NOVENCO

Novenco Air Handling Units

Climaster ZCP

June 2005

Product Facts

Product
Air handling units of type ZCP for ventilation and air conditioning. The units are made in accordance with existing CEN standards.

Range
4 installation sizes with air flow rates from 4 m^3/s to 30 m^3/s. Max. negative pressure 2000 Pa. Max. positive pressure 1500 Pa in the unit housing.

Construction
Self-supporting insulated panels mounted around a light frame structure, divided into sections with integrated, easily accessible air handling components (functions) mounted on solid base frames.

Material and Surface Treatment
Frame: 2 mm hot-dip galvanised steel sections.
Panels: 50 mm with 0.9 mm aluzinc sheet steel externally and internally.
Insulation in panels: mineral wool, 100 kg/m^3.

Corrosion Classification
The units are supplied as standard for operation in unheated, low-corrosion environments in accordance with the standard:
DS/EN ISO 12944-2.
Corrosion category: C3.

Temperature range:
-20° C to +40° C with standard motor.
-35° C to +70° C with special motor.

Delivery Form
As standard in sections. Other delivery forms on request. For outdoor installation, units are available in stainless steel.

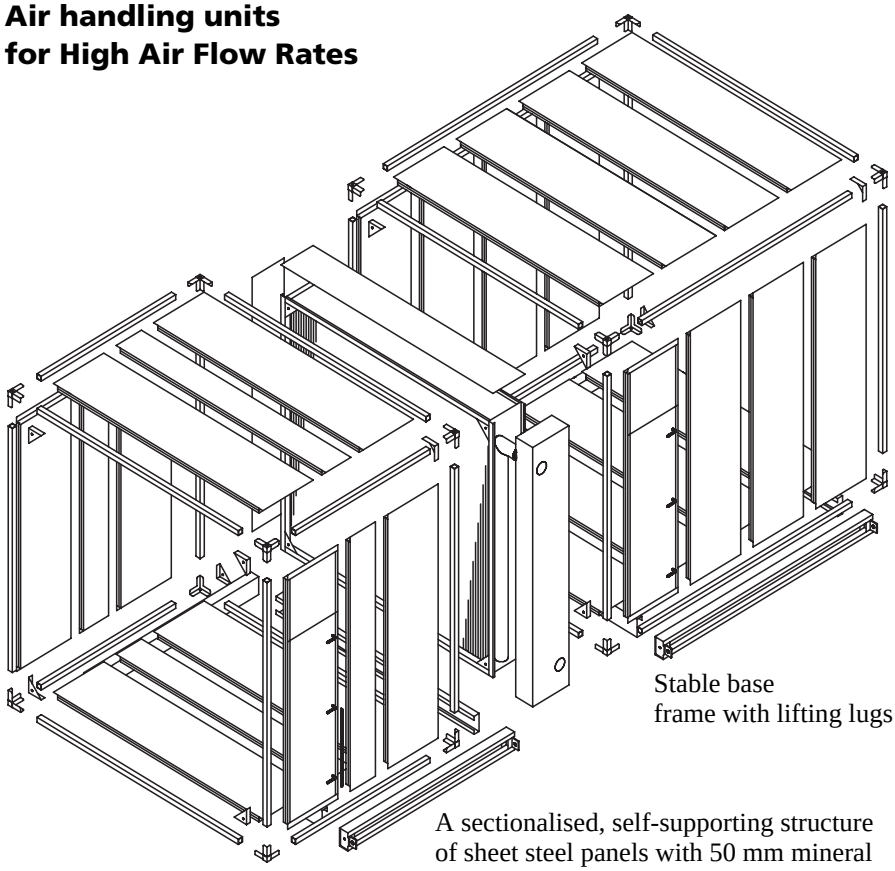
Classifications
Tightness, dampers:
DS/EN 1751-3.
Insulation:
heat transfer coefficient, panels: 0.6 $W/m^2, °C$.
Mechanical performance in accordance with DS/EN 1886.
Tightness at negative pressure -400 Pa:
Class A.
Tightness at positive pressure +700 Pa:
Class A.

Novenco is also certified in accordance with ISO 9001, EN 29001, BS 5750 Part 1 and ISO 14001.

Novenco Climaster ZCP

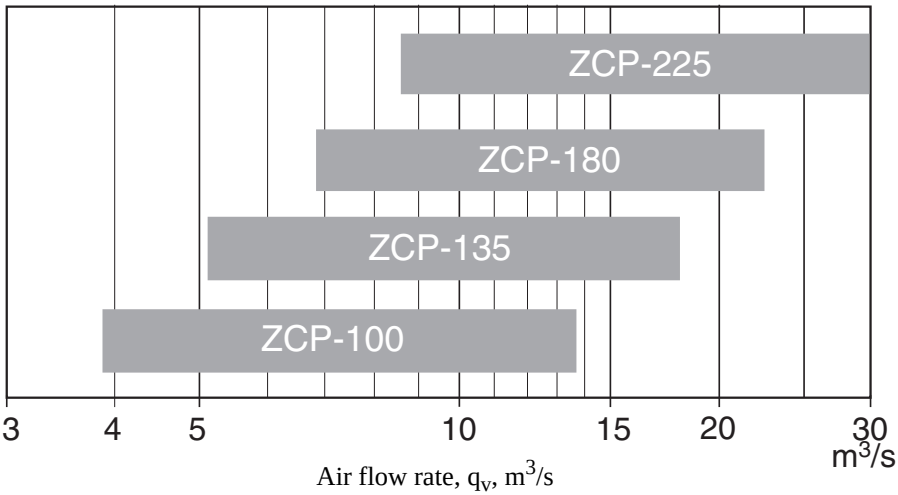
Description and Capacity Diagram

Air handling units for High Air Flow Rates



Stable base frame with lifting lugs

A sectionalised, self-supporting structure of sheet steel panels with 50 mm mineral wool between them, mounted around a light frame structure and fitted with tight, smooth-acting inspection doors.



Air flow rate, q_v, m^3/s

Louvre damper

Heating and cooling coils

Humidifiers

Centrifugal Fans

Axial Flow Fans

The Climaster ZCP is a system of air handling units for individual combination of air handling functions for individual air conditions.
The construction of the system is described in further detail on page 8.

Use

ZCP is used in large ventilation and air conditioning systems, including installations with high requirements for the condition of the air.

Range

ZCP units are available in 4 sizes with air flow rates up to 30 m^3/s and pressures up to 2000 Pa.

Functions

The functions (components) included comprise:

- Dampers for shut-off, mixing and recirculation.
- Filters with different degrees of separation.
- Heating and cooling coils for water for heating and cooling the air and for twin-coil heat recovery systems.
- Cooling coils for direct expansion.
- Electric heating coils.
- Humidifiers.
- Double inlet centrifugal fans or axial flow fans with fixed blades.
- Silencers.
- Inspection rooms with or without doors.

Construction

The unit housings are made of self-supporting insulated panels mounted around a light frame structure, divided into sections with integrated, easily accessible air handling components. The sections are mounted on solid base frames. Construction details for the individual components are specified under the components on pages 12-34.

Material and Surface Treatment

The unit housing consists of hot-dip galvanised steel sections and aluzinc sheet steel.
The panels are a sandwich construction of 2 layers of 0.9 mm aluzinc sheet steel with an intermediate layer of 50 mm mineral wool, 100 kg/m^3.
The surfaces are unpainted.
The material and finishing of the individual components are described under the components.

Drains

Wet sections (cooling coils and humidifiers) are fitted with waterproof drip pans with drains out through the access side.
The drain must be provided with a water trap and must be installed with a gentle incline to an open floor drain. Novenco can supply a special plastic water trap.

Delivery and Installation

The units are delivered as standard in sections. Other methods of delivery can be arranged. The sections are easy to assemble. Detailed installation instructions are supplied.

Accessories and Special Versions

- Inlet vane control for centrifugal fans.
- Inspection windows.
- Internal light.
- Safety switch.
- Non-slip bottom plating.
- Special water trap for drain.
- Baffle plates for fan outlet *).
- Flexible connections, etc.

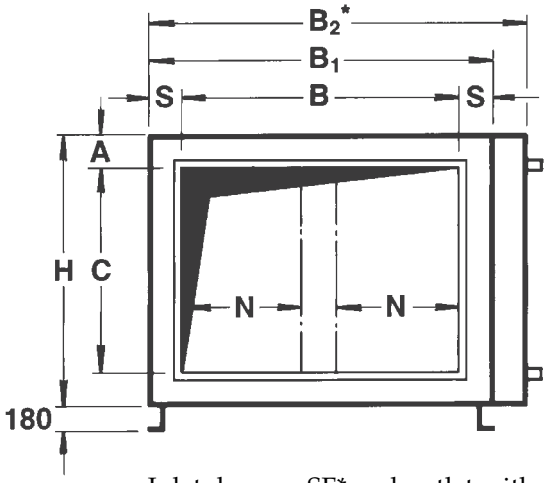
*) When using baffle plates after a fan outlet, the total distance from the fan's pressure boss to the subsequent component (for example, sound baffles) must be:

Centrifugal fan size	Distance
-710	580
-800	650
-900	730
-1000	820

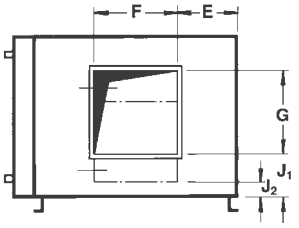
Axial flow fan size	Distance
-900	810
-1000	900
-1120	1008
-1250	1125

ZCP units are available in stainless steel for outdoor installation.
The units are also available in a special reinforced two-way version for both supply and extraction. Systems with two-way units must *only* be implemented in cooperation with Novenco.

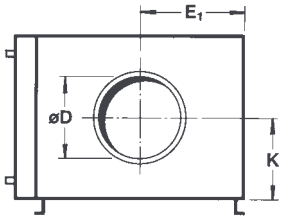
Cross-sectional Dimensions and Connections



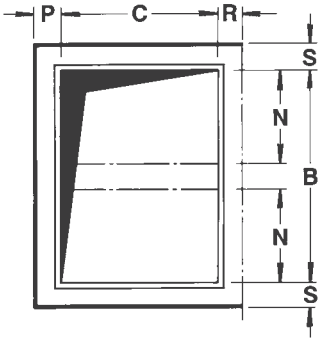
Inlet damper SF* and outlet with end panel.
* Only for heating and cooling coils, both intermediate and integrated



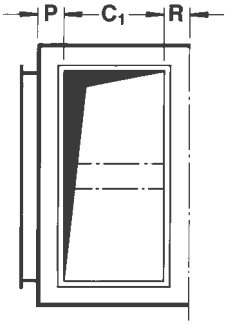
Outlet, centrifugal fans, pos. B & C.



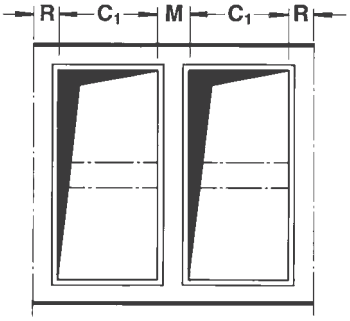
Outlet, axial flow fans.



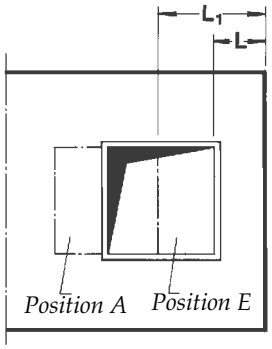
Inlet damper SF*
at top: pos. 1
(at bottom: pos. 4).



Inlet damper SB*
at top: pos. 1 - 2
(at bottom: pos. 4 - 2).



Mixing damper SA*
at top: pos. 1
(at bottom: pos. 4).



Outlet, centrifugal fan
at top: pos. A and E
(at bottom: pos. D and F).

* Dampers on ZCP-225 are in two parts: 2 C (C1) x N

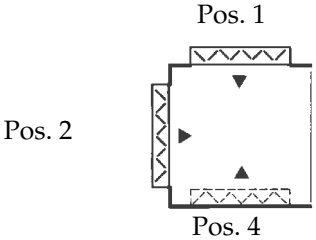
Position Designations

Main position of the unit, seen from the access side:
Pos. R: Air flow direction to the right.
Pos. L: Air flow direction to the left.

Connection Positions:

(See the dimensioned drawings)
Inlet, mixing damper: Pos. 1, 2 and 4.
Outlet, centrifugal fan: Pos. A, B, C, D, E and F.

Mixing Damper, SB



Dimensions Tables

Dimensions in mm

		ZCP-100	ZCP-135	ZCP-180	ZCP-225
Main dimensions	H	1930	1930	2540	2540
	B_1	1930	2540	2540	3150
	B_2	2136	2746	2746	3356
Inlet and connections	A	265	265	270	270
	B	1400	2000	2000	2750
	C	1400	1400	2000	2000
	C_1	1000	1000	1200	1200
	P	162.5	162.5	215	215
	R	110	110	162.5	162.5
	M	220	220	325	325
	N	-	-	-	1300
	S	265	270	270	200

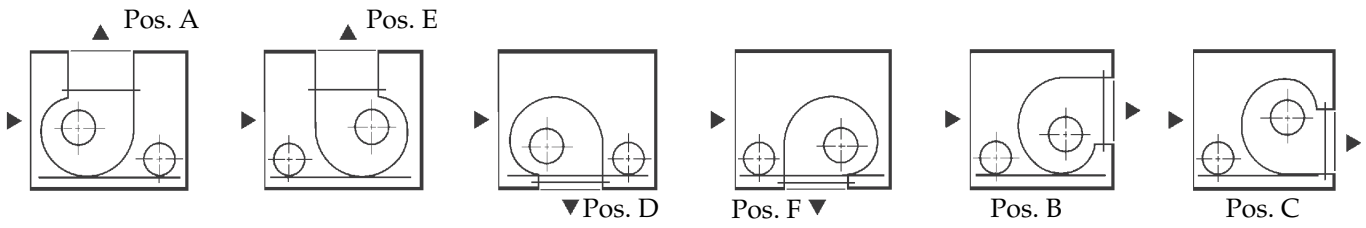
Outlet – Centrifugal Fans CL

	ZCP-100		ZCP-135			ZCP-180			ZCP-225	
CL	-710	-800	-710	-800	-900	-800	-900	-1000	-900	-1000
E	510	455	815	760	700	760	700	630	1005	935
F	910	1020	910	1020	1140	1020	1140	1280	1140	1280
G	910	1020	910	1020	1140	1020	1140	1280	1140	1280
J_1	586	684	586	684	624	684	624	706	624	706
J_2	278	250	278	250	190	250	190	249	190	249
L	586	531	586	531	624	531	624	706	624	706
L_1	744	689	744	689	781	689	781	864	781	864

Outlet – Axial Flow Fans AC

	ZCP-100		ZCP-135		ZCP-180		ZCP-225
ACG	-900	-1000	-1000	-1120	-1120	-1250	-1250
dia. D	1000	1120	1120	1250	1250	1400	1400
E_1	965	965	1270	1270	1270	1270	1575
K	1033	1093	1093	1100	1153	1203	1203

Outlet Positions, Centrifugal Fan CL



Range and Construction

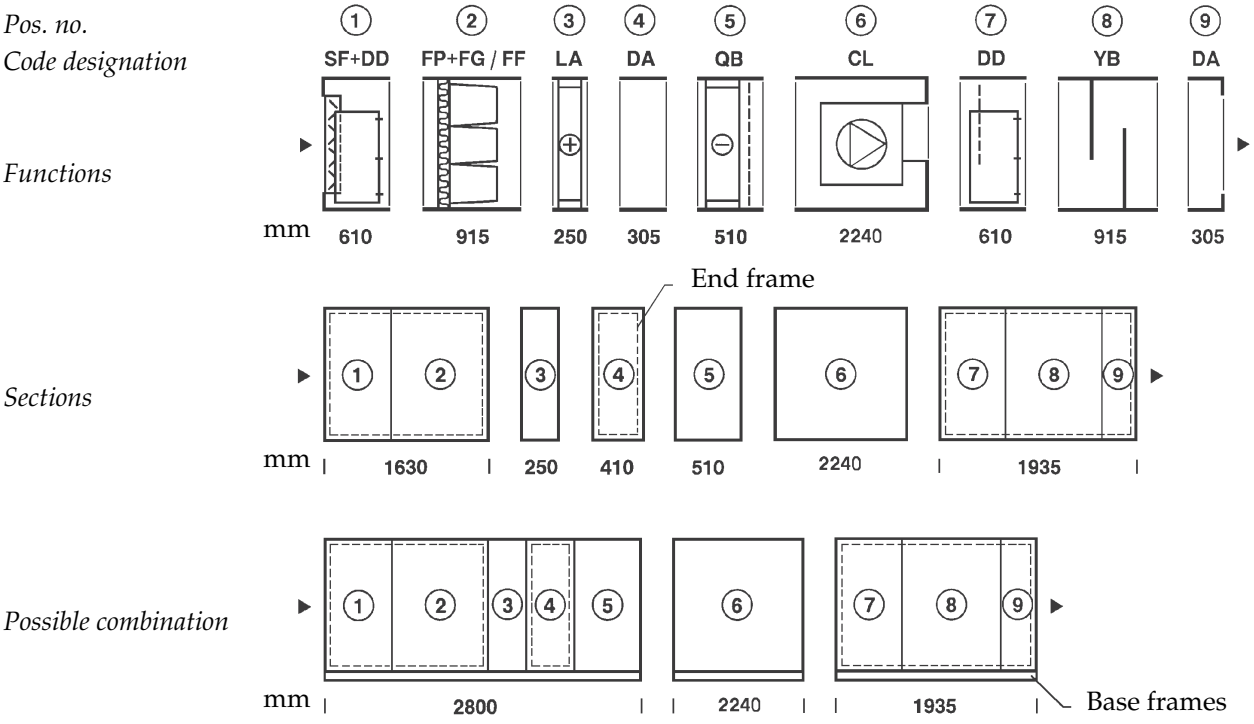
The ZCP system consists of a number air handling functions which are built into in sections (housings) individually or in combination.
The sections are supplied on solid longitudinal base angles and assembled into complete units at the installation site.
The code designations, descriptions, lengths and approximate weights of the functions are shown on the following pages.

The weights include the individual functions with the corresponding housings and base angles.
The weights of the sections' end frames must also be *added*, and are, *per section*:

ZCP-100: 109 kg.
ZCP-135: 129 kg.
ZCP-180: 139 kg.
ZCP-225: 160 kg.

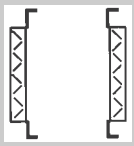
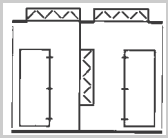
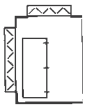
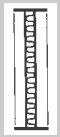
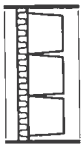
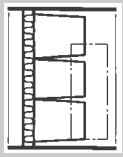
The overall length of a section is the sum of the lengths of the functions included plus the length of the section's end frames, a total of 105 mm (2 x 52.5 mm).
Heating and cooling functions for intermediate installation, plus the fan sections, are all self-supporting sections. Therefore, the end frames need not be added.
Several sections can be combined on a common base frame. Please see the example.

Example: A ZCP-180 unit for heating and cooling with an internal damper for the inlet and silencer for the fan outlet.



1. Inspection part with door, end panel and damper, SF + DD. In the configuration shown, only internal damper regulation can be used.
2. Filter function with prefilter and basic filter or fine filter, FP + FG/ FF.
3. Intermediate heating coil, 4 rows of pipes, LA.
4. Intermediate part, DA, independent section. - Necessary for installation of heating and cooling functions. If inspection is required, a DD function is used.
5. Intermediate cooling coil with eliminator plate, QB, 8 rows of pipes.
6. Centrifugal fan with horizontal outlet, CL.
7. Inspection part (pressure chamber) with door DD and integrated baffle plate for fan outlet.
8. Silencer, YB.
9. Pressure chamber after silencer with end panel and duct connection, DA (necessary for air distribution).

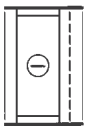
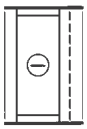
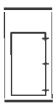
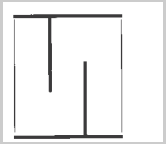
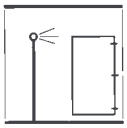
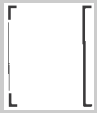
Functions

Code	Symbol	Function	ZCP					
				-100	-135	-180	-225	
SF		Shut-off damper. Mounted externally or internally on the end panel. Internal damper is mounted in a DA function, length 305 mm.	Length Weight	305 89	305 112	305 141	305 181	mm kg
SF		Shut-off damper. Mounted on top of the housing. Alternative mounting internally in the bottom of the housing.	Length Weight	1525 311	1525 348	2135 544	2135 613	mm kg
SA		Mixing and recirculation damper. Incl. 2 inspection doors.	Length Weight	2440 588	2440 669	3050 918	3050 1055	mm kg
SB		Mixing damper. Incl. 1 inspection door.	Length Weight	1220 338	1220 390	1525 529	1525 618	mm kg
FP*		Flat filter, basic filter.	Length Weight	305 98	305 120	305 145	305 172	mm kg
(FP) + FG*		Pocket filter, base filter. Can be supplemented with an FP flat filter as a prefilter.	Length Weight	610 163	610 193	610 227	610 269	mm kg
FP + FG/FF**		Pocket filter. Base or fine filter supplemented with an FP flat filter as a prefilter. With or without inspection door.	Length Weight	915 224	915 268	915 317	915 368	mm kg

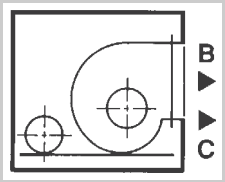
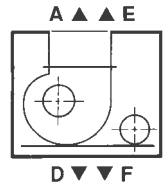
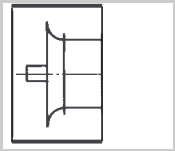
* NB: When using these filter functions, there must be a function with inspection access immediately before it for changing the filter.
** NB: The filter is changed from the clean side. This is not an optimal solution.

Assembly into Sections (example on page 8):

Function: **Lengths, mm**	1 + 2 610 + 915 + 105	+	3 250	+	4 305 + 105	+	5 510	=	total 2800
Function: **Lengths, mm**	6 2240	(No addition for frame section in 3 and 5 as the functions are independent sections.)						=	total 2240
Function: **Lengths, mm**	7 + 8 + 9 610 + 915 + 305 + 105							=	total 1935
					Total length of unit, mm Total weight of unit, kg				6975 4482

Code	Symbol	Function	ZCP					
				-100	-135	-180	-225	
LA	 Internal installation	Heating coil, 1-5 rows of pipes	Length	305	305	305	305	mm
		Function weight excl. heating coil	Weight	110	120	135	145	kg
LB		Heating coil, 6-15 rows of pipes	Length	610	610	610	610	mm
		Function weight excl. heating coil	Weight	180	185	225	245	kg
QA	 Internal installation incl. eliminator plate	Cooling coil, 2-10 rows of pipes	Length	610	610	610	610	mm
		Function weight excl. cooling coil	Weight	215	240	285	315	kg
QB		Cooling coil, 11-15 rows of pipes	Length	915	915	915	915	mm
		Function weight excl. cooling coil	Weight	230	255	305	335	kg
LA [1]	 Intermediate installation	Heating coil, 1-5 rows of pipes	Length	250	250	250	250	mm
		Function weight excl. heating coil	Weight	35	40	50	50	kg
LB [1]		Heating coil, 6-9 rows of pipes	Length	390	390	390	390	mm
		Function weight excl. heating coil	Weight	45	50	60	60	kg
LC [1]		Heating coil, 10-13 rows of pipes	Length	510	510	510	510	mm
		Function weight excl. heating coil	Weight	55	60	70	70	kg
QA [1]	 Intermediate installation incl. eliminator plate	Cooling coil, 2-5 rows of pipes	Length	390	390	390	390	mm
		Function weight excl. cooling coil	Weight	80	95	120	130	kg
QB [1]		Cooling coil, 6-9 rows of pipes	Length	510	510	510	510	mm
		Function weight excl. cooling coil	Weight	90	105	130	140	kg
QC [1]		Cooling coil, 10-13 rows of pipes	Length	630	630	630	630	mm
		Function weight excl. cooling coil	Weight	100	115	145	150	kg
DA [2]		Intermediate part between 2 other functions.	Length	n x 305				mm
			Weight	n x 61	n x 69	n x 78	n x 88	kg
DD		Inspection part with door.	Length	610	610	610	610	mm
			Weight	126	142	161	181	kg
YA [3]		Silencer.	Length	610	610	610	610	mm
			Weight	270	336	406	488	kg
YB [3]		Silencer.	Length	915	915	915	915	mm
			Weight	386	477	555	666	kg
YC [3]		Silencer.	Length	1220	1220	1220	1220	mm
			Weight	497	613	748	898	kg
HB		Humidifier (evaporative type)						
		60 % humidification.	Length	1220	1220	1220	1220	mm
			Weight	405	478	541	628	kg
		85 % humidification.	Length	1220	1220	1220	1220	mm
			Weight	447	532	605	704	kg
		95 % humidification.	Length	1220	1220	1220	1220	mm
			Weight	471	564	645	756	kg
		End panel, closed.	Length	0	0	0	0	mm
			Weight	77	102	137	170	kg
		End panel, with duct connection.	Length	0	0	0	0	mm
			Weight	51	62	74	83	kg

1) No addition for end frames.
2) Used as a pressure chamber between the fan and silencer or as an empty part for later installation of functions.
3) Baffle thickness: 200 mm.
Baffle spacing: 105 mm.

Code	Symbol	Function	ZCP					
				-100	-135	-180	-225	
CL Pos. B or C.	 Centrifugal fan with horizontal outlet (Pos. B or C).	Fan, CL-710 (ZCP-100 and -135)	Length Weight [1]	1935 910	1935 1007			mm kg
		Fan, CL-800 (ZCP-100, -135 and -180)	Length Weight [1]	2240 1055	2240 1160	2240 1265		mm kg
		Fan, CL-900 (ZCP-135, -180 and -225)	Length Weight [1]		2545 1344	2545 1455	2545 1598	mm kg
		Fan, CL-1000 (ZCP-180 and -225)	Length Weight [1]			2545 1560	2545 1703	mm kg
CL Pos. A, D, E or F.	 Centrifugal fan with vertical outlet (Pos. A, D, E or F).	Fan, CL-710 (ZCP-100 and -135)	Length Weight [1]	2240 975	2240 1080			mm kg
		Fan, CL-800 (ZCP-100, -135 and -180)	Length Weight [1]	2240 1055	2240 1160	2240 1265		mm kg
		Fan, CL-900 (ZCP-135, -180 and -225)	Length Weight [1]		2545 1455	2545 1455	2545 1598	mm kg
		Fan, CL-1000 (ZCP-180 and -225)	Length Weight [1]			2850 1642	2850 1793	mm kg
AC	 Novax axial flow fan with adjusted blades.	Fan ACG-900 (ZCP-100)	Length Weight [1]	1935 843				mm kg
		Fan ACG-1000 (ZCP-100 and -135)	Length Weight [1]	1935 968	1935 1073			mm kg
		Fan ACG-1120 (ZCP-135 and -180)	Length Weight [1]		1935 1247	1935 1372		mm kg
		Fan ACG-1250 (ZCP-180 and -225)	Length Weight [1]			1935 1426	1935 1587	mm kg

1) Excl. weight of motor.

Standard Equipment

All fans are mounted on anti-vibration mountings (centrifugal fans – spring anti-vibration mountings; axial flow fans - rubber anti-vibration mountings) and provided with an internal flexible connection for the outlet.
All fan sections are also provided with inspection doors.

Sensor and drain outlet on heating and cooling coils.

Accessories

- Inlet vane control for centrifugal fans.
- Inspection windows.
- Internal light.
- Safety switch.
- Non-slip bottom plating.
- Water trap for drain.
- Baffle plates for fan outlet
- Flexible connections, etc.
- Air flow rate measuring nozzle, only for axial flow fans.
- Manometers for filter relay.

Dampers

The integrated dampers are louvre type with opposed blades and comprise:

Shut-off Damper, code SF

- for closure when the system is not operating.

Mixing Damper, code SB

- for mixing 2 air flows at the inlet.

Mixing and Recirculation Damper, code SA

- for closure when the system is not operating and mixing outdoor air and recirculation air and corresponding differentiation of discharge air.

Construction

The damper blades are made of extruded aluminium and supported in an aluminium frame in plastic bushings.
The dampers' stainless drive shafts can be connected directly to damper motors (for example, BELIMO) or linked to each other with rodding. The necessary control force is indicated in the table.

Classification

When closed, the dampers meet tightness requirements in accordance with DS-447 and VVS AMA 98, class 3.

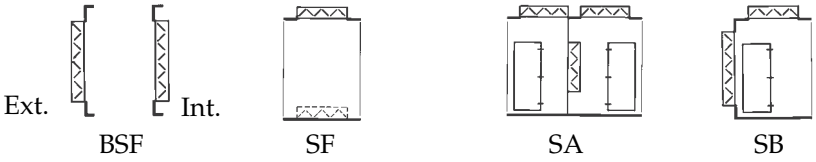
Special Installation Conditions

All dampers are available for motors mounted externally on the unit. SF+DD become SF+DA+DD when SF is mounted internally and external mounting of the damper motor is required.

Control moments

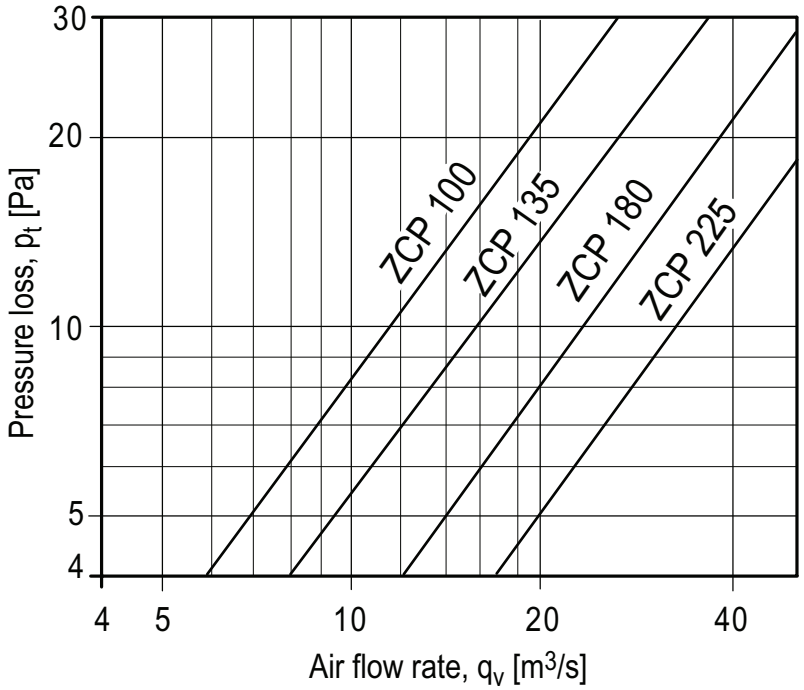
Unit	Moment Nm
ZCP-100	15
ZCP-135	20
ZCP-180	20
ZCP-225	2 x 15

For connected dampers, the above values are multiplied by 2.



Pressure Loss SF

The graphs apply to open dampers



Pressure loss in mixing damper type SA and type SB:
ZCP-100 and ZCP-135: Δp_{SF} x 1.96
ZCP-180 and ZCP-225: Δp_{SF} x 2.8

Filters

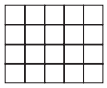
The filter units for the Climaster units are supplied mounted in special frames and are available in different types, depending on the specific cleanness and separation requirements for the ventilation air.

Prefilters
For cleanness requirements that specify a filter of class F8, we recommend mounting a basic filter as a prefilter.
The filters meet the requirements for EN 779 and ASHRAE 52-76.
The EN 779 classifications for the individual filters are stated in front of the filter types.

Further filter data can be obtained from one of Novenco's sales representatives.

Filter type	Description of filter	Filter class	Designation	Material	Discoloration	Length of filter units
Basic filters with degree of separation 80 - 85%	Flat filters	EU2	FM, PERM ALU	Cleanable aluminium filter		48 mm
		EU3	FS, AM-300	Disposable filter of synthetic		50 mm
	Pocket filters	EU3	FG	material		305 mm
Fine filters with degree of separation over 95 %	Pocket filters	EU5	FF	Disposable filter of glass fibre material	55 %	305 mm
		EU6	FF		65 %	635 mm
		EU7	FF		85 %	635 mm
		EU8/9	FF		95 %	635 mm
	Compact-filters	EU6	VV6-6	Disposable filter of glass fibre medium with a polystyrene frame	65 %	292 mm
		EU7	VV6-9		85 %	292 mm
		EU8	VV6-10		95 %	292 mm

Number of filter units per air channel

ZCP-100		Total of 9. Filter dimensions: 592 mm x 592 mm
ZCP-135		Total of 12. Filter dimensions: 592 mm x 592 mm
ZCP-180		Total of 16. Filter dimensions: 592 mm x 592 mm
ZCP-225		Total of 20. Filter dimensions: 592 mm x 592 mm

Flat filter FS (synthetic)

Flat filter FM (metal)

Pocket filter FG (basic filter)

Pocket filter FF (fine filter)

Compact filter FF (fine filter)

Heating Coils for Water

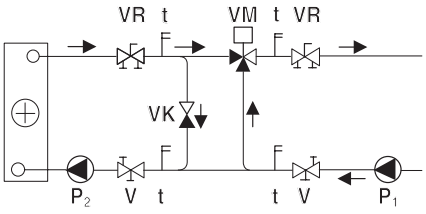
The heating coils consist of copper pipes with aluminium fins housed in a sheet steel frame.
The heating coils are used as preheating and reheating coils.
The heating coils are available with different numbers of pipes and circuits, depending on the actual heating requirements.

The heating coils are available as A: built-in coils, mounted in rails in the unit, and B: intermediate coils, where the heating coil's frame is insulated and mounted together with the rest of the unit as a separate section.

To achieve the greatest possible face area, the heating coils' header is always mounted outside the unit and covered with an insulated, airtight hood.
The water is supplied and discharged through steel headers that pass through the hood on the access side of the unit and have threaded connections at their ends.

Connection

It is important that the water flow through the heating coil always equals the calculated flow.



Heating coil
VM = Motorised valve
V = Shut-off valve
VR = Regulation and shut-off valve
VK = Automatic nonreturn valve
P_1 = Circulation pump for heating system (primary circuit)
P_2 = Circulation pump for heating coil (secondary circuit)
t = Thermometer

LA
LB
LC

This is best ensured by modulating regulation of the water temperature by means of a separate circuit in connection with a shunt arrangement close to the heating coil, as shown in the accompanying diagram.

Precise temperature regulation without fluctuations in the air temperature is then achieved. The system should also have automatic controls and thermometers, etc., as shown in the diagram.

Technical specifications	HW
Pipes *	5/8" Cu 0.45 mm
Pipe division	TR 60 x 30
Fins *	Al 0.13 mm
Fin spacing	1.6 – 2.0 – 2.5 and 3.0 mm
Frame *	Hot-dip galvanised sheet steel
Pipe socket	$1^1/_4$" to 4"
Vent connection	Yes
Boss for stem bulb sensor	Yes
Drain screw	Yes
Max. working pressure	10 bar
Test pressure under water at 20°C	30 bar
Max. working temp.	100 °C
Position	V1 right - V2 left

*) Other material combinations are available on request.

Type designation (example):
HW-TR-2-2370-2340-2R-39-V1-Cu/Al

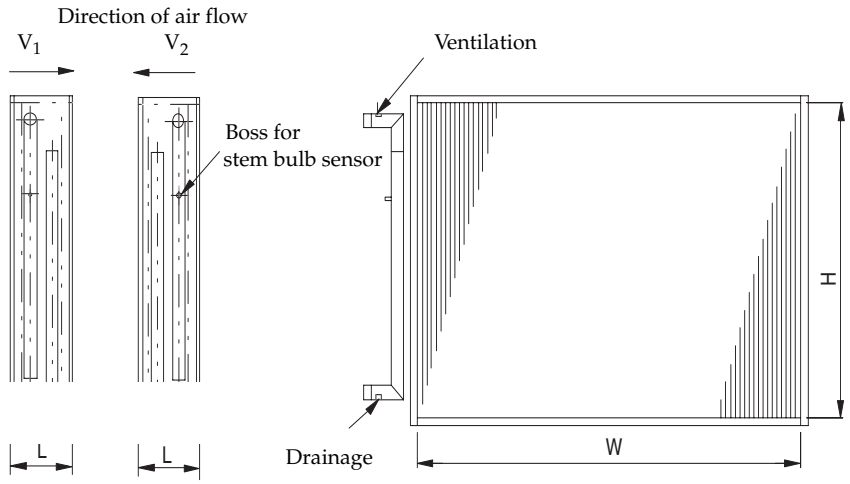
Cu pipe/Al fins
Position designation
Number of circuits
Number of rows of pipes
Fin height (mm)
Fin width (mm)
Fin spacing (mm)
Pipe division 60 x 30 mm
Heating coil for water

Frost Protection

Where heating coils may be exposed to air temperatures under 0°C, precautions must be taken against freezing and the consequent risk of frost burst. Therefore the system should be equipped with automatic controls that open the flow valve, stop the fan and close the damper against outdoor air if there is a risk of frost.

Dimensioning

The heating coils are dimensioned according to the counterflow principle and must be connected as shown in the figure in order to achieve the calculated output.
The precise calculation is done by the PC program, in which all relevant data for the heating coil are entered.

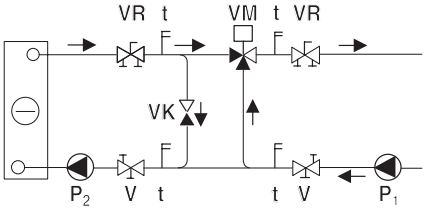


	Heating coils						Function lengths				
	A: Internal installation			B: Intermediate installation			A: Internal installation		B: Intermediate installation		
	B mm	H mm	A m^2	B mm	H mm	A m^2	LA mm	LB mm	LA mm	LB mm	LC mm
ZCP-100	1760	1740	3.06	1800	1800	3.24	305	610	250	390	510
ZCP-135	2370	1740	4.12	2410	1800	4.34	1-5 rows of pipes	6-15 rows of pipes	1-5 rows of pipes	6-9 rows of pipes	10-13 rows of pipes
ZCP-180	2370	2340	5.55	2410	2400	5.78					
ZCP-225	2980	2340	6.97	3020	2400	7.25					

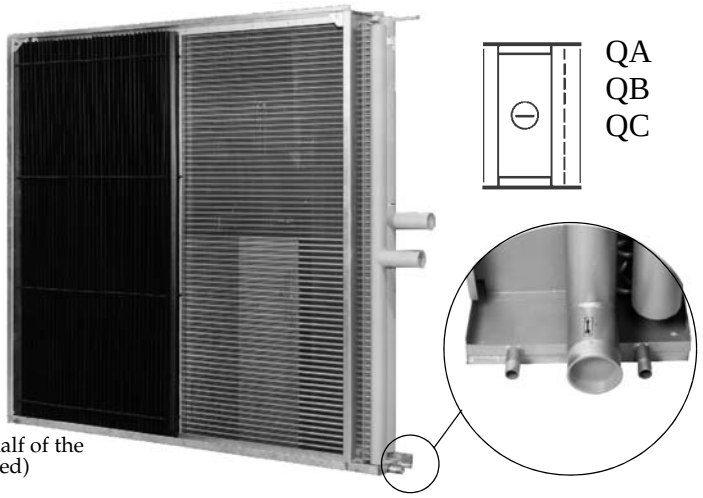
All data for the heating coil are shown in the customer printout.

Cooling Coils for Water

The cooling coils consist of copper pipes with aluminium fins housed in a sheet steel frame.
The cooling coils are used for cooling and dehumidification.
The cooling coils are available with different numbers of pipes and circuits, depending on the cooling requirements. The cooling coils are available as
A: built-in coils, mounted in rails in the unit, and
B: intermediate coils, where the cooling coil's frame is insulated and mounted together with the other part of the unit as a separate section.
To achieve the greatest possible face area, the cooling coils' header is always mounted outside the unit and covered with an insulated, airtight hood, as shown in the picture on the front of the catalogue.
The drip pan is designed as part of the frame structure of the cooling coil. The drip pan is provided with two drains, dia. 32 mm, unthreaded.
The drip pan has room for an eliminator mat, which should always be used at air speeds over 2.5 m/s.
The water is supplied and discharged through steel headers that pass through the hood on the access side of the unit and have threaded connections at their ends.



Cooling coil
VM = Motorised valve
V = Shut-off valve
VR = Regulation and shut-off valve
VK = Automatic nonreturn valve
P_1 = Circulation pump for cooling system (primary circuit)
P_2 = Circulation pump for cooling system (secondary circuit)
t = Thermometer



(Here shown with half of the eliminator plate fitted)

Connection

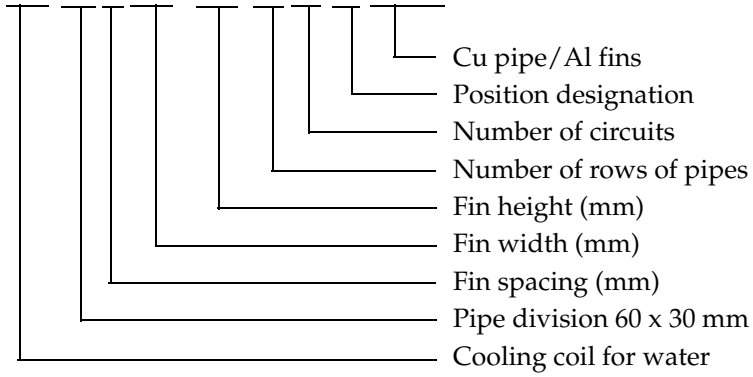
It is important that the calculated water flow through the cooling coil is always present.
This is best ensured by modulating regulation of the water temperature by means of a separate circuit in connection with a shunt arrangement close to the cooling coil, as shown in the accompanying diagram.
Precise temperature regulation without fluctuations in the air temperature is then achieved. The system should also have automatic controls and thermometers, etc., as shown in the diagram.

Technical specifications	CW
Pipes *	5/8" Cu 0.45 mm
Pipe division	TR 60 x 30
Fins *	Al 0.13 mm
Fin spacing	2.5 and 3.0 mm
Frame *	Hot-dip galvanised sheet steel
Pipe socket	$1^1/_4$" to 4"
Vent connection	Yes
Boss for stem bulb sensor	No
Drain screw	Yes
Max. working pressure	10 bar
Test pressure under water at 20°C	30 bar
Position	V1 right - V2 left

*) Other material combinations are available on request.

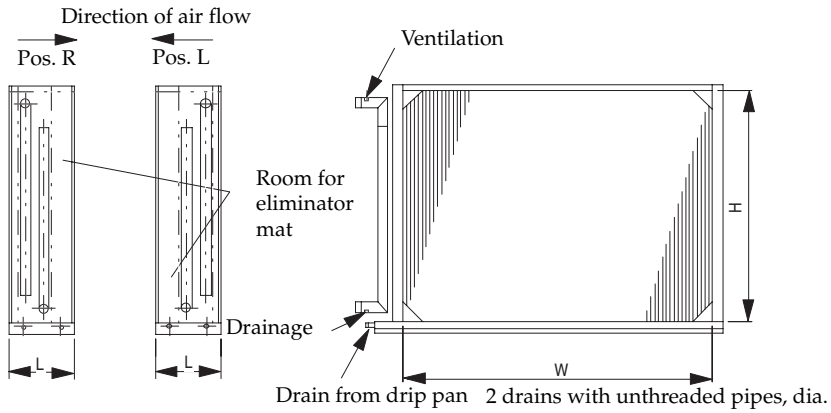
Type designation (example):

CW-TR-2.5-2410-1800-6R-45-V1-Cu/Al



Dimensioning

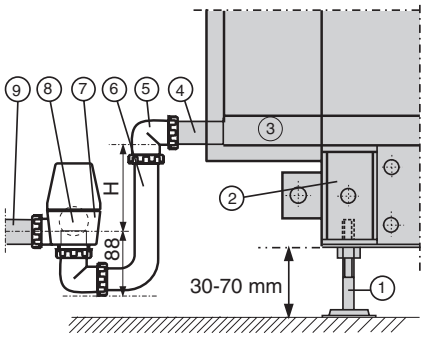
The cooling coils are dimensioned according to the counterflow principle and must be connected as shown in the figure in order to achieve the design output.
The precise calculation is done by the PC program, in which all relevant data for the cooling coil are entered. All data for the cooling coil are shown in the customer printout.



	Cooling coils						Function lengths *				
	A: Internal installation			B: Intermediate installation			A: Internal installation		B: Intermediate installation		
	B mm	H mm	A m_2	B mm	H mm	A m_2	QA mm	QB mm	QA mm	QB mm	QC mm
ZCP-100	1760	1740	3.06	1800	1800	3.24	610	915	390	510	630
ZCP-135	2370	1740	4.12	2410	1800	4.34	2-10 rows of pipes	11-15 rows of pipes	1-5 rows of pipes	6-9 rows of pipes	10-13 rows of pipes
ZCP-180	2370	2340	5.55	2410	2400	5.78					
ZCP-225	2980	2340	6.97	3020	2400	7.25					

Special Water Trap

It is beneficial to use Novenco's special water trap for drains from wet sections.
Please note: There are two drains from the drip pan on cooling coils.



1. Adjusting screw with foot
2. Base frame
3. Drip pan
4. Drain connection, 32 mm ext. diameter without thread
5. Angle
6. Pipe, dia. 32 mm
7. Water trap
8. Ball
9. Drain, 32 mm ext. diameter without thread

Cooling Coils for Direct Expansion

Cooling coils (DX) for systems for direct expansion of the cooling medium are available with the same number of rows of pipes and in the same materials as cooling coils for water. However, inlet pipes and outlet pipes are made of copper.
DX cooling coils have the same front area and function length and the same drip pan with eliminator mat and are installed in the same function as water cooling coils.

Inlet and outlet pipes pass through the panel. DX cooling coils are supplied without expansion valves. The expansion valve should be mounted immediately outside the cooling function.
Information on the calculation of DX cooling coils is available from Novenco.
The type designation is the same as for water cooling coils, but with DX instead of CW.

Electric Heating Coils

Electric heating coils for Climaster ZCP are made of stainless steel tubular heating elements integrated in a sheet steel frame with a junction box with the necessary cable terminals.
The heating coils are available with various numbers of rows of pipes, depending on the heating requirements.
The heating coils are grouped in terms of power in accordance with the actual need.
In the standard version, the heating coils are designed for dry rooms that are not at risk of explosion but are available for other operating conditions.
The function length is 305 mm and the maximum powers are:

ZCP-100	690 kW
ZCP-135	925 kW
ZCP-180	1250 kW
ZCP-225	1570 kW

For further details on the design and connection, ask Novenco's sales departments.

Safety Thermostats

The heating coils have a maximum thermostat with automatic reclosing (adjustable from 30 to 110°C) and an overheating thermostat (110°C, not adjustable) with manual reclosing after being triggered.

Electrical Connection

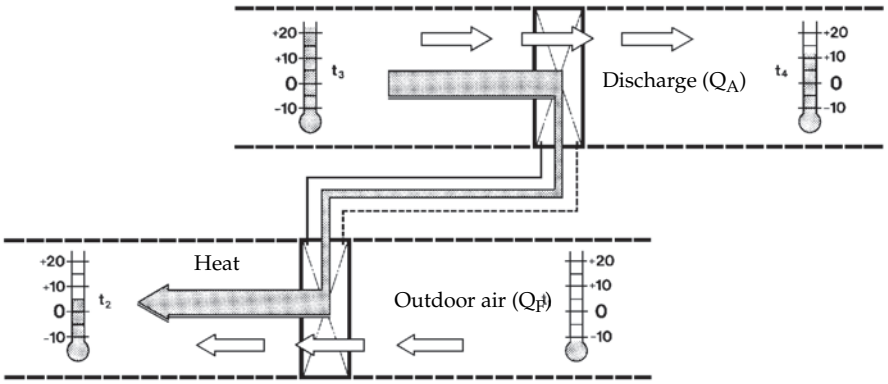
The heating coils are normally supplied for 3 x 400 V, but are available for other voltages.

Automatic Controls and Safety Functions

The automatic control system must be implemented in such a way that the heating coil can only be supplied with voltage when the fan is in operation.
If the maximum thermostat is triggered, only the voltage to the tubular heating elements must be cut. Automatic reclosing takes place after cooling by approximately 15°C.
If the overheating thermostat is triggered, the fan must stop and other automatic control functions go to the idle position. Before the system is restarted, the thermostat's reclosing contact is activated.
To avoid unnecessary triggering of the overheating thermostat in connection with scheduled system shutdowns, the system should be equipped with an automatic control for cooling, prolonged fan operation.

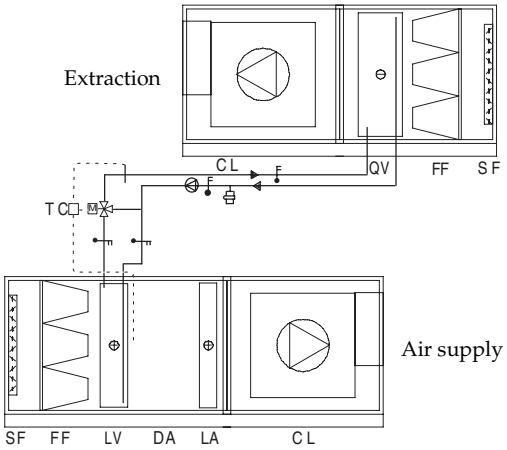
Twin-coil Heat Exchangers

Twin-coil batteries are a heat recovery system in which the discharge air passes a cooling coil connected by a pipe system to a heating coil in the outdoor air. This system is used where it is inappropriate to combine the supply and extraction function in one unit. The heat transfer medium (water with the addition of glycol) circulates through the pipe system and the discharge air transfers heat to the outdoor air.



Temperature efficiency $\eta = \frac{t_2 - t_1}{t_3 - t_1}$

A cooling coil is used on the extraction side so that any condensate will be collected in the drip pan, which has a drain.
In their external construction and size, both the heating coils and cooling coils are identical to the heating and cooling coils described on pages 14 and 16.



Pipe System

The pipe system that connects the two batteries is installed and furnished with a pump and control, safety and monitoring equipment as shown in the simplified diagram. The pipes must be insulated in accordance with the temperature conditions in and around the system.

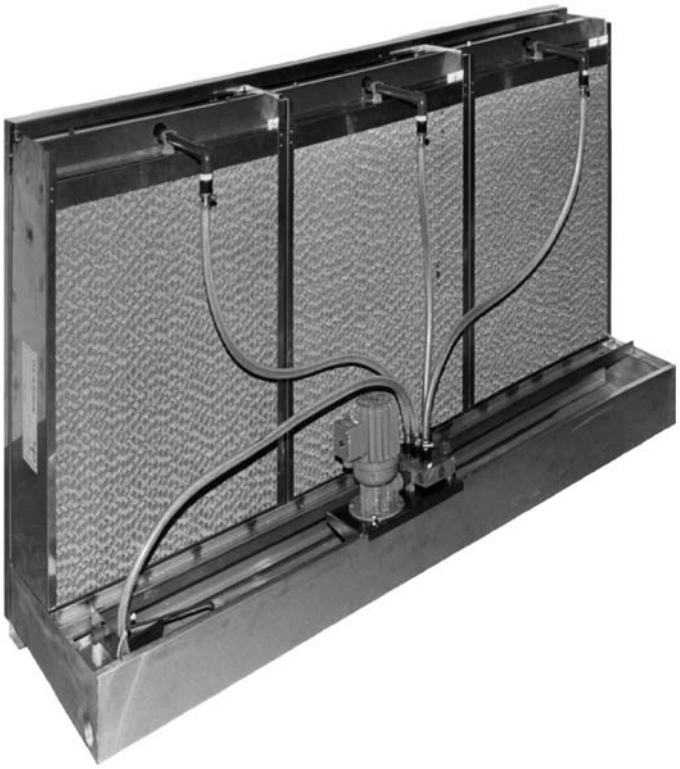
Control

The TC control unit controls the motorised valve according to a signal from a sensor in the outdoor air duct (see the diagram at the top). If there is risk of freezing in the extraction cooling coil, the pipe sensor will override the control, forcing the motorised valve to the position in which the heating coil is bypassed.

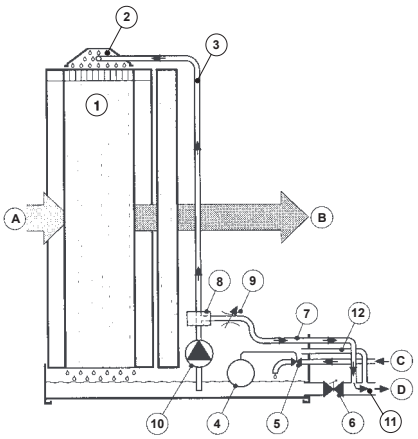
Dimensioning

Dimensioning is carried out by Novenco sales offices.

Humidifiers



HB



Evaporative humidifier HB

Climaster ZCP is available with an evaporative humidifier. This humidifier consists of an impregnated porous glass wall with continuous cells mounted vertically across the air flow in a stainless steel frame with a water reservoir. Water is sprinkled from a pipe with holes at the top of the glass wall, from where the water is distributed down over the glass wall and evaporates as the air passes. A circulation pump with inspiration from the reservoir supplies the distribution pipe with the necessary quantity of water.
The water level is regulated by a float valve.
The reservoir is equipped with a $1^1/_4$" BSP overflow connection with an external thread that passes out through the access side.
The evaporative humidifier is available with glass walls in three thicknesses for maximum humidification of 60%, 85% and 95% respectively.

The evaporative humidifier is operated from the discharge side of the humidifier, where humidifier cassettes can be removed for cleaning.

Connections

Evaporative humidifier, HB
Water supply: $^1/_2$" BSP external thread.
Drain: $1^1/_4$" BSP external thread.

Water Quality

When connecting the system to the water supply, water softening measures should be implemented, depending on the hardness of the water.
Moreover, during the operation of the humidifier, there must be adequate water replenishment to avoid excessive mineral concentration.
A water analysis should be carried out at the project planning stage.

Evaporative humidifier

A. Non-humidified air
B. Humidified air
C. Mains water
D. Discharge water
1. Humidifier cassette
2. Distribution unit
3. Water distribution pipe
4. Float
5. Float valve
6. Reservoir drain valve
7. Drain hose
8. Water distributor
9. Drain valve
10. Circulation pump
11. Drain pipe
12. Overflow drain

Humidification

Humidification is defined as the ratio between the water quantity absorbed by the air during humidification and the water quantity required to achieve saturation.

When the water temperature does not deviate significantly from the air temperature, the humidification will take place as shown in the accompanying extract from the ix diagram. Using the designations shown in the figure, the humidification can be expressed by the equation:

$$\eta = \frac{x_2 - x_1}{x_3 - x_1}$$

For further calculation, the ix diagram can be used.

Example: The water content of the air before the humidifier $x_1 = 1$ g/kg. The desired water content after the humidifier $x_2 = 7$ g/kg, equivalent to approximately 40% relative humidity at normal room temperature. Inserting the known values in the equation for humidification produces:

$$0,\ 8 = \frac{7 - 1}{x_3 - 1}$$

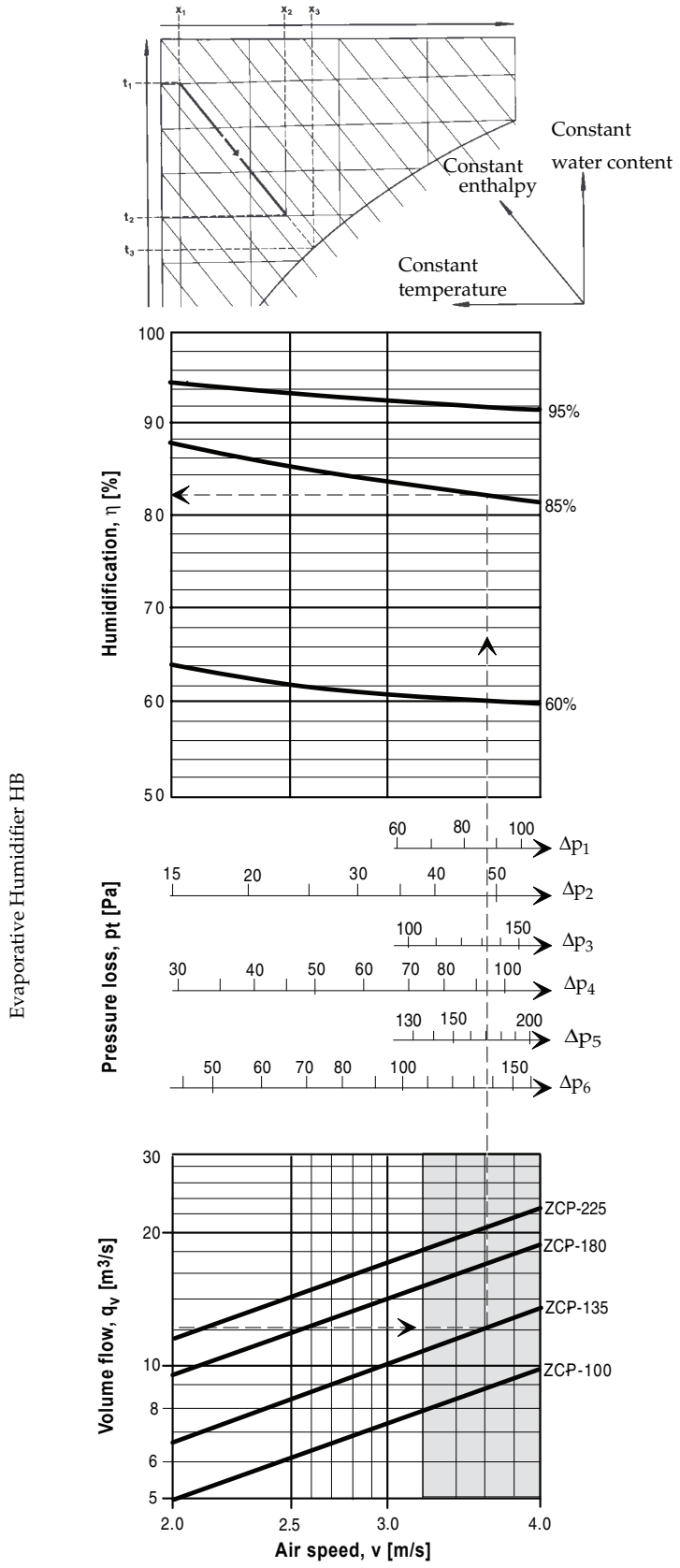
$$x_3 = 1 + \frac{6}{0,\ 8} = 8,\ 5 \text{g/kg}$$

From the point on the saturation graph that corresponds to a water content of 8.5 g/kg, a diagonal line is now drawn for constant enthalpy, that indicates the course of the humidification process, and it is possible to read the air temperatures t_1 and t_2 to be used when dimensioning the preheating coil and reheating coil.

Example: ZCP-135 with volume flow 12.1 m^3/s. Humidification of 82% is achieved with an 85% RH humidifier. An eliminator mat is necessary.

$\Delta p_3 = 132$ Pa

Evaporative Humidifier HB



Pressure Loss

Δp_1: 60% humidifier with eliminator mat

Δp_2: 60% humidifier without eliminator mat

Δp_3: 85% humidifier with eliminator mat

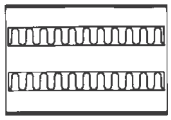
Δp_4: 85% humidifier without eliminator mat

Δp_5: 95% humidifier with eliminator mat

Δp_6: 95% humidifier without eliminator mat

Silencers

Silencers YA, YB and YC consist of functions with lengths 610, 915 and 1220 mm equipped with a number of vertical sound-absorbing baffles 200 mm thick.
The silencers can be directly connected to other sections with full cross section. However, at the fan outlet a DA section must be installed between the fan and the silencer to house the baffle plate.
When connecting a duct to the silencer, a DA function, L = 305 mm, provided with an inlet panel, must be fitted on its discharge side.
Silencing values and pressure losses are shown in the table and the diagram.

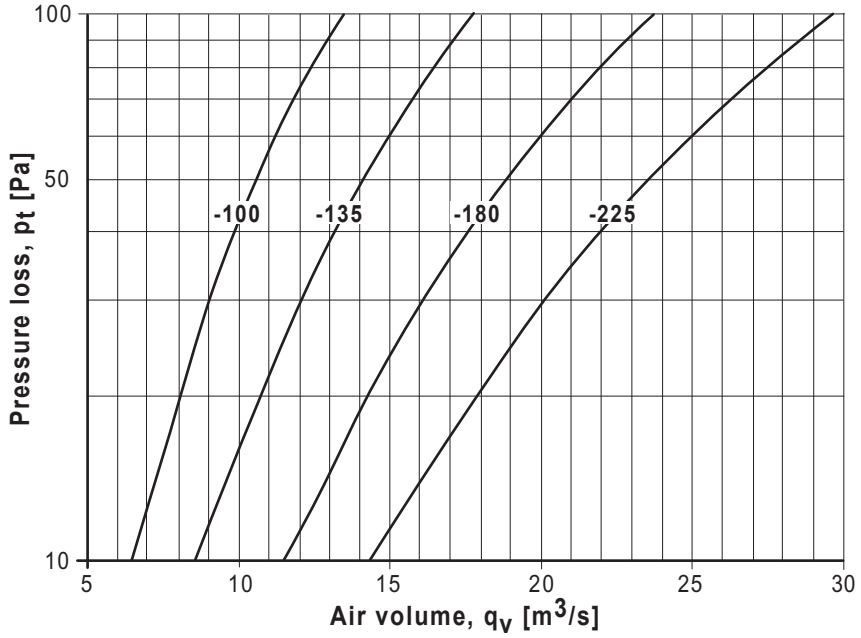


YA
YB
YC

Silencing

Type	Length, mm	Mean frequency, Hz, db							
		63	125	250	500	1k	2k	4k	8k
YA	**610**	2	4	9	19	26	24	17	11
YB	**915**	2	6	15	26	37	34	21	13
YC	**1220**	3	7	18	30	42	41	25	16

Pressure Loss



Novenco Axial Flow Fans

Axial flow fans with fixed blades for ZCP units are Novax type ACG. The fan is designed as a pipe with a funnel-shaped inlet.

The mount for the motor and impeller is designed to create optimal flow and the motor's position on the inflow side ensures optimal cooling of the motor.
The inlet is provided with a guard net. A downstream guide vane with a core is mounted on the fan's outlet side, allowing the ACG to achieve a very high efficiency.

The motor is a flanged motor with electrical connection in a junction box.
The Novax rotor (the impeller) consists of a pressed, two-part, assembled hub with depressions in which the blades are fixed at predetermined angles. The rotor is provided with a hub boss with a drilled hole for fitting on the motor shaft.
The blades of the rotor can be adjusted to any angle between 25° and 60°, depending on the size and RPM.

On the outlet side, the fan is provided with a flexible connection to the outlet panel of the unit.
The fan is provided with mounting feet and supported on anti-vibration mountings at the base of the section.
The design of the fan in connection with the individually calculated blade angles has the effect that the fan can be supplied with great accuracy for the given operating point with optimal efficiency, typically above 80%.
ZCP units include axial flow fans with combinations of impeller and hub diameters as shown in the capacities graph.

For further information on Novax fans, refer to the chapter on Novax.

Investment costs, operating costs and space requirements are often lower for Novax fans than for centrifugal fans with the same performance.

Max. RPM for Novax rotors **RPM at 20°C ***

Hub diameter	Rotor diameter			
	900	1000	1120	1250
380	2651	2324		
403	2179	2025	1885	1730
578	2128	1957	1804	1685

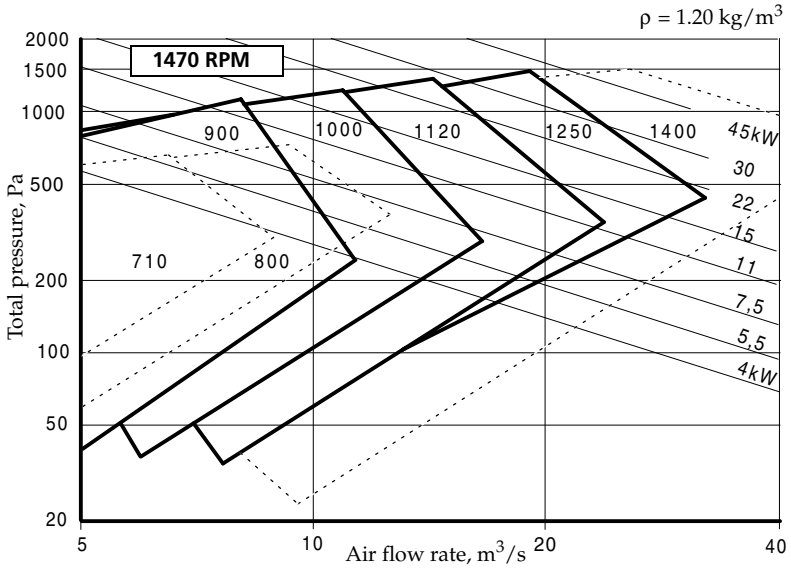
* Reduced max. RPM at higher or lower temperatures.

Dimensions

Capacities: - ACG Overview

The diagram shows the duty ranges of the individual fan sizes without taking the hub diameter into consideration.
The capacities are based on fan installation in accordance with BS 848 1980, installation type B (free inlet, duct connection for outlet).
If other installation types are used, other data will be produced.

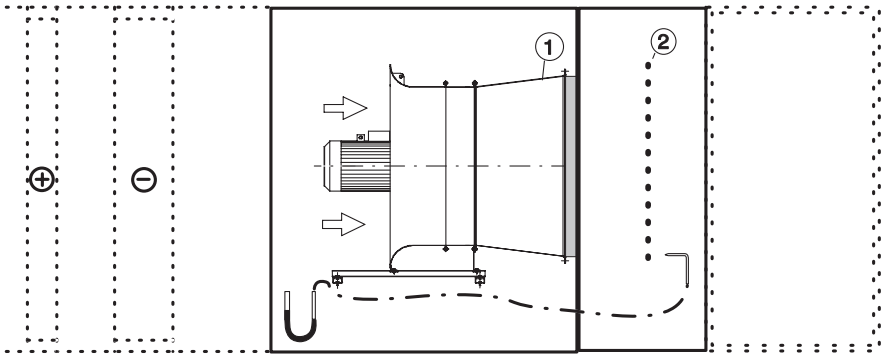
Specific calculations for Novax fans are carried out in the ***WinNovax*** calculation program.



Integration of Novax ACG in a Unit

The figure shows a typical installation in a ZCP unit.
In relation to the values calculated in the ***WinNovax*** program for a specific working point, correction is necessary for:

- a free outlet without a duct
- a short diffuser
- a baffle plate.



1. Short diffuser 2. Baffle plate

Free outlet without a duct

The correction value "a" produced by the
WinNovax calculation program is a loss factor that, multiplied by the fan's dynamic pressure p_{dF}, must be added to the calculated static pressure p_{sF} for the fan.
The a factor is due to the speed loss (Δp_d) that derives from the difference in air speeds between the fan's blade area and the gross area in the outlet opening.

Diffuser

The effect of the a factor is reduced if a diffuser is fitted on the outlet side of the axial flow fan. The diffuser is designed to achieve maximum recovery of dynamic energy. This is done by increasing the exhaust area, thus reducing the exhaust speed and thus p_d.

"Recovery Factor" y

Installation	Duct on outlet	Free outlet without a duct
Without a diffuser	*)1	a
With a short diffuser	0.1 x a +0.63	0.1 x a +0.81
With a long diffuser	0.15 x a +0.40	0.15 x a + 0.47

*Measured combination in accordance with BS-848.

The design pressure (p_{tF}) of the fan is calculated using the following formula:
$p_{tF} = p_s + y \times p_{dF}$.
The recovery factor y is determined in laboratory measurements and is shown in the table.

Baffle Plate

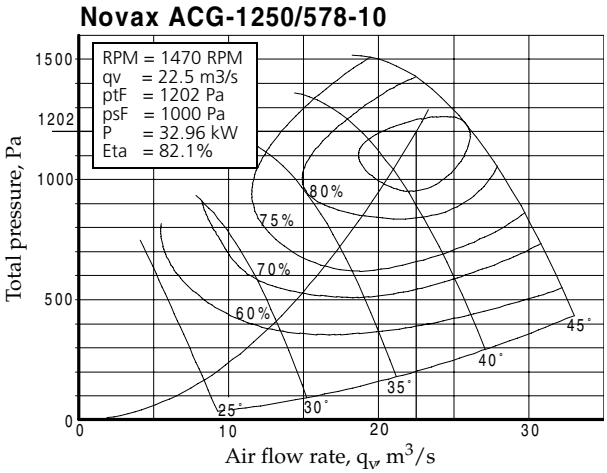
A circular baffle plate is installed after the outlet from the diffuser to distribute the air evenly over the subsequent component, for example a silencer or a filter.
The baffle plate has a resistance value of 0.2 x p_{dF}.

P_d in the Unit

The air speed in a unit is normally in the order of 2 - 4 m/s.
This means that the dynamic pressure in the unit does not exceed 10 Pa, for which reason we ignore this in the calculations for the fan.
The following example shows how the Novax fan's working point must be corrected in relation to the calculation in the WinNovax program when a baffle plate and diffuser are used.

Example:
Desired working point:
Air flow rate 22.5 m^3/s
Total static pressure loss in ducts and unit:
ps = 1000 Pa
Graph 1 shows data for the working point.
The data is in accordance with installation type B.

In the WinNovax calculation program, the a factor is read as 1.62 and pd is read as 202 Pa. Both readings apply to ACG-1250/578-10.
A subsequent correction is necessary for use other than installation type B. See the next page.



Correction for a free outlet without a duct and use of a baffle plate:

recovery factor y = a factor

$\Delta p_{baffle} = 0.2 \times p_{dF}$

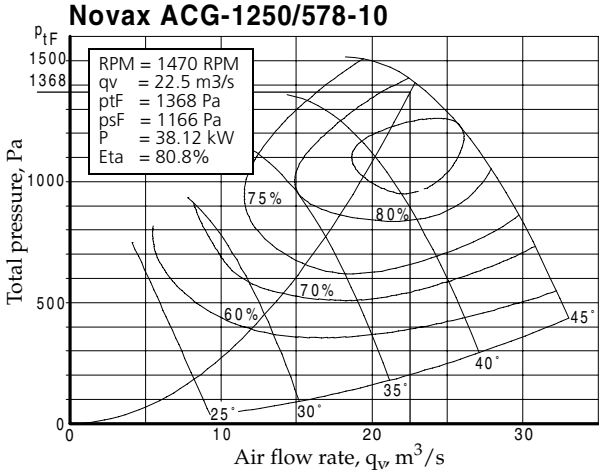
$p_{tF} = p_s + y \times p_{dF} + 0.2 \times p_{dF}$

$= 1000 + 1.62 \times 202 + 0.2 \times 202$

$= 1368$ Pa.

A new calculation is carried out with $p_t = 1368$ Pa.

The data is shown in graph 2.



Correction for the use of a short diffuser with a free outlet without a duct and use of a baffle plate:

recovery factor y = 0.1 x a + 0.81

$\Delta p_{baffle} = 0.2 \times p_{dF}$

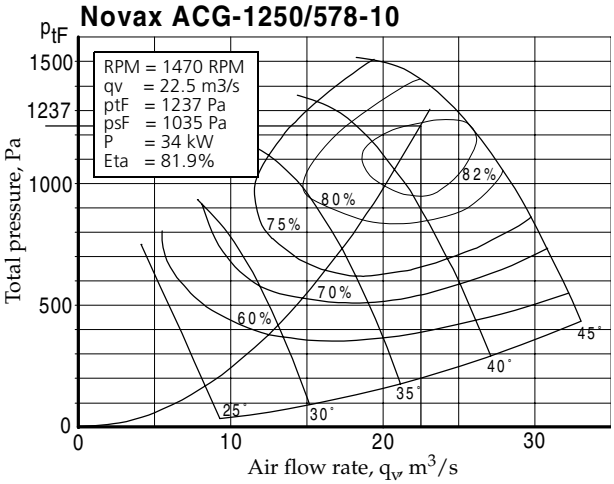
$p_{tF} = p_s + y \times p_{dF} + 0.2 \times p_{dF}$

$= 1000 + (0.1 \times 1.62 + 0.81) \times 202 + 0.2 \times 202$

$= 1237$ Pa.

Therefore, the use of a short diffuser "recovers" 131 Pa, equivalent to approximately 4 kW.

The calculation in graph 2 is included only to show how much is saved by using diffusers.



Variable RPM Regulation by Means of Frequency Inversion

The use of directly coupled fans means that the working range for, for example, 50 Hz motors is as shown in the graphs on page 23, and restrictions in the maximum permissible RPM mean that double-pole motors cannot be used.

Therefore, frequency inverters are used together with Novax axial flow fans. This has two effects:

1. Variable regulation of the air flow rate is possible, although it is necessary to be aware that there may be operating situations in which this is not possible, where a specific pre-pressure is required at low air flow rates.
2. It is possible to use the Novax fan for a higher pressure range than can be achieved with 50 Hz mains operation.

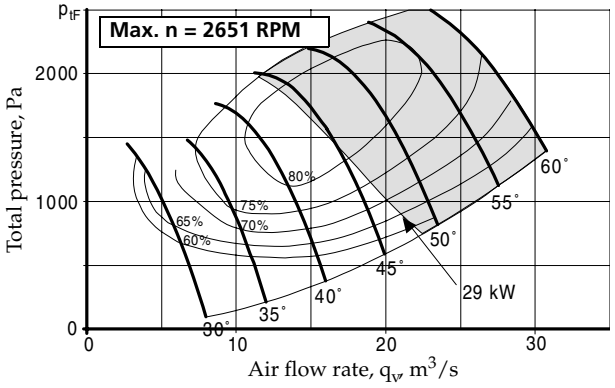
The working range for the four fans mentioned with fixed RPM is shown in the performance graphs on page 23.

Where frequency inverters are used, the power of a standard motor can be increased.

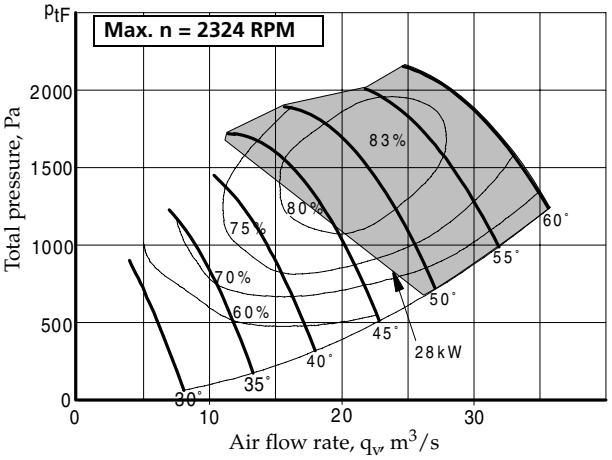
Page 26 contains examples of the use of frequency inverters.

Performance graphs for axial flow fans with 4-pole motors utilised for maximum RPM/power when operated with a frequency inverter. For specific calculations, the WinNovax program is used and a correction is made for use of a short diffuser and any baffle plate, as shown in the example on page 24. The maximum permitted RPM must not be exceeded and the maximum motor size must not be exceeded.

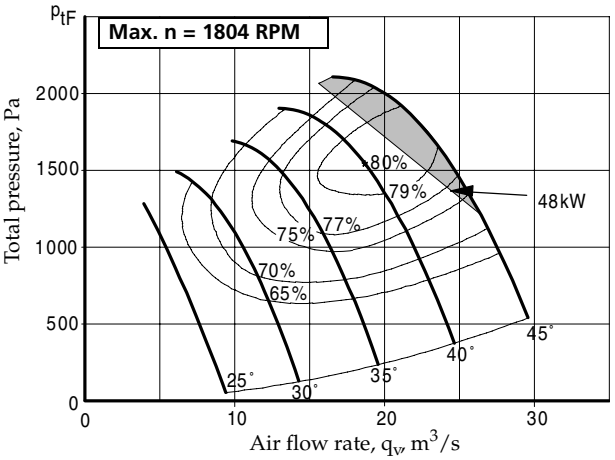
ZCP-100
ACG-900/380-12, max. motor size -180



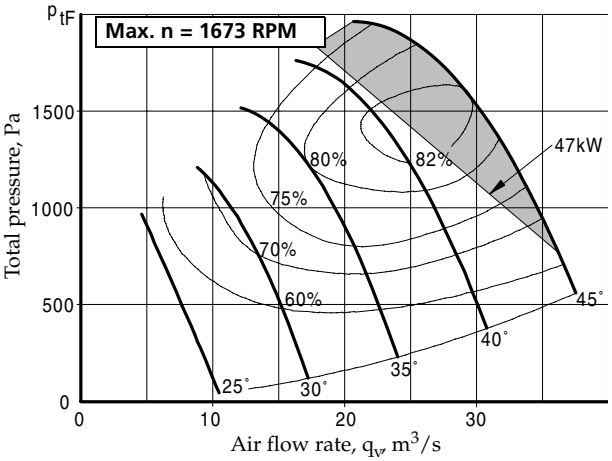
ZCP-100, ZCP-135
ACG-1000/380-12, max. motor size -180



ZCP-135, ZCP-180
ACG-1120/578-10, max. motor size -225

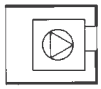


ZCP-180, ZCP-225
ACG-1250/578-10, max. motor size -225



Centrifugal Fans

Centrifugal fans for ZCP units are double inlet centrifugal fans available in two versions, with forward or backward curved blades. The fan unit - consisting of a fan, motor, V-belt drive and base frame - is mounted on spring anti-vibration mountings. The fan's outlet flange is connected to the unit with a flexible connection so that vibrations from the fan are not transferred to the unit.



CL

Fans with Forward-curved Blades

The fan is characterised by small dimensions in relation to pressure and air flow rate and by a low sound level. This fan type is suitable for systems with moderate pressure and relatively constant system resistance.
Capacities: The fans are available in 4 sizes with air flow rates from approximately 8 to 30 m^3/s.

Fans with Backward-curved Blades

These fans are highly efficient and thus provide good operating economy. The sound level is low in relation to the fan performance.
The design of this fan type makes it well suited for installations in which the system resistance varies, as these variations cause only moderate changes in air flow rate and power consumption.
However, the fan output can be regulated with a guide vane mounted on the inlet openings.
Capacities: The fans are available in 4 sizes with capacities from approximately 8 to 30 m^3/s.

Dimensioning

Dimensioning can also take place using the capacity graphs on pages 28-34.

The fan's shaft power is stated on the graphs. To cover loss in the belt drive, differences between the calculated and actual RPM and minor uncertainties in the system resistance, a value is added to this shaft power as shown in the table and the next largest motor is chosen.

Shaft power	Addition
< 4 kW	+ 20 %
< 10 kW	+ 14 %
< 70 kW	+ 10 %

Please note:
Installation Loss for Fans: As several fan sizes, each with its own installation loss, can be used for the same unit, the installation losses are entered on the graphs as P3.1 or P3.2. The fans' total pressure is calculated as indicated in the graphs.

The fans' sound values are entered on the graphs as the basis for sound data. Sound data for the individual fans can be found with the data on the fans.
Tolerance of the indicated sound values: ±3 dB (in the 63 Hz octave band ±5 dB) at maximum efficiency.

Baffle Plate

For installation after the fan's outlet opening for free delivery into the subsequent section.

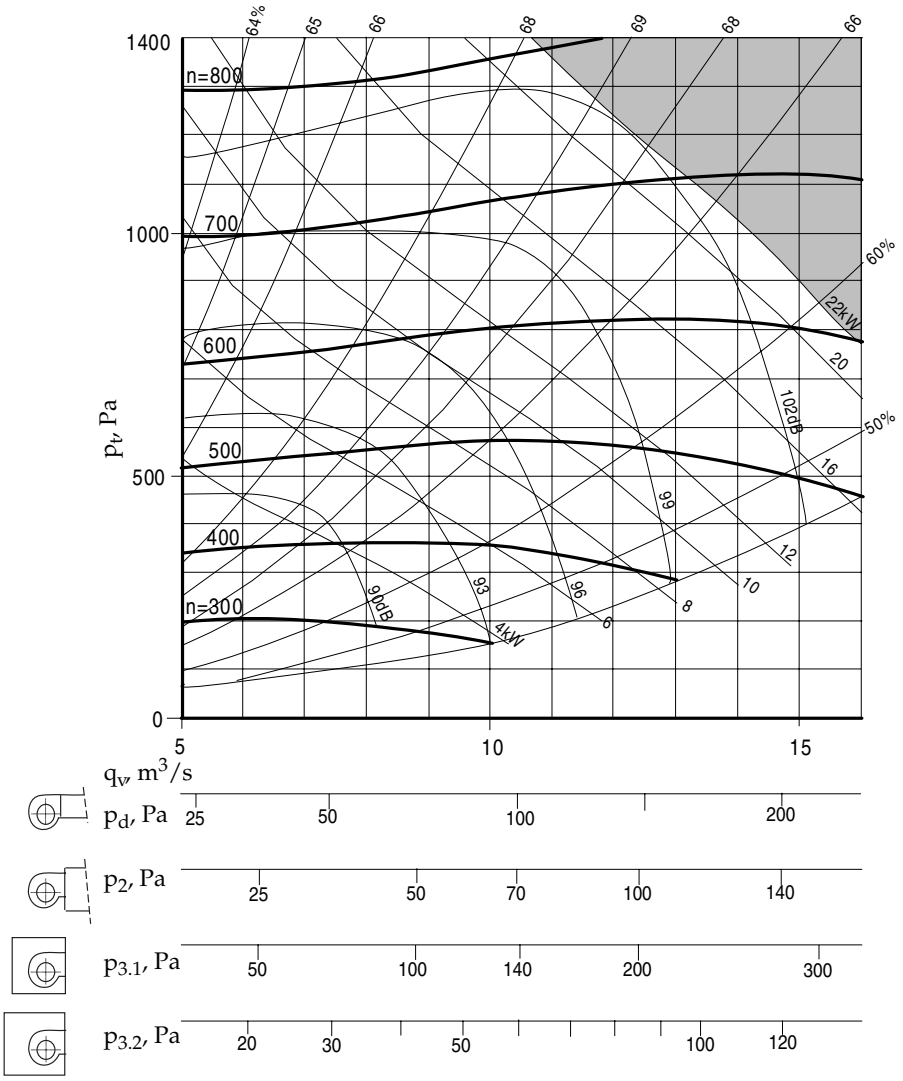
Climaster ZCP-100 and -135

Impeller with forward-curved blades.

Fan type:
TLZ-710T
max. 850 RPM
max. 22 kW
I_v = 3.4 kg/m^2

Motors:
-132, -160, -180,-200, -225

n =	RPM
η =	efficiency in %
kW=	power demand excl. belt drive
dB=	total sound power level
q_v =	volume flow, air
	ρ = 1.20 kg/m^3
p_t =	total pressure
p_d =	dynamic pressure, outlet
p_2 =	outflow loss with free delivery
$p_{3.1}$ =	Installation loss in ZCP-100
$p_{3.2}$ =	Installation loss in ZCP-135



Total pressure p_t for a fan with a duct on the suction side and a duct on the pressure side of the same cross-section as the fan's pressure connection:
$p_t = p_k + p_{agg.}$

p_k = total pressure drop in the duct system[1].
[1] Sometimes the pressure drop in the duct system is stated as static pressure. In this case, it is necessary to add the dynamic pressure in the interface between the unit and the duct system to p_k before the fan's working point is found.
$p_{agg.} = p_{int} + p_{3.1}$ or $p_{3.2}$
p_{int} = internal pressure drop in the unit (static pressure drop over components).

Sound Conditions

The fan graph shows the total sound power level, L_{wt} (ref. 10^{-12}W), attributed to the fan's outlet opening.
For division into octave bands, the following formula is used:

$L_w = L_{wt} + K_{corr.}$
L_w = Sound power level, dB
L_{wt} = Total sound power level, dB
$K_{corr.}$ = Correction value, that is read in the accompanying table

Correction values ($K_{corr.}$)

	Octave band, Hz							
	63	125	250	500	1k	2k	4k	8k
	-6	-7	-10	-12	-13	-15	-19	-23
To plant room Attenuation through unit wall. Less the corrected value.	11	14	20	28	33	38	42	45

Climaster ZCP-100 and -135

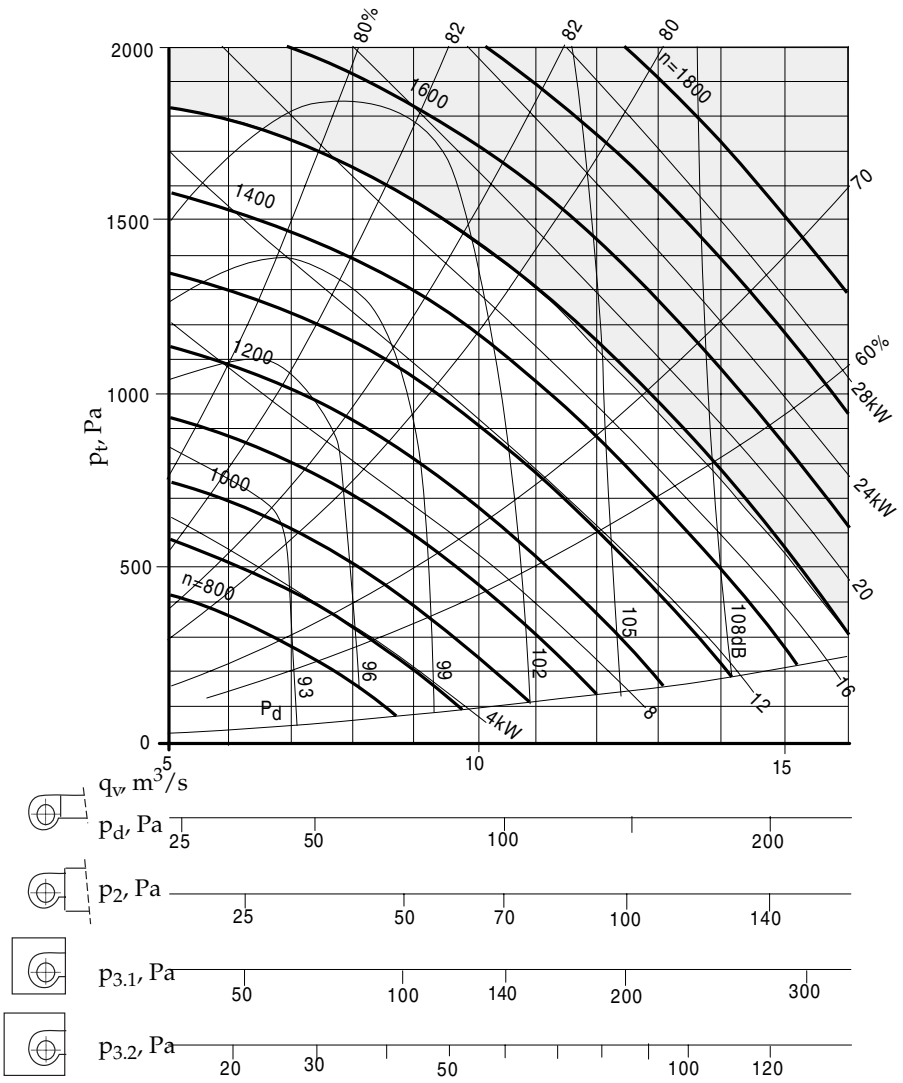
Impeller with backward-curved blades.

Fan type:
T-HLZ-710T
max. 1500 RPM
max. 18 kW
I_v = 4.8 kg/m^2

HLZ-710T
max. 2050 RPM
max. 45 kW
I_v = 6.4 kg/m^2

Motors:
-132, -160, -180,-200, -225

n =	RPM
η =	efficiency in %
kW=	power demand excl. belt drive
dB=	total sound power level
q_v =	volume flow, air ρ = 1.20 kg/m^3
p_t =	total pressure
p_d =	dynamic pressure, outlet
p_2 =	outflow loss with free delivery
$p_{3.1}$ =	Installation loss in ZCP-100
$p_{3.2}$ =	Installation loss in ZCP-135



Total pressure p_t for a fan with a duct on the suction side and a duct on the pressure side of the same cross-section as the fan's pressure connection:
$p_t = p_k + p_{agg.}$

p_k = total pressure drop in the duct system[1].
[1] Sometimes the pressure drop in the duct system is stated as static pressure. In this case, it is necessary to add the dynamic pressure in the interface between the unit and the duct system to p_k before the fan's working point is found.
$p_{agg.} = p_{int} + p_{3.1}$
or $p_{3.2}$
p_{int} = internal pressure drop in the unit (static pressure drop over components).

Sound Conditions

The fan graph shows the total sound power level, L_{wt} (ref. 10^{-12}W), attributed to the fan's outlet opening.
For division into octave bands, the following formula is used:

$L_w = L_{wt} + K_{corr.}$
L_w = Sound power level, dB
L_{wt} = Total sound power level, dB
$K_{corr.}$ = Correction value, that is read in the accompanying table

Correction values ($K_{corr.}$)

	Octave band, Hz							
	63	125	250	500	1k	2k	4k	8k
	-4	-6	-7	-9	-11	-15	-19	-23
To plant room Attenuation through unit wall. Less the corrected value.	11	14	20	28	33	38	42	45

If a guide vane is used, up to 5 dB(A) must be added.

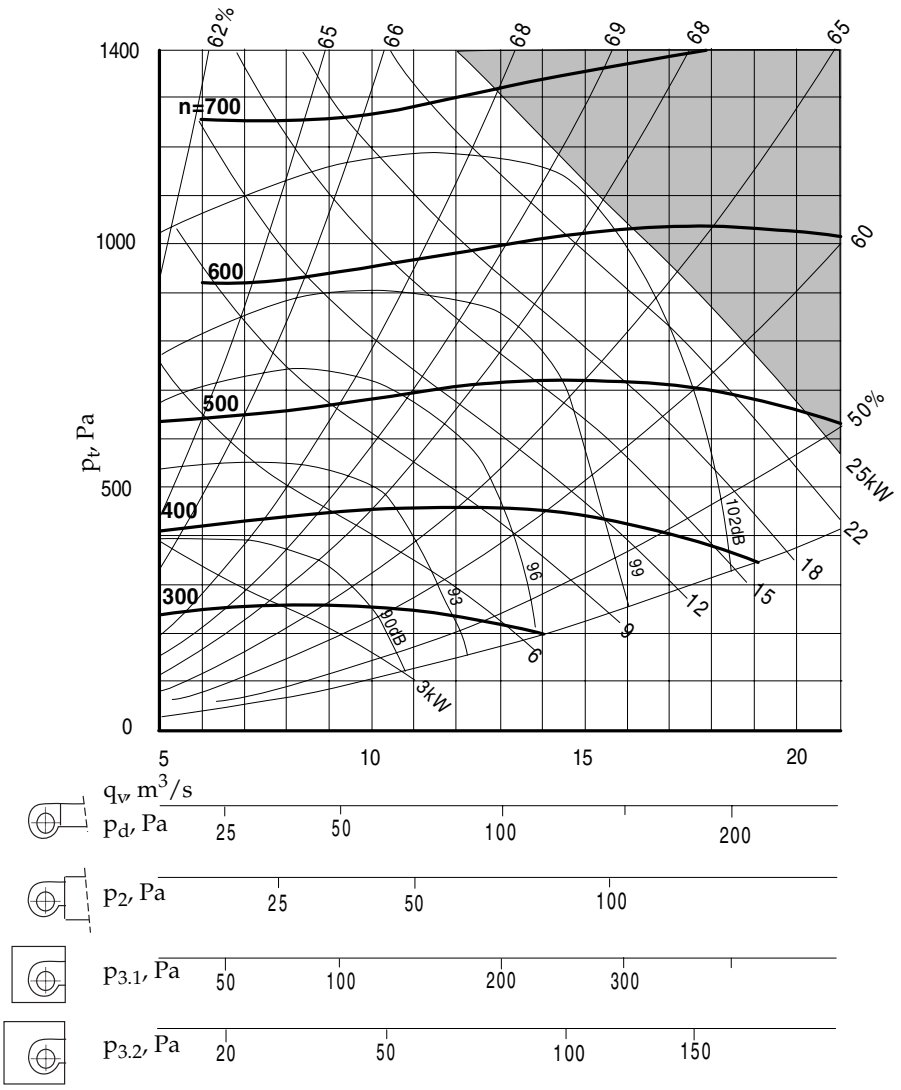
Climaster ZCP-100, -135 and -180

Impeller with forward-curved blades.

Fan type:
TLZ-800T
max. 750 RPM
max. 25 kW
I_v = 5.8 kg/m^2

Motors:
-132, -160, -180, -200, -225, -250

n =	RPM
η =	efficiency in %
kW=	power demand excl. belt drive
dB=	total sound power level
q_v =	volume flow, air
	ρ = 1.20 kg/m^3
p_t =	total pressure
p_d =	dynamic pressure, outlet
p_2 =	outflow loss with free delivery
$p_{3.1}$ =	Installation loss in ZCP-100
$p_{3.2}$ =	Installation loss in ZCP-135 and ZCP-180



Total pressure p_t for a fan with a duct on the suction side and a duct on the pressure side of the same cross-section as the fan's pressure connection:
$p_t = p_k + p_{agg.}$

p_k = total pressure drop in the duct system[1].

[1] Sometimes the pressure drop in the duct system is stated as static pressure. In this case, it is necessary to add the dynamic pressure in the interface between the unit and the duct system to p_k before the fan's working point is found.

$p_{agg.} = p_{int} + p_{3.1}$ or $p_{3.2}$
p_{int} = internal pressure drop in the unit (static pressure drop over components).

Sound Conditions

The fan graph shows the total sound power level, L_{wt} (ref. 10^{-12}W), attributed to the fan's outlet opening.
For division into octave bands, the following formula is used:

$L_w = L_{wt} + K_{corr.}$
L_w = Sound power level, dB
L_{wt} = Total sound power level, dB
$K_{corr.}$ = Correction value, that is read in the accompanying table

Correction values ($K_{corr.}$)

	Octave band, Hz							
	63	125	250	500	1k	2k	4k	8k
	-6	-7	-10	-12	-13	-15	-19	-23
To plant room Attenuation through unit wall. Less the corrected value.	11	14	20	28	33	38	42	45

Climaster ZCP-100, -135 and -180

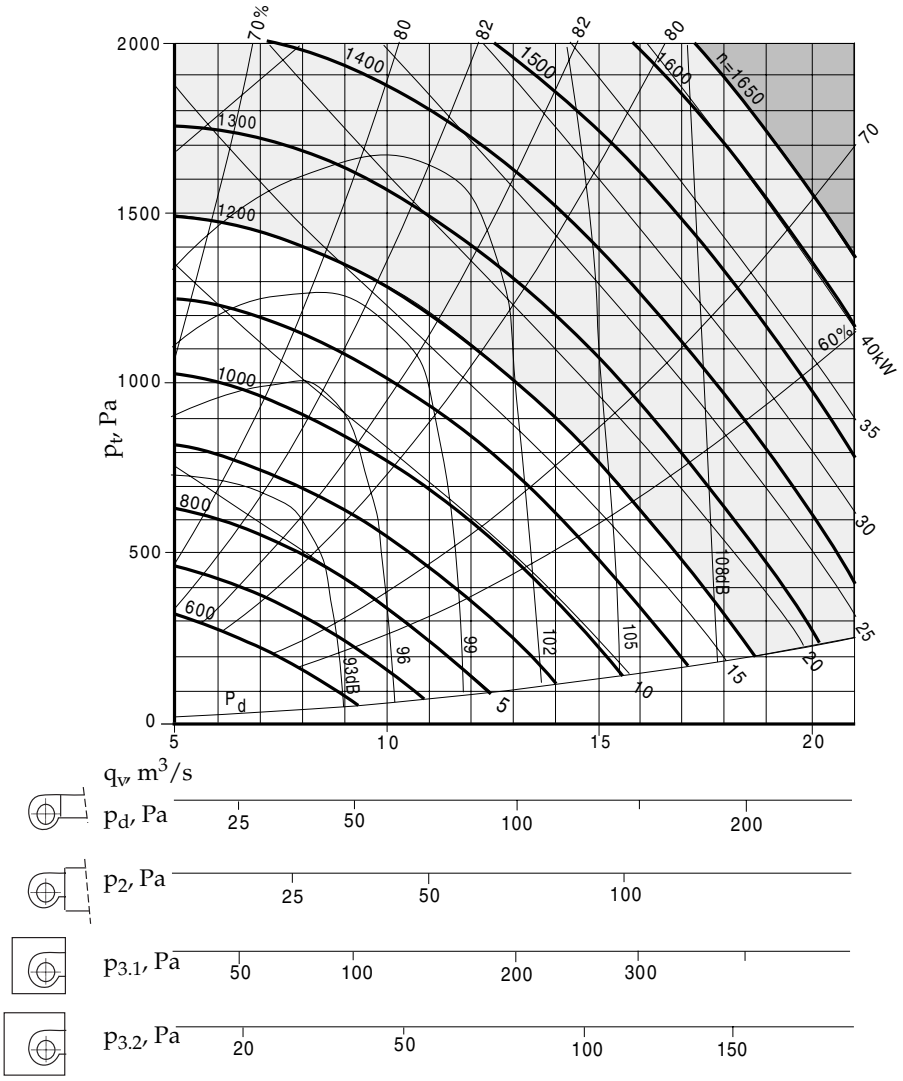
Impeller with backward-curved blades.

Fan type:
T-HLZ-800T
max. 1200 RPM
max. 18 kW
I_v = 7.6 kg/m^2

HLZ-800T
max. 1650 RPM
max. 45 kW
I_v = 10.2 kg/m^2

Motors:
-132, -160, -180, -200, -225, -250

n = RPM
η = efficiency in %
kW= power demand excl. belt drive
dB= total sound power level
q_v = volume flow, air
ρ = 1.20 kg/m^3
p_t = total pressure
p_d = dynamic pressure, outlet
p_2 = outflow loss with free delivery
$p_{3.1}$ = Installation loss in ZCP-100
$p_{3.2}$ = Installation loss in ZCP-135 and ZP-180



Total pressure p_t for a fan with a duct on the suction side and a duct on the pressure side of the same cross-section as the fan's pressure connection:
$p_t = p_k + p_{agg.}$

p_k = total pressure drop in the duct system[1].
[1] Sometimes the pressure drop in the duct system is stated as static pressure. In this case, it is necessary to add the dynamic pressure in the interface between the unit and the duct system to p_k before the fan's working point is found.
$p_{agg.} = p_{int} + p_{3.1}$ or $p_{3.2}$
p_{int} = internal pressure drop in the unit (static pressure drop over components).

Sound Conditions

The fan graph shows the total sound power level, L_{wt} (ref. 10^{-12}W), attributed to the fan's outlet opening.
For division into octave bands, the following formula is used:

$L_w = L_{wt} + K_{corr.}$
L_w = Sound power level, dB
L_{wt} = Total sound power level, dB
$K_{corr.}$ = Correction value, that is read in the accompanying table

Correction values ($K_{corr.}$)

	Octave band, Hz							
	63	125	250	500	1k	2k	4k	8k
	-4	-6	-7	-9	-11	-15	-19	-23
To plant room Attenuation through unit wall. Less the corrected value.	11	14	20	28	33	38	42	45

If a guide vane is used, up to 5 dB(A) must be added.

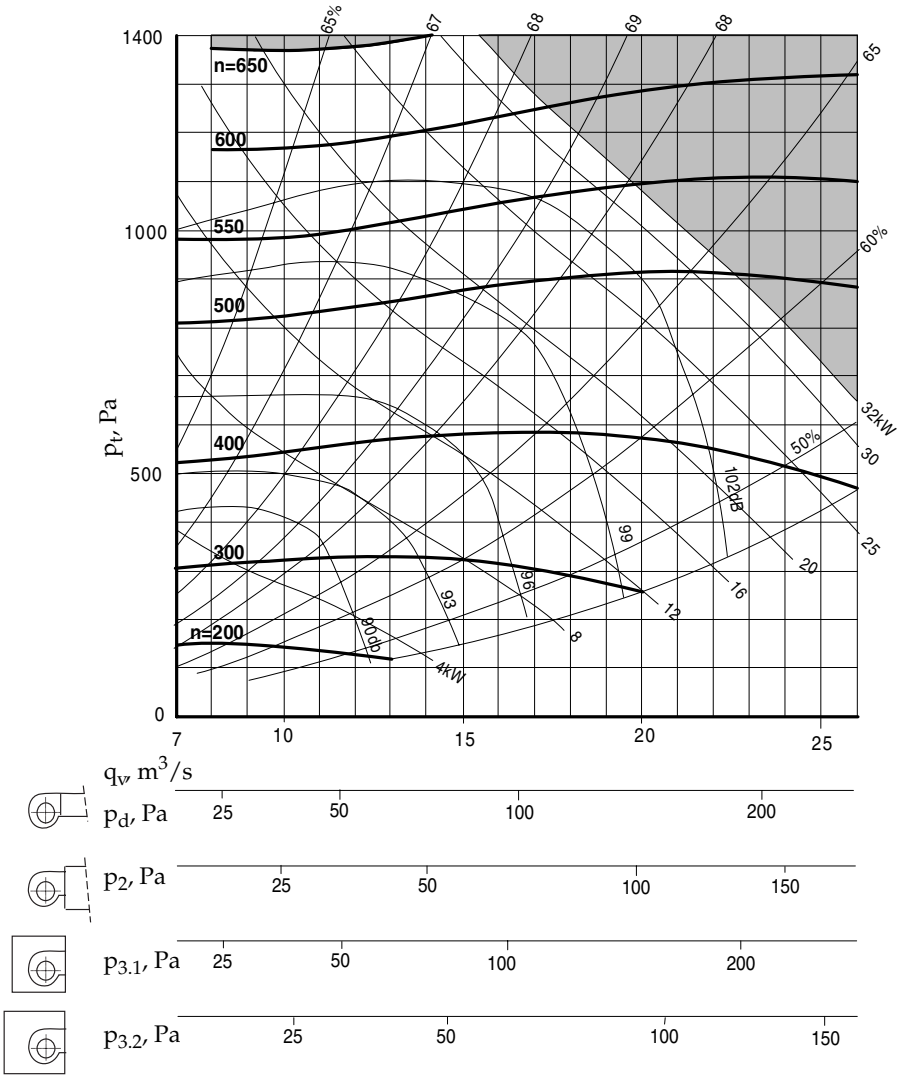
Climaster ZCP-135, -180 and -225

Impeller with forward-curved blades.

Fan type:
TLZ-900T
max. 650 RPM
max. 32 kW
I_v = 8.9 kg/m^2

Motors:
-132, -160, -180, -200, -225, -250, -280

n =	RPM
η =	efficiency in %
kW=	power demand excl. belt drive
dB=	total sound power level
q_v =	volume flow, air
	ρ = 1.20 kg/m^3
p_t =	total pressure
p_d =	dynamic pressure, outlet
p_2 =	outflow loss with free delivery
$p_{3.1}$ =	Installation loss in ZCP-135 and ZCP-180
$p_{3.2}$ =	Installation loss in ZCP-225



Total pressure p_t for a fan with a duct on the suction side and a duct on the pressure side of the same cross-section as the fan's pressure connection:
$p_t = p_k + p_{agg.}$

p_k = total pressure drop in the duct system[1].
[1] Sometimes the pressure drop in the duct system is stated as static pressure. In this case, it is necessary to add the dynamic pressure in the interface between the unit and the duct system to p_k before the fan's working point is found.

$p_{agg.} = p_{int} + p_{3.1}$ or $p_{3.2}$
p_{int} = internal pressure drop in the unit (static pressure drop over components).

Sound Conditions

The fan graph shows the total sound power level, L_{wt} (ref. 10^{-12}W), attributed to the fan's outlet opening.
For division into octave bands, the following formula is used:

$L_w = L_{wt} + K_{corr.}$
L_w = Sound power level, dB
L_{wt} = Total sound power level, dB
$K_{corr.}$ = Correction value, that is read in the accompanying table

Correction values ($K_{corr.}$)

	Octave band, Hz							
	63	125	250	500	1k	2k	4k	8k
	-6	-7	-10	-12	-13	-15	-19	-23
To plant room Attenuation through unit wall. Less the corrected value.	11	14	20	28	33	38	42	45

Climaster ZCP-135, -180 and -225

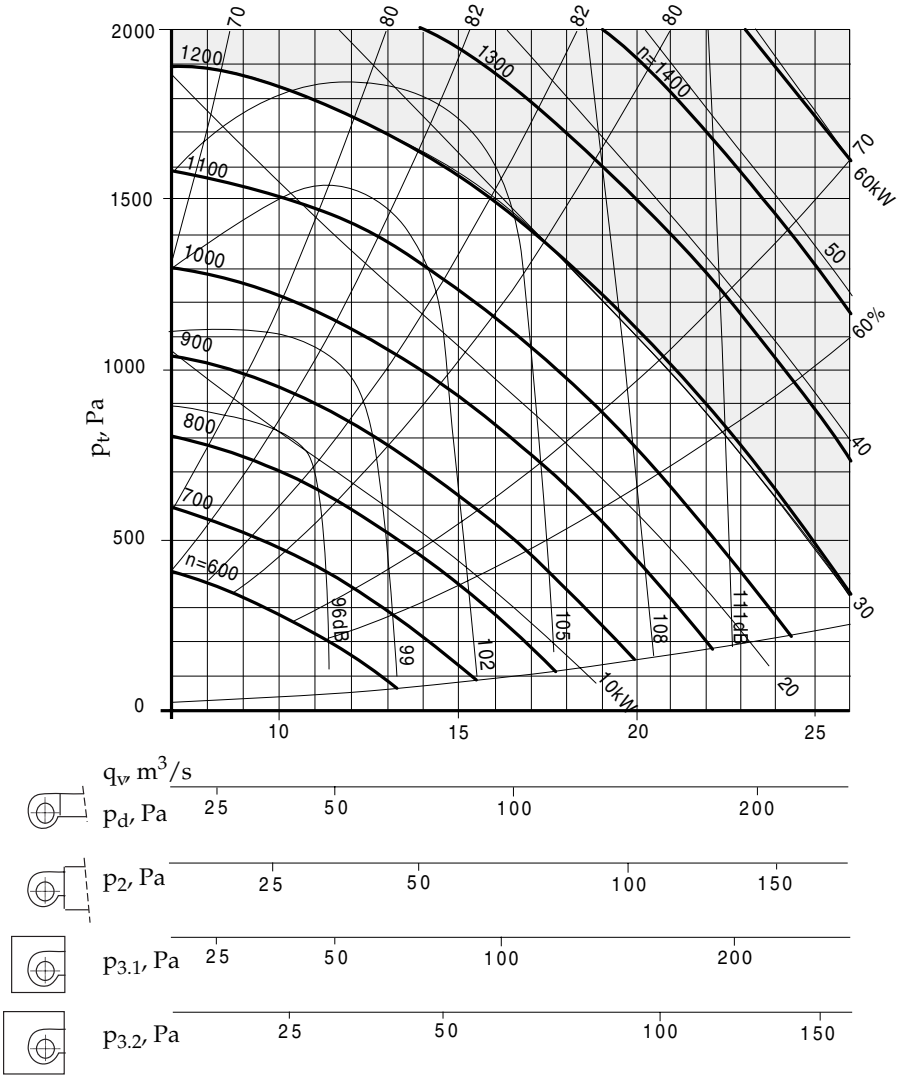
Impeller with backward-curved blades.

Fan type:
T-HLZ-900T
max. 1200 RPM
max. 30 kW
I_v = 13.4 kg/m^2

HLZ-900T
max. 1600 RPM
max. 70 kW
I_v = 19.4 kg/m^2

Motors:
-132, -160, -180, -200, -225, -250, -280

n =	RPM
η =	efficiency in %
kW=	power demand excl. belt drive
dB=	total sound power level
q_v =	volume flow, air ρ = 1.20 kg/m^3
p_t =	total pressure
p_d =	dynamic pressure, outlet
p_2 =	outflow loss with free delivery
$p_{3.1}$ =	Installation loss in ZCP-135 and ZCP-180
$p_{3.2}$ =	Installation loss in ZCP-225



Total pressure p_t for a fan with a duct on the suction side and a duct on the pressure side of the same cross-section as the fan's pressure connection:
$p_t = p_k + p_{agg.}$

p_k = total pressure drop in the duct system[1].
[1] Sometimes the pressure drop in the duct system is stated as static pressure. In this case, it is necessary to add the dynamic pressure in the interface between the unit and the duct system to p_k before the fan's working point is found.

$p_{agg.} = p_{int} + p_{3.1}$
or $p_{3.2}$
p_{int} = internal pressure drop in the unit (static pressure drop over components).

Sound Conditions

The fan graph shows the total sound power level, L_{wt} (ref. 10^{-12}W), attributed to the fan's outlet opening.
For division into octave bands, the following formula is used:

$L_w = L_{wt} + K_{corr.}$
L_w = Sound power level, dB
L_{wt} = Total sound power level, dB
$K_{corr.}$ = Correction value, that is read in the accompanying table

Correction values ($K_{corr.}$)

	Octave band, Hz							
	63	125	250	500	1k	2k	4k	8k
	-6	-7	-10	-12	-13	-15	-19	-23
To plant room Attenuation through unit wall. Less the corrected value.	11	14	20	28	33	38	42	45

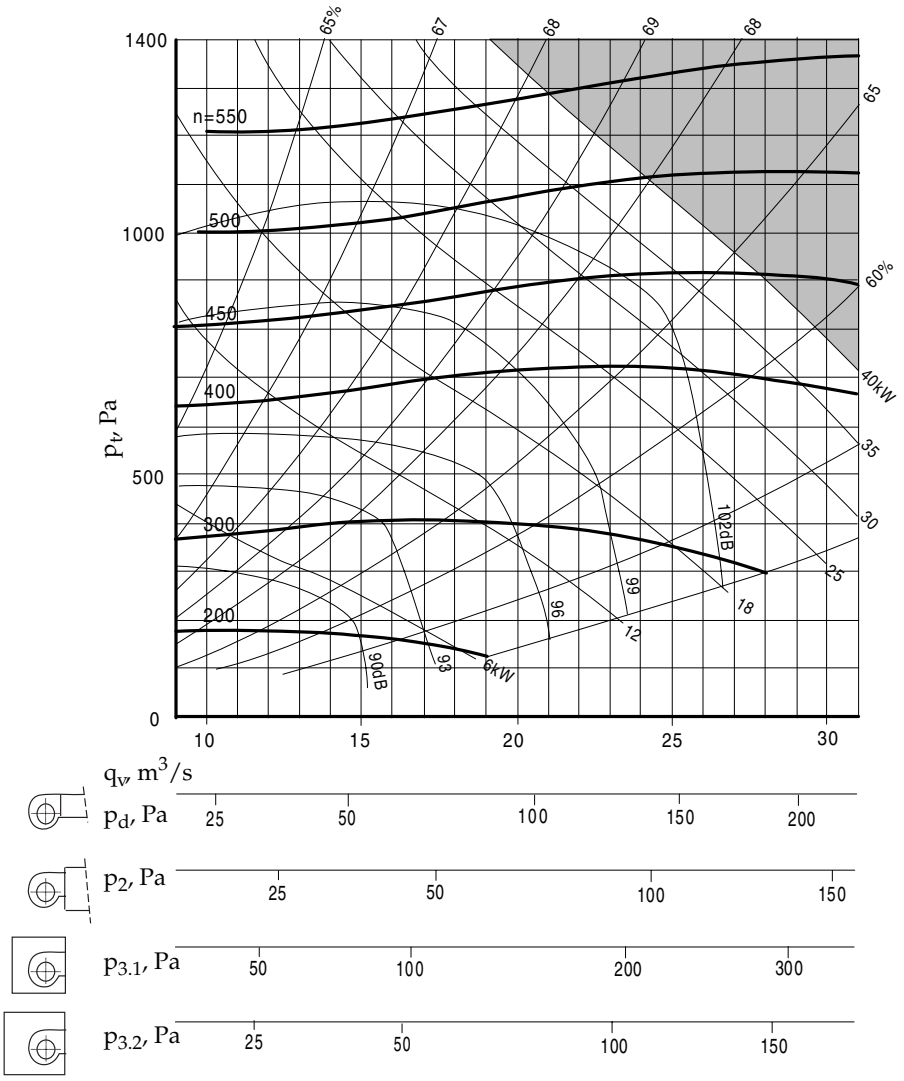
Climaster ZCP-180 and -225

Impeller with forward-curved blades.

Fan type:
TLZ 1000T
max. 600 RPM
max. 40 kW
I_v = 13.5 kg/m^2

Motors:
-132, -160, -180, -200, -225, -250, -280

n =	RPM
η =	efficiency in %
kW=	power demand excl. belt drive
dB=	total sound power level
q_v =	volume flow, air ρ = 1.20 kg/m^3
p_t =	total pressure
p_d =	dynamic pressure, outlet
p_2 =	outflow loss with free delivery
$p_{3.1}$ =	Installation loss in ZCP-180
$p_{3.2}$ =	Installation loss in ZCP-225



Total pressure p_t for a fan with a duct on the suction side and a duct on the pressure side of the same cross-section as the fan's pressure connection:
$p_t = p_k + p_{agg.}$

p_k = total pressure drop in the duct system[1].
[1] Sometimes the pressure drop in the duct system is stated as static pressure. In this case, it is necessary to add the dynamic pressure in the interface between the unit and the duct system to p_k before the fan's working point is found.
$p_{agg.} = p_{int} + p_{3.1}$ or $p_{3.2}$
p_{int} = internal pressure drop in the unit (static pressure drop over components).

Sound Conditions

The fan graph shows the total sound power level, L_{wt} (ref. 10^{-12}W), attributed to the fan's outlet opening.
For division into octave bands, the following formula is used:

$L_w = L_{wt} + K_{corr.}$
L_w = Sound power level, dB
L_{wt} = Total sound power level, dB
$K_{corr.}$ = Correction value, that is read in the accompanying table

Correction values ($K_{corr.}$)

	Octave band, Hz							
	63	125	250	500	1k	2k	4k	8k
	-6	-7	-10	-12	-13	-15	-19	-23
To plant room Attenuation through unit wall. Less the corrected value.	11	14	20	28	33	38	42	45

Climaster ZCP-180 and -225

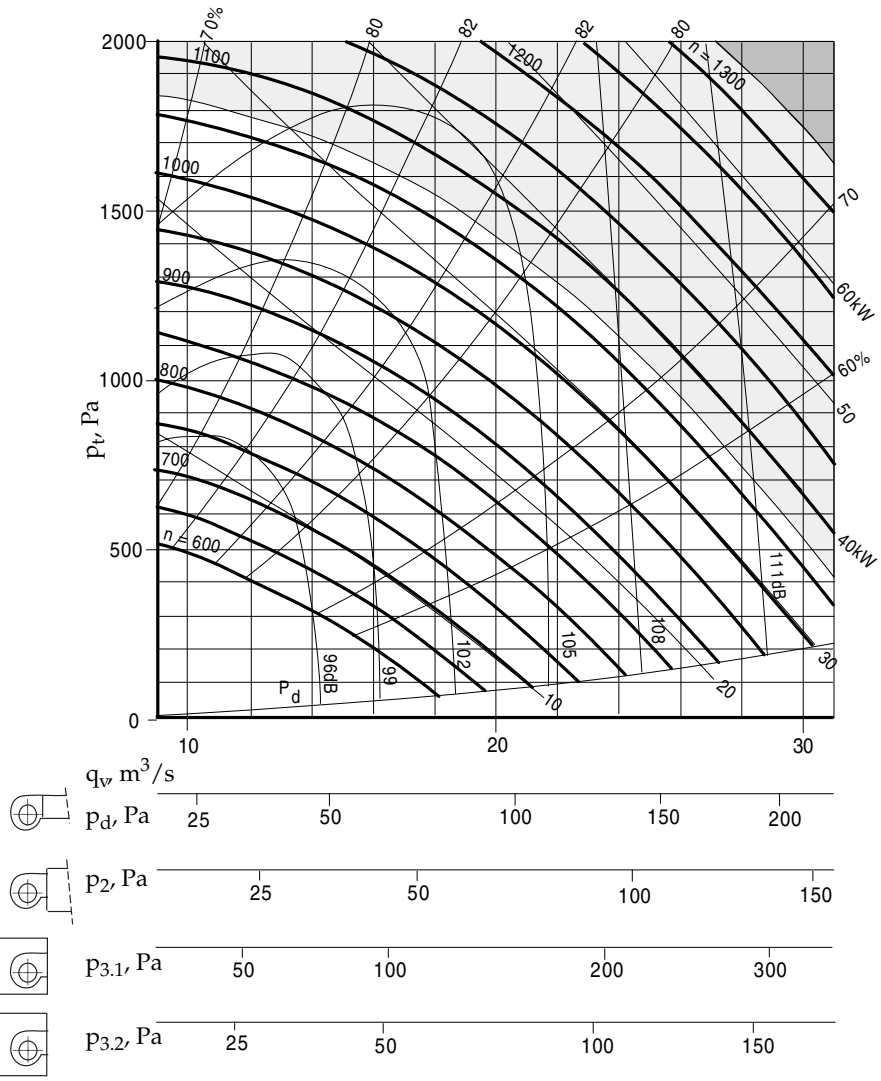
Impeller with backward-curved blades.

Fan type:
T-HLZ-1000T
max. 1065 RPM
max. 35 kW
I_v = 21.5 kg/m^2

HLZ-1000T
max. 1330 RPM
max. 70 kW
I_v = 29.5 kg/m^2

Motors:
-132, -160, -180, -200, -225, -250, -280

n =	RPM
η =	efficiency in %
kW=	power demand excl. belt drive
dB=	total sound power level
q_v =	volume flow, air ρ = 1.20 kg/m^3
p_t =	total pressure
p_d =	dynamic pressure, outlet
p_2 =	outflow loss with free delivery
$p_{3.1}$ =	Installation loss in ZCP-180
$p_{3.2}$ =	Installation loss in ZCP-225



Total pressure p_t for a fan with a duct on the suction side and a duct on the pressure side of the same cross-section as the fan's pressure connection:
$p_t = p_k + p_{agg.}$

p_k = total pressure drop in the duct system[1].
[1] Sometimes the pressure drop in the duct system is stated as static pressure. In this case, it is necessary to add the dynamic pressure in the interface between the unit and the duct system to p_k before the fan's working point is found.
$p_{agg.} = p_{int} + p_{3.1}$ or $p_{3.2}$
p_{int} = internal pressure drop in the unit (static pressure drop over components).

Sound Conditions

The fan graph shows the total sound power level, L_{wt} (ref. 10^{-12}W), attributed to the fan's outlet opening.
For division into octave bands, the following formula is used:

$L_w = L_{wt} + K_{corr.}$
L_w = Sound power level, dB
L_{wt} = Total sound power level, dB
$K_{corr.}$ = Correction value, that is read in the accompanying table

Correction values ($K_{corr.}$)

	Octave band, Hz							
	63	125	250	500	1k	2k	4k	8k
	-6	-7	-10	-12	-13	-15	-19	-23
To plant room Attenuation through unit wall. Less the corrected value.	11	14	20	28	33	38	42	45

MU 13947 06.05

NOVENCO

Novenco develops and manufactures ventilation and fire fighting systems that are marketed and distributed world-wide through subsidiaries and agents.

The company was founded in Denmark 1947 and has become one of the world-leading suppliers.

Novenco symbolises quality and environmentally friendly products. The company is certified according to ISO 9001 and ISO 14001.

The headquarters of Novenco is located in Naestved, Denmark.

Read more about Novenco on the Internet.

Novenco A/S · Industrivej 22 · DK-4700 Naestved · Denmark · Tel. +45 70 12 42 22 · Fax +45 55 75 65 50

www.novenco-group.com