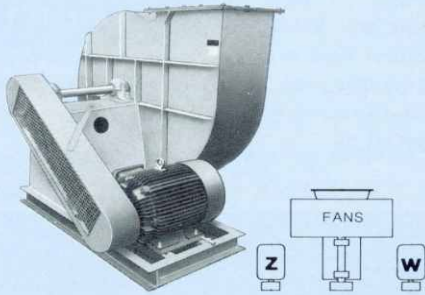




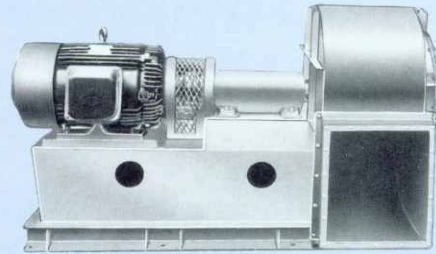
榮風抽送風機傳動方式參考圖

RONG FONG FANS - DRIVE METHOD REFERENCE CHARTS

- 皮帶驅動式
BELT-DRIVE TYPE



- 聯結器直結驅動式
DIRECT-COUPLING DRIVEN TYPE



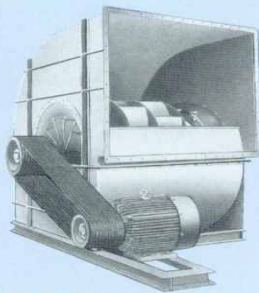
- 臥式馬達直結式
HORIZONTAL MOTOR DIRECT-COUPLING
TYPE



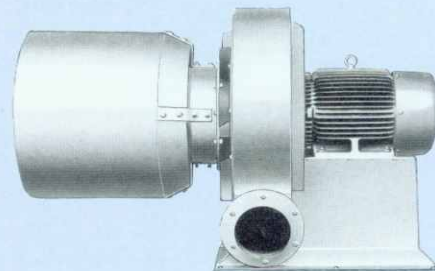
- 立式馬達直結式
VERTICAL MOTOR DIRECT-COUPLING
TYPE



- 皮帶雙入口式
BELT DRIVEN WITH DOUBLE INPUTS
TYPE



- 吸入風口消音器
SUCTION NOISE DAMPING DEVICE



- 軸流皮帶驅動式
AXIAL-FLOW BELT DRIVEN TYPE



- 軸流直結式
AXIAL DIRECT-COUPLING TYPE



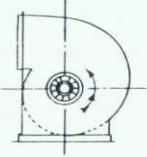


榮風抽送風機出口方向之選擇

RONG FONG FANS -DISCHARGE DIRECTIONS

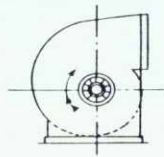
請面對皮帶輪或馬達 FACING PULLEY OR MOTOR

風管裝配法如圖： DUCT CONNECTIONS



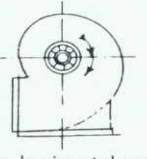
① 上部水平
反時計回轉

top, horizontal and counter-clockwise



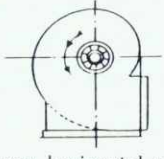
② 上部水平
時計回轉

top, horizontal and clockwise



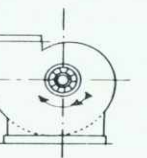
③ 下部水平
時計回轉

bottom, horizontal and clockwise



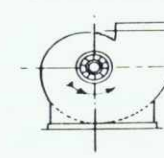
④ 下部水平
反時計回轉

bottom, horizontal and counter-clockwise



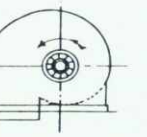
⑤ 上方向
時計回轉

top, upright and counter-clockwise



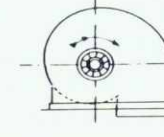
⑥ 上方向
反時計回轉

top, upright and counter-clockwise



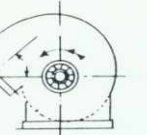
⑦ 下方向
反時計回轉

bottom, downright and counter-clockwise



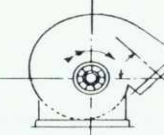
⑧ 下方向
時計回轉

bottom, downright and clockwise



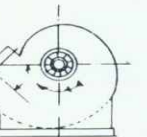
⑨ 上部斜下向
反時計回轉

skew down from top and counter-clockwise



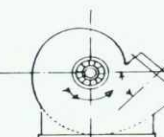
⑩ 上部斜下向
時計回轉

skew down from top and clockwise



⑪ 下部斜上向
時計回轉

skew up from bottom and clockwise



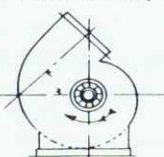
⑫ 下部斜上向
反時計回轉

skew down from top and clockwise



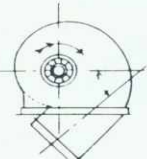
⑬ 上部斜上向
反時計回轉

skew up from top and counter-clockwise



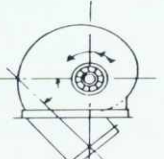
⑭ 上部斜上向
時計回轉

skew up from top and clockwise



⑮ 下部斜下向
時計回轉

skew down from bottom and clockwise

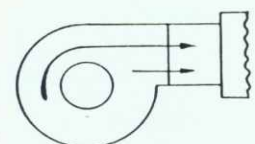


⑯ 下部斜下向
反時計回轉

skew down from bottom and counter-clockwise

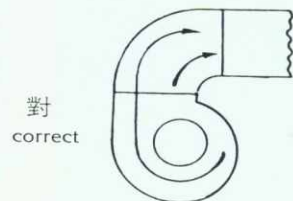


對
correct



錯
wrong

急擴大
due to abrupt change
in duct size



對
correct



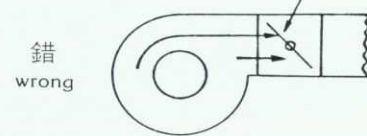
錯
wrong

反方向
due to reverse direction



對
correct

Damper orientation correct
開關
Damper
開關



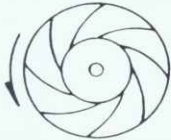
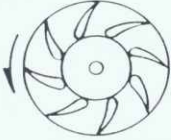
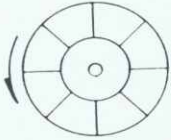
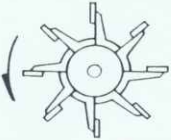
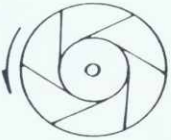
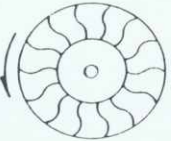
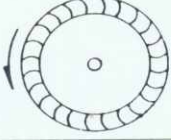
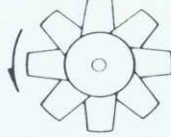
錯
wrong

Damper orientation incorrect



榮風抽送風機葉輪構造及用途

RONG FONG FANS - BLADE CONFIGURATIONS & APPLICATIONS

型 式	葉 輪 構 造	特 徵 與 用 途
透 浦 式 Turbo Type		此為一般最常用的機種，葉向呈後向彎曲(backward bending)。構造堅固故可高速旋轉，自低壓至高壓均可製出。其葉輪容許少量灰塵進入，但不耐大量之灰塵。適用於所有各種氣體的輸送或集塵設備之抽風等。用途最為廣泛。
翼 截 式 Airfoil Type		此係透浦式之改良型，其葉片依飛機翼型製造，效率高，且具有定載性(limit load characteristic)不虞馬達超載。其噪音亦為所有機種中之最低者。適用於一般之通風設備，如辦公大樓或工廠之空氣調節，各種窯爐之送風等。
直 翼 式 Plate Type		此葉輪之葉片出口角度呈徑向輻射而出。有時與葉式同稱為板葉式(Plate type)。其葉輪較耐磨損，容許固體進入。適用於中含塵量之集塵設備或粉粒體之輸送，亦適用於各種窯爐之抽風等。
槳 葉 式 Paddle Type		此係由直翼式轉變而得的型式。其葉輪並無側板，葉片完全成單獨板狀，因構造關係轉數不宜過高，但較耐磨且粉塵不易附著，容許高含量的氣體進入，及有線狀之含塵更易於排出，適用於各種窯爐的直接抽風，集塵設備以及粉粒體輸送。
徑 向 式 Radial Type		此葉輪呈後向直翼式，俱備翼型，定載式及靜音之特性，結構簡單耐磨損亦堅固，容許固體進入不易附著，適用於鍋爐之送風，集塵設備，粉粒輸送及一般工廠之強力通風。
定 載 式 Limit Load Type		此葉輪葉片為S型，係透浦式與多翼式之綜合改良型，具有定載性故通稱定載式，其葉輪容許微粉進入，適用於一般之排氣換氣及窯爐之循環風扇等。
多 翼 式 Sirocco Type		此葉輪之葉片呈前向彎曲(forward bending)片數多達數十片。風量較大，但因葉輪構造簡單僅適於低速旋轉，故壓力低。其葉輪直徑每6吋為1號。適用於工廠或建築物之空氣調節，冷氣輸送等。
軸 流 式 Axial Type		此送風機之風向與轉軸同向，置於管路中安裝與拆解皆甚方便。其風量大、壓力低。風門全開時所需馬力最低，與離心形剛好相反。外形可分為馬達內藏型，皮帶驅動型與曲管型等。適用於紡織工廠、船舶、墜道或冷水塔通風等。

- 附件選用(Accessary)：可附裝清除孔、排洩孔、出入口開關、消音器、出入口方轉圓或圓轉方管等。
- 冷卻方法(Cooling)：輸送常溫氣體可用空冷式軸承，高溫氣體則用水冷式或特殊空冷式。
- 材質選擇(Material)：包括一般鋼板、不銹鋼板、耐磨鋼板、鑄鋁合金、鋁板、鑄鐵等。
- 潤滑方式(Lubrication)：低速旋轉者採用滑脂潤滑，高速旋轉者採用浸油、噴油或強制潤滑。
- 驅動方式(Drive)：利用三角皮帶、聯結器直結或馬達軸直結等三種方式驅動。
- 特殊加襯(Lining)：為耐酸、耐鹼、耐磨，可施以FRP加襯、橡膠加襯、鋼板加襯等。
- 平衡校正(Balancing)：葉輪及皮帶輪，都經本公司動力平衡試驗機細心校正。



送風機的選定及性能圖之選擇

SIZING FANS & BLOWERS USING PERFORMANCE CHARTS

選定圖係按照每個送風機的順序，定為橫軸表示風量 (m³/min)，縱軸表示靜壓 (mmAq)，則其交點的回轉數，就是送風機的回轉數，包含交點的動力的範圍為所需要的馬力。

選定例 (參照右圖) Example (refer to the performance chart on the right):
機型: TFB-5 1/2 Model: TFB - 5 1/2"
風量 = 260 m³/min Volume Capacity: 260 m³/min
靜壓 = 340 mmAq Static pressure: 340 mmAq

選定程序

- ① 風量：由橫軸 260 m³/min 之點畫垂直線。
- ② 靜壓：由縱軸 340 mmAq 之點畫水平線。
- ③ 馬力：由交點的範圍內求得。(30 HP)
- ④ 轉數：由交點右下角求得。(1610 RPM)

此型錄選定圖以吸進標準吸入狀態的空氣 (比重 1.2 kg/m³) 為基準。吸入狀態的空氣 (絕對壓力 760 mmHg、溫度 20°C、濕度 65%、比重 1.2 kg/m³) 若操作規格不同於上述條件時，請由下面的公式換算後選定。

① 吸入空氣 20°C 以外的情形

$$PS = \frac{T + t_1}{T + 20} \times PS_1 \quad L_1 = \frac{T + 20}{T + t_1} \times L$$

② 比重不同的氣體的情形

$$PS = \frac{1.2}{r_1} \times PS_1 \quad L_1 = \frac{r_1}{1.2} \times L$$

PS：換算成標準狀態 (選定圖) 的靜壓 (mmAq)

PS₁：使用狀態的靜壓 (mmAq)

L：標準狀態的電動機馬力 (HP)

L₁：使用狀態的電動機馬力 (HP)

T：絕對溫度 273 °K

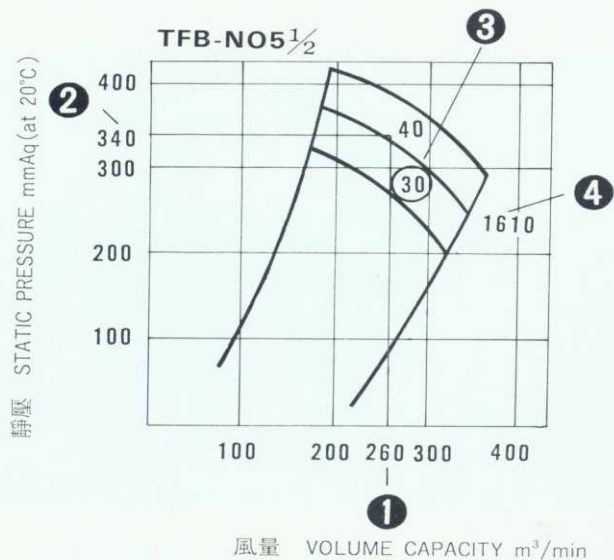
t₁：氣體的溫度 (°C)

r₁：氣體的比重 (kg/m³)

Sizing procedures:

1. Locate volume of 260 m³/min on the x-axis and draw a vertical line therefrom.
2. Locate static pressure of 340 mmAq on the y-axis and draw a horizontal line therefrom.
3. horsepower can be readily read out from the horsepower region where the intersection of the vertical and the horizontal lines drawn in 1. and 2. is in it is found to be 30HP for this instance.
4. Revolution in rpm is provided lower right to the intersection and is found to be 1610 rpm in this case.

Performance charts for all models of fans/blowers are provided herewith in due order, in which the x-axis denotes volume in m³/min while the y-axis indicates static pressure in mmAq. Example below shows how to size a blower, with known requirements on volume and static pressure.



The performance charts provided in this catalogue are made basing upon standard conditions for the sucked air as below:

- Specific weight of sucked air: 1.2 kg/m³
- Absolute pressure: 760 mmHg
- Ambient temperature: 20°C
- Humidity: 65%

If operating conditions are different from those described above, following formulas should be used to get them adjusted accordingly:

1. For temperature deviations

$$PS = \frac{T + t_1}{T + 20} \times PS_1 \quad L_1 = \frac{T + 20}{T + t_1} \times L$$

2. For specific weight deviations

$$PS = \frac{1.2}{r_1} \times PS_1 \quad L_1 = \frac{r_1}{1.2} \times L$$

Where PS = Static pressure already adjusted to be equivalent to standard conditions.

PS₁ = operating static pressure (mmAq)

L = Motor horsepowers (HP) with reference to standard conditions

L₁ = Motor horsepowers (HP) with reference to operating conditions

T = Absolute temperature 273 °K

t₁ = Sucked air temperature (°C)

r₁ = Sucked air specific weight (kg/m³)



設計參考資料

DESIGN MATERIALS REFERENCE

室(廠)內所需換氣量及噪音標準

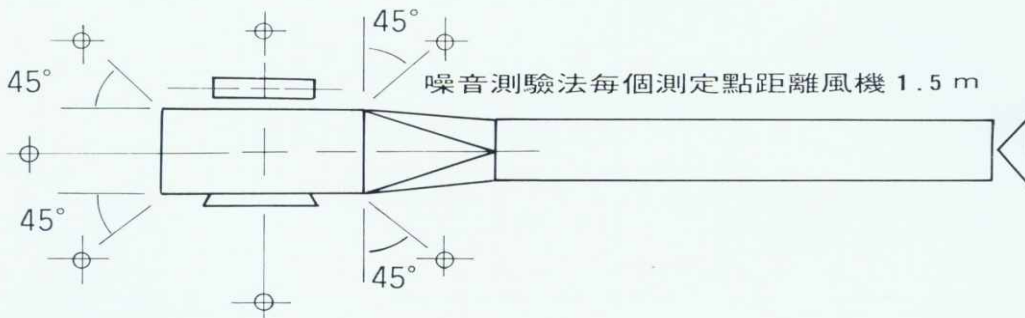
Q : 必要換氣量

計算公式 $Q = \frac{V \cdot a}{60}$

V : 室內容積

a : 每小時換氣次數

場所	換氣次數 次/h	容許噪音	場所	換氣次數 次/h	容許噪音
圖書館	6-10	35-40 db	餐廳	7-20	50-55 db
醫院	4-6	35-40 db	廚房	20-60	60-65 db
戲院	10-20	40-45 db	體育館	15-30	60-65 db
教室	6-10	45 db	一般工廠	6-12	60-65 db
辦公室	6-12	55 db	機械工廠	12-20	70-75 db
百貨公司	10-15	50-55 db	鍋爐工廠	15-30	75-80 db



流量	m ³ /h (cmh)	m ³ /min (cmm)	(英) gal/min	(米) gal/min	ft ³ /h	ft ³ /min (cfm)
	3.6	0.060	13.197	15.8514	127.14	21.192
	1	0.0167	3.6658	4.4032	35.317	0.5881
	60.0	1	219.98	264.1833	2,119.183	35.3165
	0.2728	0.0045	1	1.2011	9.6342	0.1606
	0.2271	0.0038	0.8325	1	8.0208	0.1777
	0.0283	0.0005	0.1038	0.1247	1	0.0167
	1.6989	0.0283	6.2279	7.4855	60.0	1

壓力	kg/cm ² (abs)	氣壓 (atm)	水 銀 柱		水 柱 (15°C) Aq	
			mmHg	inHg	mmAq	ftAq
	1	0.9678	735.5	28.96	10.01	32.883
	0.0703	0.0680	51.71	2.0355	0.704	2.250
	1.0333	1	760	29.92	10.34	33.933
	0.0014	0.0013	1	0.0394	0.0136	0.0446
	0.0345	0.0334	25.4	1	0.3456	1.134
	0.0999	0.0967	73.49	2.893	1	3.2808
	0.0305	0.0295	22.404	0.8819	0.3048	1

動力	HP	KW	kg. m/sec	kcal/sec
	0.9859	0.7355	75	0.1757
	1	0.746	76.07	0.1782
	1.3405	1	101.97	0.2389
	0.0132	0.0098	1	0.0023
	0.0018	0.0014	0.1383	0.0332
	5.611	4.186	426.9	1
	1.414	1.055	107.6	0.2520



風速、風量相抵抗之關係圖(圓形管)

如圖：在風量 600 M³/min，通風管直徑 1000 mm時，通風管內風速為 13 m/sec，每 100 M 的磨擦損失為 20 mmAq。

例：如長方形通風管 450 mm×300 mm，換算成圓形通風管時，可由下列公式求得。

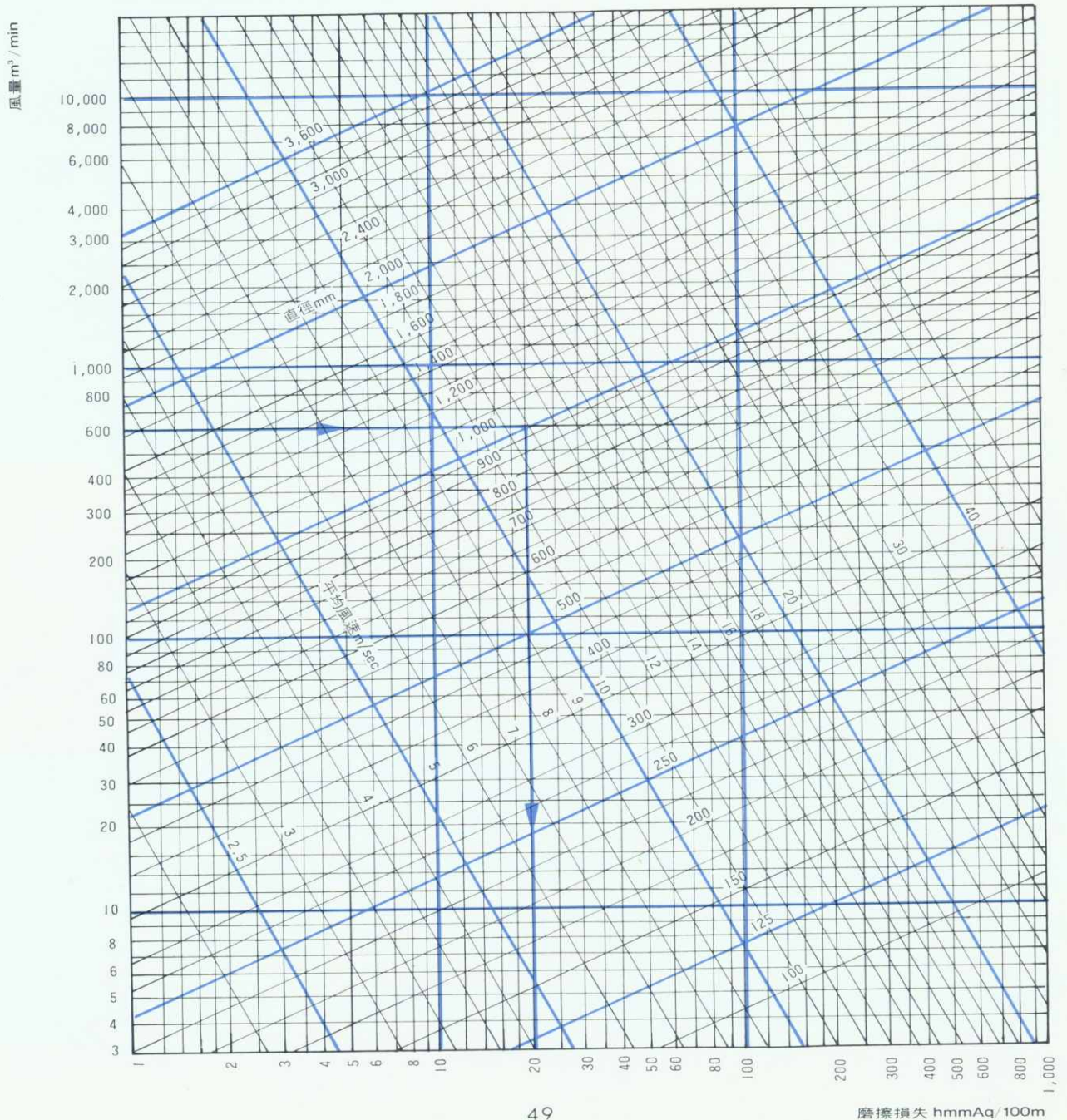
$$De = 1.3 \sqrt{\frac{(a \times b)^5}{(a+b)^2}}$$

De = 圓形通風管的直徑(mm)

a = 長方形通風管的長邊之長度(mm)

b = 長方形通風管的短邊之長度(mm)

圓型直管磨擦損失



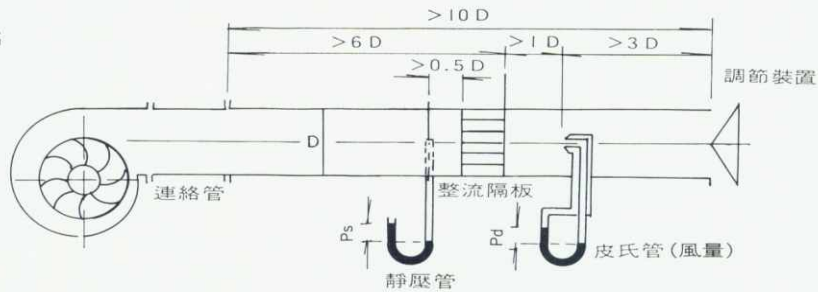


(送風機標準性能測試方法)

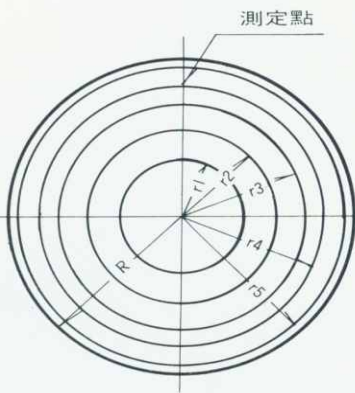
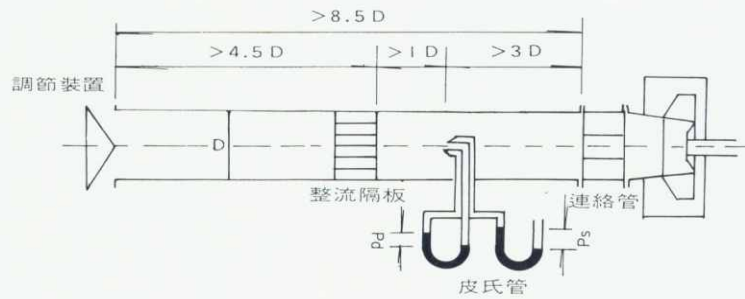
FANS FUNCTION & TESTING METHODOLOGY

依CNS (國家標準) 送風機之性能測試如下：

出口配管



入口配管



$$r_1 = 0.316 R$$

$$r_2 = 0.548 R$$

$$r_3 = 0.707 R$$

$$r_4 = 0.837 R$$

$$r_5 = 0.949 R$$

$$pd = \frac{pd(1) + pd(2) + \dots + pd(20)}{20}$$

$$V = \sqrt{2 g \frac{Pd}{r}} \dots \dots \dots (1)$$

$$r = 1.2 \text{ kg/m}^3 \quad g = 9.8 \text{ m/sec}^2$$

$$Q = A \cdot V \cdot 60 \dots \dots \dots (2)$$

標準狀態溫度為 20°C 絕對壓力 760 mmHg, 相對濕度 65% 如風量, 靜壓, 軸動力於特定溫度, 壓力狀態之下, 換算公式如下：

$$Q_1 = Q_2 \cdot \frac{P_2}{P_1} \cdot \frac{T_1}{T_2} \dots \dots \dots (3)$$

$$P_1 = P_2 \cdot \frac{T_2}{T_1} \dots \dots \dots (4)$$

$$L_1 = L_2 \cdot \frac{T_2}{T_1} \dots \dots \dots (5)$$

風量計算公式

$$Q = 60 \cdot A \cdot V$$

$$V = \sqrt{2 g \frac{Pd}{r}}$$

$$A = \pi d^2 / 4$$

送風機相似定律

$$\frac{Q_2}{Q_1} = \left(\frac{N_2}{N_1}\right) \times \left(\frac{D_2}{D_1}\right)^3$$

$$\frac{PS_2}{PS_1} = \left(\frac{N_2}{N_1}\right)^2 \times \left(\frac{D_2}{D_1}\right)^2 \times \left(\frac{r_2}{r_1}\right)$$

$$\frac{HP_2}{HP_1} = \left(\frac{N_2}{N_1}\right)^3 \times \left(\frac{D_2}{D_1}\right)^5 \times \left(\frac{r_2}{r_1}\right)$$

Q=風量(m³/min)

A=管路面積(m²)

V=風速(m/sec)

g=重力加速度(m/sec²)

r=氣體比重(kg/m³)

d=管路直徑(m)

Pd=動壓(mmAq)

Ps=靜壓(mmAq)

N: 轉速(RPM)

D: 代表尺寸(mm)

T: 絕對溫度

L: 軸動力