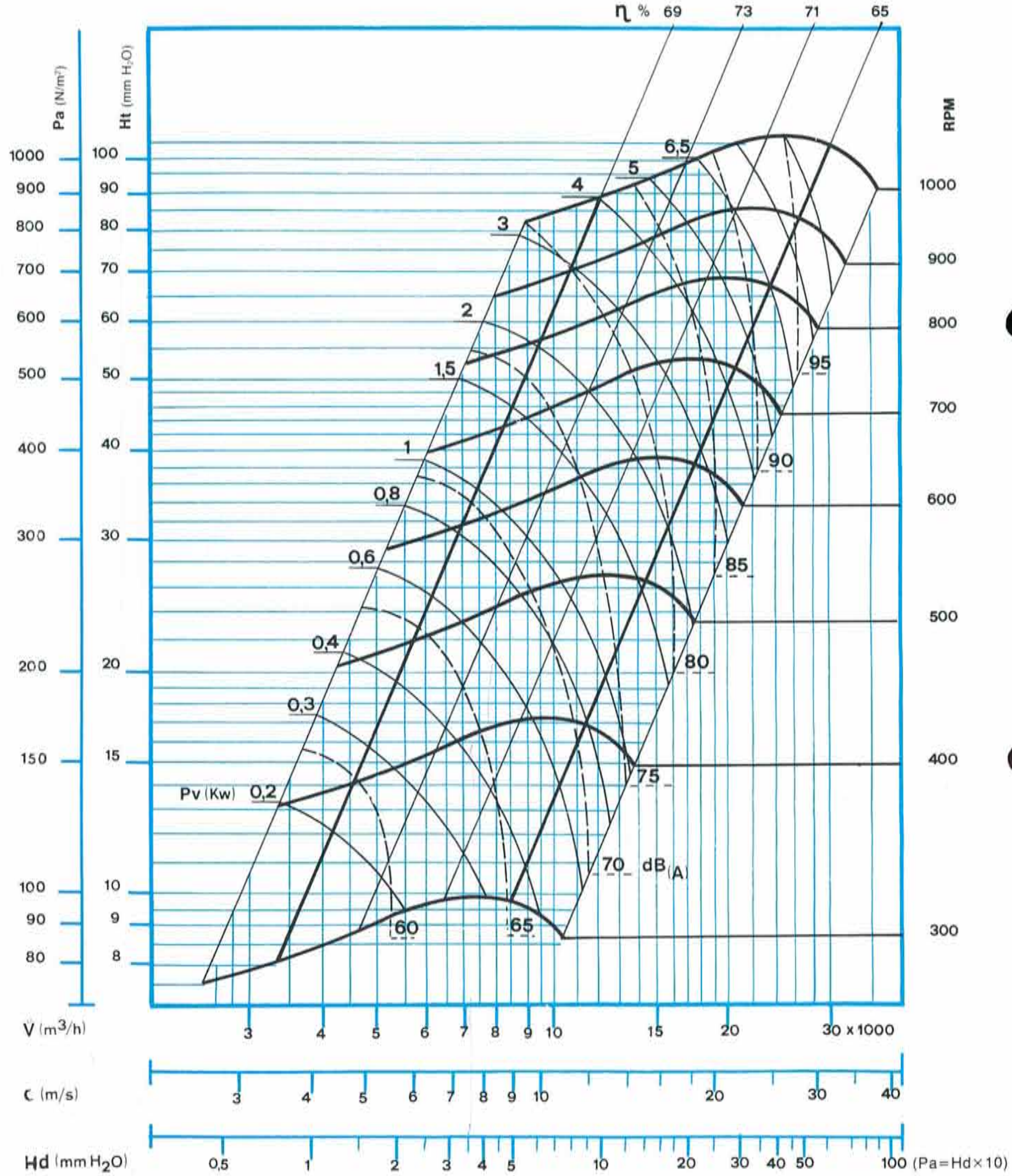
Golden

KAT(S)-450a

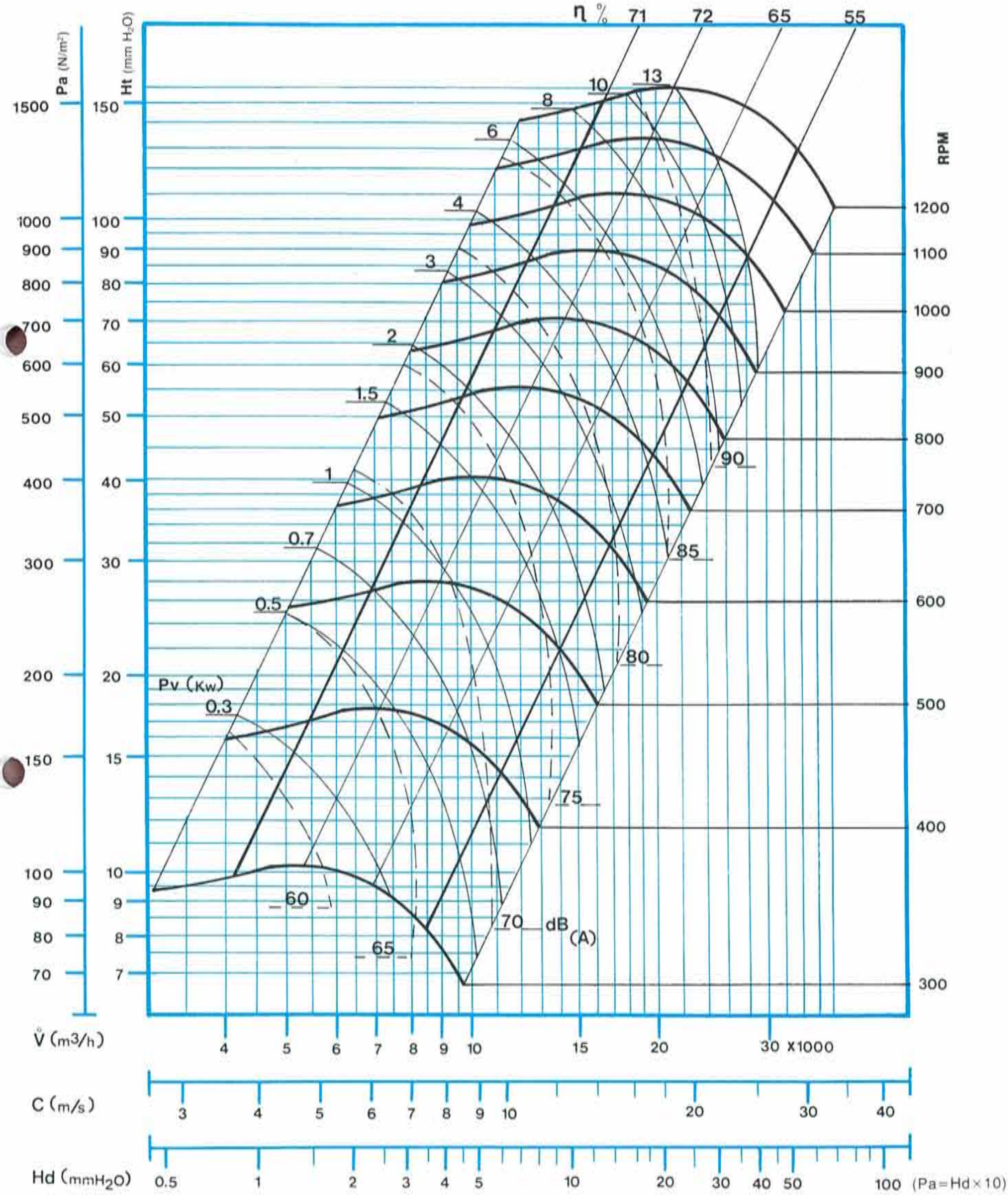


Golden

KAT(S)-450



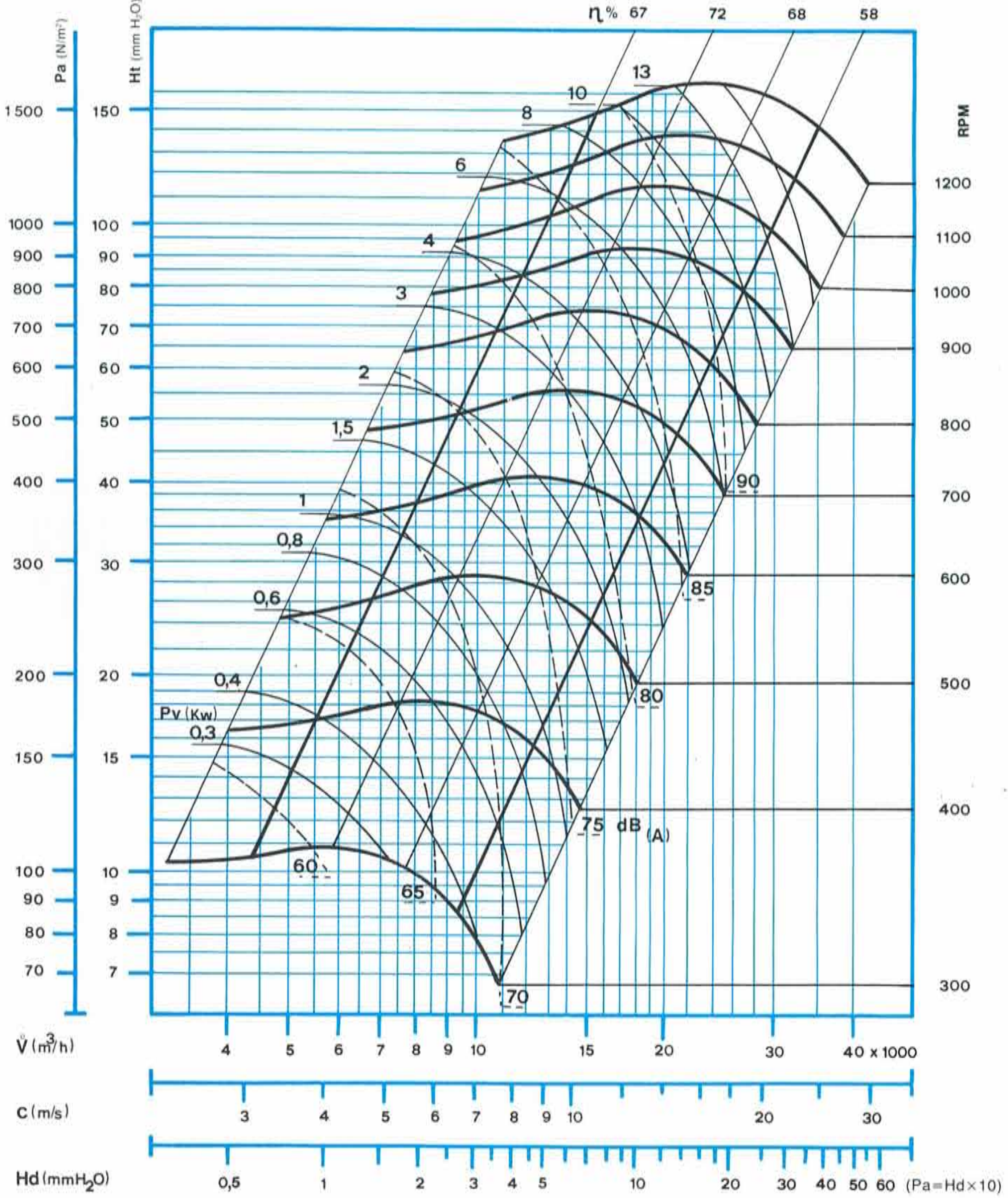
KAT(S)-500a



η %
71
72
65
55
Pa (N/m²)
Ht (mm H₂O)
1500
150
1000
100
900
90
800
80
700
70
600
60
500
50
400
40
300
30
200
20
150
15
100
10
90
9
80
8
70
7
RPM
1200
1100
1000
900
800
700
600
500
400
300
13
10
8
6
4
3
2
1.5
1
0.7
0.5
0.3
Pv (Kw)
90
85
80
75
70
65
60
dB (A)
V̊ (m3/h)
4
5
6
7
8
9
10
15
20
30 X1000
C (m/s)
3
4
5
6
7
8
9
10
20
30
40
Hd (mmH₂O)
0.5
1
2
3
4
5
10
20
30
40
50
100
(Pa=Hd×10)

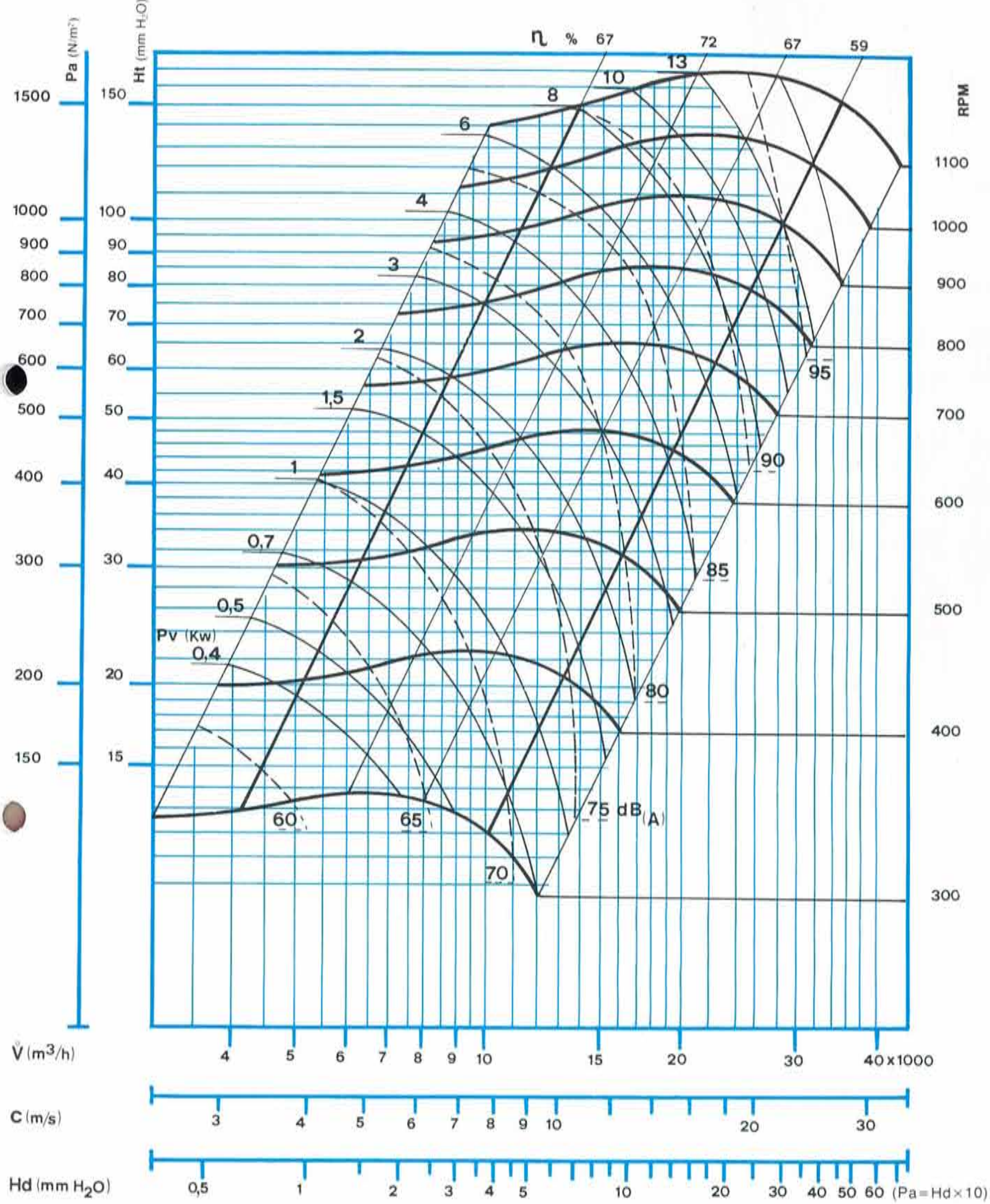
Golden

KAT(S)-500

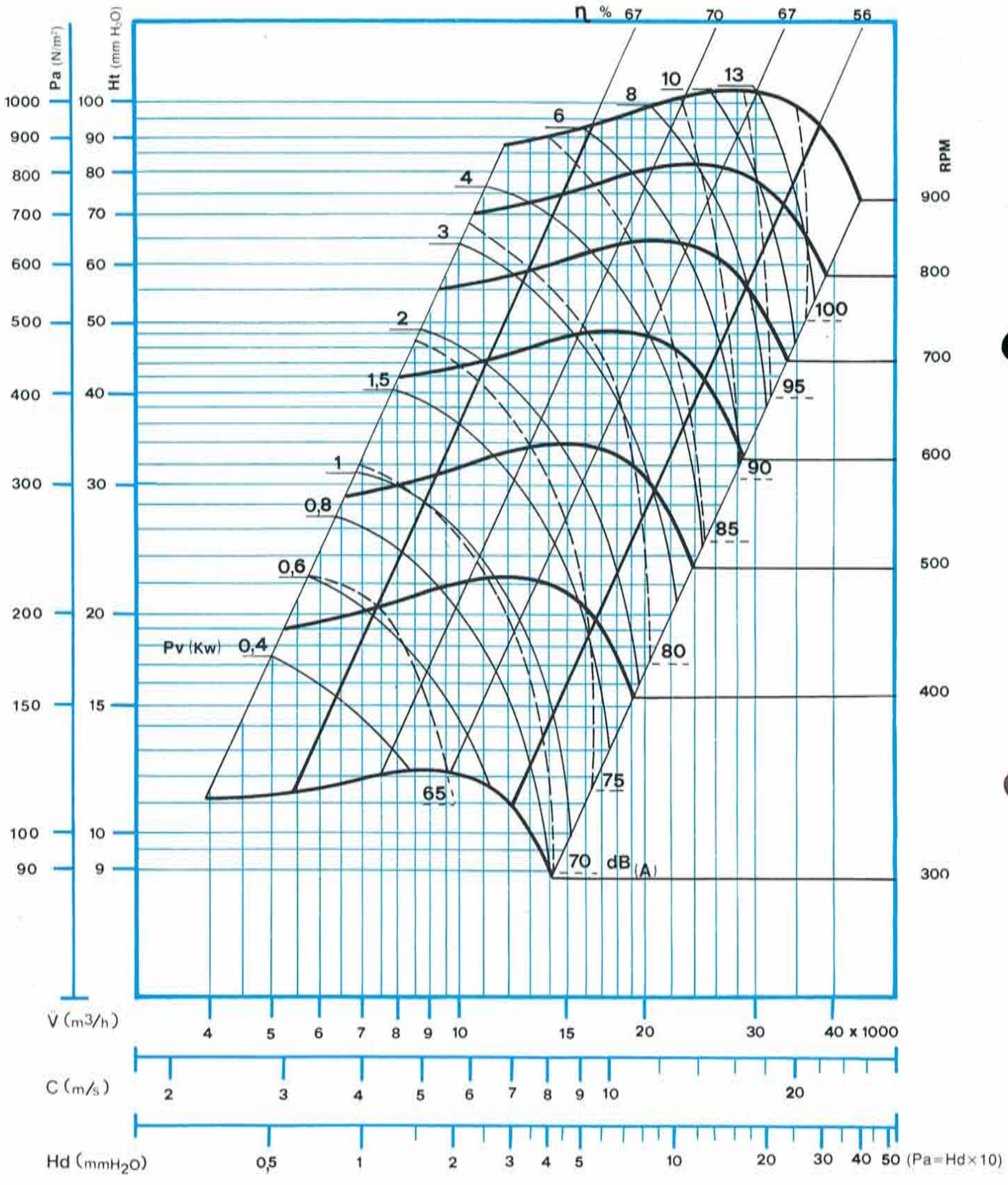


Golden

KAT(S)-560a

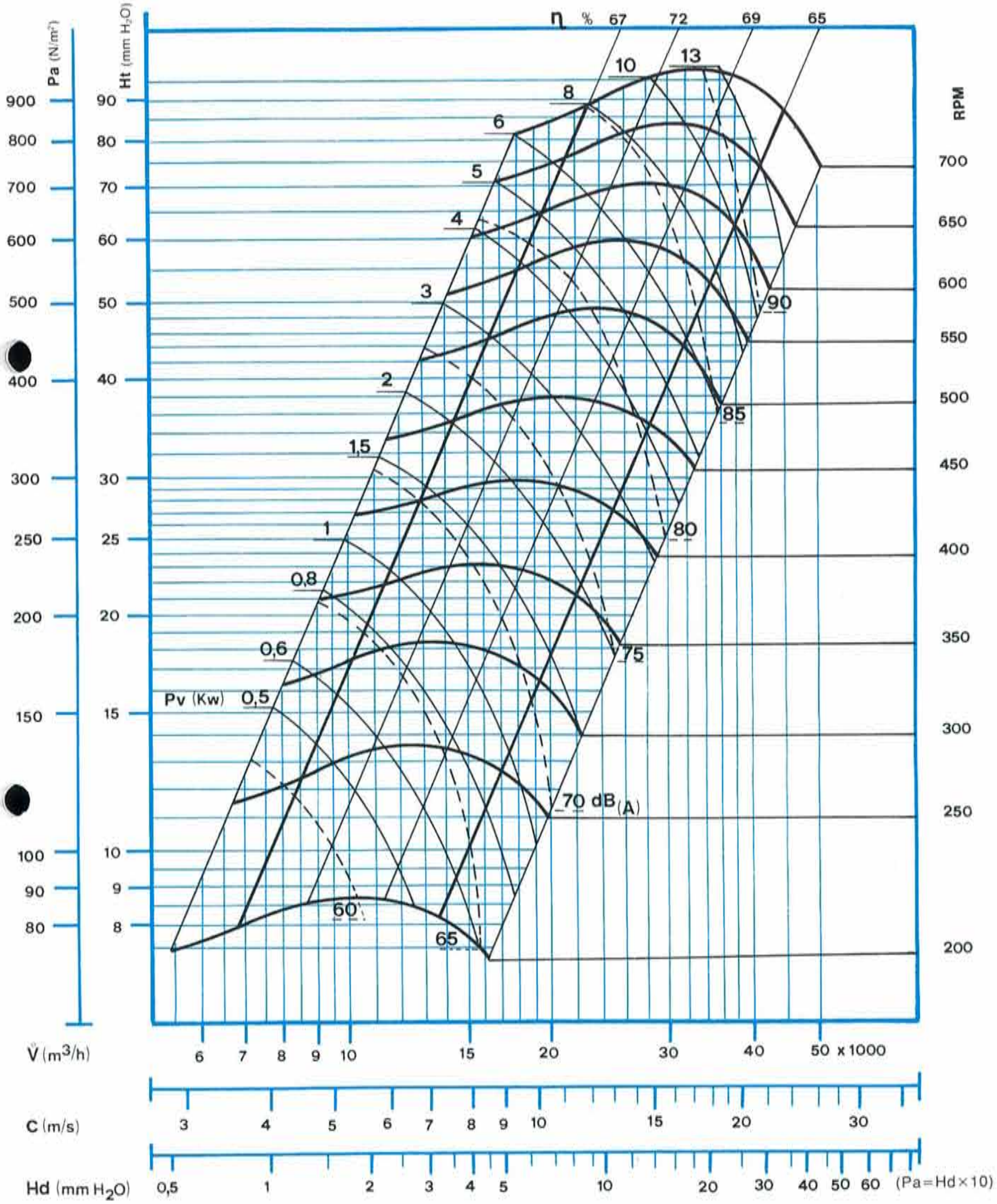


KAT(S)-560



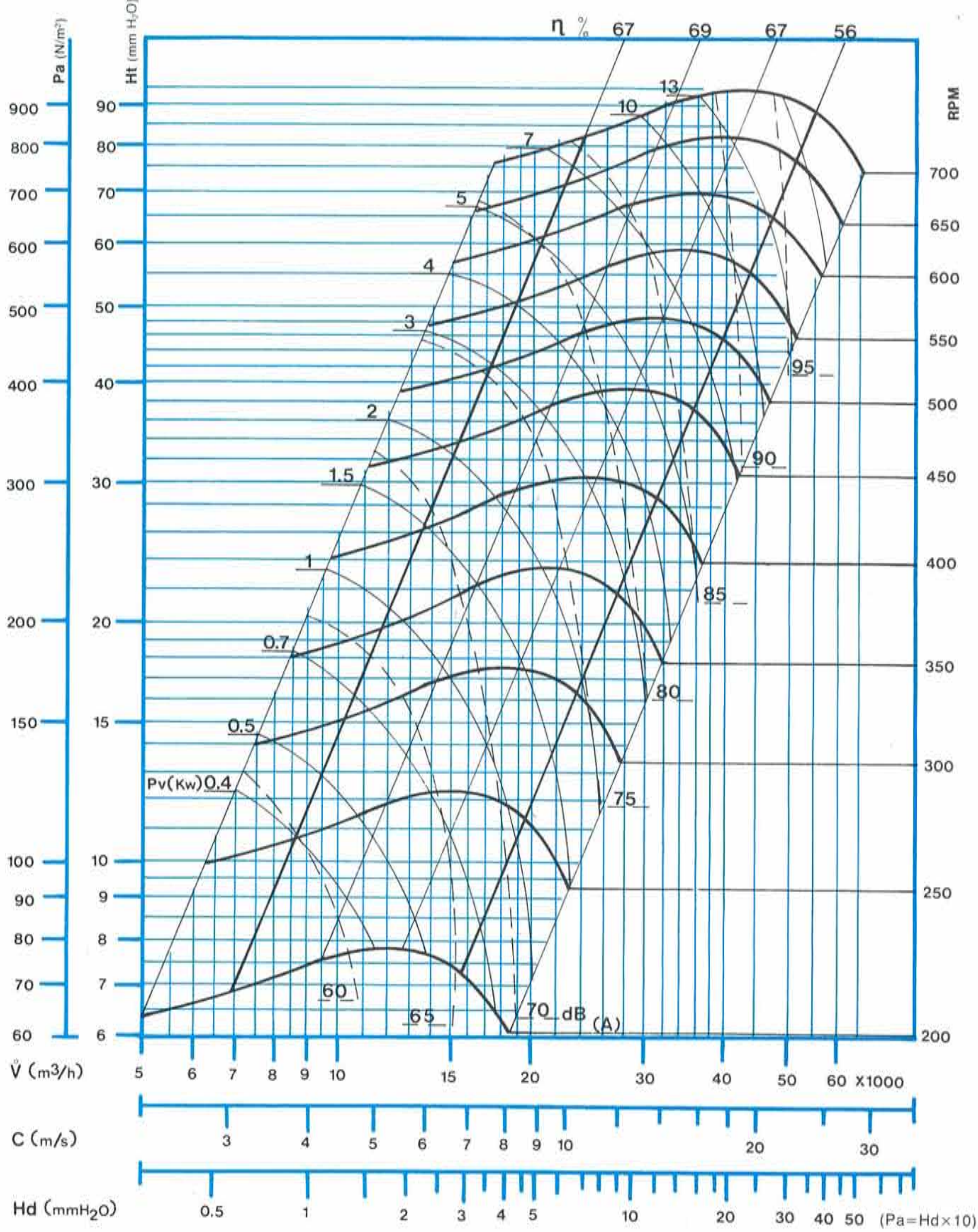
Pa (N/m²)
Ht (mm H₂O)
1000
900
800
700
600
500
400
300
200
150
100
90
100
90
80
70
60
50
40
30
20
15
10
9
η %
67
70
67
56
RPM
900
800
700
600
500
400
300
Pv (Kw)
0,4
0,6
0,8
1
1,5
2
3
4
6
8
10
13
65
70 dB (A)
75
80
85
90
95
100
V (m3/h)
4
5
6
7
8
9
10
15
20
30
40 x 1000
C (m/s)
2
3
4
5
6
7
8
9
10
20
Hd (mmH2O)
0,5
1
2
3
4
5
10
20
30
40
50 (Pa=Hd×10)

KAT(S)-630a


Pa (N/m²)
900
800
700
600
500
400
300
250
200
150
100
90
80
Ht (mm H₂O)
90
80
70
60
50
40
30
25
20
15
10
9
8
η % 67 72 69 65
13
10
8
6
5
4
3
2
1,5
1
0,8
0,6
Pv (Kw) 0,5
90
85
80
75
70 dB(A)
60
65
RPM
700
650
600
550
500
450
400
350
300
250
200
V̊ (m³/h)
6 7 8 9 10 15 20 30 40 50 x 1000
C (m/s)
3 4 5 6 7 8 9 10 15 20 30
Hd (mm H₂O)
0,5 1 2 3 4 5 10 20 30 40 50 60 (Pa=Hd×10)

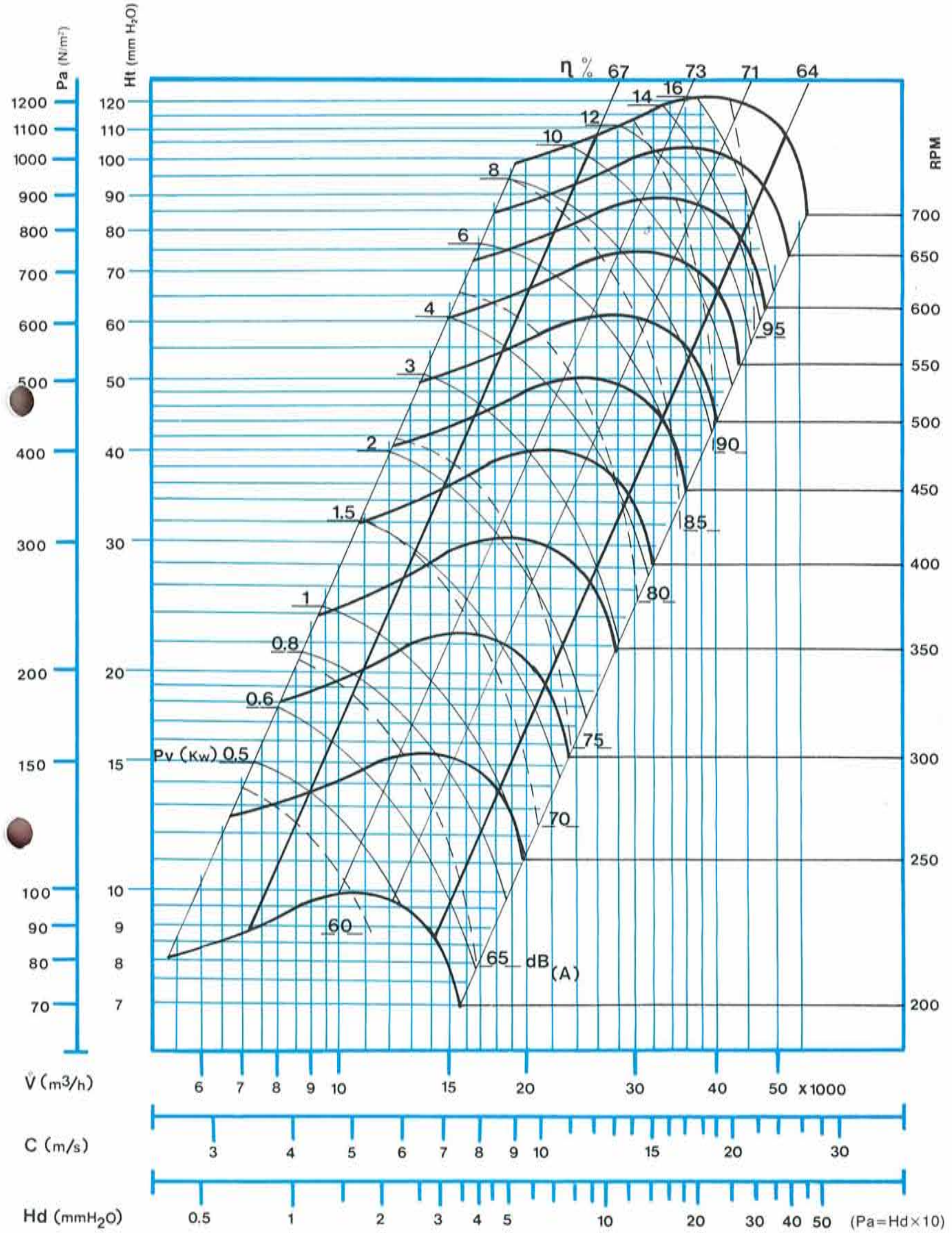
Golden

KAT(S)-630



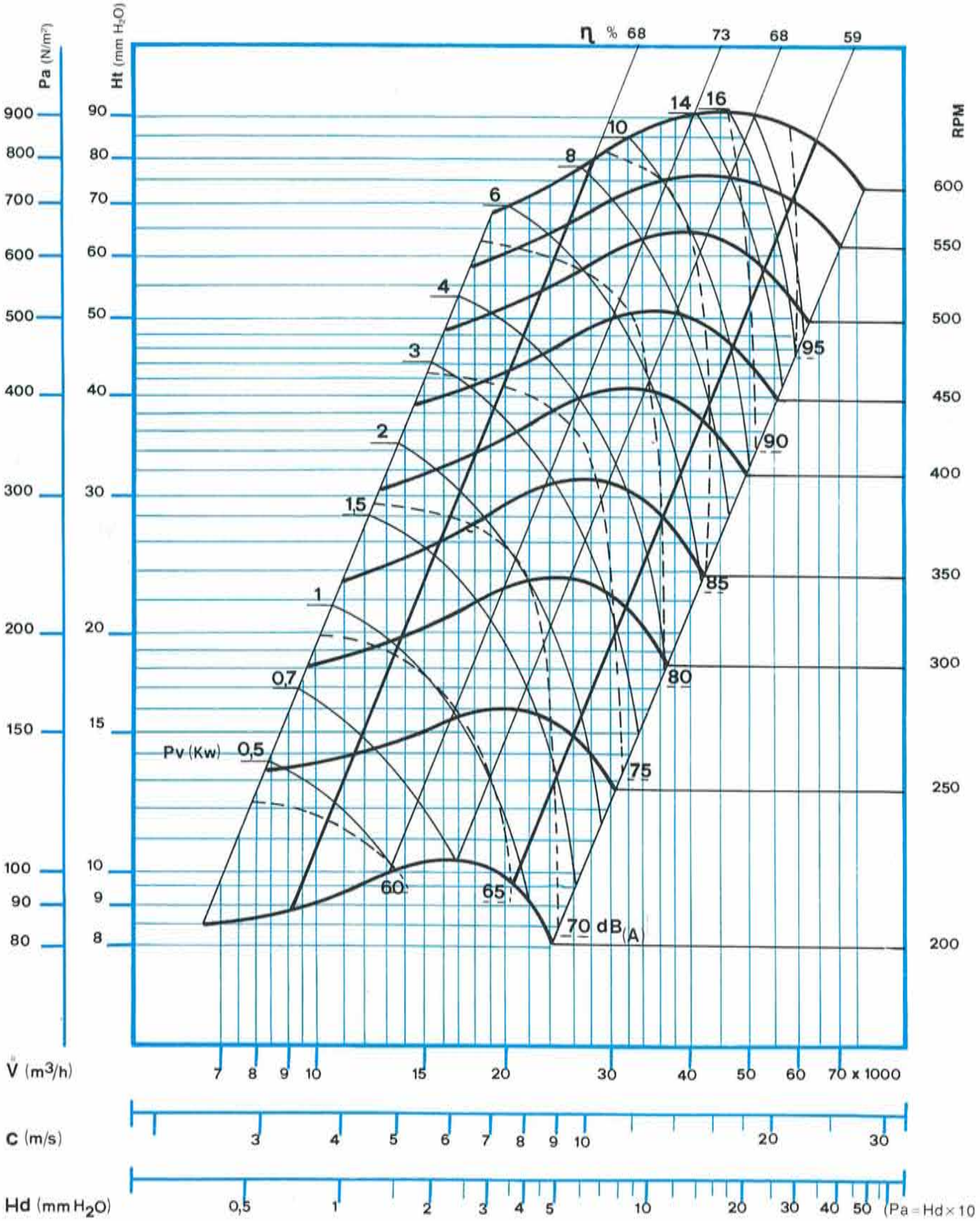
Golden

KAT(S)-710a



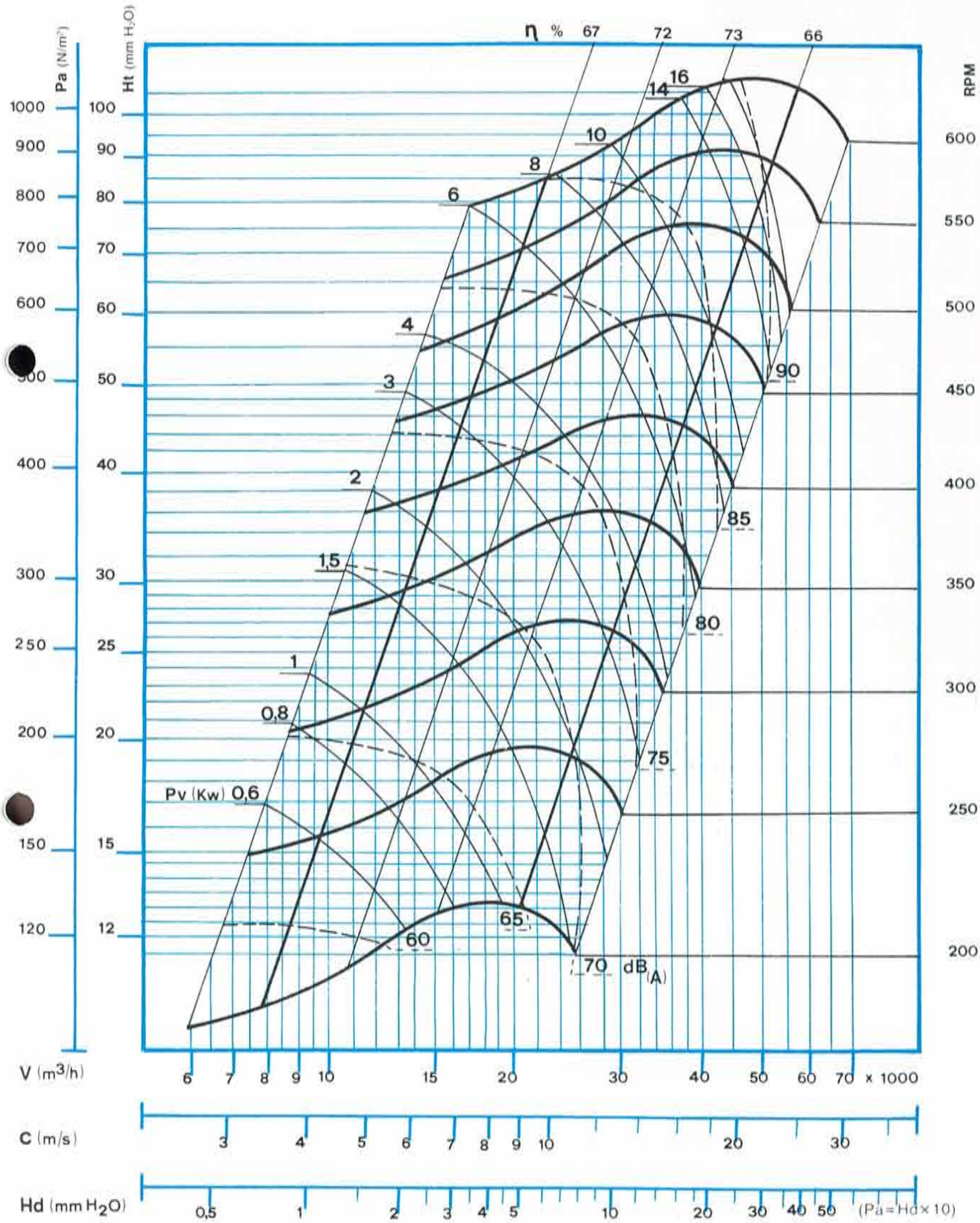
Golden

KAT(S)-710

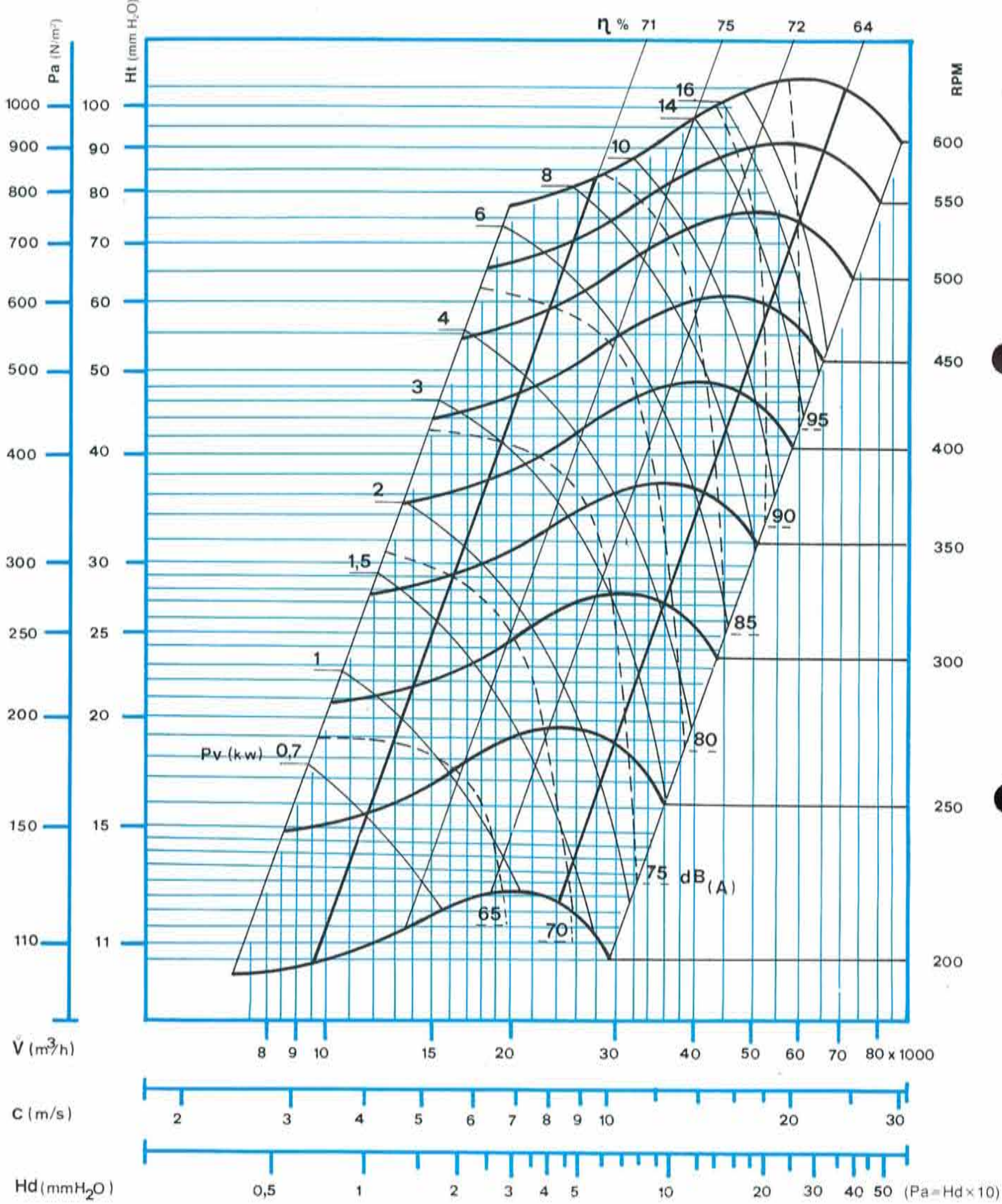


Golden

KAT(S)-800a



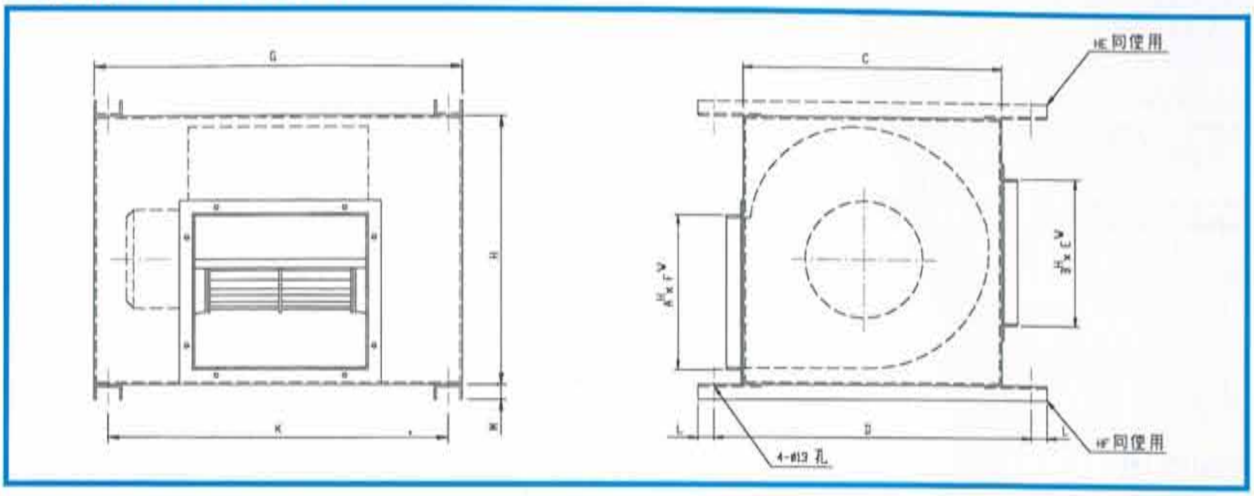
KAT(S)-800



Pa (N/m²)
1000
900
800
700
600
500
400
300
250
200
150
110
Ht (mm H₂O)
100
90
80
70
60
50
40
30
25
20
15
11
η % 71 75 72 64
RPM
600
550
500
450
400
350
300
250
200
16
14
10
8
6
4
3
2
1,5
1
Pv (kw) 0,7
95
90
85
80
75 dB(A)
70
65
V (m³/h)
8 9 10 15 20 30 40 50 60 70 80 x 1000
C (m/s)
2 3 4 5 6 7 8 9 10 20 30
Hd (mmH₂O)
0,5 1 2 3 4 5 10 20 30 40 50 (Pa = Hd × 10)

外觀尺寸 Dimension

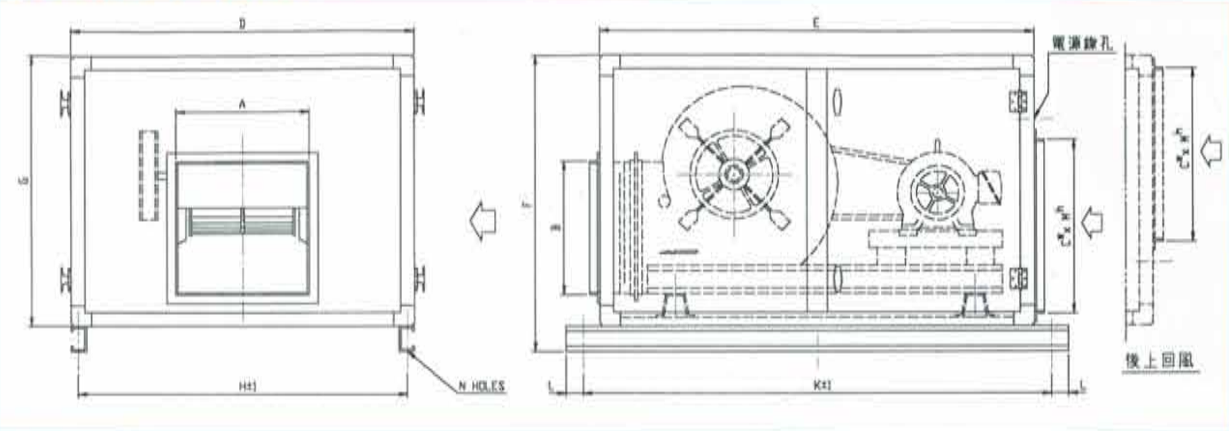
直結式 Direct Driven



GBF-	AT-	A	B	C	D	E	F	G	H	K	L	M	略重 KG	備註
180	7-7	208	200	350	450	440	236	500	364	460	25	20	18	
225	9-9	265	280	420	520	540	294	600	424	560	25	20	24	
250	10-10	290	300	470	570	640	327	700	479	660	25	20	30	
280	12-12	342	350	550	650	740	391	800	559	760	25	20	39	

Unit:mm

皮帶式 Belt Driven



KAT(S)	AT-	A	B	C	D	E	F	G	H	K	L	M	N	備註
250	10-10	332	290	720	800	960	755	680	760	1060	50	400	8-ø14	
280	12-09	310	342	720	800	1160	875	800	760	1260	50	520	8-ø14	
310	12-12	396	342	720	800	1160	875	800	760	1260	50	520	8-ø14	
350	15-11	374	406	970	1050	1360	1125	1050	1010	1460	50	650	8-ø14	
400	15-15	472	406	970	1050	1360	1125	1050	1010	1460	50	650	8-ø14	
450a	18-13	430	480	1280	1360	1600	1235	1160	1320	850x2	50	700	10-ø16	
450	18-18	558	480	1280	1360	1600	1235	1160	1320	850x2	50	700	10-ø16	
500	20-20	630	630	1280	1360	1600	1235	1160	1320	850x2	50	700	10-ø16	
560	22-22	694	694	1420	1500	1900	1435	1360	1460	1000x2	50	850	10-ø16	
630	25-25	796	796	1420	1500	1900	1435	1360	1460	1000x2	50	850	10-ø16	
710	28-28	872	872	1680	1760	2250	1885	1760	1720	1175x2	60	1100	10-ø16	
800	30-28	872	940	1680	1760	2250	1885	1760	1720	1175x2	60	1100	10-ø16	

Unit:mm

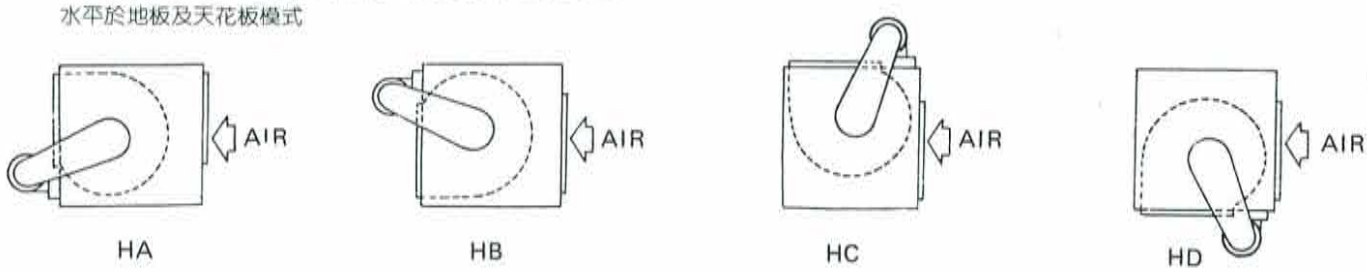
操作界線Operation Limits

	9-7	9-9	10-8	10-10	12-9	12-12	15-11	15-15	18-13	18-18	20-15	20-20	22-15	22-22	25-20	25-25	28-20	28-28	30-20	30-28
風扇軸最大負擔馬力 :KW Max. absorbed power at fan shaft	3	3	3	3	3.5	3.5	5	5	6.5	6.5	13	13	13	13	13	13	16	16	16	16
迴轉葉輪最大轉矩 :kgm Wheel: max. torque	5.5	5.5	5.5	5.5	10	10	10	10	16	16	40	40	40	40	40	40	65	65	65	65
迴轉葉輪最大轉數 :RPM Wheel: max. R.P.M.	2500	2100	2500	2000	2000	1500	2000	1200	1200	1100	1300	1200	1300	1200	1000	900	800	800	800	800

使用溫度範圍：$-5°C \sim 45°C$ (max operating temperature)

箱型風機配置BOX TYPE FAN

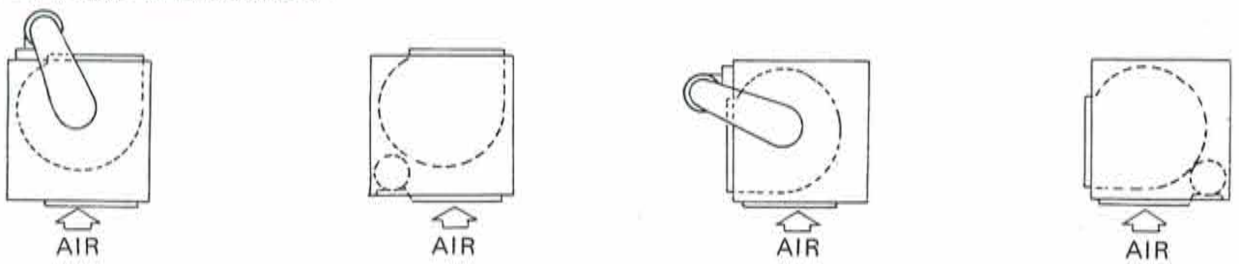
HORIZONIAL FLOOR AND CEILING MODELS
水平於地板及天花板模式



HA HB HC HD

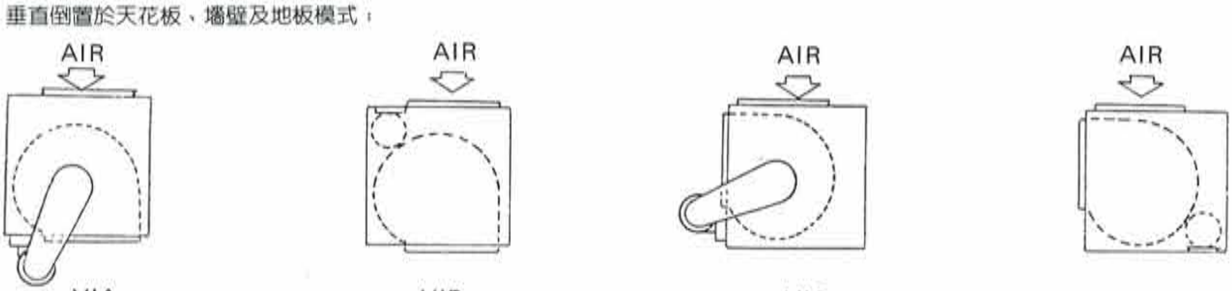
HE HF HG HI

VERTICAL FLOOR WALL AND CEILING MODELS
垂直於地板、墻壁及天花板模式：



VA VB VC VD

VERTICAL INVERTED CEILING, WALL AND FLOOR MODELS
垂直倒置於天花板、墻壁及地板模式：



VIA VIB VIC VID

89. 8. 1000本

King王牌冷氣

國祥冷凍機械股份有限公司

KING MACHINERY CO., LTD.

地址：桃園市龜山區大華里頂湖一街二十號

ADD：20,DING-HU 1ST. STREET, KUEI SHAN Dist.,

TAO-YUAN CITY

電話(TEL): 03-3972271,傳真(FAX)：03-3978524

E-mail：king@kingmach.com.tw

http//www.kingmach.com.tw/