

BLOWERS IN PA'S.

Heat transport : $Q = m \times C_p \times dT$

$m = (\text{kg/s}),$
 $C_p = (\text{Ws/kg} \times \text{C})$
 and $Q = (\text{W})$

Volum flow : $L = A \times v$
 $A = (\text{m}^2), v = (\text{m/s})$
 and $L = (\text{m}^3/\text{s})$

Backpressure v.s. Volum flow : $dp = k \times L^2, k = \text{const}$
 (see tabel 1)

Volum flow in holes : $L = 0.6 \times A \times \sqrt{2 \times g \times dp/\rho}$

$dp = \text{diff in static pressure. (kg/m}^2 = \text{mmVs)}$

$g = 9.81, \text{ and } A \text{ in } \text{m}^2$

MEASURING.

$P_{\text{tot}} = P_{\text{st}} + P_d$, where $P_d = \text{dynamic pressure, } P_{\text{st}} = \text{static}$

$P_d = \rho \times v^2 / 2 \times g$ in $(\text{kg/m}^2 = \text{mmVs})$ $v = \text{speed (m/s)}$

(v as function of P_d is given i tabel 2)

TEST-TUBE FOR MEASURING OF DYNAMIC PRESSURE.

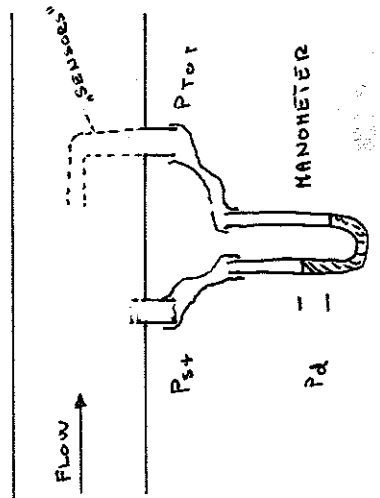


FIG 1.

FAN'S PERFORMANCE DIAGRAM. (Pressure-volum diagrams)
 Most diagrams shows P_{tot} , adj needed for P_{st} .

Diagram here also show an parabel (system drop).

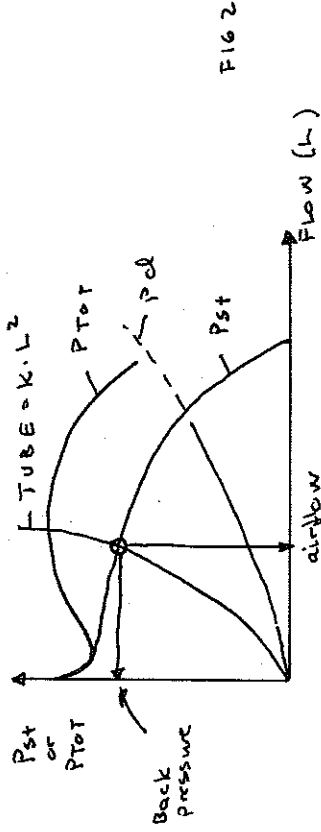


FIG 2

FAN'S IN SERIE AND PARALLEL.

In paralell : Add airflow on x-axis
 In serie : Add pressure on y-axis.

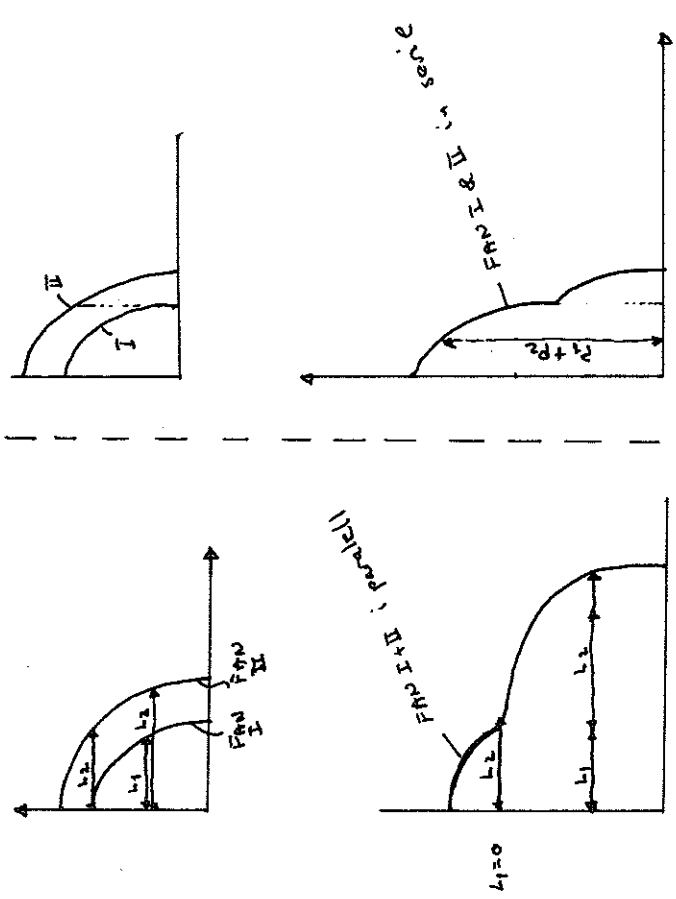


FIG 3.1

FIG 3.2

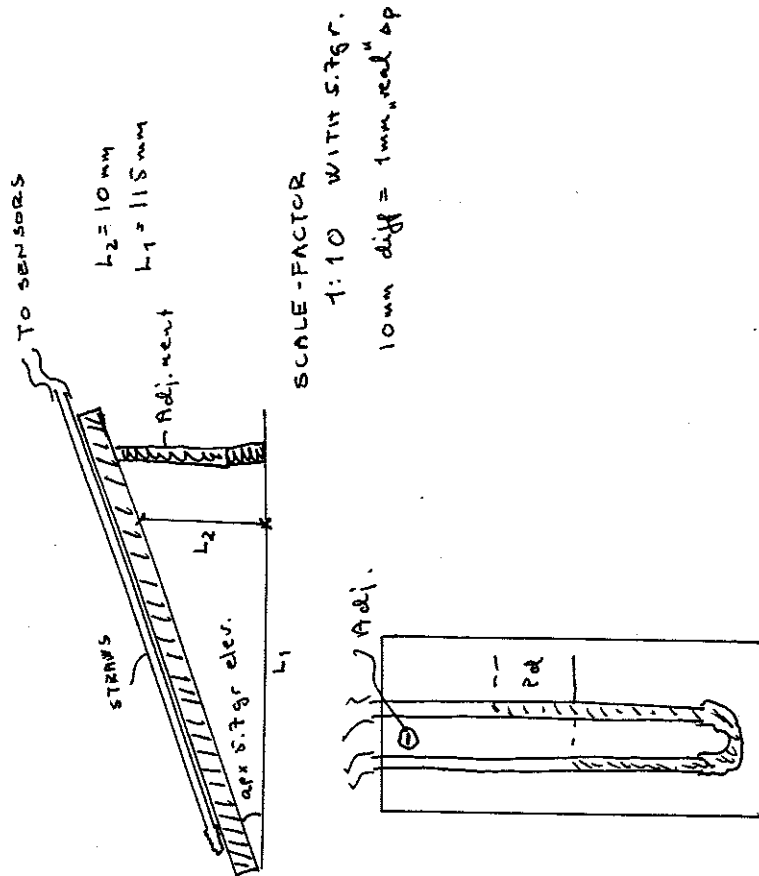
HOW TO MAKE YOUR OWN MEASUREGEAR.

- 1) Find a plastic or metal tube with diameter apx 3-5 cm.
- 2) Make "sensors" out of tubes 2-3 mm in diameter.
- 3) Mount "sensors" in plastic tube :

SE FIG 1

- 4) Make manometer. 2 pieces of clear straws og plastic tube. 1 meter or so of rubbertube, and a piece of wood/metall.

To make scale-factor ok the manometer should be apx 5.7 gr elevator only. This make scalefactor 1:10. 10 mm measured eq 1 mm of real pressure.



Tabel 1. k-faktors for well known tubes.

Tube	Min airflow in m ³ /s	Min Pst in mmVs	k-faktor
3-1000Z/8164	0.0117	9.652	70509
3CX800A7	0.0089	8.890	112233
3CX1500/8877	0.0163	10.414	39196
4CX250	0.0030	20.828	2300000
4CX350	0.0034	30.480	2637000
4CX1000a/8168	0.0117	5.100	37256
8874	0.0040	9.398	587375

This is minimum req. by manufacturer. Air outlet temp will be apx 100 gr C. For all practical use 100 Watt = 0.001 m3/s airflow. MINIMUM.....Air flow is given for 20 gr C.

Tabel 2. Dynamic pressure v.s. airspeed.

Airspeed m/s	Pd mmVs	Airspeed m/s	Pd mmVs
1.0	0.061	4.75	1.38
1.25	0.096	5.0	1.53
1.5	0.14	5.5	1.85
1.75	0.19	6.0	2.20
2.0	0.24	6.5	2.58
2.25	0.31	7.0	3.00
2.5	0.38	7.5	3.44
2.75	0.46	8.0	3.91
3.0	0.55	8.5	4.42
3.25	0.65	9.0	4.95
3.5	0.75	9.5	5.52
3.75	0.86	10.0	6.12
4.0	0.98	10.5	6.74
4.25	1.10	11.0	7.40
4.5	1.24	11.5	8.09

Tabel 3. Diff. Units for Flow and pressure.

Pressure :

1 mmVs = 1 kg/m² = 9.81 Pa = 1/25.4 inch of water = 0.0981 mbar.

Flow : 1 CFM = 0.028 m³/min = 0.000467 m³/s.

Air density v.s temp.: 20 gr C = 1.189 kg/m³

60 gr C = 1.046 kg/m³, 100 gr C = 0.934 kg/m³

Air volum = air mass / density

Special measurement on the 4CX250-tube.

K-factors on Anode apx 230000. On socket with tube (no Chimney), k-factor apr 1200000.

This mean that airflow with pressurised anode will be 3/4 of airflow in anode, and 1/4 in socket. This also mean that less backpressure is needed.

Practical measurement done on PA's indicate apx an backpressure og 8-10 mmVS is good.

With 8 mmVs in anode part of construction, Chimney of teflon in outlet, and 5 holes each with 6 mm diameter in grid part you should expect an ariflow of apx 0.0062 m3/s through anode and apx 0.0026 m3/s through socket/grid, wich is OK according to manufacturers spesification.

Brand new fan's from :

Clas Ohlson, Sverige: Smal. (minimum for most PA's)
1.8 m3/min free air, Max backpressure
apx 10 mmVs.
Big. (any PA's up to 2000 w)

Ziehl Norge
Ziehl Sverige
Erik Jenks Efterfølger
DK 2610 RØDOVRE

The G2E-serie. 085 type for low pressure (maks 10 mmVS)
108 type for medium pressure (20 mmVs)
120 type for high pressure (maks 30 mmVs)

Company in Norway will offer discount for radioclubs/
members of NRRL. Prices apx 700 - 900 NKR.

m/s	kg/m ²	m/s	kg/m ²	m/s	kg/m ²
0,25	0,0038	5,5	1,85	16	15,7
0,5	0,015	6,0	2,20	17	17,7
0,75	0,034	6,5	2,58	18	19,8
1,0	0,061	7,0	3,00	19	22,1
1,25	0,096	7,5	3,44	20	24,5
1,5	0,14	8,0	3,91	21	27,0
1,75	0,19	8,5	4,42	22	29,6
2,0	0,24	9,0	4,95	23	32,4
2,25	0,31	9,5	5,52	24	35,2
2,5	0,38	10,0	6,12	25	38,2
2,75	0,46	10,5	6,74	26	41,3
3,0	0,55	11,0	7,40	27	44,6
3,25	0,65	11,5	8,09	28	48,0
3,5	0,75	12,0	8,81	29	51,4
3,75	0,86	12,5	9,56	30	55,0
4,0	0,98	13,0	10,34	31	58,8
4,25	1,10	13,5	11,15	32	62,6
4,5	1,24	14,0	11,99	33	66,6
4,75	1,38	14,5	12,86	34	70,7
5,0	1,53	15,0	13,76	35	74,9