

# Air Handling Units

Quick Guide to Danvent DV



Den Blå Planet, National Aquarium Denmark

## Danvent DV Modular Air Handling Unit

Airflow 0,2-24 m<sup>3</sup>/s, 750-86.000 m<sup>3</sup>/h



### Facts about Danvent DV

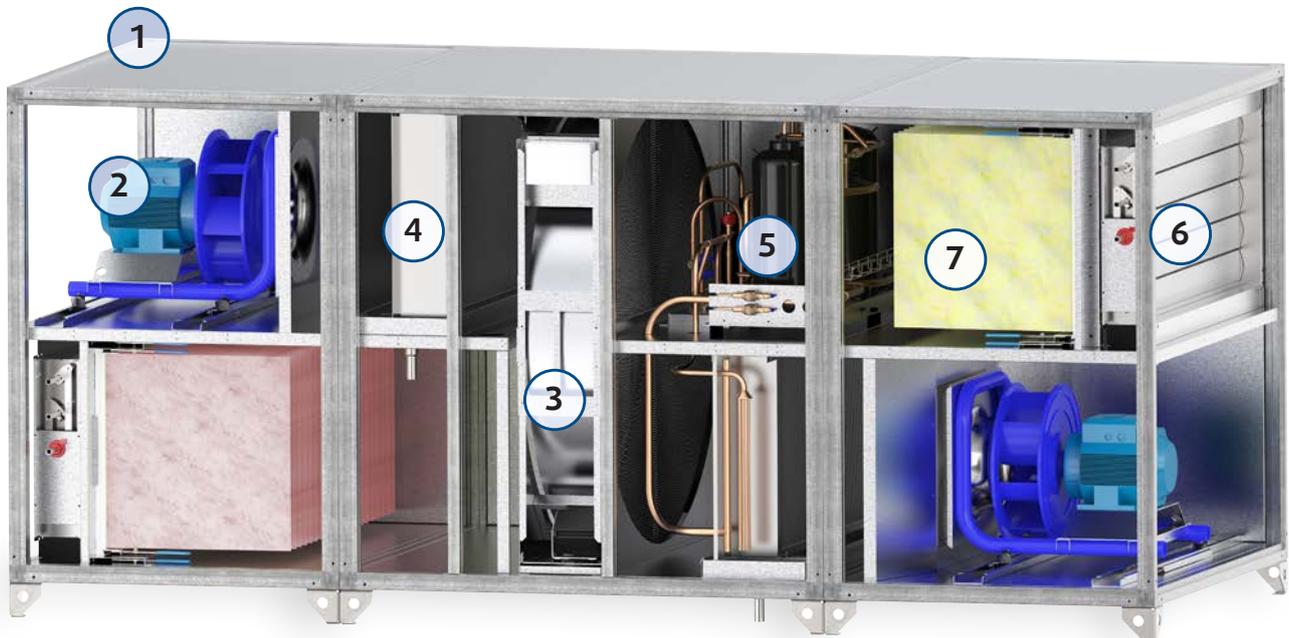
- 14 sizes with airflows from 0,2-24 m<sup>3</sup>/s, 750-86.000 m<sup>3</sup>/h
- With rotary heat exchanger, counter flow exchanger or run-around coil exchangers
- With EC motor IE4, PM motor IE4 or AC motor IE2
- Plug fan
- With or without supply air, extract air, or mixing damper
- Filter classes: G4, M5, M6, F7, F8, F9 or F7 City-Flo
- With water heating coil, electric heating coil and/or cooling coil
- Can be supplied with integrated heat pump DVU-HP
- Can be supplied with humidifier/adiabatic cooling DVX
- With or without control system
- For indoor or outdoor installation



Danvent DV is designed as a modular air handling unit. The modular functions can be configured for many different applications to make up the heart of any ventilation system.

The flexibility makes it possible to optimize the air handling unit for each project.

Danvent DV is dimensioned in the design programme SystemairCAD. SystemairCAD makes it possible to combine air handling unit functions as required very quickly and easily.



### The unit casing **1**

The unit casing consists of a strong frame construction with sound and heat insulated panels. The frame consists of a closed 1,3/1,5 mm steel profile with surface of alu-zinc AZ185 for corrosion protection. The corners are die-cast and painted aluminum corners. The panels are also corrosion protected with alu-zinc AZ185 and consist of a sandwich construction with two 0,8 mm steel sheets and 50 mm mineral wool. The unit sections are assembled with an assembly bracket; Disc-Lock. Large inspection doors provide easy access for service and maintenance. It is possible to lift off the doors, if needed. The doors are provided with lockable handles.

### Plug fan DVE **2**

The plug fan DVE has the impeller fitted direct to the motor shaft and is built into a soundproof unit casing. The fan is a single inlet, free-blowing fan where the unit casing acts as fan housing. DVE has an efficiency of up

to 75% and a low noise level. On large units, twin fans for parallel operation are built-in. DVE can be supplied with EC motor (IE4) in Danvent DV 10-40, PM motor (IE4) or AC motor (IE2). Fan impeller and motor are statically and dynamically balanced. Motor and fan are mounted on a sturdy frame, which is placed on rubber vibration isolators, and the fan inlet is connected to the unit with a flexible connection.

### Heat exchangers **3**

The rotary heat exchanger DVC is supplied in 3 types: Standard, enthalpy and sorption heat exchangers. Generally, the rotary heat exchanger has a high efficiency from 75% to 87% depending on operating conditions. It can recover moisture and is the heat exchanger that requires the least space. The enthalpy exchanger recovers more moisture, and therefore contributes to the humidification of the supply air. The sorption exchanger dehumidifies the air more, making it particularly suitable for

dehumidifying the outdoor air, for example before cooling.

The plate heat exchanger DVQ is supplied in 3 types: Standard, high efficiency and counter flow heat exchangers. Generally, the plate heat exchanger has a high efficiency. It has separated airflows, and thus the transfer of odors to the supply air is avoided. There is no transfer of moisture between the two airflows, and so it can also be used for dehumidification. The standard cross flow exchanger has an efficiency of up to 65%. The high efficiency cross flow exchanger has an efficiency of up to 75%. These two types are supplied in two variants: One made of aluminium for comfort and one made of corrosion-resistant plastic-coated aluminium for aggressive environments. The counter flow exchanger has an efficiency of up to 90% and is supplied only in aluminium. The heat exchangers are fitted with by-pass for capacity control and have a built-in drip tray.

## Functions

The run-around coil heat exchanger DVR has an efficiency of up to 70% and is used, where the two airflows must be kept completely separate, or where the airflows are at a distance from each other. For example on 2 different storeys. The DVR is a heat exchanger system with circulating water-glycol brine between the supply air heating coil and extract air cooling coil. The transfer of energy is done through a pipe system. Capacity regulation is done through a shunt system and a motor valve or by controlling the circulation pump.

### Coils ④

The heating coil DVH is used for heating the supply air. The heating can be effected by hot water or condensation of refrigerant. These coils consist of copper tubes and aluminum fins. Heating can also be effected with electricity. These coils consist of heating elements of stainless steel and have built-in safety control system. In the standard version the coils are built into the unit. More variants and options are possible.

The cooling coil DVK is used for cooling the supply air. It can be effected by cold water or direct evaporative refrigerant. A cooling coil for evaporation has the liquid distributor placed in the unit. These coils consist of copper tubes and aluminum fins. In the standard version, the coils are built into the unit. More variants and options are possible.

The change-over battery DVHK is basically a cooling coil for cold water, which can also be used for heating by changing the water temperature from cold to warm as required. Typically used in connection with heat pumps.

### Heat pump DVU-HP ⑤

The DVU-HP is an integrated reversible heat pump system built into a unit section. The system consists of a reversible heat pump and a rotary heat exchanger that enables both heating and cooling. The DVU-HP can be supplied for Danvent DV 10 to 80. The unit is equipped with 2 scroll compressors (1 compressor for the two smallest sizes DV 10 and DV 15), and cooling/heating capacity is stepless variable in the range 5-100%. The heat pump is based on R-410A refrigerant. The DVU-HP is equipped with a complete control system which can communicate both with Systemair Corrigo control system and other control systems. Tested and ready for operation from the factory.

### Humidifier DVX

The humidifier is made as a complete unit, which includes humidification elements, tray and frame made of stainless steel AISI 304, circulation pump, irrigation regulation valves, overflow, bleed-off regulation valve, float valve for controlling the water supply to the tray and valve for emptying the tray. The HU-CELL humidification elements are stainless steel frames which contains corrugated fiberglass plates arranged in cross-channel configuration. The function

of the humidifier is based on the natural process that water evaporates when air passes a wet surface. The humidifier can either be placed in the supply air after a heating coil or used as indirect adiabatic cooling by placing it in the extract air before a heat exchanger.

### Damper ⑥

The dampers comply with tightness class 3 according to EN 1751:2014. The dampers have counter rotating aerodynamically shaped damper blades made of aluminium, which ensures a low pressure loss when open. The blades are equipped with tight-fitting, rubber sealings, and are mounted on sturdy, square shafts and service-free, synthetic bearings. The connection between the blades is a rod drive located outside the airflow. The bearings in the pivoting system are made of brass. The blades can be supplied insulated and/or anodized. The following types of dampers can be supplied: DVA shutoff damper with horizontal connection, DVB shutoff damper with vertical connection, DVM mixing damper with 2 built-in dampers, DVP mixing damper with 3 built-in dampers. All dampers are equipped with position indicator and are prepared for internal damper motor.

### Filter ⑦

The compact filter DVG is a basic filter class G4 according to EN779:2012 with a short building length. It is designed on pleated filter principle. The DVG can be used as pre-filter and thereby extend the life of the main filter.

## Functions

The bag filter DVF is a bag filter, whose design provides a large filter area. DVF has a long lifetime and thus good overall economy. DVF can be supplied in the filter classes G4, M5, M6, F7, F8, F9 og F7 City-Flo according to EN 779:2012. F7 City-Flo is a filter with particle and molecular filtration specially designed for use in urban areas and areas with heavy traffic. The filter cells are fixed with a simple but effective fixing system of transverse locking rails which can easily be activated using a large handle. This ensures that the filter cells are tight and meet tightness requirement according to EN 1886:2008.

### Sound attenuator DVD

The sound attenuator DVD is an absorption attenuator with baffles. DVD is used to reduce the sound power level from the air handling unit to the duct system. The baffles have a surface coating which prevents the entrainment of the sound absorbing material. The surface coating is available in two variants: A standard lining, which is a hard wear-resistant material where the baffles can be cleaned by dry cleaning. As well as a variant with a synthetic lining suitable for wet cleaning. This variant is selected for hygienic reasons.

### Inspection and empty section DVI and DVO

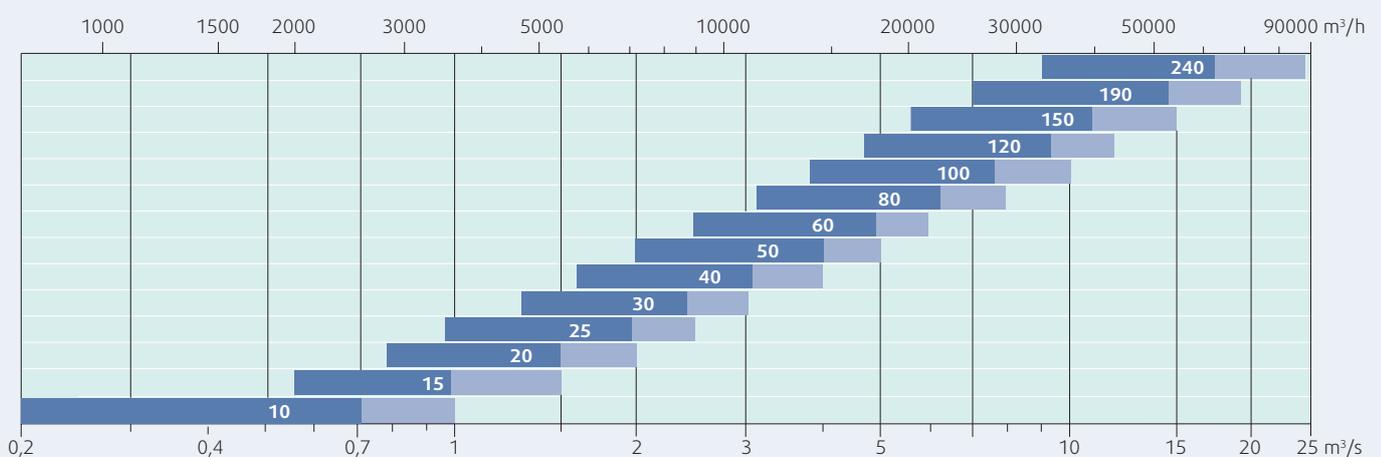
Installation of an inspection and an empty section DVI and DVO is possible.

### Roof unit DV

Danvent DV 10-150 can be supplied as a roof unit for outdoor installation. In this version, the unit is supplied assembled on a base frame. You can select between 2 different roof coverings: Bitumen roof, which consists of strong polyester reinforced bitumen material. Supplied finished from the factory. Steel profile roof, which consists of trapezoidal alu-zinc coated steel sheets, as well as profiles for the attachment and termination of the roof panels. Supplied for on-site installation. Air intake and exhaust can be supplied with louvers.

Outdoor air section DVY allows for exhaust of extract air at the rear of the unit.

Danvent DV airflows



Indicates airflow range at the shown combination examples with heat recovery and by specific fan power 2,1 kW/(m³/s). The exact values are calculated by SystemairCAD.

Indicates airflow range for the unit size.



# Control System Corrigo

Danvent DV can be supplied with a pre-assembled and fully tested control system. The control system is a user-friendly system, where functions and parameters are selected from the external control panel. The control panel can be positioned freely and used as a remote control. The most important operating data are continuously displayed on the control panel display, including alarms, operating values, operating status and time settings. Commissioning is simplified, as the control system is preloaded with temperatures, time settings and control sequences. The settings can easily be changed if desired.

## Functions:

- Weekly clock.
- Select between:
  - Temperature control: Cascade room control, fixed supply air temperature, outdoor compensated supply air temperature, outdoor temperature dependent change between room control and supply air control.
  - Airflow control: 2 fixed airflows, constant duct pressure (VAV), constant duct pressure with extract air as slave.
- Extended operation.
- Free night cooling.
- Cooling recovery.
- Filter guard for supply and extract air.
- Alarm and safety functions.
- Readout of fan data: Airflow and pressure.
- Water heating coil, control and frost protection.
- Electric heating coil, modulating with protection against overheating as well as control.
- Cooling coil, control.
- Run-around coil heat exchangers, control.
- Recirculation.
- Heating and cooling valves incl. actuator.
- Control/communication of DVU-HP heat pump.
- Supply air and extract air dampers as well as damper motors.
- External fire signal.
- CO<sub>2</sub>/temperature control.
- Humidity control.

## BMS communication configured via the control panel:

- Integrated BACnet IP or MS/TP.
- Integrated Modbus RTU via RS485 or TCP/IP.
- Updated WEB master standard.
- LON is possible.



# Combination Examples

Rotary heat exchanger		Unit size														
		10	15	20	25	30	40	50	60	80	100	120	150	190	240	
Unit	Width	970	1120	1270	1420	1570	1720	2020	2170	2170	2370	2590	2890	3190	3490	
Rotary heat exchanger section	Width	-	-	-	-	-	-	-	-	-	2320	2520	2890	3040	3720	4020
Unit	Height*	970	1120	1270	1420	1570	1720	2020	2240	2540	2840	3140	3440	4340	4940	
C1 	Length	2160	2160	2460	2460	2760	3060	2910	3280	3210	3960	4260	4560	5010	5530	
	Weight kg	430	520	660	760	920	1100	1470	1980	2140	2630	3250	3990	6290	7610	
C2 	Length	2910	2910	3210	3210	3510	3810	3660	4030	4030	4930	5230	5530	5980	6430	
	Weight kg	500	610	770	870	1080	1270	1690	2250	2470	3050	3890	4690	7220	8600	
C3 	Length	2680	2680	3130	3130	3430	3880	4030	4400	4400	5450	5900	6200	6430	7100	
	Weight kg	480	580	730	810	1010	1220	1700	2230	2480	3160	3870	4660	6870	8280	
C4 	Length	3430	3430	3880	3880	4180	4630	4780	5220	5220	6420	7020	7170	7400	8000	
	Weight kg	560	660	840	930	1180	1390	1930	2560	2830	3610	4560	5320	7790	9180	
C5 	Length	2680	2680	3130	3130	3430	3880	3730	4100	4100	5080	5380	5680	6430	7100	
	Weight kg	480	570	720	800	1010	1220	1630	2120	2330	2970	3620	4390	6860	8280	
C6 	Length	3430	3430	3880	3880	4180	4630	4480	4850	4850	6050	6350	6650	7400	8000	
	Weight kg	550	660	840	920	1180	1380	1850	2410	2670	3370	4280	5060	7790	9170	

The above dimensions and weights are a guideline only. Accurate values and combinations are calculated in SystemairCAD.

\* Height excl. legs/base frame. The heights of DV 190 and 240 are incl. base frames.

Plate heat exchanger Counter flow heat exchanger		Unit size						
		10	15	20	25	30	40	50
Unit	Width	970	1120	1270	1420	1570	1720	2020
Unit	Height*	970	1120	1270	1420	1570	1720	2020
Q1 	Length	3280	3430	3880	3880	4480	4780	4930
	Weight kg	570	700	874	1003	1296	1508	2084
Q2 	Length	3890	4180	4630	4630	5230	5530	5680
	Weight kg	660	790	1000	1140	1470	1680	2310
Q3 	Length	3730	3950	4550	4550	5150	5600	5750
	Weight kg	650	760	970	1020	1400	1630	2270
Q4 	Length	4480	4700	5300	5300	5900	6350	6500
	Weight kg	720	840	1080	1190	1560	1800	2510
Q5 	Length	3730	3950	4550	4550	5150	5600	5750
	Weight kg	640	750	960	1050	1410	1450	2250
Q6 	Length	4480	4700	5300	5300	5900	6350	6500
	Weight kg	720	840	1080	1180	1550	1790	2490

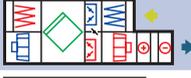
The above dimensions and weights are a guideline only. Accurate values and combinations are calculated in SystemairCAD.\* Height excl. legs/base frame.

### Design an air handling unit

Danvent DV contains countless combination options. To ease the process of designing a unit the most popular combinations are illustrated here.

### Key to symbols

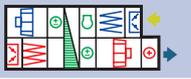
Exhaust air  Extract air   
 Outdoor air  Supply air 

Plate heat exchanger Cross-flow exchanger		Unit size											
		10	15	20	25	30	40	50	60	80	100	120	150
Unit	Width	970	1120	1270	1420	1570	1720	2020	2170	2170	2370	2590	2890
Unit	Height*	970	1120	1270	1420	1570	1720	2020	2240	2540	2840	3140	3440
Q1 	Length	3210	3580	4030	4330	4780	5080	5230	5460	5230	5910	6960	7260
	Weight kg	570	760	940	1130	1370	1640	2300	2550	2610	3210	4200	5130
Q2 	Length	3960	4330	4780	5080	5530	5830	5980	6210	5980	6880	7930	8230
	Weight kg	660	850	1060	1260	1540	1810	2520	2880	2910	3660	4870	5790
Q3 	Length	3800	4100	4700	5000	5450	5900	6050	6280	6280	7330	8380	8680
	Weight kg	650	820	1030	1140	1470	1760	2480	2720	2840	3620	4600	5550
Q4 	Length	4550	4850	5450	5750	6200	6650	6800	7030	6800	8000	9050	9350
	Weight kg	720	900	1140	1310	1630	1930	2720	3030	3130	3980	5150	6130
Q5 	Length	3800	4100	4700	5000	5450	5900	6050	6280	6130	7030	8080	8680
	Weight kg	640	810	1020	1170	1480	1750	2460	2700	2890	3690	4690	5840
Q6 	Length	4550	4850	5450	5750	6200	6650	6800	7100	6800	8000	9050	9350
	Weight kg	720	900	1140	1300	1620	1920	2700	3030	3200	4120	5320	6380

The above dimensions and weights are a guideline only. Accurate values and combinations are calculated in SystemairCAD.  
\* Height excl. legs/base frame.

Run-around coil heat exchangers		Unit size													
		10	15	20	25	30	40	50	60	80	100	120	150	190	240
Unit	Width	970	1120	1270	1420	1570	1720	2020	2170	2170	2370	2590	2890	3190	3490
Single height unit	Height*	520	595	670	745	820	895	1045	1120	1270	1420	1570	1720	2170	2470
Double height unit	Height*	1040	1190	1340	1490	1640	1790	2090	2240	2540	2840	3140	3440	4340	4940
R1 	Length	2540	2540	2690	2690	2840	2990	2990	3140	3140	3590	3890	4110	5010	5230
	Weight kg	580	700	840	990	1170	1420	1980	2240	2460	2990	3800	4580	6290	7420
R2 	Length	3360	3360	3510	3510	3360	3810	3810	3960	3960	4560	4860	5010	5910	6060
	Weight kg	680	820	980	1150	1360	1620	2220	2550	2790	3510	4340	5170	7050	8270

The above dimensions and weights are a guideline only. Accurate values and combinations are calculated in SystemairCAD.  
\* Height excl. legs/base frame. The heights of DV 190 and 240 are incl. base frames.

Integrated reversible heat pump		Unit size								
		10	15	20	25	30	40	50	60	80
Unit	Width	970	1120	1270	1420	1570	1720	2020	2170	2170
Rotary heat exchanger section	Width	-	-	-	-	-	-	-	-	2320
Unit	Height*	970	1120	1270	1420	1570	1720	2020	2240	2540
U1 	Length	3280	3280	3280	3580	3730	4030	5080	5150	5450
	Weight kg	550	650	1040	1290	1460	1780	2700	3460	3870

The above dimensions and weights are a guideline only. Accurate values and combinations are calculated in SystemairCAD.  
\* Height excl. legs/base frame.

# Certificates

Systemair strives constantly to improve the energy saving, technical and mechanical quality of Danvent DV. The unit is certified and approved on a number of important points.

### Eurovent certification

Danvent DV air handling units are Eurovent certified. This ensures the conformity between the calculated performance in SystemairCAD design programme, and the measured performance at independent test laboratories. Certificate 07.02.339.

### Machinery directive

Danvent DV air handling units are manufactured according to the safety demands of the EU Machinery Directive 2006/42/EF. This is confirmed through the issuance of corresponding Declaration of Incorporation for units without control system, and corresponding Declaration of Conformity and CE label for units with factory installed control system.

### ISO 9001:2008 certification

Danvent DV air handling units are developed and manufactured in Denmark. The factory's quality management system is certified according to the standard EN ISO 9001:2008 by Bureau Veritas Certification.

### Eurovent energy classification

Danvent DV air handling units are energy classified according to Eurovent's guidelines for air handling units RS 6/C/005-2015. The energy class expresses the unit's total energy consumption. The energy class is calculated by the design programme SystemairCAD based on the actual data of the designed unit.

### Classifications

The performance of the air handling unit casing corresponds with the following classifications according to the European standard EN 1886, 2. edition 2008.

### Mechanical strength

Class D2

### Casing air leakage

Negative pressure:  
- 400 Pa: Klasse L2  
Positive pressure:  
+ 700 Pa: Klasse L2

### Filter by-pass leakage

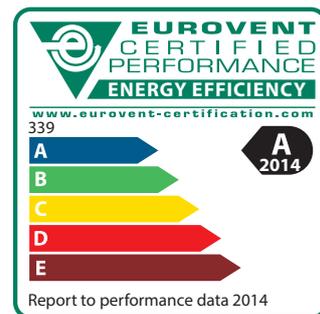
Negative pressure:  
- 400 Pa: Klasse F9  
Positive pressure:  
+ 400 Pa: Klasse F9

### Thermal transmittance

Class T2

### Thermal bridging factor

Class TB3



# SystemairCAD



Danvent DV units are designed in SystemairCAD. It is an advanced design programme which ensures an optimal dimensioning of the unit's functions. The programme is free and can be downloaded from [www.systemair.com](http://www.systemair.com). SystemairCAD is very user-friendly and allows a simple and quick way to combine the unit functions as required. When the unit design is finished, SystemairCAD makes a technical calculation and automatically generates a complete technical documentation in pdf format for the selected unit.

The documentation includes the following highlights:

- Frontpage with a summary of the most important technical data of the selected unit: Airflow, external pressure drop, motor data, overall dimensions, weight, efficiency of the heat exchanger, SFP, performance of the heating coil and sound power level.

- Detailed drawing of the unit's construction, dimensions and duct connections.
- Sound power level divided into frequency bands.
- Technical specifications of all components included in the unit such as pressure loss, dimensions, electric data, efficiencies, air temperatures, COP, EER, description of materials, ErP, power input, etc.
- Shipping, dimensions and weights of all parts.
- The control system including flow-chart, external electrical components, description of control functions, alarms, and safety functions, as well as communication options.

- Molliere diagram with summer and winter conditions.
- SystemairCAD includes a feature that can automatically generate a complete consultant text adapted to the selected unit.

The drawn to scale drawings from SystemairCAD can be exported to other CAD software. There are the following options:

- Export of DXF files 2D and 3D
- Export of DMR files to Autodesk Revit.
- SystemairCAD project files can be opened directly in AutoCAD via MagiCAD plugin and in Autodesk Revit via Revit plugin.





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