CND CNF
CENTRIFUGAL FANS STANDARD AND ATEX

Member of SCHAKO Group
NOVENCO
Building & Industry

PRODUCT FACTS

PRODUCT

Centrifugal fans type CND and CNF are light, compact low-pressure and medium fans with high efficiency, low sound levels and good operating economy, designed for universal installation.

APPLICATION

The CND and CNF are, due to the choice of material and finishing, well suited for ventilation in aggressive environments. Versions for installation in ATEX zones are also available.

RANGE

The CNF fans are made for 10 to 25% higher RPMs than the CND, depending on fan size. The CNF impellers are all-welded, compared to the lighter spot welded impeller of the CND.

Both the CND and CNF are produced in 7 standard sizes with impeller diameters of 315, 400, 450, 500, 560, 630 and 710 mm.

For CND airflow rates are from 0.2 to 10 m^3/s with total pressures up to 2000 Pa.
For CNF airflow rates are from 0.2 to 11 m^3/s with total pressures up to 4000 Pa.

CONSTRUCTION

Fan housing has rectangular side panels for universal installation. The CND and CNF are available in both directly coupled and belt-driven versions.
The impeller has backward-curved blades.

MOTORS

Asynchronous motors are standard.
Directly coupled: Structural shape B5 (large flange)
Belt-driven: Structural shape B3 (base motor)
Dimension standard: IEC-72
Electrical standard: IEC-34
Insulation: Class F

MOTOR INSTALLATION SIZES

Impeller diameter [mm]	Motor size
315	80 - 112
400	80 - 132
450	80 - 132
500	80 - 132
560	100 - 160
630	100 - 160
710	112 - 180

DIRECTLY COUPLED FANS

Impeller diameter [mm]	Motor size
315	80 - 132
400	80 - 132
450	80 - 160
500	80 - 160
560	100 - 160
630	100 - 180
710	112 - 200

BELT-DRIVEN FANS

EFFICIENCIES

Excellent operating economy with efficiencies up to 84%, depending on fan size, configuration and motor.

MATERIALS

Housing: Hot-rolled sheet steel, Domex 240, and hot-dip galvanised
Impeller: Domex 500 steel quality and hot-dip galvanised

CLASSIFICATIONS

Flange standard: Eurovent 1/2 for inlet
Corrosion categories: CND and CNF meet requirements for operation in corrosion category C5-I (very high) in accordance with the standard DS/EN ISO 12944-2.
C5-I produces lifetimes of 8 -10 years with hot-dip galvanisation with 60 - 80 µm layer thickness.
Technical capacity: BS 848-1:2007 and EN ISO 5801:2008
Temperature range, standard: -20 to +70 °C
ATEX: CND and CNF meet directive 2014/34/EU for category 2G/D.
Calculation software: AirBox program is certified by TÜV for the ZerAx® range of fans.

ACCESSORIES

- Duct spigots
- Flexible connections
- Counter flanges
- Wire guards for inlet and outlet
- Anti-vibration mountings
- Base plate
- Inspection door
- Drain
- Brass or copper inlet cones

DESCRIPTION

The centrifugal fans type CND and CNF are light, compact low-pressure and medium fans designed for universal installation in compost plants and greenhouses as well as light industrial plants in aggressive environments.

INSTALLATION SIZES

Type CND is produced in 7 sizes with impeller diameters from 315 to 710 mm, airflow rates from 0.2 to 10 m^3/s and total pressures up to approximately 2000 Pa.

Type CNF is produced in 7 sizes with impeller diameters from 315 to 710 mm, airflow rates from 0.2 to 11 m^3/s and total pressures up to approximately 4000 Pa.

CONSTRUCTION

Centrifugal fans type CND and CNF consist of the following main components.

Fan housing, constructed from two rectangular side panels and an all-welded casing.

Inlet cone, mounted in the front side panel with a spigot for duct connection and designed to guide the air with as little loss as possible.

Impeller with 8 backward-curved blades designed and produced with the same geometry and material for both CND and CNF. However, where the CND is spot welded, the CNF is fully welded and thus designed for higher operating RPMs.

Bearing part with two dust-proof and waterproof deep groove ball bearings mounted in flanged bearing housings. The bearings have lifetime lubrication.

SURFACE TREATMENT

All the fan parts are protected and treated with min. 60 µm hot-dip galvanisation.

MOTORS

These are in accordance with customer specifications. Directly coupled motors have B5 flanges, i.e. large flanges for all motor sizes. Belt-driven motors have B3 base flanges.

ENVIRONMENTS

All CND and CNF fans are designed for the temperature range -20 to +70 °C. The standard version is designed, with regard to the choice of material and finishing, to function in corrosion category C5-I (very high), see DS/ EN ISO 12944-2.

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

ACCESSORIES

Duct spigot - inlet

Loose duct spigots are available for connection of ducts with flexible connections.

Flexible connections

These are available for both circular (inlet) and rectangular (outlet) connectors.

Counter flange

The counter flanges are for installation on fan outlets, consist of welded steel frames and are finished with min. 60 µm hot-dip galvanisation.

Inspection door

CND and CNF fans are available with inspection doors located in the housing. Inspection doors are available in two sizes, depending on the fan size. Please state the location of the door in relation to the outlet direction.

Drain

The drain allows condensed water to escape. Please state the location of the drain plug in the side panels of the fan housing the position is in relation to the outlet direction.

Wire guards

Wire guards for the inlet (circular) and outlet (rectangular) respectively.

Anti-vibration mountings

The mountings are available for both fan types.

The location and choice of anti-vibration mountings are shown in the installation instructions.

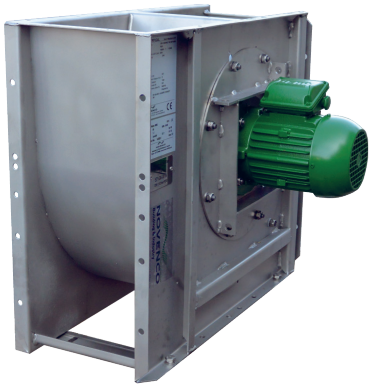
Brass or copper inlet cones

The inlet cone is available in brass or copper for both CND and CNF fans for use in environments with increased safety.

AIRBOX CALCULATION PROGRAM

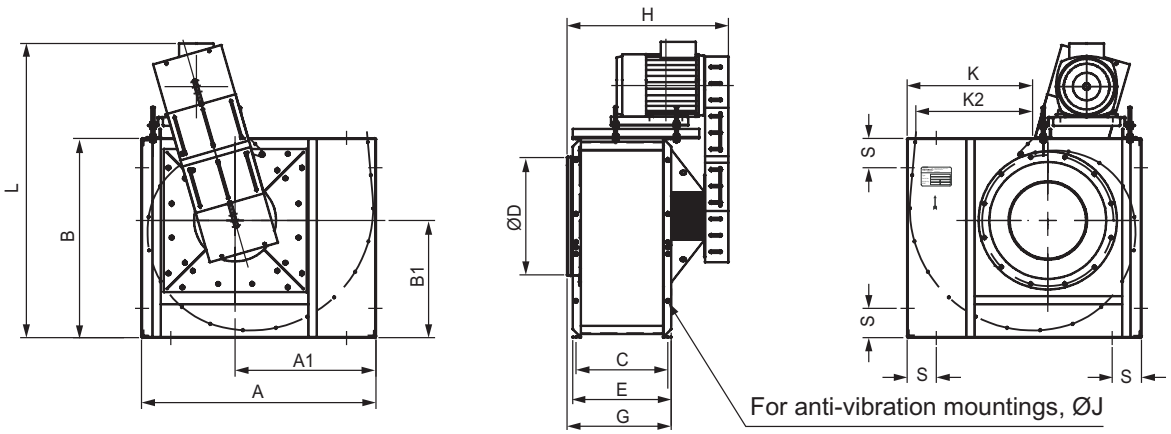
The AirBox program is Novenco's calculation and configuration tool for fans. Input to the program are the requirements for airflow and pressure as well as specific characteristics of the operating environment. Further requirements for the fan, motor and accessories are also input and form the basis for calculation of possible solutions.

Novenco AirBox is available on www.novenco-building.com in the Support >Software section. It requires registration, checks automatically for updates and is for free.

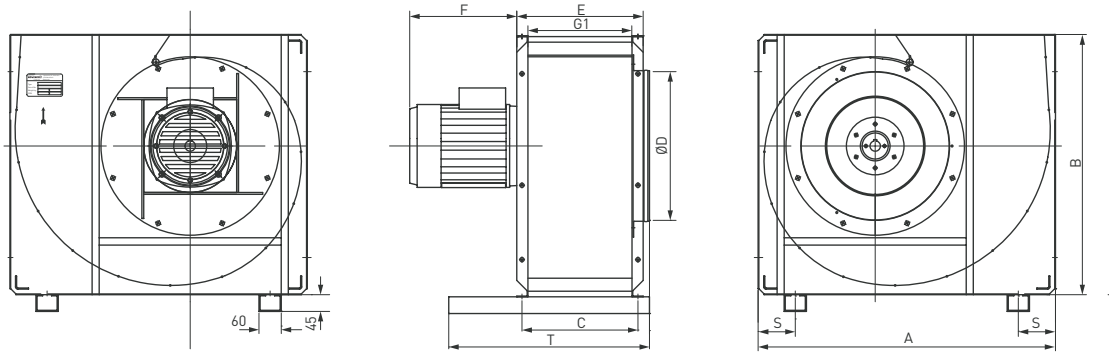


DIMENSIONS

CND AND CNF FANS



Belt-driven fans



Directly coupled fans

Sizes	A	A1	B	B1	C	ØD = K2	E	F *	G	G1	H	ØJ	K	L	S	T
315	690	410	595	345	252	315	280	24	297	220	525	11.5	345	1040	100	475
400	800	485	700	400	312	400	340	24	357	280	585	11.5	430	1120	100	540
450	891	543	760	445	347	450	375	29 23.5	392	315	655	14	480	1175	125	610
500	1000	600	850	500	392	500	420	29 28.5	443	350	690	14	535	1255	125	670
560	1121	673	953	560	437	560	465	29 28	488	395	795	14	595	1440	125	780
630	1246	760	1063	622	482	630	510	26 24	533	440	840	14	665	1525	125	825
710	1405	869	1135	672	537	710	577	31	595	497	910	14	750	1620	125	940

Dimensions are in mm.
* This value must be subtracted from the motor length to obtain how much the motor protrudes outside of the fan casing. Refer to motor catalogue. In fields with two values the upper is for the belt-driven versions and the lower for the directly coupled.

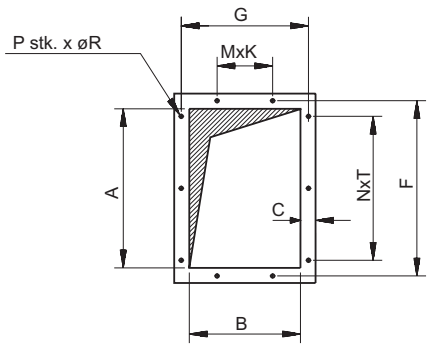
FAN WEIGHTS WITHOUT MOTORS

Sizes	Directly coupled [kg]	Belt-driven [kg]
315	40	62
400	59	78
450	77	100
500	84	118
560	113	165
630	153	206
710	187	255

OUTLET FLANGES

Counter flanges with the same bolt holes as the outlet flanges are available as accessories.

Connection ducts are made with the same internal dimensions as the fan outlet opening (A x B).

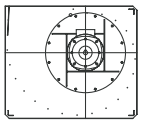


Sizes	A	B	C	F	G	K	M	N	T	P	R
315	315	220	30	347	252	110	1	2	142.5	10	7
400	400	280	30	432	312	140	1	2	185	10	7
450	450	315	30	482	347	125	2	2	185	12	7
500	500	350	35	536	386	125	2	3	155	14	7
560	560	395	35	596	431	125	2	3	155	14	7
630	630	440	35	666	476	170	2	3	200	14	7
710	710	497	40	750	537	150	3	4	170	18	10

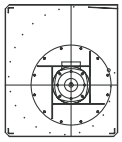
Dimensions are in mm.

POSITION DESIGNATIONS

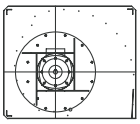
RD 0



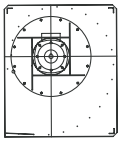
RD 90



RD 180

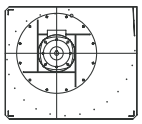


RD 270

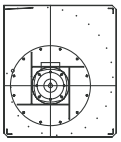


Directly coupled and low motor bracket for belt drive

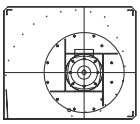
LG 0



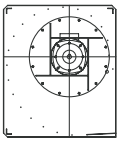
LG 90



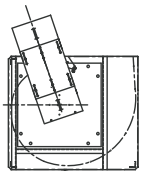
LG 180



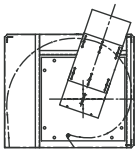
LG 270



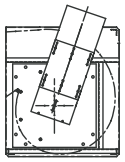
LG/1



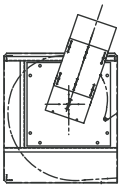
LG/2



LG/3

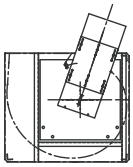


LG/4

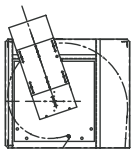


Belt-driven with motor mounted on fan housing. Refer to the Air-Box software for full array of motor positions

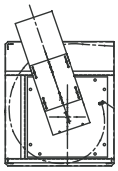
RD/1



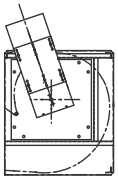
RD/2



RD/3

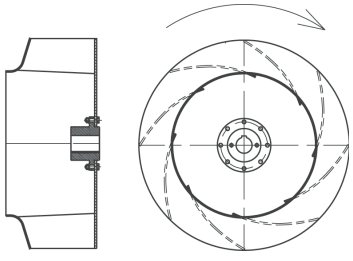


RD/4

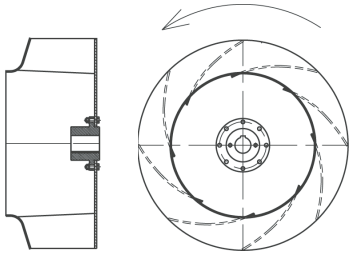


Positions are in accordance with Eurovent seen from motor side.

IMPELLER POSITIONS



Pos. LG

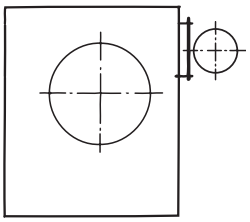


Pos. RD

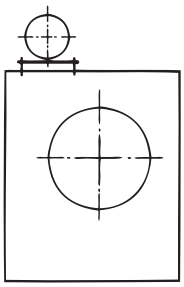
MOTORS

MOTOR INSTALLATION SIZES AND WEIGHTS

The tables show the maximum motor sizes that can be installed on the fans. Directly coupled fans have flange mounted motors. Belt-driven fans have foot mounted motors.
The motor junction box must be coordinated wit the fan motor cover.



Motor on side
– vertical motor panel



Motor on top
– horizontal motor panel

DIRECTLY COUPLED MOTORS

Fan sizes	Motor sizes
315	80-112
400	80-132
450	80-132
500	80-132
560	100-160
630	100-160
710	112-180

BELT-DRIVEN - MOTOR ON SIDE

Fan sizes	Max. motor	
	Motor sizes	Weight [kg]
315	112	40
400	112	40
450	112	40
500	132	70
560	132	70
630	132	70
710	132	70

BELT-DRIVEN - MOTOR ON TOP

Fan sizes	Max. motor	
	Motor sizes	Weight [kg]
315	112	40
400	112	40
450	112	40
500	132	70
560	132	70
630	132	70
710	132	70

MAX. RPM FOR CND/CNF

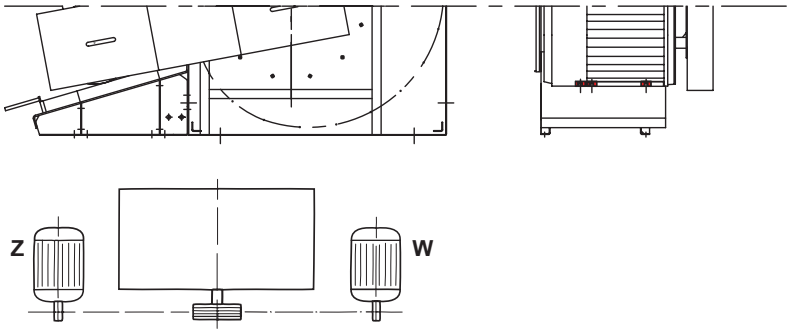
Fan types CND and CNF are designed and produced with the same geometry. The impeller in the CND is spot welded and the CNF is fully welded and thus designed for higher operating RPMs.

Steel quality: Domex 500
Surface treatment: Hot-dip galvanisation, approximately 60 µm zinc

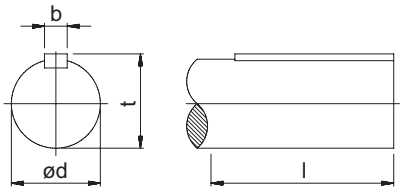
Sizes	Max. RPMs	
	CND	CNF
315	4618	5874
400	3426	4090
450	2957	3365
500	2592	2927
560	2249	2464
630	2086	2387
710	1797	1994

LOW-MOUNTED MOTOR BRACKET FOR LARGE MOTORS

Large motors are mounted on low motor brackets bolted to the fan housing. The low centre of gravity and the large distances between the installation points stabilise the installation.
Required motor position and fan position



SHAFT END OF BELT-DRIVEN FANS



Fan sizes	d [mm]	l [mm]	b [mm]	t [mm]
315	28h6	30	8	31
400	28h6	30	8	31
450	38h6	50	10	41
500	38h6	50	10	41
560	48h6	70	14	51
630	48h6	70	14	51
710	65h6	70	18	69

DIMENSIONING CHARTS

CND 315 [1]

Max. = 4618 RPM

I_{pt} = 0.0951 kg x m^2

CNF 315 [2]

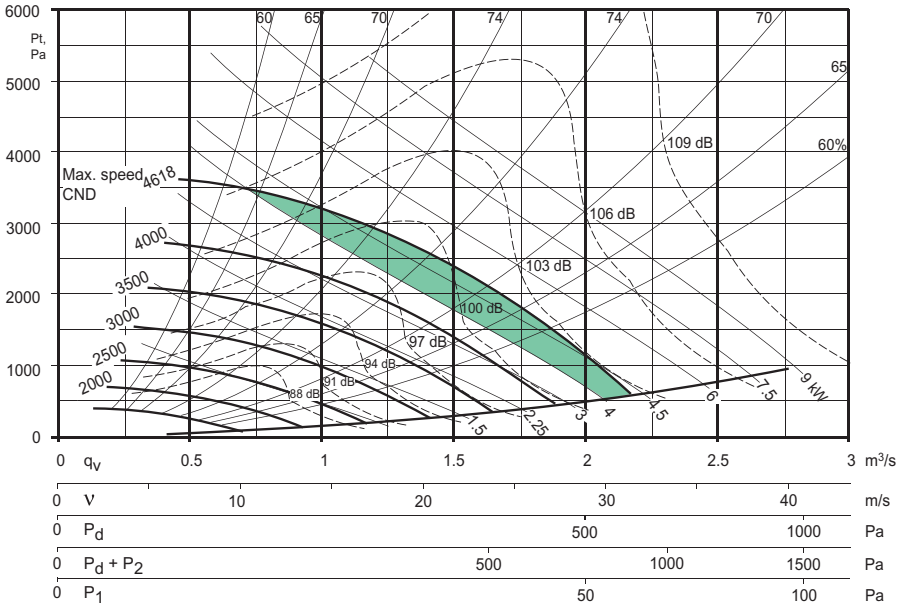
Max. = 5874 RPM

I_{pt} = 0.0951 kg x m^2

δ = 1.20 kg/m^3 (at 20° C)

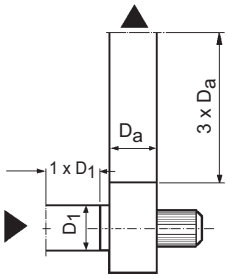
[1] The dark shaded area for CND fans represents a work area where it is questionable if suitable motors are available.

[2] Motors for CNF fans in the work area above the max. speed of the CND are currently unavailable.



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

CND 400

Max. = 3426 RPM

I_{pt} = 0.2440 kg x m^2

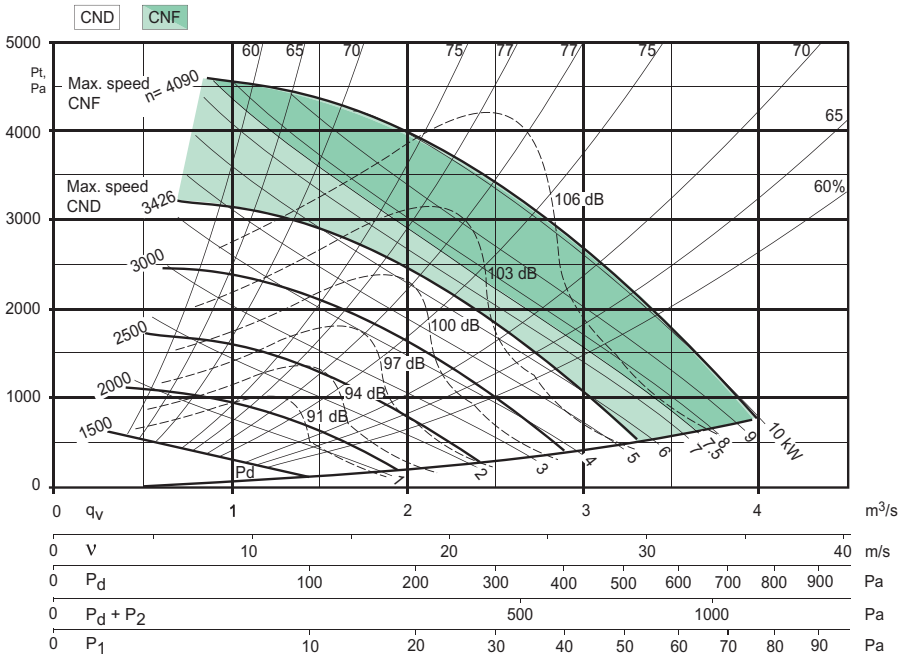
CNF 400 [1]

Max. = 4090 RPM

I_{pt} = 0.2440 kg x m^2

δ = 1.20 kg/m^3 (at 20° C)

[1] The dark shaded area for CNF fans represents a work area where it is questionable if suitable motors are available.



CND 450

Max. = 2957 RPM

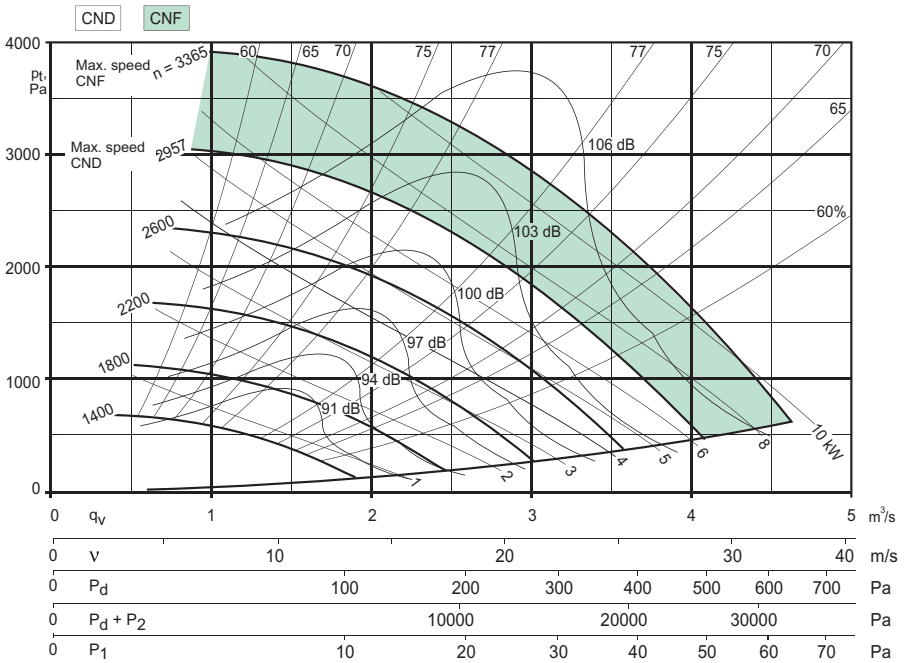
I_{pt} = 0.4218 kg x m^2

CNF 450

Max. = 3365 RPM

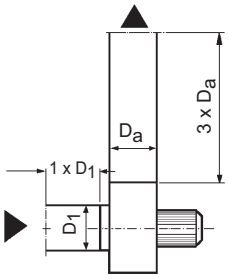
I_{pt} = 0.4218 kg x m^2

δ = 1.20 kg/m^3 (at 20° C)



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

CND 500

Max. = 2592 RPM

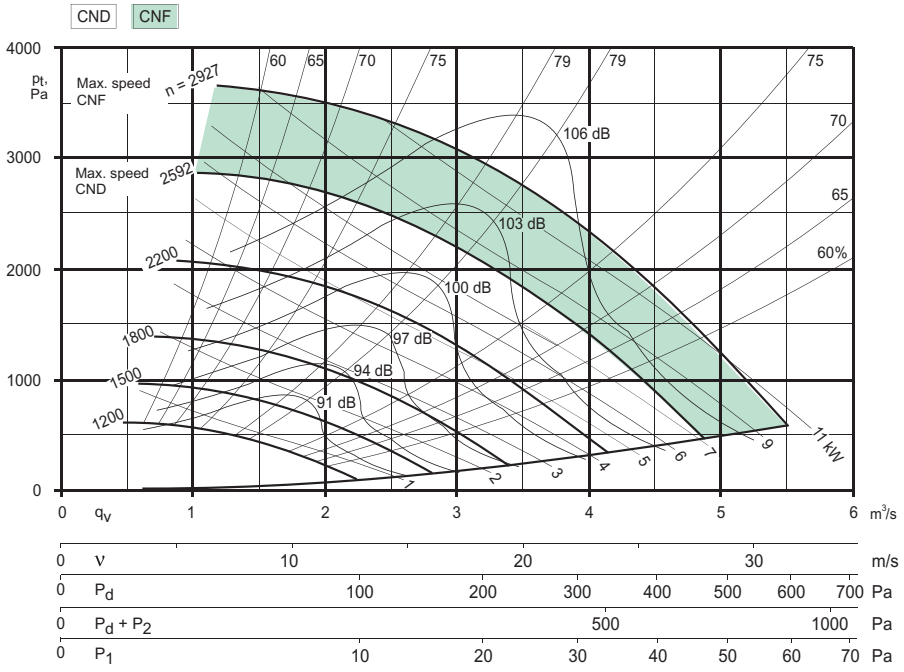
I_{pt} = 0.6430 kg x m^2

CNF 500

Max. = 2927 RPM

I_{pt} = 0.6430 kg x m^2

δ = 1.20 kg/m^3 (at 20° C)



CND 560

Max. = 2249 RPM

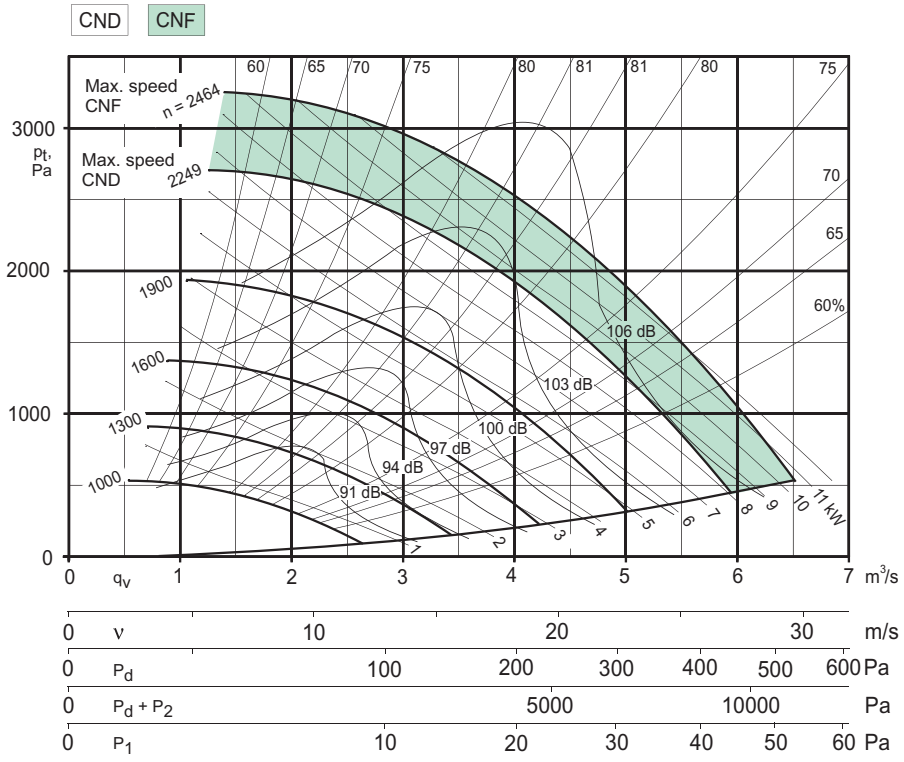
I_{pt} = 1.0212 kg x m^2

CNF 560

Max. = 2464 RPM

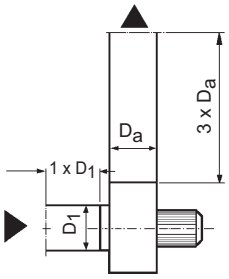
I_{pt} = 1.0212 kg x m^2

δ = 1.20 kg/m^3 (at 20° C)



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

CND 630

Max. = 2086 RPM

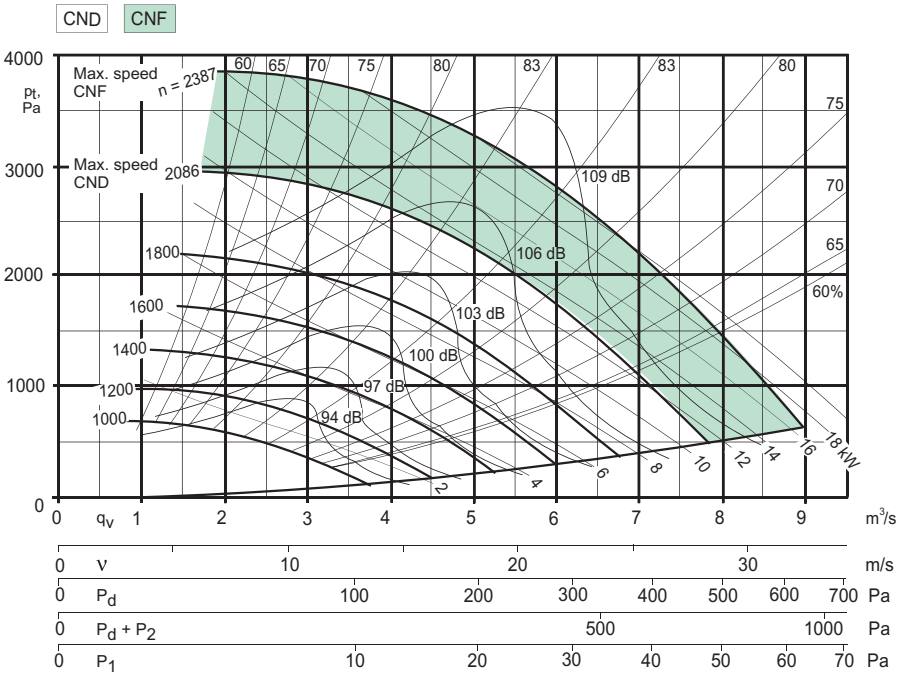
I_{pt} = 2.2571 kg x m^2

CNF 630

Max. = 2387 RPM

I_{pt} = 2.2571 kg x m^2

δ = 1.20 kg/m^3 (at 20° C)



CND 710

Max. = 1797 RPM

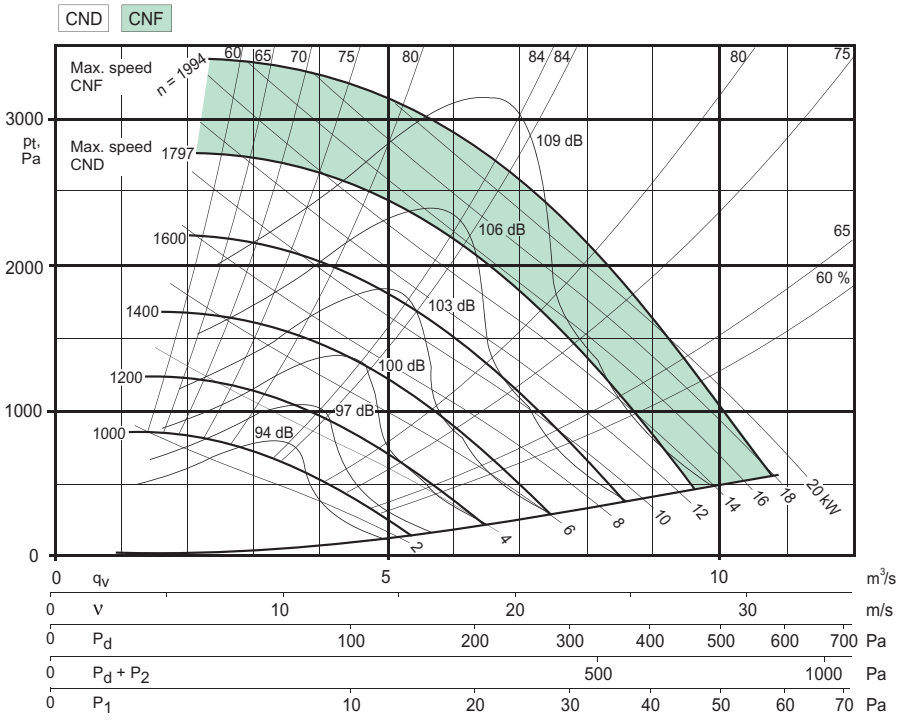
I_{pt} = 3.6479 kg x m^2

CNF 710

Max. = 1994 RPM

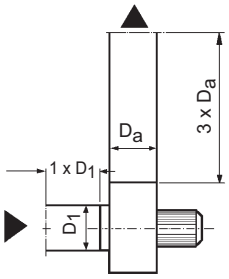
I_{pt} = 3.6479 kg x m^2

δ = 1.20 kg/m^3 (at 20° C)



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

ACCESSORIES

DUST SPIGOTS

The spigots are available as loose supplies and used for connection of ducts with flexible connections. They are standard on both CND and CNF.

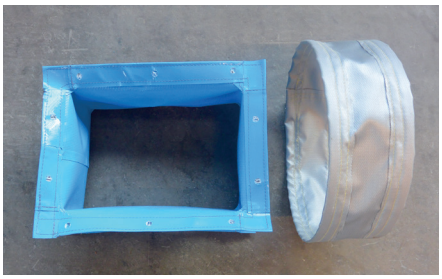
Material: Steel
Surface treatment: Hot-dip galvanised, approx. 60 µm

DUCT SPIGOTS

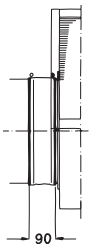
FLEXIBLE CONNECTIONS

The connections are available for duct spigots and outlet flanges.
Versions in different materials are available for both flame-proof flexible connections and incombustible flexible connections.

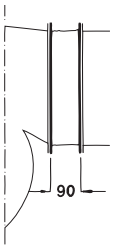
Material quality: Perl E 6
Temperature range: -30 to +80 °C
Material quality: Alpha Maritex
Temperature range: -36 to +260 °C



FLEXIBLE CONNECTIONS



INLET

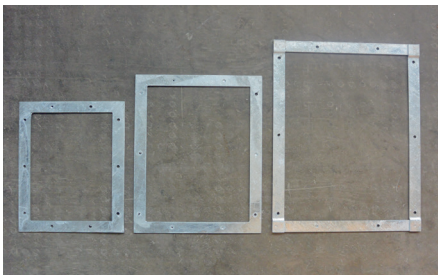


OUTLET

COUNTER FLANGES

The flanges are for installation on the fan outlets. The constructions are welded steel frames.

Material: Steel Domex 240
Surface treatment: Hot-dip galvanised, approx. 60 µm



COUNTER FLANGES

WIRE GUARDS

The nets are for the inlet (circular) and outlet (square) respectively.

Material: Steel wire
Surface treatment: Electro-galvanised, approx. 20 µm
Finish treatment: Passivated

WIRE GUARDS FOR INLET AND OUTLET

ANTI-VIBRATION MOUNTINGS

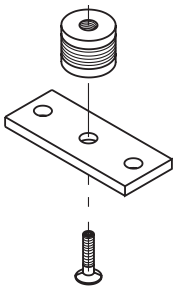
The CND and CNF are available with anti-vibration mountings.
Refer to the installation instructions for location and choice of anti-vibration mountings.

ANTI-VIBRATION MOUNTINGS

BASE PLATE FOR ANTI-VIBRATION MOUNTINGS

The CND and CNF are available with base plates for fixing anti-vibration mountings to the foundation.

Material: Domex 240
Surface treatment: Hot-dip galvanised, approx. 60 µm

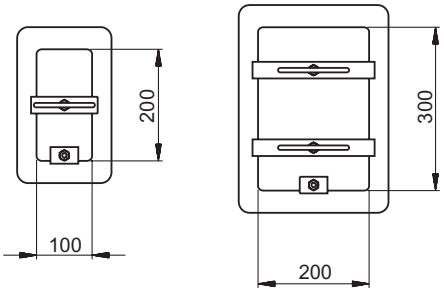


BASE PLATE FOR ANTI-VIBRATION MOUNTINGS

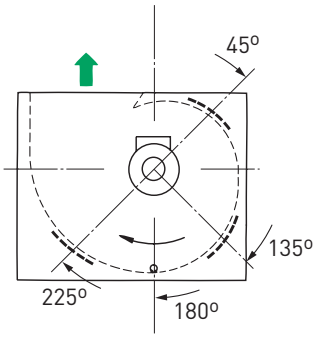
INSPECTION DOORS

The CND and CNF are available with inspection doors located in the fan housing.
Inspection doors are available in 2 sizes and depend on fan size.
Please state the location of the inspection door in relation to the outlet direction on order.

Material: Domex 240
Surface treatment: Hot-dip galvanised, approx. 60 µm



INSPECTION AND ACCESS DOORS

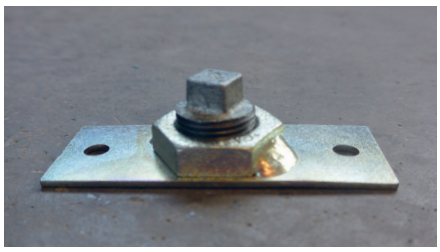


DRAIN INSPECTION DOOR

DRAIN PLUG

The location of the drain plug in the fan housing side panels must be stated on order. The position is in relation to the outlet direction.

Material: Stainless steel and hot-dip galvanised fittings respectively
Connection: 3/4" RG



DRAIN PLUG

BRASS OR COPPER INLET CONES

Inlet cones made of brass or copper for use in environments with increased safety is available for CND and CNF.

Material: Half-hard brass or copper

BRASS INLET CONES

SOUND CONDITIONS

Fans in operation generate sound. It is partly electrical and also mechanical sounds from the motor, bearings and other mechanical parts. Sound from airflows through the fan add to the sound picture as well.
The sound generation is minimised by careful design and production of fan parts. In particular the inlet cone and impeller, which contribute greatly to the overall sound generation. Poor installation conditions, for example a sharp duct bend immediately before the inlet opening, may add considerably to the sound generation.
Electrical and mechanical generated sounds and the part of sound from the airflow that passes out through the fan housing, can only be dampened by enclosing the fan in a casing or with walls of low-vibration materials.
Sound generated in the impeller spreads through the inlet and outlet openings to the duct system and on to the ventilated rooms. Calculation of the sound conditions in the duct system and the ventilated rooms, including dimensioning of any silencers in the system, is only possible on the basis of the sound power level in the fan inlet and outlet openings. A sharp distinction must be made between the terms sound power level and sound pressure level.
Sound power level expresses the energy emitted through the fan inlet and outlet openings and forms the basis for any calculation concerning the sound conditions in the connected duct systems and in the rooms served by the fan.
Sound pressure level is a measure of the sound impression perceived by the ear at a given location in the environment. It can be measured using a sound meter with a microphone mounted in location.
Sound pressure level depends on the fan sound power level, the distance from the fan and the silencing properties of the environment. When the fan sound properties are characterised by stating a sound pressure level, it is necessary also to give a precise description of the conditions under which the stated sound level occurs. When comparing the sound properties of two fans, make sure not to compare the sound power level with the sound pressure level. Do only compare sound pressure levels with the same distances from the fan and with the same silencing in the environment.
For a correctly designed fan, the sound power level depends primarily on the supplied airflow rate and the total fan pressure. It can be read on the graphs for the individual fans in section "Dimensioning charts" beginning on page 9.
The sound power level is stated in dB with a reference value of 10-12 W, and applies within the normal working range of the fan. The tolerance is ±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 found. The correction values depend on the blade frequency

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

z = number of blades
n = fan speed in RPM

The CND and CNF have 8 blades each.

Example:
A centrifugal fan of type CND-500 has an output of 3 m³/s at 1600 Pa and 2323 RPM.

Blade frequency:

$$8 \times \frac{2323}{60} \sim 310 \text{ Hz}$$

On the chart on page 11, the total sound power level is 100 dB.
The correction value for 250 Hz is 4 dB.
The sound power level for this octave band is thus 100 dB - 4 dB = 96 dB
The full octave analysis is shown in the below table.

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	11	7	4	7	12	17	22	27
360-710	13	11	7	4	7	12	17	22
710-1400	15	13	10	6	4	7	12	18
	63	125	250	500	1k	2k	4k	8k
Example	89	93	96	93	88	83	78	73

SOUND POWER LEVELS

REGULATION OF AIRFLOW RATE

The fan capacity can be regulated in several ways, depending on the operating requirements.

REGULATION METHODS

- By changing poles between 2 fixed RPMs in the ratio 3: 2 (motor with 2 separate windings) or 2:1 (Dahlander winding motor)
- By frequency regulation
- By a combination of the above

CHANGING POLES

In connection with time-related variations in the air-flow 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 a different RPM, the fan efficiency is unchanged.
The change can be timer-controlled.
If other operating points are required, than can be achieved by changing poles, other regulation methods must be used.

FREQUENCY REGULATION

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 Novenco CND-CNF centrifugal fans are produced in accordance with Novencos well-known quality standards. Novenco is ISO certified and all fans are inspected and tested, before leaving the production.
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 warranties 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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