CAL
CENTRIFUGAL FANS STANDARD AND ATEX

Member of SCHAKO Group
NOVENCO
Building & Industry

PRODUCT FACTS

PRODUCT

A robustly built centrifugal fan of the medium pressure type for operation in aggressive environments.

APPLICATION

For process air in composting plants and other installations in aggressive environments and in industrial installations with high physical requirements. Versions for installation in ATEX zones are also available.

RANGE

The standard range comprises 9 directly-coupled installation sizes. The impeller diameters range from 400 to 1250 mm.
Airflow rates are from 0.3 to 21 m³/s and total pressures up to 8500 Pa.

CONSTRUCTION

- Welded housing, impeller and bearing bracket
- Impeller with backward-curved blades
- Motors are directly coupled on all versions and are drive side removable

MOTORS

Mounting: On support frame connected directly to the impeller and removable
Terminal boxes: Boxes of steel mounted on fan casing
Dimension standard: IEC-72
Electrical standard: IEC-34
Enclosure: IP-55 or IP-56
Insulation: Class F or H
Balancing: ISO 2373
Structural shape: B3 for flanges

MOTOR INSTALLATION SIZES

Fan size	100%	85%	70%
400			
500			
630	160-225		160-225
710	160-225		160-225
800	160-225	160-280	160-280
900	160-280	160-280	160-280
1000	180-280	180-280	180-280
1120	250-280	250-280	250-315
1250	280	280	280-315

EFFICIENCIES

Excellent operating economy with efficiencies up to 82%, depending on fan size, configuration and motor.

MATERIALS

Housing: Heavy sheet steel, steel 37-2 or stainless sheet AISI 316L
Impeller: Corten, DOMEX 500 and SAF-2205 steel qualities, AISI 316L at reduced RPMs
Bearing bracket: Heavy steel sections
Surface treatment: Hot-dip galvanised

CLASSIFICATIONS

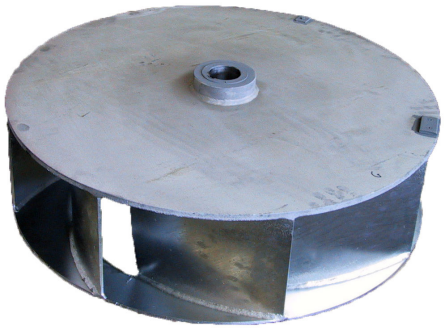
Flange standard: Eurovent 1/2 for inlet
Corrosion categories: Meets the requirements for operation in medium-level corrosive environments in accordance with DS/EN ISO 12944-2 and category C4.
Technical classifications: Outputs in accordance with BS 848:1980 and ISO 5801 1997, installation type D
Temperature range, standard: 0 to 70 °C
ATEX: Category 2G/D according to EU directive 2014/34/EU
Calculation software: AirBox program is certified by TÜV.

ACCESSORIES

- Anti-vibration mountings
- Counter flange
- Drain
- Flexible connections for inlet and outlet
- Guide vane arrangement
- Inspection door
- Mating flange for outlet
- Wire guard

DESCRIPTION

The CAL is a robustly built compact centrifugal fan for universal installation of the medium pressure type. It is primarily designed for process air in composting plants and other aggressive environments. It is also well suited for a wide range of industrial purposes with high physical load and long life requirements.
There are 9 installation sizes available, all with directly coupled motors.
Impeller diameters range from 400 to 1250 mm.
Airflow rates go from 0.3 to 21 m³/s and pressure outputs up to 8500 Pa.
The temperature range runs from 0 to 70 °C.



Impeller

CONSTRUCTION

The fan consists of a robustly welded housing with angle stiffeners, an impeller, a combined motor and bearing bracket and a support frame for the motor. The stiffeners and brackets are all made of strong steel sections.
The base of the brackets forms the base frame of the fan.
The motor is drive side removable and mounted on the support frame.
The impeller is mounted directly on the motor shaft and has backward-curved blades.
The shaft bushing in the fan housing is either a simple gap seal with approximately 1 mm gap between shaft and housing, or a double lip seal that prevents aggressive gases and condensate from leaking out.
The fan housing has the following features

- A duct boss and conical inlet funnel on the inlet side
- A flange on the outlet side
- A discharge boss at the lowest point of the fan housing in those installation positions where it is necessary.

MATERIALS AND SURFACE TREATMENT

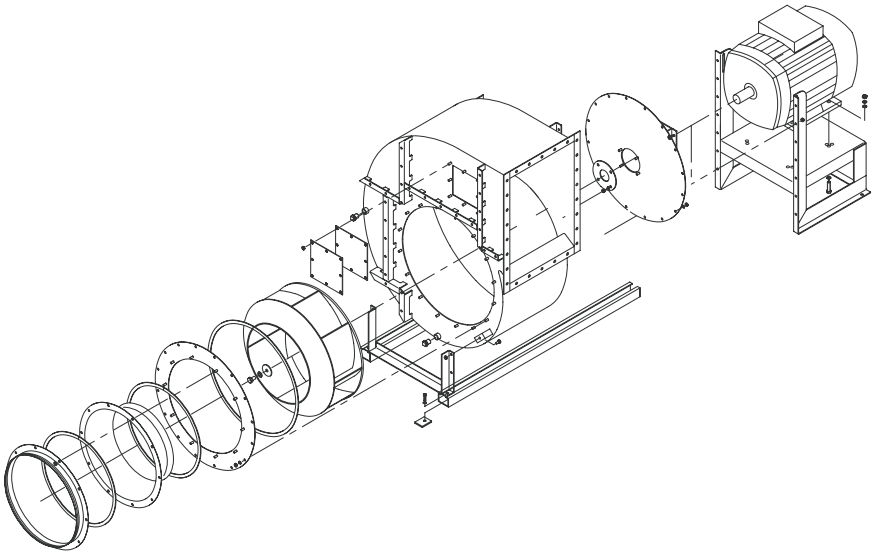
The fan housing and brackets are made of heavy sheet steel.
The impeller is available in two stainless versions, either SAF 2205 or AISI 316L for limited RPM's. See "Dimensioning charts" on page 10.
The surface is hot-dip galvanised and meets international requirements for operation in medium-level corrosive environments in accordance with DS/EN ISO 12944, part 2.

ATEX

The ATEX version is made to comply with the ATEX directive 2014/34/EU for category 2 G/D fans.

AIRBOX CALCULATION PROGRAM

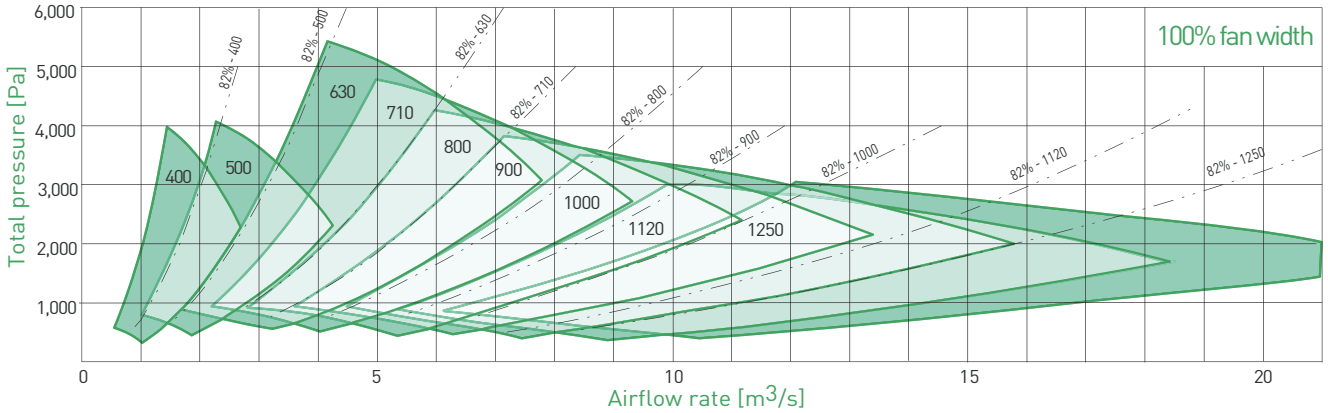
The AirBox program is Novenco's calculation and configuration tool for fans. Input to the program are the requirements for airflow and pressure as well as specific characteristics of the operating environment. Further requirements for the fan, motor and accessories are also input and form the basis for calculation of possible solutions.
Novenco AirBox is available on www.novenco-building.com in the download section. It requires registration, checks automatically for updates and is for free.

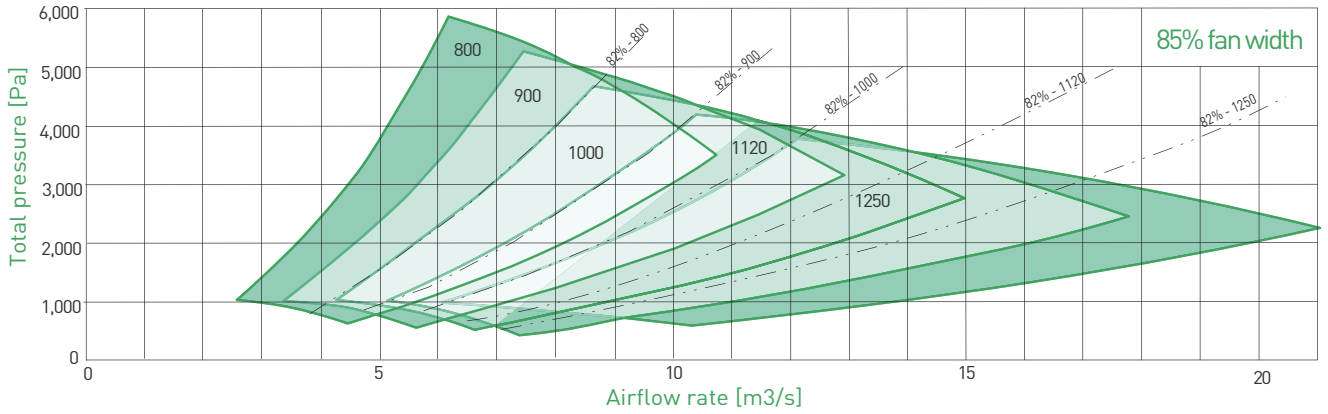


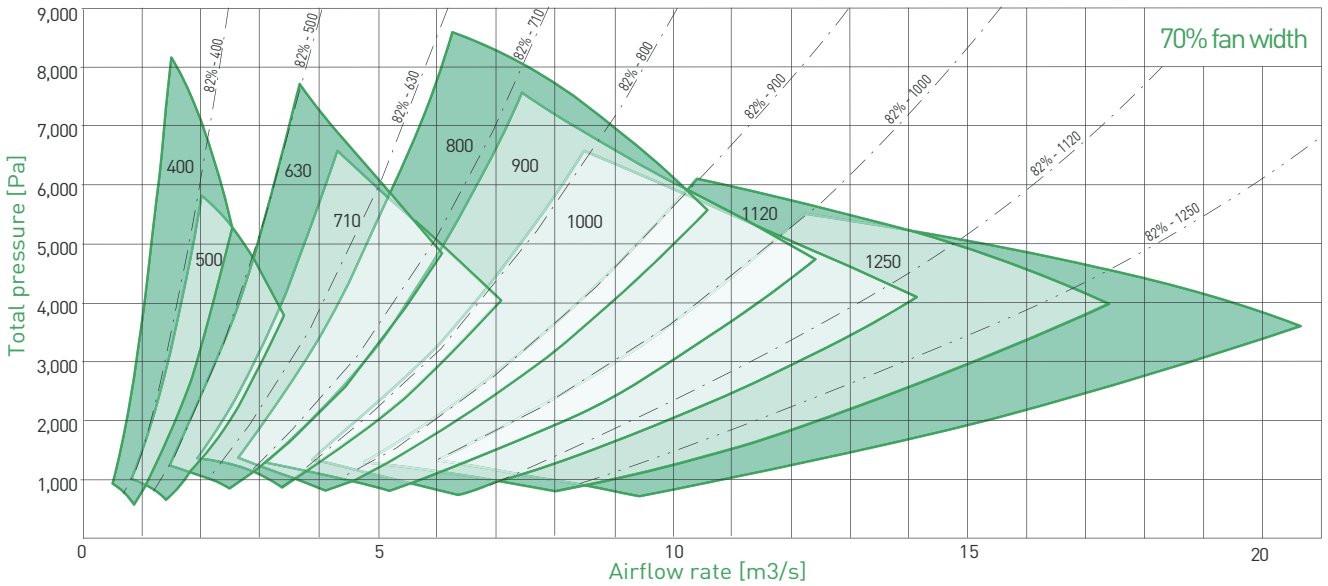
Exploded view of the CAL

WORK AREAS

The work area is plotted for each of the three fan widths and for each fan size in which the efficiency is greater than 75%, with an indication of the peak efficiency of 82%.



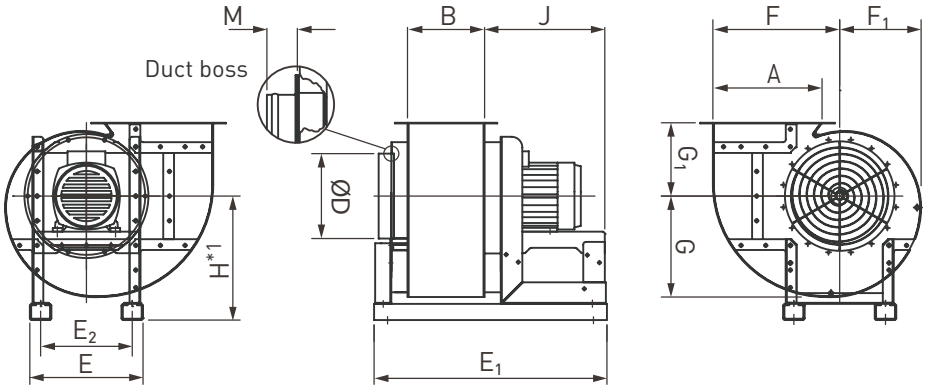




Performance curves

DIMENSIONS

CAL 100% FAN WIDTH, MOTOR SIZES 132-160-180-200-225-250

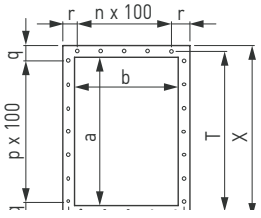


Drain plug 1½' RG
Measurements are in mm.

	A	B	ØD	E	E1			E2	F	F1	G	G1	M			
					132-160-180	200-225	250						Pos 0	Pos 90	Pos 180	Pos 270
CAL-400	400	286	315	420	864			340	471	302	375	272	55	110	53	53[*9]
CAL-630	630	441	500	644[*3]		1219		564[*4]	737	470	591	429			64	64
CAL-710	710	497	560	708	1095	1275		628	835	536	667	483	64	64	64	53
CAL-800	800	560	630	780		1340		700	936	600	752	544				53
CAL-900	900	630	710	860	1410	1410[*5]	1486	780	1053	670	845	612	66	66	66	
CAL-1000	1000	700	800	925		1480		846	1170	745	939	680	66		66	
CAL-1120	1120	784	900	1016		1795		956	1310	845	1048	762	53			

	H				J								Weights [kg] [*2]
					Motors 132-160-180				Motors 200-225-250				
	Pos 0	Pos 90	Pos 180	Pos 270	Pos 0	Pos 90	Pos 180	Pos 270	Pos 0	Pos 90	Pos 180	Pos 270	
CAL-400	460	460	460	620	446	446	446	446					
CAL-630			510	860							630	630	
CAL-710	770	620	560	960	450					630	630	630	
CAL-800				1060								630	
CAL-900	960	770	690			630			650		630[*6]		
CAL-1000	1060		770						630		630		
CAL-1120	1186								850				

OUTLET FLANGES



	q	p	r	n	T	X	S	Y	u	a	b
CAL-400[*7]	47.5 / 50	4	90	2	450	500		380	16	405 / 400	285 / 280
CAL-630	62.5	6	68	4	680	725	491	536	24	635	446
CAL-710	45	7	96	4	760	805	547	592	26	715	502
CAL-800	47.5	8	77.5	5	850	895	610	655	30	805	565
CAL-900[*8]	47.5 / 50	9	112.5 / 118	5 / 4	950	995	680 / 586	725 / 636	32 / 30	905 / 950	635 / 586
CAL-1000	50	10	100.0	6	1050	1100	750	800	36	1000	700
CAL-1120	70	11	102	7	1180	1240	844	904	40	1125	794

Please note that on the mating flange, A and B dimensions are table value +5 mm, X and Y dimensions are table value -5 mm, and r and q dimensions are table value -2.5 mm.

Footnotes

[1] Depends on fan position. H is increased by 30-64 mm depending on anti-vibration mountings.

[2] Maximum weights excluding motors.

[3] For motor size 225 the distance is 664 mm.

[4] For motor size 225 the distance is 584 mm.

[5] For position RD180 the distance is 1390 mm.

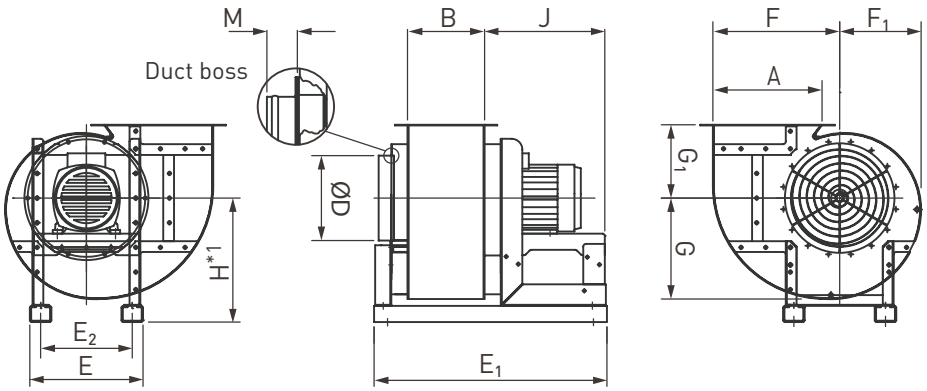
[6] For motor size 250 the distance is 795 mm.

[7] In cells with two values the right is for fans in position RD180.

[8] In cells with two values the right is for fans with motor sizes 250.

[9] For position RD270 the distance is 110 mm.

CAL 85% FAN WIDTH, MOTOR SIZES 200-225-250-280

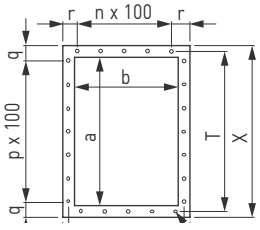


Drain plug 1½' RG
Measurements
are in mm.

	A	B	ØD	E	E_1		E_2	F	F_1	G	G_1	M			
					200-225	250-280						Pos 0	Pos 90	Pos 180	Pos 270
CAL-800	800	476*3	630	780*4	1256		700	941*5	604*6	749*7	544		114	114	53
CAL-900	900	536	710	860	1316	1486*8	780	1053	670*9	845	612		114	120*10	114
CAL-1000	1000	595	800	925		1545	846	1170	754*11	940	680		126	126	
CAL-1120	1120	667	900	1016		1699	956	1310	845	1048	762		53	53	

	H				J								Weights [kg] *2
					Motors 200-225				Motors 250-280				
	Pos 0	Pos 90	Pos 180	Pos 270	Pos 0	Pos 90	Pos 180	Pos 270	Pos 0	Pos 90	Pos 180	Pos 270	
CAL-800		690	620	1060						630	630	630	
CAL-900		770	690	1180		630	630	630		800	800	800	
CAL-1000		860	770							800	800		
CAL-1120		960	860							850	850		

OUTLET FLANGES



	q	p	r	n	T	X	S	Y	u	a	b
CAL-800	47.5	8	85.5	4	850	895	526	571	28	805	481
CAL-900*12	47.5 50	9	115.5 118	4	950	995	586	631 636	30	905 900	541 536
CAL-1000	50	10	97.5	5	1050	1100	645	695	34	1005	600
CAL-1120*13	70 67.5	11	93.5 99.5	6 7	1180	1235	727 844	782 899	38 40	1125	672 789

Please note that on the mating flange, A and B dimensions are table value +5 mm, X and Y dimensions are table value -5 mm, and r and q dimensions are table value -2.5 mm.

Footnotes

1 H is increased by 30-64 mm depending on anti-vibration mountings.

2 Maximum weights excluding motors.

3 For positions RD180 with motor sizes 200 and 225, and LG270 with motor size 225 the distance is 486 mm.

4 For positions RD180 with motor sizes 200 and RD180 with motor sizes 225 the distance is 760 mm.

5 For position LG270 with motor size 225 the distance is 936 mm.

6 For position LG270 with motor size 225 the distance is 600 mm.

7 For positions RD180 with motor sizes 200 and 225, and LG270 with motor size 225 the distance is 752 mm.

8 For position RD90 with motor size 280 the distance is 1496 mm.

9 For position LG270 with motor sizes 225 and 250 the distance is 675 mm. For position RD180 with motor sizes 225, 250 and 280, and LG180 with motor sizes 225 and 250 the distance is 679 mm.

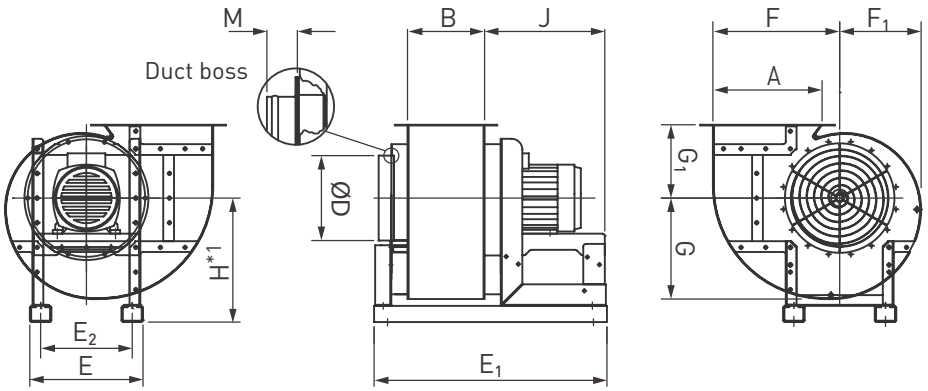
10 For position RD180 with motor size 225 the distance is 114 mm.

11 For position RD180 with motor size 250 the distance is 745 mm.

12 Bottom values are for position RD90 with motor sizes 250 and 280.

13 Bottom values are for position LG180 with motor size 280.

CAL 70% FAN WIDTH, MOTOR SIZES 132-160-180-200-225-250-280

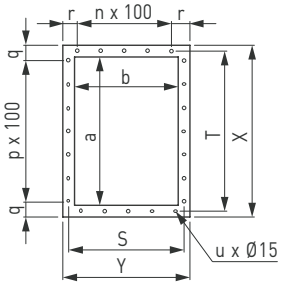


Drain plug 1½' RG
Measurements
are in mm.

	A	B	ØD	E	E_1 (as to motor sizes)			E_2	F	F_1	G	G_1	M (as to fan positions)			
					132-160-180	200-225	250-280						Pos 0	Pos 90	Pos 180	Pos 270
CAL-400	400	202	315	420	780			340	471	302	375	272	55	110	53	53
CAL-500	500	245	400	540	841			460	585	376	470	340		55	53	55
CAL-630	630	309	500	644	887*3	1087		564	737	470	591	429		140	140*4	53
CAL-710	710	348	560	708		1126		628	835	536	665	483		64	53	
CAL-800*5	800	486	630	780		1342		700	941	604	749	544		114		53
CAL-900	900	441	710	860		1440	1391	780	1058	675	845	612	53		174	114
CAL-1000	1000	490	800	926			1430	846	1175	745	680	640		186		186
CAL-1120	1120	549	900	1036			1581	996	1310	845	1048	762		53	53	

	H (as to fan positions)				J (as to motor sizes and fan positions)								Weights [kg] *2
					Motors 132-160-180				Motors 200-225-250-280				
	Pos 0	Pos 90	Pos 180	Pos 270	Pos 0	Pos 90	Pos 180	Pos 270	Pos 0	Pos 90	Pos 180	Pos 270	
CAL-400	460	460	460	620	446	446	446	446					
CAL-500		460	460	770		450	450	450					
CAL-630		560	510	860		450	450	450			630	630	
CAL-710		620	560							630	630		
CAL-800		690		1060						800		630	
CAL-900	960		690	1180					800		800	800	
CAL-1000		860		1310						800		800	
CAL-1120		960	860							850	850		

OUTLET FLANGES



	q	p	r	n	T	X	S	Y	u	a	b
CAL-400	47.5	4	95.5	1	450	495	246	291	14	405	201
CAL-500*6	47.5	5	70	2	550	595	295	340	18	505	250
CAL-630*7	62.5	6	68	4	680	725	491	536	24	635	446
CAL-710	52.5	7	121.5	2	700	805	398	443	22	715	353
CAL-800*8	47.5	8	93.5	3	850	895	442	487	28	805	397
CAL-900*9	47.5	9	118	3	950	995	491	536	28	905	446
CAL-1000	50	10	95	4	1050	1100	540	590	32	1000	490
CAL-1120	67.5	11	82	5	1180	1235	609	664	40	1125	554

Please note that on the mating flange, A and B dimensions are table value +5 mm, X and Y dimensions are table value -5 mm, and r and q dimensions are table value -2.5 mm.

Footnotes

[1] H is increased by 30-64 mm depending on anti-vibration mountings.

[2] Maximum weights excluding motors.

[3] For position RD90 with motor size 160 and position RD180 with motor size 180 the distance is 907 mm.

[4] For position RD180 with motor sizes 200 and 225 the distance is 64 mm.

[5] For position LG270 with motor size 225 the following values apply: B = 486, E_1 = 1256, F = 936, F_1 = 600 and G = 752.

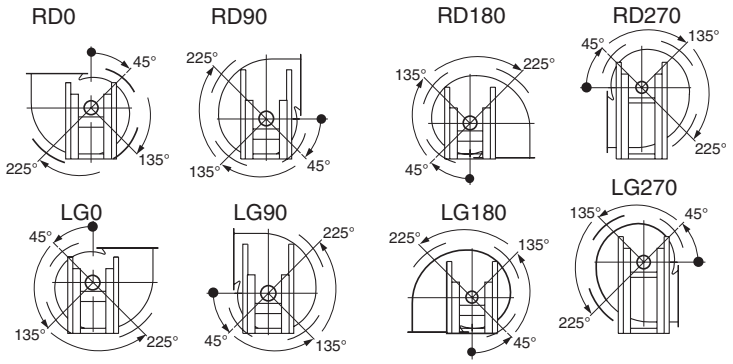
[6] For position LG270 with motor size 160 the following values apply: q = 50, r = 72.5, X = 600 and Y = 345.

[7] For position RD90 with motor size 160, position RD180 with motor size 180 and position RD180 with motor sizes 200 and 225 the following values apply: r = 102, n = 2, S = 359, Y = 404, u = 20 and b = 314.

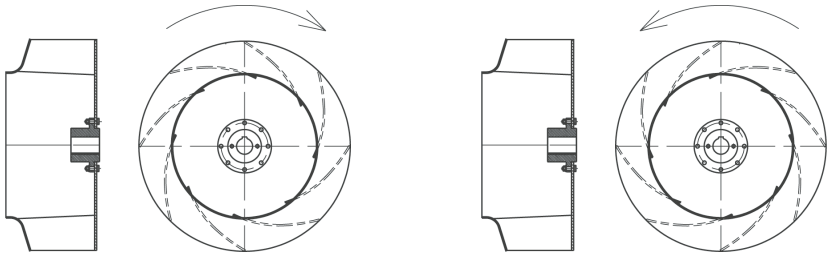
[8] For position LG270 with motor size 225 the following values apply: r = 85.5, n = 4, S = 526, Y = 571 and b = 481.

[9] For position LG270 with motor size 250 and position RD0 with motor sizes 250 and 280 the following values apply: r = 115.5, n = 4, S = 586, Y = 631, u = 30 and b =541.

POSITION DESIGNATIONS



Eurovent position designations from shaft end



Pos. LG

Pos. RD

Impeller positions

ACCESSORIES

ANTI-VIBRATION MOUNTINGS

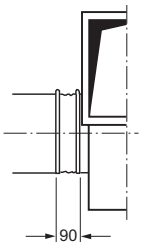
These are cylindrical rubber discs fitted at the installation points. They prevent spreading of vibrations from the fan unit to the surroundings and vice versa. Anti-vibration mountings are available in three size combinations and chosen based on fan size and the mounted accessories. Novenco can calculate, select and supply the mountings.

Feet size	Diameter [mm]	Height [mm]
Small	40	40
Medium	50	45
Large	70	45

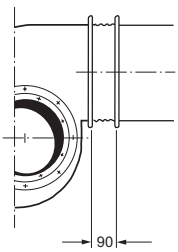
All fans are supplied with installation instructions that provide a precise indication of the position of the anti-vibration mountings.

FLEXIBLE CONNECTIONS

The inlet and outlet can be fitted with flexible connections of flameproof material for max. 80 °C or incombustible material for max. 250 °C.



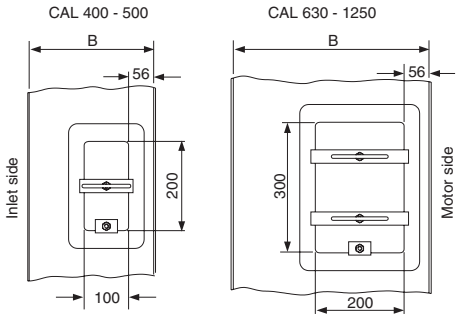
Standard flexible connection for inlet



Standard flexible connection for outlet

INSPECTION DOOR

The door is positioned on the side of the fan housing and is locked with nuts for easy operation. Tightness is ensured with a rubber seal.
The available positions are shown below.



Dimensions of inspection doors

MATING FLANGES

These flanges for the outlet are made of flats. See "Dimensions" on page 5.

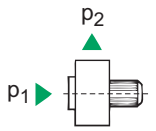
WIRE GUARDS

Wire guards are available for mounting on the inlet.

CALCULATION OF SIZES

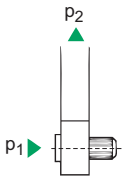
The basis for calculations is the air flow rate and the system pressure loss. This is the fan static pressure, ps = ps2 - ps1.
To establish the total fan pressure pt, add the air speed pressure, the dynamic pressure pd at the outlet and the installation loss at the inlet p1 and outlet p2.
The values are stated in connection with the dimensioning charts beginning on page page 10.
All graphs are plotted for arrangement D.

ARRANGEMENT A



$p_{s2} - p_{s1}$	=	Pa
$+ p_1$	=	Pa
$+ p_d - p_2$	=	Pa
Total pressure		Pa

ARRANGEMENT B

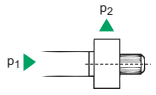


$p_{s2} - p_{s1}$	=	Pa
$+ p_1$	=	Pa
$+ p_d$	=	Pa
Total pressure		Pa

EXAMPLE OF MOTOR CHOICE

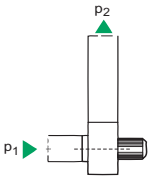
The power consumption in the dimensioning graphs refers to the fan shaft.
Arrangement B — free inlet and duct for outlet
Airflow rate qv = 1.6 m3/s
Pressure loss = static pressure = ps = ps2 - ps1 = 2000 Pa
The chart on page page 10 shows that type CAL-400 is best suited.

ARRANGEMENT C



$p_{s2} - p_{s1}$	=	Pa
$+ p_d + p_2$	=	Pa
Total pressure		Pa

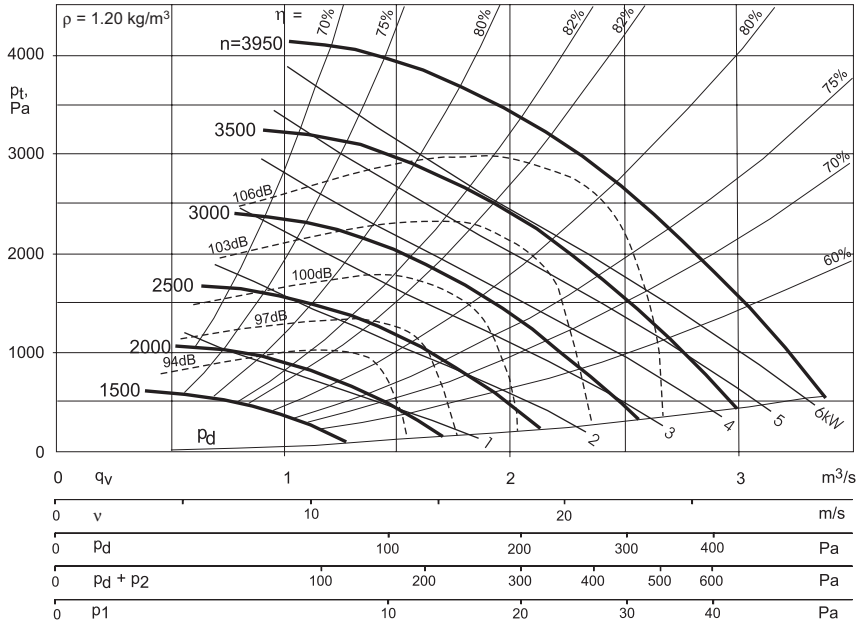
ARRANGEMENT D



$p_{s2} - p_{s1}$	=	Pa
$+ p_d$	=	Pa
Total pressure		Pa

Calculation		
$p_{s2} - p_{s1}$	=	2000 Pa
$+ p_1$	=	12 Pa
$+ p_d$	=	120 Pa
Total pressure		2132 Pa

The chart also shows the following:
Fan speed of 2833 RPM
Efficiency of 81.8%
Power demand of 4.17 kW
Correction 4.17 x 1.2 = 5 kW
Choice of motor: 5 kW

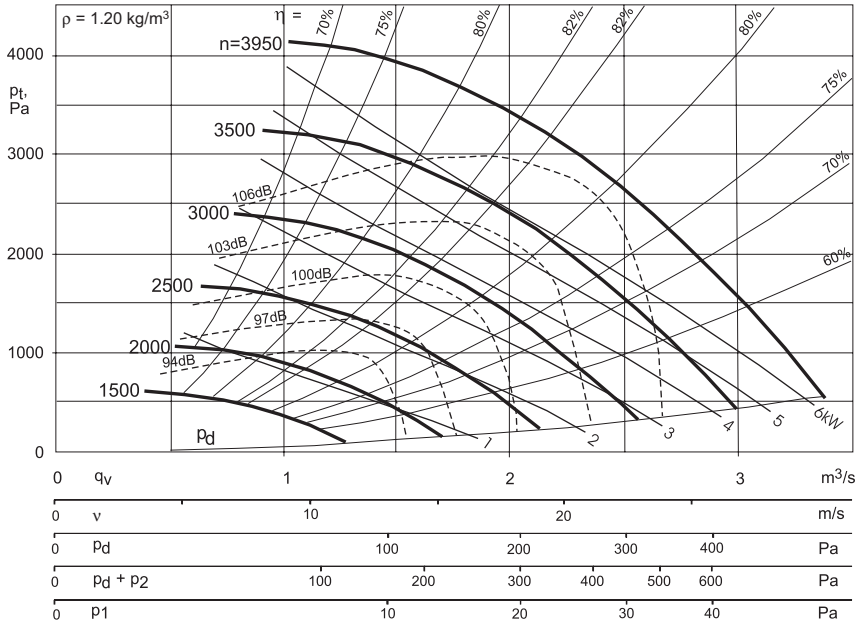


DIMENSIONING CHARTS

CAL 400 - 100%

Moment of inertia: Iv = 0.38 kgm^2
Circumferential speed: u = 0.021 x n, m/s

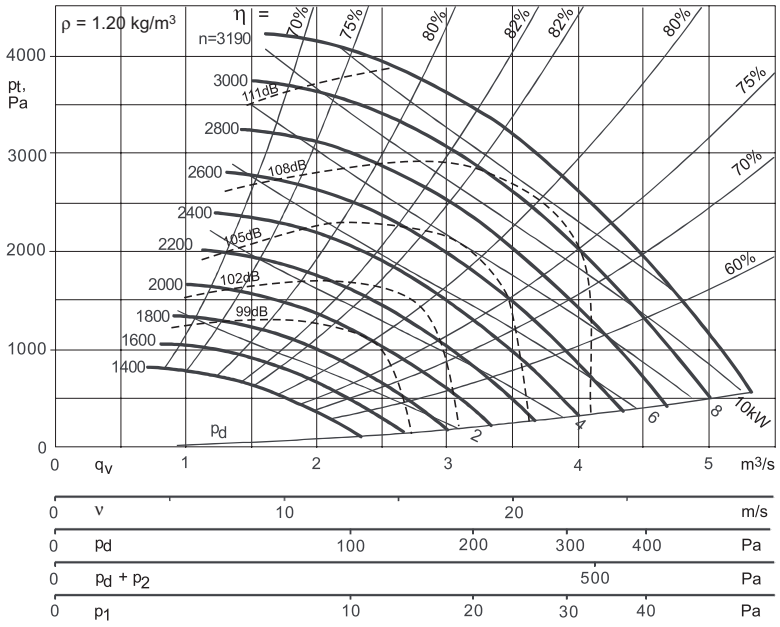
Impeller of DOMEX 500 Max. 3950 RPM



CAL 500 - 100%

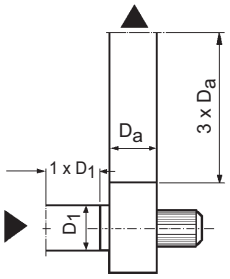
Moment of inertia: Iv = 1.17 kgm^2
Circumferential speed: u = 0.026 x n, m/s

Impeller of DOMEX 500
Max. 3190 RPM



BASIS FOR CHART

(Arr. D)



SYMBOLS

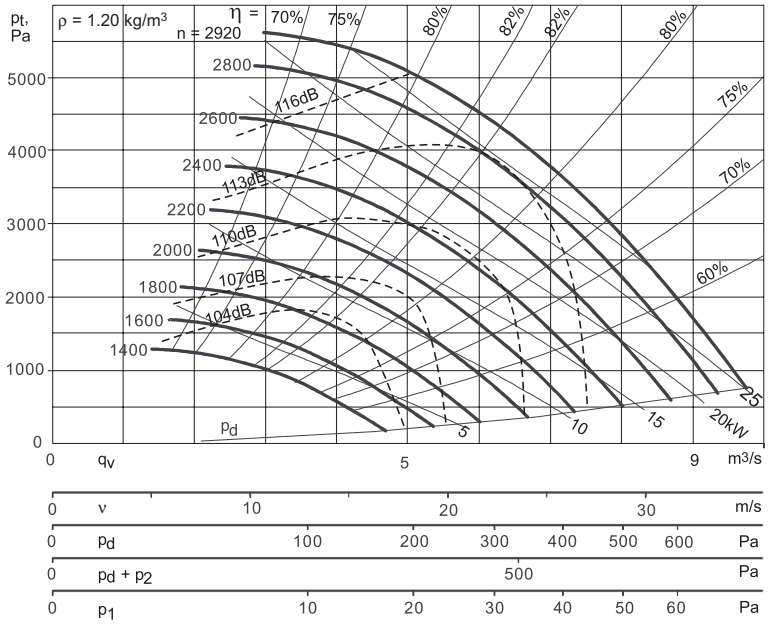
p_t	= total pressure	q_v	= volume flow
p_d	= dynamic pressure, outlet	n	= RPM
p_1	= connection loss, inlet	η	= efficiency in %
p_2	= connection loss, outlet	kW	= power demand, impeller
v	= air speed, outlet	dB	= sound power level, outlet

CAL 630 - 100%

Moment of inertia: Iv = 3.56 kgm^2
Circumferential speed: u = 0.033 x n, m/s

Impeller of DOMEX 500 or SAF-2205
Max. 2920 RPM
At 45 °C max. 2715 RPM
At 70 °C max 2601 RPM

Impeller of AISI 316L
Max. 1913 RPM
At 45 °C max. 1820 RPM
At 70 °C max. 1751 RPMs

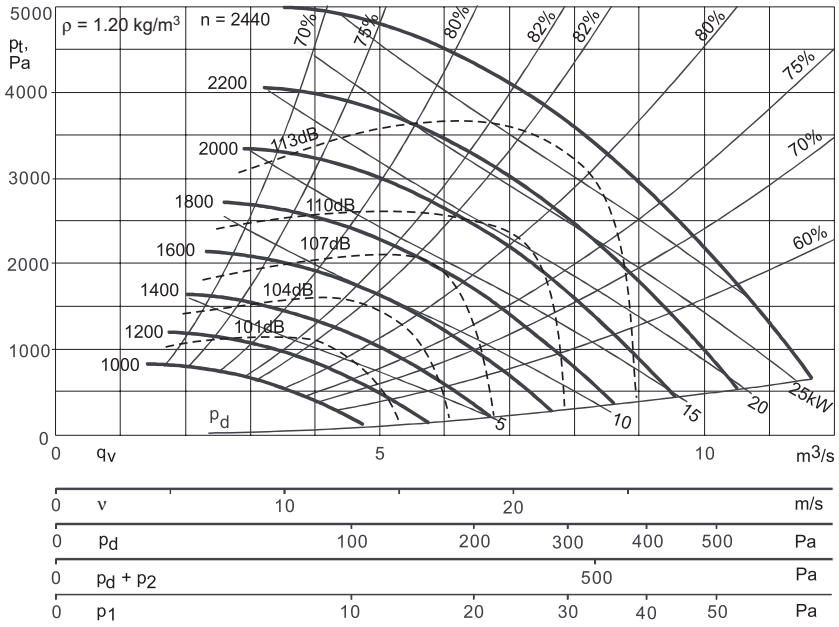


CAL 710 - 100%

Moment of inertia: Iv = 5.76 kgm^2
Circumferential speed: u = 0.037 x n, m/s

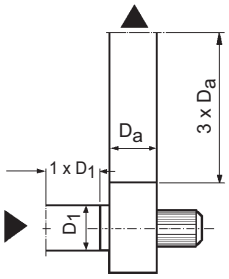
Impeller of DOMEX 500 or SAF-2205
Max. 2440 RPM
At 45 °C max. 2270 RPM
At 70 °C max. 2174 RPM

Impeller of AISI 316L
Max. 1599 RPM
At 45 °C max. 1521 RPM
At 70 °C max. 1464 RPM



BASIS FOR CHART

(Arr. D)



SYMBOLS

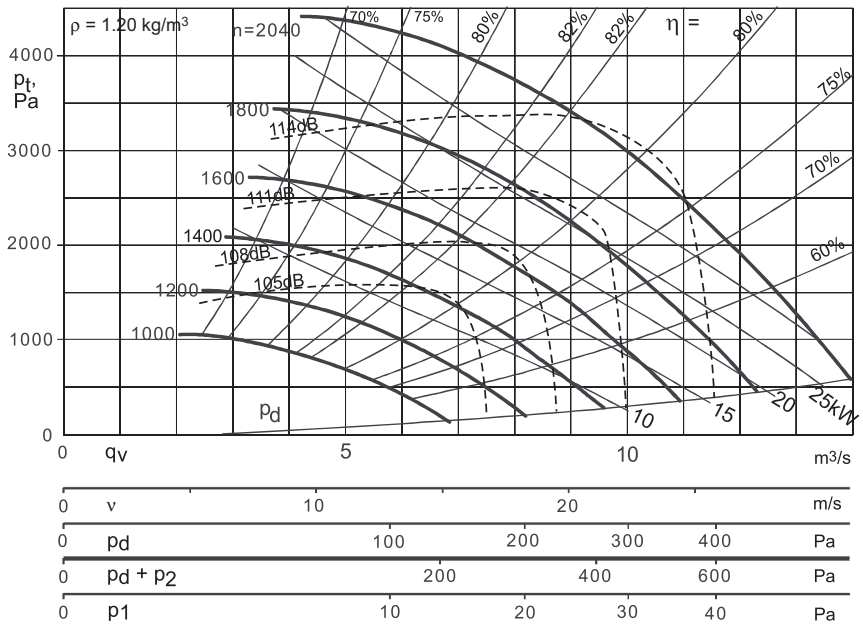
p_t	= total pressure
p_d	= dynamic pressure, outlet
p_1	= connection loss, inlet
p_2	= connection loss, outlet
v	= air speed, outlet
q_v	= volume flow
n	= RPM
η	= efficiency in %
kW	= power demand, impeller
dB	= sound power level, outlet

CAL 800 - 100%

Moment of inertia: Iv = 9.31 kgm^2
Circumferential speed: u = 0.042 x n, m/s

Impeller of DOMEX 500 or SAF-2205
Max. 2040 RPM
At 45 °C max. 1898 RPM
At 70 °C max. 1817 RPM

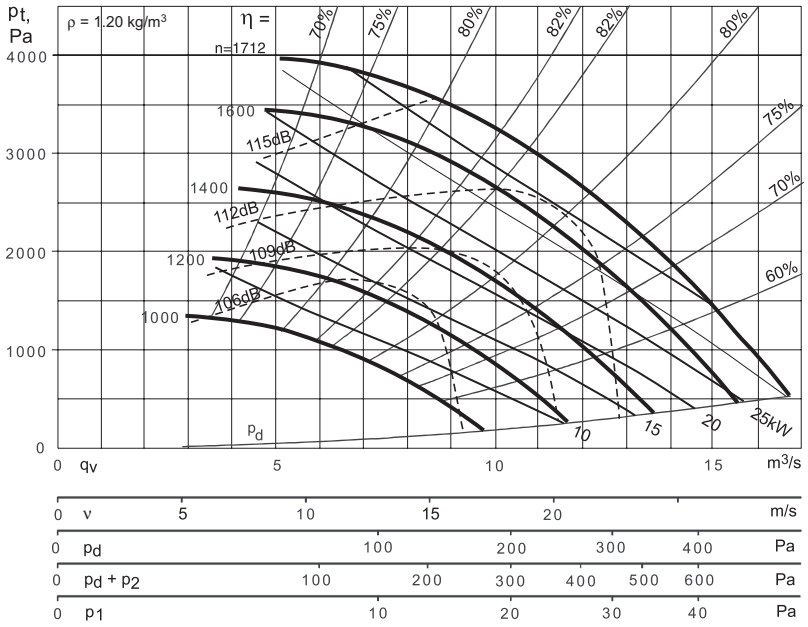
Impeller of AISI 316L
Max. 1337 RPM
At 45 °C max. 1272 RPM
At 70 °C max. 1224 RPM



CAL 900 - 100%

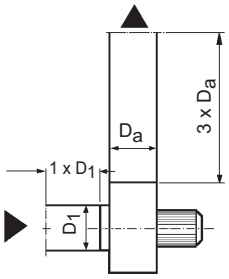
Moment of inertia: Iv = 15.0 kgm^2
Circumferential speed: u = 0.047 x n, m/s

Impeller of DOMEX 500 or SAF-2205
Max. 1712 RPM
At 45 °C max. 1590 RPM
At 70 °C max. 1523 RPM



BASIS FOR CHART

(Arr. D)



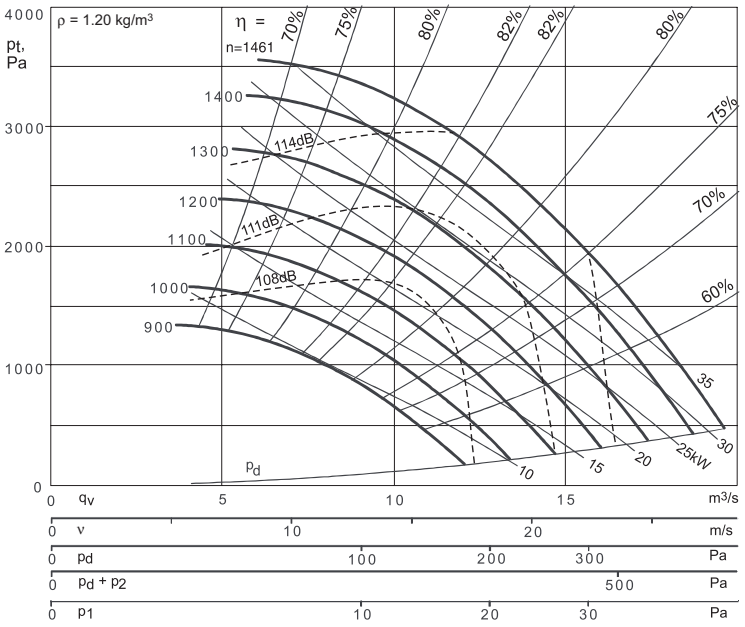
SYMBOLS

p_t	= total pressure
p_d	= dynamic pressure, outlet
p_1	= connection loss, inlet
p_2	= connection loss, outlet
v	= air speed, outlet
q_v	= volume flow
n	= RPM
η	= efficiency in %
kW	= power demand, impeller
dB	= sound power level, outlet

CAL 1000 - 100%

Moment of inertia: Iv = 23.0 kgm^2
Circumferential speed: u = 0.052 x n, m/s

Impeller of DOMEX 500 or SAF-2205
Max. 1461 RPM
At 45 °C max. 1358 RPM
At 70 °C max 1300 RPM

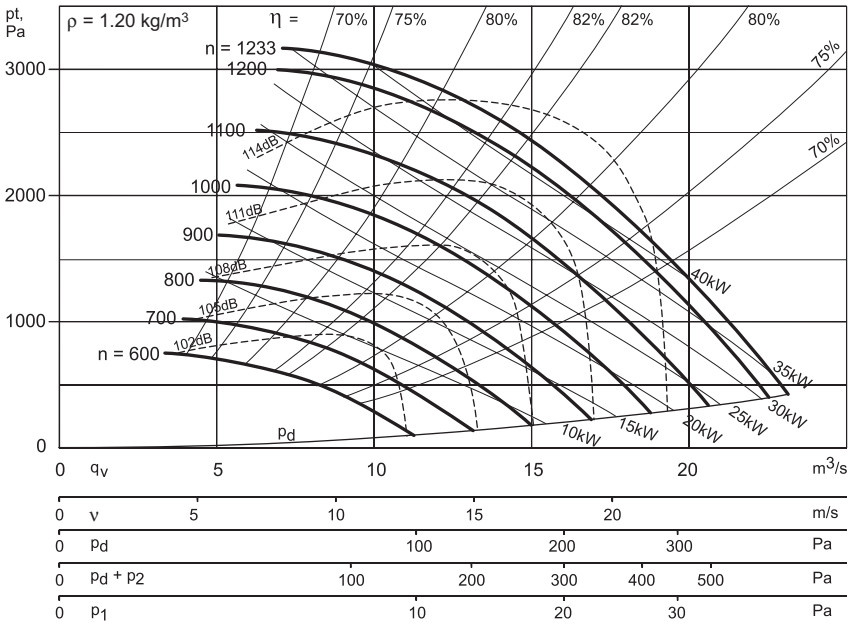


CAL 1120 - 100%

Moment of inertia: Iv = 35.2 kgm^2
Circumferential speed: u = 0.059 x n, m/s

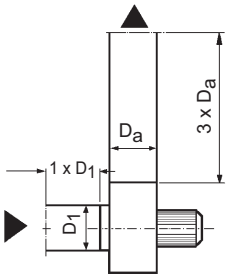
Impeller of DOMEX 500 or SAF-2205
Max. 1233 RPM
At 45 °C max. 1146 RPM
At 70 °C max. 1097 RPM

Impeller of AISI 316L
Max. 957 RPM
At 45 °C max. 910 RPM
At 70 °C max. 876 RPM



BASIS FOR CHART

(Arr. D)



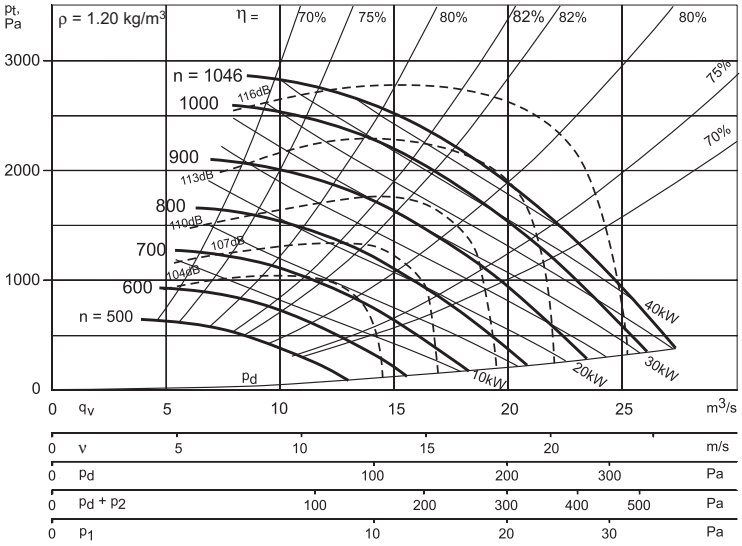
SYMBOLS

p_t	= total pressure	q_v	= volume flow
p_d	= dynamic pressure, outlet	n	= RPM
p_1	= connection loss, inlet	η	= efficiency in %
p_2	= connection loss, outlet	kW	= power demand, impeller
v	= air speed, outlet	dB	= sound power level, outlet

CAL 1250 - 100%

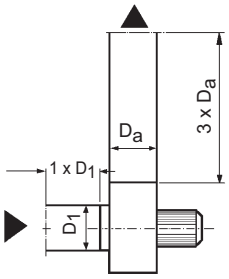
Moment of inertia: Iv = 54.5 kgm^2
Circumferential speed: u = 0.065 x n, m/s

Impeller of DOMEX 500 or SAF-2205
Max. 1046 RPM
At 45 °C max. 972 RPM
At 70 °C max 930 RPM



BASIS FOR CHART

(Arr. D)



SYMBOLS

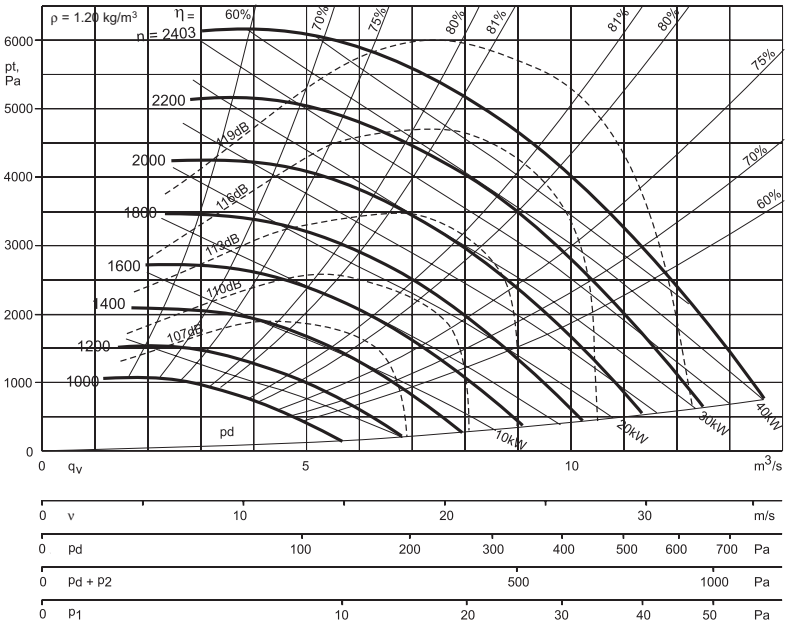
p_t	= total pressure
p_d	= dynamic pressure, outlet
p_1	= connection loss, inlet
p_2	= connection loss, outlet
v	= air speed, outlet
q_v	= volume flow
n	= RPM
η	= efficiency in %
kW	= power demand, impeller
dB	= sound power level, outlet

CAL 800 - 85%

Moment of inertia: Iv = 8.81 kgm^2
Circumferential speed: u = 0.042 x n, m/s

Impeller of DOMEX 500 or SAF-2205
Max. 2403 RPM
At 45 °C max. 2232 RPM
At 70 °C max 2138 RPM

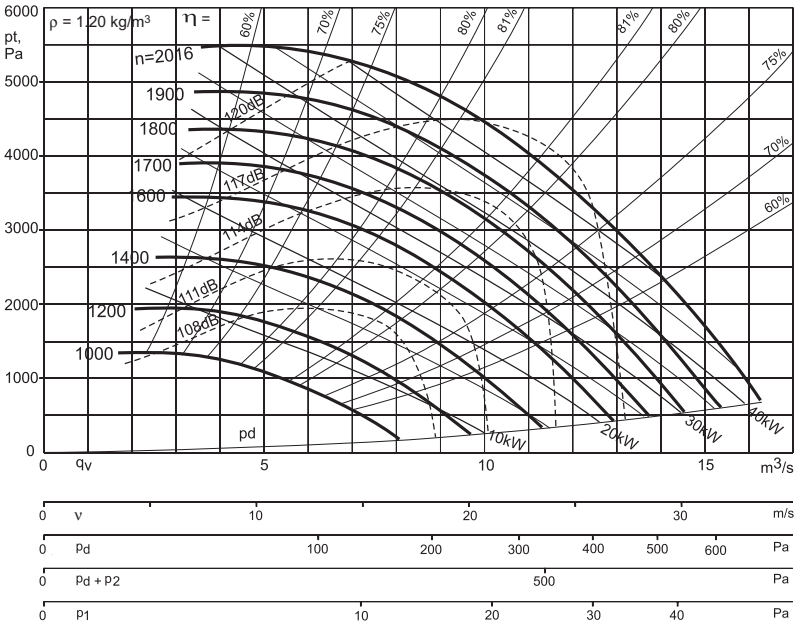
Impeller of AISI 316L
Max. 1573 RPM
At 45 °C max. 1496 RPM
At 70 °C max. 1440 RPM



CAL 900 - 85%

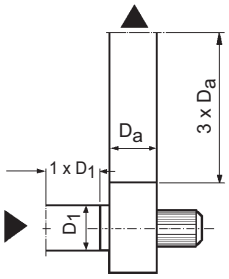
Moment of inertia: Iv = 14.2 kgm^2
Circumferential speed: u = 0.047 x n, m/s

Impeller of DOMEX 500 or SAF-2205
Max. 2016 RPM
At 45 °C max. 1871 RPM
At 70 °C max. 1792 RPM



BASIS FOR CHART

(Arr. D)



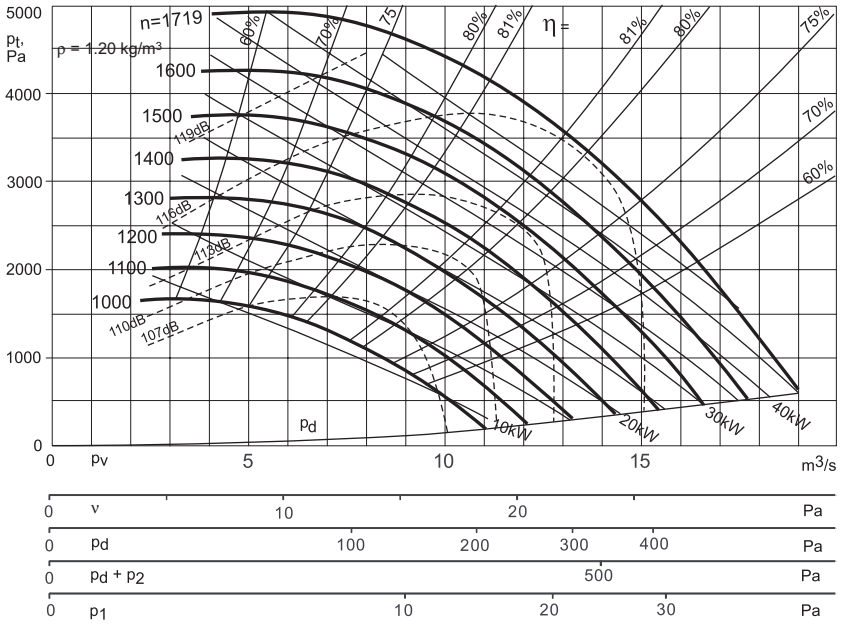
SYMBOLS

p_t	= total pressure	q_v	= volume flow
p_d	= dynamic pressure, outlet	n	= RPM
p_1	= connection loss, inlet	η	= efficiency in %
p_2	= connection loss, outlet	kW	= power demand, impeller
v	= air speed, outlet	dB	= sound power level, outlet

CAL 1000 - 85%

Moment of inertia: Iv = 21.7 kgm^2
Circumferential speed: u = 0.052 x n, m/s

Impeller of DOMEX 500 or SAF-2205
Max. 1719 RPM
At 45 °C max. 1597 RPM
At 70 °C max. 1530 RPM

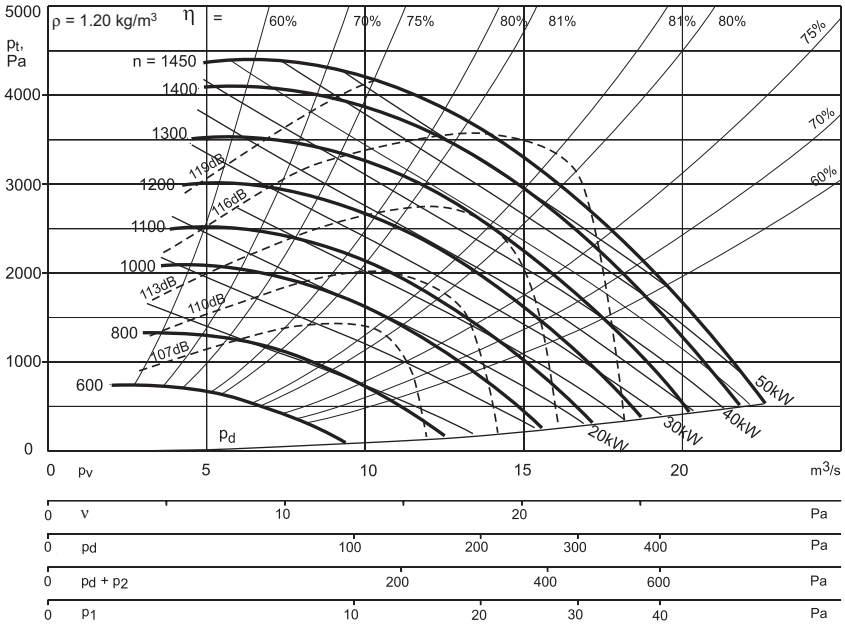


CAL 1120 - 85%

Moment of inertia: Iv = 33.4 kgm^2
Circumferential speed: u = 0.059 x n, m/s

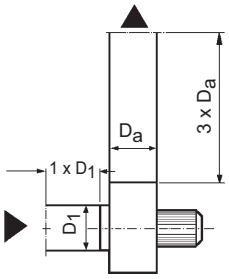
Impeller of DOMEX 500 or SAF-2205
Max. 1450 RPM
At 45 °C max. 1348 RPM
At 70 °C max. 1291 RPM

Impeller of AISI 316L
Max. 1126 RPM
At 45 °C max. 1071 RPM
At 70 °C max. 1030 RPM



BASIS FOR CHART

(Arr. D)



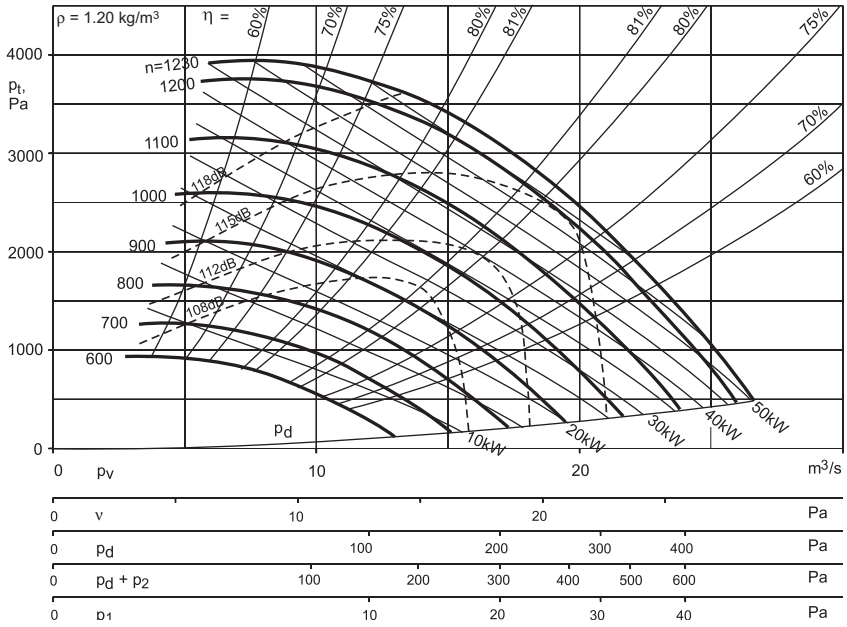
SYMBOLS

p_t	= total pressure
p_d	= dynamic pressure, outlet
p_1	= connection loss, inlet
p_2	= connection loss, outlet
v	= air speed, outlet
q_v	= volume flow
n	= RPM
η	= efficiency in %
kW	= power demand, impeller
dB	= sound power level, outlet

CAL 1250 - 85%

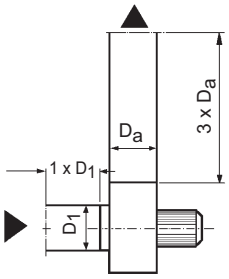
Moment of inertia: Iv = 51.8 kgm^2
Circumferential speed: u = 0.065 x n, m/s

Impeller of DOMEX 500 or SAF-2205
Max. 1230 RPM
At 45 °C max. 1143 RPM
At 70 °C max 1095 RPM



BASIS FOR CHART

(Arr. D)



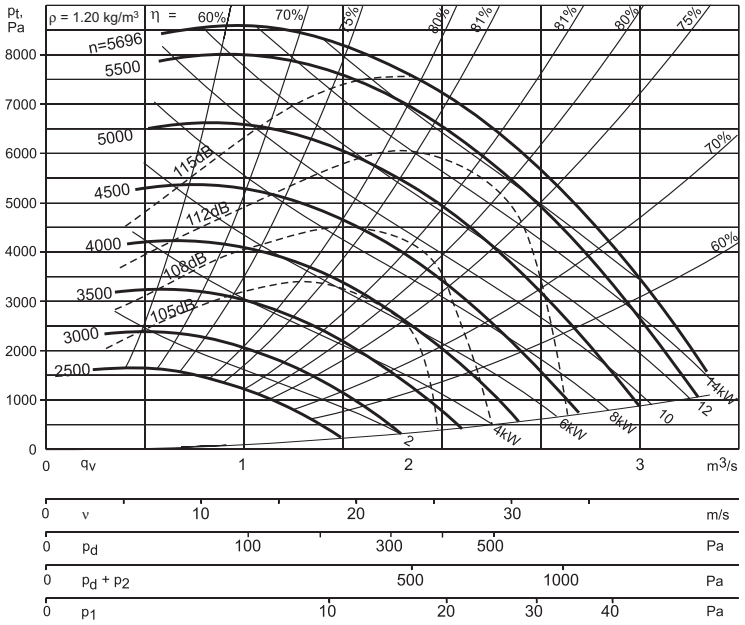
SYMBOLS

p_t	= total pressure
p_d	= dynamic pressure, outlet
p_1	= connection loss, inlet
p_2	= connection loss, outlet
v	= air speed, outlet
q_v	= volume flow
n	= RPM
η	= efficiency in %
kW	= power demand, impeller
dB	= sound power level, outlet

CAL 400 - 70%

Moment of inertia: Iv = 0.34 kgm^2
Circumferential speed: u = 0.021 x n, m/s

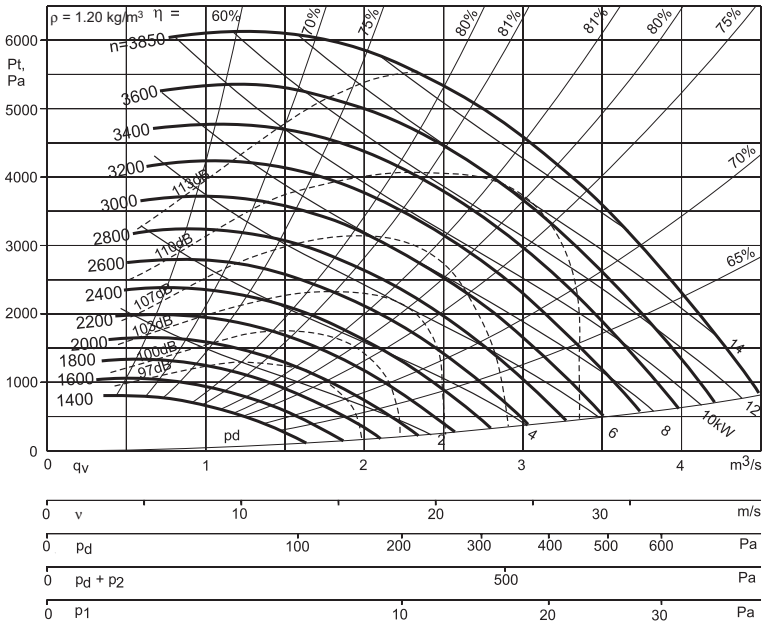
Impeller of DOMEX 500
Max. 5696 RPM



CAL 500 - 70%

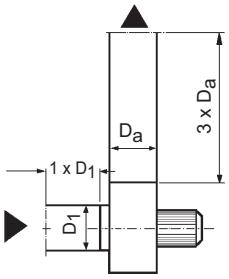
Moment of inertia: Iv = 1.05 kgm^2
Circumferential speed: u = 0.026 x n, m/s

Impeller of DOMEX 500
Max. 3850 RPM



BASIS FOR CHART

(Arr. D)



SYMBOLS

p_t	= total pressure	q_v	= volume flow
p_d	= dynamic pressure, outlet	n	= RPM
p_1	= connection loss, inlet	η	= efficiency in %
p_2	= connection loss, outlet	kW	= power demand, impeller
v	= air speed, outlet	dB	= sound power level, outlet

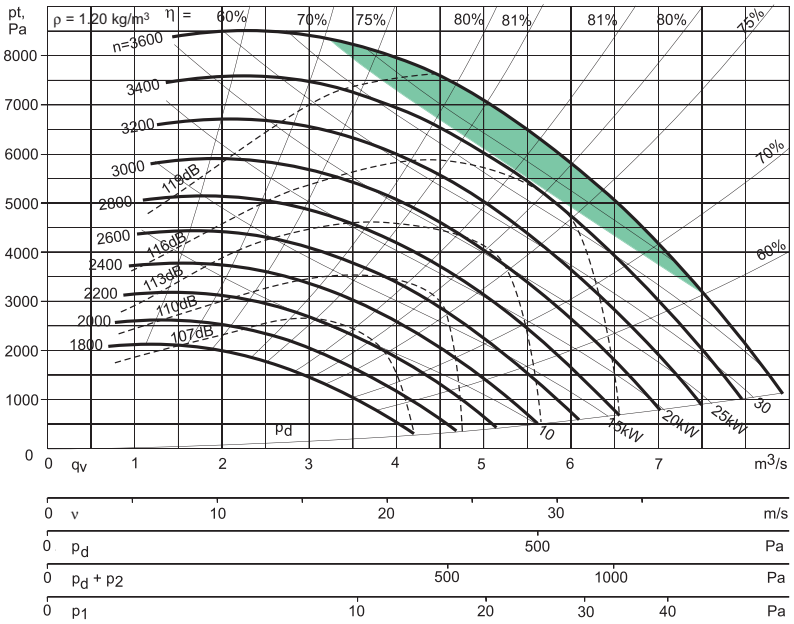
CAL 630 - 70%

Moment of inertia: Iv = 3.20 kgm^2
Circumferential speed: u = 0.033 x n, m/s

Impeller of DOMEX 500 or SAF-2205
Max. 3600 RPM

Impeller of AISI 316L
Max. 2733 RPM
At 45 °C max. 2600 RPM
At 70 °C max. 2502 RPM

Please consider the choice of motor size carefully for fans to be used in the shaded area. The necessary power may be unachievable.



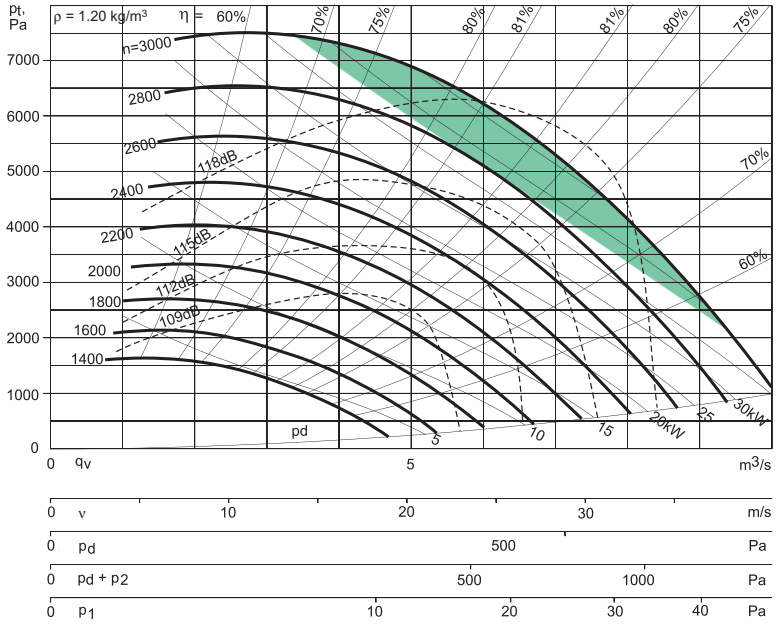
CAL 710 - 70%

Moment of inertia: Iv = 5.20 kgm^2
Circumferential speed: u = 0.037 x n, m/s

Impeller of DOMEX 500 or SAF-2205
Max. 3000 RPM

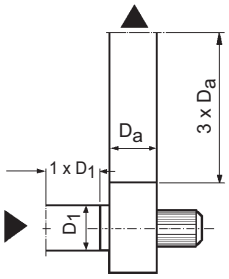
Impeller of AISI 316L
Max. 2284 RPM
At 45 °C max. 2173 RPM
At 70 °C max. 2091 RPM

Please consider the choice of motor size carefully for fans to be used in the shaded area. The necessary power may be unachievable.



BASIS FOR CHART

(Arr. D)



SYMBOLS

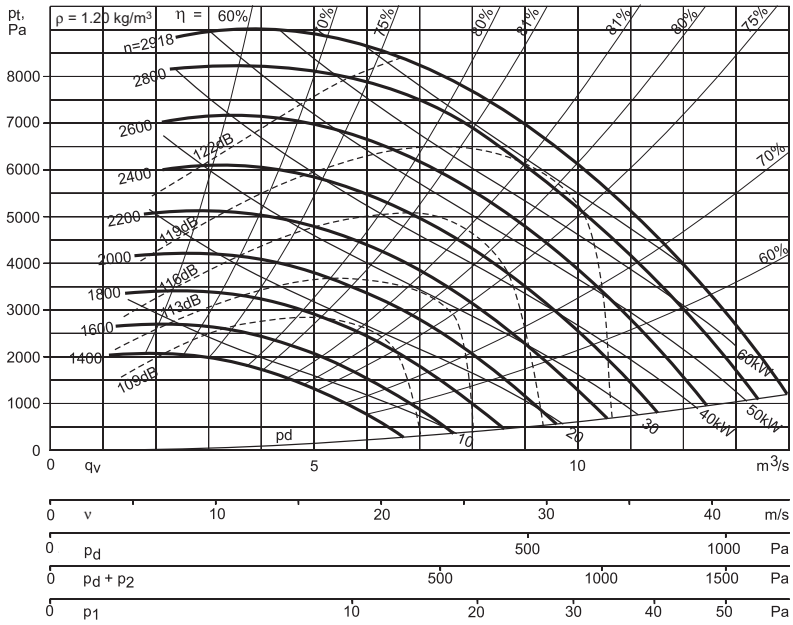
p_t	= total pressure	q_v	= volume flow
p_d	= dynamic pressure, outlet	n	= RPM
p_1	= connection loss, inlet	η	= efficiency in %
p_2	= connection loss, outlet	kW	= power demand, impeller
v	= air speed, outlet	dB	= sound power level, outlet

CAL 800 - 70%

Moment of inertia: Iv = 8.40 kgm^2
Circumferential speed: u = 0.042 x n, m/s

Impeller of DOMEX 500 or SAF-2205
Max. 2918 RPM
At 45 °C max. 2711 RPM
At 70 °C max. 2596 RPM

Impeller of AISI 316L
Max. 1910 RPM
At 45 °C max. 1817 RPM
At 70 °C max. 1749 RPM

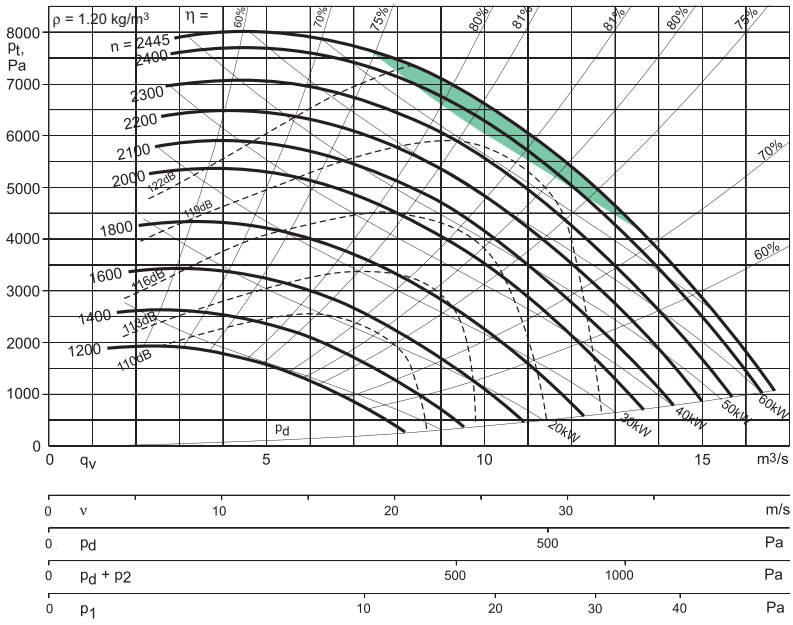


CAL 900 - 70%

Moment of inertia: Iv = 13.5 kgm^2
Circumferential speed: u = 0.047 x n, m/s

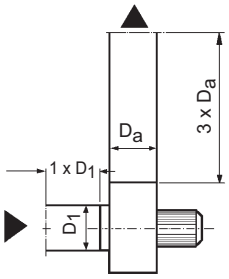
Impeller of DOMEX 500 or SAF-2205
Max. 2445 RPM
At 45 °C max. 2272 RPM
At 70 °C max. 2176 RPM

Please consider the choice of motor size carefully for fans to be used in the shaded area. The necessary power may be unachievable.



BASIS FOR CHART

(Arr. D)



SYMBOLS

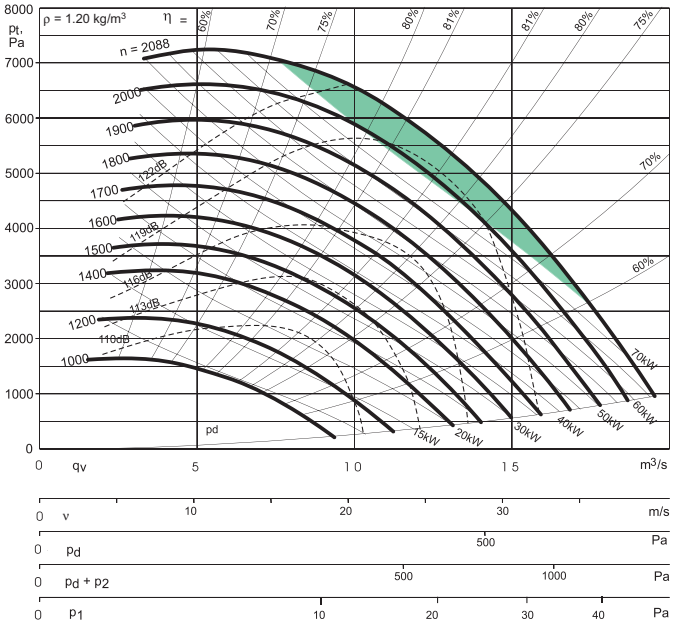
p_t	= total pressure
p_d	= dynamic pressure, outlet
p_1	= connection loss, inlet
p_2	= connection loss, outlet
ν	= air speed, outlet
q_v	= volume flow
n	= RPM
η	= efficiency in %
kW	= power demand, impeller
dB	= sound power level, outlet

CAL 1000 - 70%

Moment of inertia: Iv = 20.6 kgm^2
Circumferential speed: u = 0.052 x n, m/s

Impeller of DOMEX 500 or SAF-2205
Max. 2088 RPM
At 45 °C max. 1940 RPM
At 70 °C max 1858 RPM

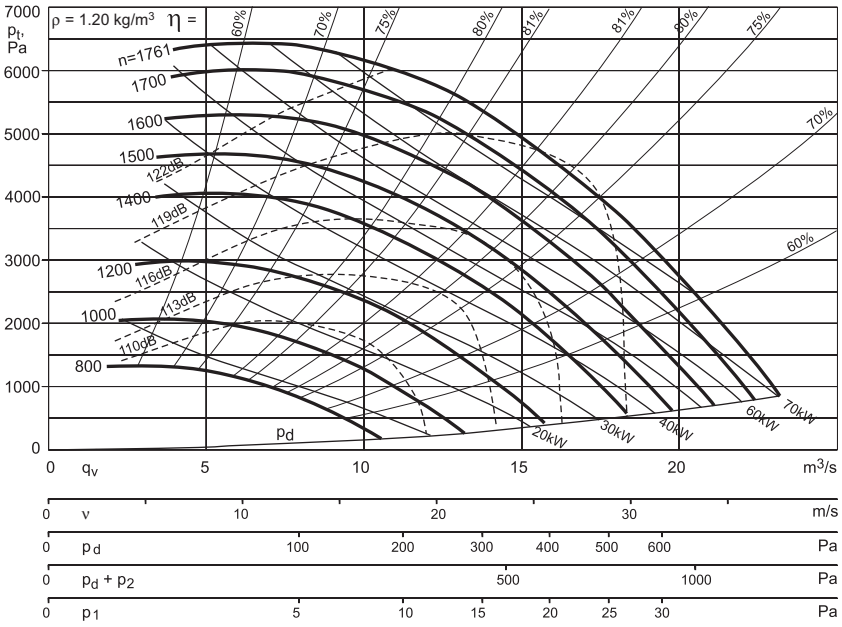
Please consider the choice of motor size carefully for fans to be used in the shaded area. The necessary power may be unachievable.



CAL 1120 - 70%

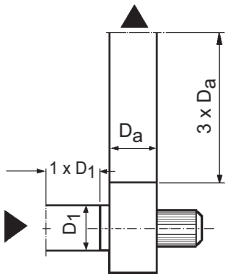
Moment of inertia: Iv = 31.7 kgm^2
Circumferential speed: u = 0.059 x n, m/s

Impeller of DOMEX 500 or SAF-2205
Max. 1761 RPM
At 45 °C max. 1636 RPM
At 70 °C max. 1567 RPM



BASIS FOR CHART

(Arr. D)



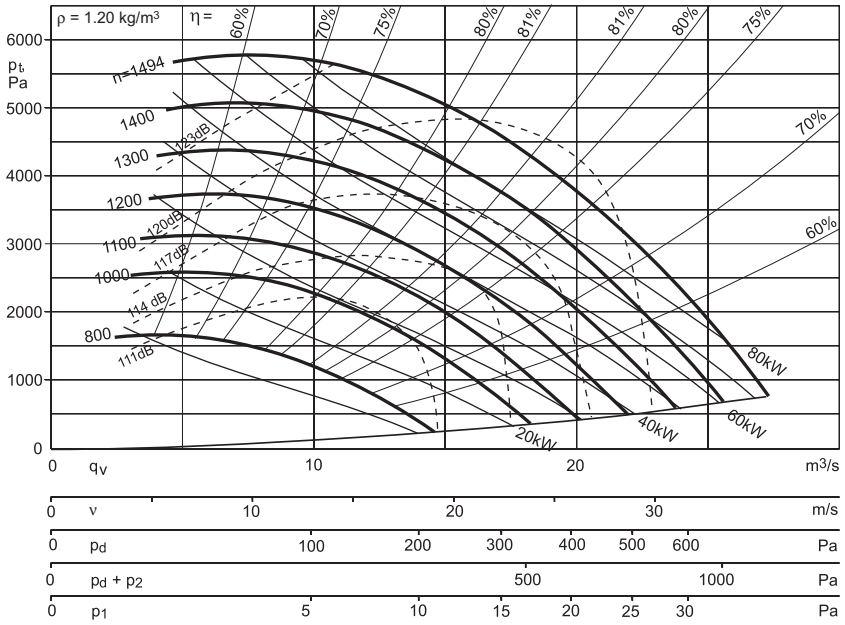
SYMBOLS

p_t	= total pressure	q_v	= volume flow
p_d	= dynamic pressure, outlet	n	= RPM
p_1	= connection loss, inlet	η	= efficiency in %
p_2	= connection loss, outlet	kW	= power demand, impeller
v	= air speed, outlet	dB	= sound power level, outlet

CAL 1250 - 70%

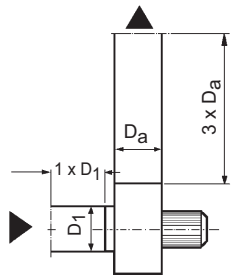
Moment of inertia: Iv = 49.1 kgm^2
Circumferential speed: u = 0.065 x n, m/s

Impeller of DOMEX 500 or SAF-2205
Max. 1494 RPM
At 45 °C max. 1388 RPM
At 70 °C max 1329 RPM



BASIS FOR CHART

(Arr. D)



SYMBOLS

p_t	= total pressure	q_v	= volume flow
p_d	= dynamic pressure, outlet	n	= RPM
p_1	= connection loss, inlet	η	= efficiency in %
p_2	= connection loss, outlet	kW	= power demand, impeller
v	= air speed, outlet	dB	= sound power level, outlet

SOUND CONDITIONS

Fans in operation generate sound.
The sound stems from electrical and mechanical workings inside the motor, bearings and other parts. Airflows that pass through the fan also contribute to the total sound picture.
The generation of sound is limited by careful design and production of fan parts. Particular important are the inlet funnel and impeller, which influence highly on the sound picture. In this connection, it must be noted that poor installation conditions, for example a sharp duct bend too close to the inlet opening, may increase sound generation considerably.
Electrical and mechanical sounds, as well as air sounds that pass out through the fan housing, can only be dampened by insulating the fan with a casing or walls of low-vibration materials.
Sounds generated in the impeller is distributed through the inlet and outlet openings to the duct system and further to the ventilated rooms. Calculation of sound conditions in the duct system and ventilated rooms, including dimensioning of silencers in the system, is only possible on the basis of the sound power level in the fan inlet and outlet openings. In connection with all considerations concerning sound, a sharp distinction must be made between the terms sound power level and sound pressure level.
The sound power level expresses how much sound energy is emitted through the fan inlet and outlet openings. It forms the basis for any calculation concerning the sound conditions in the connected duct systems and in served rooms.
The sound pressure level is a measure of the sound impression perceived by the human ear at a given location in the environment in which the fan is placed. It can be measured with a sound meter and a microphone mounted in the location in question.
The sound pressure level depends on the fan sound power level, the distance from the fan and the silencing properties of the environment.
The fan sound properties are characterised by stating the sound pressure level, together with a precise descrip-

tion of the conditions under which the stated sound level occurs.
To compare two the sound properties of fans, it is important to distinguish between the sound power and pressure levels. Remember to compare only identical levels which also means that the distance from the fan and the silencing in the environment must be the same and hence comparable.
For a correctly designed fan, the sound power level depends primarily on the supplied airflow rate and the total fan pressure and can be read on the charts for the individual fans beginning on page page 10.
The sound power level is stated in dB with reference value 10-12 W, and applies within the normal working range of the fan and with a tolerance of ±5 dB. If the sound power level needs to be divided into octave values, the sound power level in the different octave bands is determined by deducting the correction values in the table below from the total sound power level.The correction values depend on the blade frequency.

$$z \times \frac{n}{60}, \text{ where}$$

z = number of blades = 8
n = fan speed in RPM

Blade frequency [Hz]	Octave band [Hz]							
	63	125	250	500	1k	2k	4k	8k
90-180	7	4	7	12	17	22	27	32
180-360 Hz	11	7	4	7	12	17	22	27
360-710	13	11	7	4	7	12	17	22
710-1400 Hz	15	13	10	6	4	7	12	18

A centrifugal fan type CAL 710 has an output of 5 m^3/s at 3000 Pa and 2000 RPM.
Blade frequency: 8 x 2000 / 60 = 266 Hz
Total sound power (page 11): 111 dB
Correction value (250 Hz): 4 dB
Sound power level: 111 dB - 4 dB = 107 dB
The full octave analysis is shown in the table below.

Octave band [Hz]	63	125	250	500	1k	2k	4k	8k
Sound power level [dB]	100	104	107	104	99	94	89	84

REGULATION OF AIRFLOW RATE

Regulation of fan capacity can be achieved in several ways, depending on the operating requirements.

REGULATION METHODS

- Changing poles between two fixed RPMs in the ratio 3:2 (motor with 2 separate windings) or 2:1 (Dahlander winding motor).
- Frequency regulation
- A combination of the above

CHANGING POLES

For time-related variations in the airflow rate demand, for example night-time and daytime operation, it is recommended that the fan is fitted with a change-pole motor. When the fan is changed to different RPMs, the fan efficiency is unchanged.
The changing is usually controlled with a timer.
If other operating points are required than can be achieved by changing poles, other regulation methods must be used.

FREQUENCY REGULATION

In systems with continually changing airflow rate demands or in systems with constant airflow rates regardless of external pressure conditions, frequency inversion can be used.
The fan efficiency remains virtually unchanged throughout the regulation range and no sound is generated as a result of the regulation.

QUALITY AND SERVICE

REST ASSURED

The CAL centrifugal fans are produced in accordance with Novenco's well-known quality standards.
Novenco Building & Industry A/S is ISO certified and all fans are inspected and tested.

The fans are offered with options for technical guidance on installation, test of function and training of personnel.

WARRANTY

Novenco provides according to law a standard 12 months warranty from the product is sent from the factory. The warranty covers materials and manufacturing defects. Wear parts are not covered. Extended warranty can be agreed upon.

IMPORTANT

This document is provided 'as is'. Novenco Building & Indsutry A/S reserves the right to changes without further notice due to continuous product development.

Some pictures in the catalogue show products with accessories fitted.

The fans are designed for continuous operation. The following kinds of operation may cause fatigue break in the impellers and endanger people.

- Operation in stall area
- Operation with pulsating counter pressure – called pump mode
- Daily operation with exceedingly starting and stopping

If in doubt, Novenco should be contacted to assess the suitability of the fans.

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QUALITY AND ENVIRONMENT

Novenco Building & Industry A/S is certified in accordance with ISO 9001 and 14001.

ISO 9001
ISO 14001
BUREAU VERITAS
Certification

All Novenco Building & Industry's products are designed, developed and manufactured in Denmark.

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