Operation and Maintenance

NEW EcoCooler 100-980

Order number:

Project:

IV PRODUKT

Translation of the original instructions

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IV PRODUKT

1 General

1.1 Intended use

The EcoCooler cooling unit is designed for cooling supply air in buildings (comfort cooling). The unit is designed to be installed together with IV Produkt AB air handling units.

When installed indoors, the air handling unit must be installed in an area that maintains a temperature between +7 and +30°C, and with a moisture content of <3.5 g/kg in the fan room in winter. The unit can also be equipped for outdoor installation.

Any other use and installation in other environments is prohibited unless specifically permitted by IV Produkt AB.

1.2 Safety regulations

For safety regulations relating to the cooling unit installed together with the Envistar Flex air handling unit, see Operation and Maintenance for Envistar Flex, under order-specific documentation at docs.ivprodukt.com.

1.3 Manufacturer

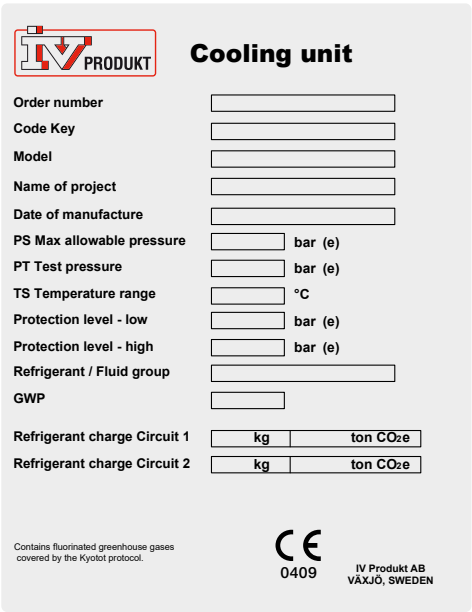
The EcoCooler cooling unit is manufactured by:

IV Produkt AB
Sjöuddevägen 7
SE-350 43 VÄXJÖ

1.4 Designations

The EcoCooler comes with a model rating plate placed on the front.

The model type plate shows the series number and the requisite designations to identify the unit.

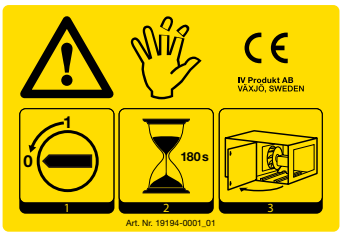


Typical model identification label

1.5 CE marking and EU Declaration of Conformity

The cooling unit is CE-marked, which means that upon delivery, it conforms to applicable provisions in EU Machinery Directive 2006/42/EC as well as to the EU Directives applicable to the type of unit, e.g. Pressure Equipment Directive (PED) 2014/68/EU.

As certification confirming that the requirements have been met, we provide an EU Declaration of Conformity, which is available under Documentation at ivprodukt.docfactory.com, or under Order Unique Documentation at docs.ivprodukt.com.



Typical CE label for air handling units

For units without integrated control equipment

The EC declaration applies only to units in the condition in which they have been delivered and installed at the facility in accordance with the enclosed installation instructions. The declaration does not include components that were subsequently added or measures subsequently taken on the unit.

1.6 Maintenance

Regular maintenance of cooling units should be performed by a certified refrigeration technician.

1.7 Handling of refrigerant

The following information summarises the requirements and guidelines for handling the refrigerant used in cooling units. For further information, see the F-gas Regulations (517/2014). The purpose of the regulations is to contribute to achieving EU goals for reduced climate impact in accordance with the Kyoto Protocol.

Operator responsibilities

By operator, we refer to the European Parliament's definition: "...the natural or legal person exercising actual power over the technical functioning of the equipment and systems...".

Generally speaking, the unit operator must:

- Minimise and prevent leakage
- Take corrective action to repair any leakage that arises
- Ensure that the service and repair of the refrigerant circuit is carried out by a certified refrigeration technician
- Ensure that refrigerant is handled in an environmentally secure manner and in accordance with national regulations.

The levels for the various actions to be taken for a system are calculated using carbon dioxide equivalents, CO_2 e(ton). This figure is calculated by multiplying the refrigerant's GWP value (Global Warming Potential) by the charge in kilos. GWP for R410a is 2088. A charge of 5.0 kg R410a therefore corresponds to (5.0×2088)/1000 = 10.44 CO_2 e(tons).

The unit is marked with refrigerant quantity and carbon dioxide equivalent.

Leakage inspection and registration

- **Leakage inspection** must be carried out by a certified refrigeration technician:
  – when installing/commissioning the unit, size 300-980
  – periodically at least once every 12 months,
  i.e. no more than 12 months between inspections, size 300-980
  – within one month of any work being performed (e.g. sealing a leak, replacing a component), size 300-980
- The operator must **record** events, such as the volume and type of refrigerant topped up, recovered refrigerant, results of inspections and work done, person and company who carried out service and maintenance, size 300-980.

If a unit has been assembled on site or supplied in sections, the rules for recording, installing and periodic leakage inspection are applicable to size 150-240 as well.

1.8 Extended warranty

In cases in which the equipment delivered falls under a 5-year warranty, in accordance with ABM 07 with supplement ABM-V 07 or in accordance with NL 09 with supplement VU13, the IV Produkt Service and Warranty Manual is supplied with the product.

In order to lay claim to an extended warranty, a complete, documented and signed IV Produkt Service and Warranty Manual must be presented.

1.9 Spare parts

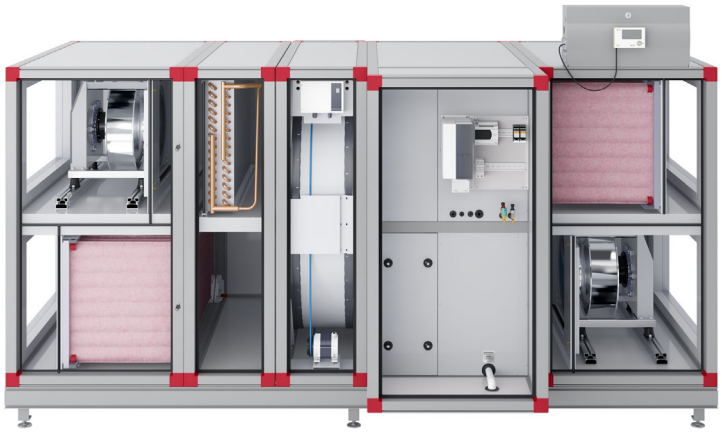
Spare parts and accessories for this unit are ordered from your nearest IV Produkt sales representative. When ordering, state the order number and designation. These are stated on a model type plate, affixed to each component. There is a separate spare parts list for the unit, refer to Order Unique Documentation at docs.ivprodukt.com.

1.10 Dismantling and decommissioning

When an air handling unit is to be dismantled, separate instructions must be followed, see Dismantling and decommissioning the AHU under Documentation at ivprodukt.docfactory.com.

2 Technical description

2.1 Cooling unit, EcoCooler



Fan and filter section (extract air fan)

EcoCooler cooling unit (with cooling recovery, code ECX)

Fan and filter section (supply air fan)

EcoCooler is a range of integrated speed controlled cooling units with stepless cooling power.

Two different versions of EcoCooler are available:

- without cooling recovery (without rotary heat exchanger), code ECO
- with cooling recovery (with rotary heat exchanger), code ECX. Cooling recovery means that the thermal wheel starts up when the extract air/room temperature drops below the outdoor temperature and cooling is required.

Cooling circuit function

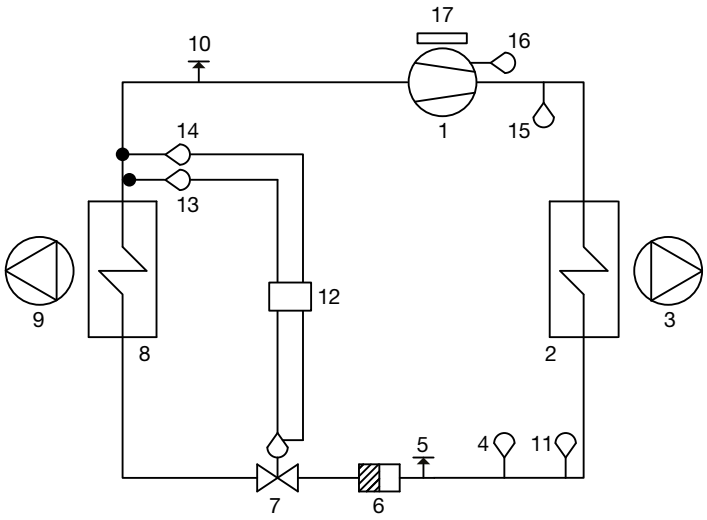
A cooling system has four basic components: evaporator, condenser, expansion valve and compressor.

The compressor carries out the work required to run the cooling process.

The evaporator is located in the supply air for the unit. The heat from the outdoor air is taken up in this coil, thereby cooling the supply air.

The energy supplied to the cooling system from the evaporator and the compressor leaves the unit via the condenser. The condenser is located in the extract air (ECO) or the exhaust air (ECX). This means that the exhaust air becomes hot when the cooling unit is running.

It is important to ensure that the air volumes are above the specified minimum flow on both the outdoor air and extract air side. The process cannot work if these air volumes are not available.



Flow chart for EcoCooler refrigerant system

1	Compressor	10	Measurement outlets – low pressure
2	Condenser	11	Liquid line sensor
3	Extract air fan	12	Control unit
4	Pressure switch – high pressure	13	Temperature sensor suction gas
5	Measurement outlet – high pressure	14	Pressure sensor – low pressure
6	Drying filter	15	Hot gas sensor
7	Expansion valve	16	Temperature sensor sump
8	Evaporator	17	Frequency inverter
9	Supply air fan		

Compressor

EcoCooler is equipped with a speed-controlled PM scroll compressor. Depending on its size, the unit may be equipped with another fixed compressor.

When cooling is required, the frequency inverter increases the speed of the compressor.

If the EcoCooler is equipped with two compressors, the fixed compressor will engage in when the speed-controlled compressor has reached its maximum speed. The speed-controlled compressor returns to its minimum speed and can then adjust back up to maximum speed. This achieves infinitely adjustable cooling power.

The function is reversed where less cooling is needed.

Compressor protection

In the event of an alarm initiated by the control equipment or the high pressure switch, the compressor stops and an alarm indication is given. If the unit is equipped with integrated control equipment, the alarm can be read on the Climatix display.

In the event of an alarm, correct the fault and then reset the alarm. If the high pressure alarm trips repeatedly, an authorised refrigeration service company must be called in.

The high pressure switch is tripped when the system is at high pressure and has a manual reset button. To avoid accidental stoppages at high pressure, the unit will lower the power using the high pressure sensor.

Cooling function

For internal control (MX), the cooling unit is interlocked across the air handling unit. If any of the fans stop, the cooling unit will also stop. The interlock and demand signal is sent via Modbus.

For external control (US, UC and MK), the interlock signal must be sent via a potential-free relay. The demand signal must be sent via 0–10 V.

Circuit board

The circuit board for the cooling unit contains the following:

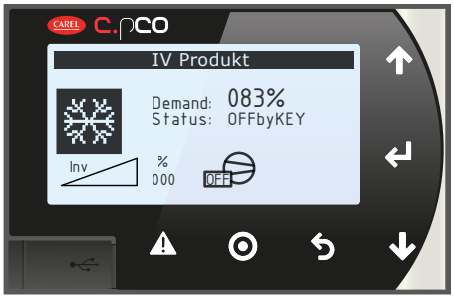
- Main switch
- Fuse
- Control unit with integrated control for expansion valve next to speed controlled compressor
- Control unit for expansion valve next to fixed speed compressor

The circuit board is installed inside the unit and is internally prewired and tested at the factory.

Current limiting

The control unit for EcoCooler is equipped with a function that measures the cooling unit's power consumption. The power consumption can be limited to an adjustable value. If the unit is connected to a fuse that is less than the one recommended in Chapter 3, this function should be used.

To activate the function, do the following in the control unit:



1. Press the circle button.
2. Press the down arrow to highlight "Status – I/O".
3. Press the enter arrow button.
4. Press the up arrow to access the "Current limit" menu.
5. Press the enter arrow button so that the cursor starts flashing.
6. Press the up arrow to change "NO" to "YES".
7. Press the enter arrow button so that the cursor starts flashing on the row below.
8. Use the up/down arrows to set the fuse size.
9. Press the enter arrow button.
10. Press the back arrow button twice to return to the start menu.

3 Wiring instructions

For connection instructions for the cooling unit, plus any associated electrical air heater, see the separate wiring diagram under order-specific documentation at docs.ivprodukt.com.

For connection of the rotary heat exchanger, see Operation and Maintenance for Envistar Flex, under order-specific documentation at docs.ivprodukt.com.

4 Operation

4.1 Commissioning

Commissioning of the cooling unit must be carried out by competent personnel according to the commissioning procedure, see EcoCooler, Commissioning record, which is available to download from ivprodukt.docfactory.com.

The commissioning procedure applies to units that are supplied with control equipment (code MX).

The validity of the product warranty is conditional on the system having been commissioned correctly. Working on the cooling unit during the warranty period without the approval of IV Produkt shall render the warranty void.

NB!
It is important that the oil is warm inside the speed controlled compressor crankcase before starting the cooling unit. The crankcase heating must be switched on long enough before the unit begins operating so that the oil maintains a temperature of at least 30 °C. The maximum warm-up time is approximately 2–3 hours. The temperature can be measured externally at the bottom of the compressor.

Prior to commissioning, the contractor must:

NB!
Wiring of connections and other electrical work may only be carried out by a qualified electrician or by service personnel recommended by IV Produkt.

1. Connect the unit to the power supply via a lockable safety switch.
2. Connect all ducts.

WARNING!
Rotating fan impeller. The unit must not be energised until all ducts have been connected.

Follow the troubleshooting instructions in the troubleshooting chart before contacting a service representative for servicing a unit under warranty. This will prevent any unnecessary service calls.

4.2 Cooling status

Status information is read on the Climatix display.

Information	Value	Explanation
Cooling unit status	UnitOn	Status of cooling unit
Cooling	x%	Cooling load from Climatix cooling regulator.
Freq. inv. output	x.x%	Frequency to the compressor.
Compr. no	Comp1	
Compr. Sum alarm	Normal	
Alarm management	>	The alarm is displayed if there is a fault with the inverter or compressor. In the event of an alarm, see "Alarm information for inverter and compressor" page 16.
**********		
Compressor C1	On/Off	Compressor operating mode.
Suction gas temp C1	x.x°C	Measured suction gas temp.
Evaporation temp C1	x.x°C	Calculated evaporation temp based on low pressure.
Low pressure C1	x.x bar	Relative pressure from low pressure sensor.
Overheating C1	x.xK	Measured overheating.
High pressure C1	x.x bar	Relative pressure from high pressure sensor.
Expansion valve 1	x.x%	Expansion valve position.
Condensation temp C	x.x°C	Calculated condensation temperature based on high pressure.
Hot gas temperature	x.x°C	Temperature of output from compressor
Liquid line temperature	x.x°C	Temperature downstream of condenser
Supercooling	x.x°C	Measured supercooling

5 Maintenance instructions

5.1 Service schedule

For a service schedule, see Operation and Maintenance for Envistar Flex, under order-specific documentation at docs.ivprodukt.com.

5.2 Periodic inspection

The operation parameters for the cooling unit must not be changed unless a check is first made to ascertain that the changes will be within the unit's operating range.

Leakage inspection and registration

For information on the operator's responsibility with regards to leakage inspection and registration, see "1.7 Handling of refrigerant" page 5.

Visual check

Check:

1. The fins on the condenser and evaporator to detect mechanical deformations
2. The drip tray and drain with water trap (clean if necessary)
3. That the water trap (without non-return valve) is filled with water.

Cleaning

If the fins on the condenser and evaporator are fouled, they should be vacuumed from the inlet side. Alternatively, you can blow them clean with compressed air from the outlet side. If they are severely fouled, you can clean them with warm water mixed with dishwashing detergent that will not corrode aluminium.

For more information, refer to Cooling coil, cleaning under Documentation at ivprodukt.docfactory.com.

Function

Check that the cooling unit operates as it should by temporarily lowering the temperature setting (setpoint).

6 Alarm management and troubleshooting

For units with control equipment (code MX), alarm information can be read on the Climatix display. For units without control equipment (code UC, MK, US), alarm information can be read on the Carel display. Press the alarm symbol to view alarms.

6.1 Troubleshooting in the event of an alarm

Inspection		Possible cause	Corrective action
Is the alarm “94 Drive offline”displayed?	YES ⇒	The frequency inverter does not have supply voltage 3×400V	Connect the supply voltage to the frequency inverter Check fuses Check cabling for communication between frequency inverter and Carel
NO ⇓			
Has the high pressure switch tripped? Is the alarm “121 Compr 1, High pressure switch” or “180 Compr 1, High pressure switch” displayed?	YES ⇒	No or too low air flow across the condenser Defective high pressure switch	Check the air flow across the condenser. Reset the pressure switch manually Check/replace
NO ⇓			
Is the alarm “118 Compr 1, Low evaporation pressure” or “176 Compr 2, LowEvapPressure” displayed?	YES ⇒	Insufficient refrigerant volume No or too low air flow across the evaporator Defective expansion valve or low pressure control	Look for leakage, seal the leak and top up with refrigerant Check/adjust the flow Check/replace
NO ⇓			
Is the LED flashing red on the frequency inverter?	YES ⇒	Phase failure/voltage failure	Check the 3-phase supply, measure the incoming voltage. Reset the frequency inverter by switching off the voltage for 1 minute or more. Check that the compressor is running without dissonance.
		Overload/defective stepless compressor	Reset the frequency inverter by switching off the voltage for 1 minute or more. Check that the compressor is running without dissonance.
Is the alarm “189 Phase Rotation order”displayed?	YES ⇒	Incorrect phase sequence for supply voltage on compressor 2	Shut off voltage and switch two of the incoming phases
NO ⇓			
Is the alarm “AL 120 Compr 1 Low pressure diff.” displayed?	YES ⇒	No pressure difference between the high-pressure and low-pressure side	Contact service
NO ⇓			
Is the alarm “AL 59 Compr 1 Low Cond Temp” displayed?	YES ⇒	Condensation temperature too low	Contact service

Alarm information for inverter and compressor

Alarm Climatix	Explanation and corrective action
Cooling unit	
Sum alarm	Sum alarm, check alarm in Carel, see table below.
Alarm C1 R. pressure switch	High pressure switch tripped or alarm for frequency inverter.
Alarm C1 EEV motor fault	Fault on electrical connection to expansion valve.
Alarm C1 low pressure sensor	Power cut or short circuit to low pressure sensor. Check EVD, cabling and sensor.
Alarm C1 suction gas sensor	Power cut or short circuit to suction gas sensor. Check EVD, cabling and sensor.
Alarm C1 high pressure sensor	Power cut or short circuit to high pressure sensor. Check EVD, cabling and sensor.
Alarm C1 low overheating	Compressor stoppage caused by low overheating.
Alarm C1 LOP	Compressor stoppage caused by low evaporation temperature.
Alarm C1 MOP	Compressor stoppage caused by high evaporation temperature.
Alarm C1 communication EVD	Fault on communication to EVD (expansion valve control).
Alarm C1 low suction gas temp	Low suction gas temperature.

Alarm Carel	Explanation and corrective action
76 Drive MainsPhaseLoss	Check that all three phases are connected to the frequency inverter.
81 Drive U_phaseLoss	
82 Drive V_phaseLoss	
83 Drive W_phaseLoss	
94 Drive offline	No communication with the frequency inverter. Check that the frequency inverter is energised with 3-phase 400V.
118 Compr 1, Low evaporation pressure	Circuit 1, low evaporation temp/pressure. Check leakage in cooling circuit.
121 Compr 1, High pressure switch	Circuit 1, high pressure switch tripped. Check air flow.
172 Compr 2, Motor protector	Circuit 2, motor protection alarm
174 Compr 2, High pressure switch	Circuit 2, high pressure switch tripped. Check air flow.
176 Compr 2, LowEvapPressure	Circuit 2, low evaporation temp/pressure. Check leakage in cooling circuit.
180 Compr 1, High pressure switch	Circuit 1, high pressure switch tripped. Check air flow.
189 Phase rotation order	Incorrect phase sequence gives incorrect rotation direction. Switch two of the incoming phases.

6.2 Troubleshooting via symptoms

Symptom	Possible cause	Corrective action
Low cooling power - too high temperature in the cooled object	The power supply has been interrupted.	Check the control/safety switches and fuses.
	No air flow or too low air flow across evaporator.	Check that nothing is inhibiting the air flow.
	The control equipment is incorrectly preset/defective	Adjust the settings or replace the equipment.
Compressor is not operating	The power supply has been interrupted.	Check the control/safety switches and fuses.
	The compressor has tripped the high pressure switch.	Check and reset, if needed.
	Defective compressor	Check/replace
Frost on the evaporator	The expansion valve is incorrectly preset/ defective	Check/replace
	Insufficient refrigerant volume	Search to detect leakage, seal the leak and charge with refrigerant
	Low supply air flow	Adjust the flow

Alarm reset

In the event of an alarm initiated by the frequency inverter or the high pressure switch, the compressor stops and the sum alarm relay is energised. The alarm is displayed in the control unit menus “Operating information, compressors” and “Status: Alarm”.

In the event of an alarm, take corrective action to correct the fault, and then press the “Alarm reset” button on the control unit for 3 seconds. If the high pressure alarm trips repeatedly, an authorised refrigeration service company must be called in.

7 Technical data

7.1 EcoCooler without cooling recovery (code ECO)

Cooling unit			EcoCooler for Envistar Flex and Flexomix (ECO)						
Size			100	150	190	240	300	360	400
Power variant			2V	2V	2V	2V	2V	2V	2V
Air flow	min. [a]	m^3/s	0.22	0.33	0.42	0.49	0.57	0.74	0.8
	max. [a]	m^3/s	1.01	1.63	2.09	2.44	2.87	3.71	4.00
Max cooling power [b]		kW	13.8	20.8	27.5	28.7	40.0	47.0	51.6
Power need compressor		kW	3.1	4.8	5.7	5.7	8.5	11.3	12.0
No. of compressors		units	1	1	1	1	1	1	1
Max. operating current		A	7.2	10.7	13.5	13.5	21.4	26.1	28.2
Rec. fuse protection, 3x400V+N 50Hz		A	10	16	20	20	25	32	32
Refrigerant R410a	circuit 1	kg	1.9	3.3	4.1	4.6	5.7	6.7	7.3

Cooling unit			EcoCooler for Envistar Flex and Flexomix (ECO)											
Size			480		600			740		850			980	
Power variant			1V	2V	1V	2V	3V	2V	3V	1V	2V	3V	1V	2V
Air flow	min. [a]	m^3/s	0.93	0.93	1.16	1.16	1.16	1.42	1.42	1.61	1.61	1.61	1.95	1.95
	max. [a]	m^3/s	4.66	4.66	5.78	5.78	5.78	7.08	7.08	8.06	8.06	8.06	9.77	9.77
Max cooling power [b]		kW	55.7	66.5	57.3	69.5	82.2	74.6	102.2	78.8	94.8	118.7	81.3	127.4
Power need compressor		kW	11.8	16.7	11.5	16.3	18.3	15.6	22.2	14.9	16.5	24.8	14.8	25.4
No. of compressors		units	1	1	1	1	2	1	2	1	2	2	1	2
Max operating current		A	28.2	36.7	28.2	36.7	45.9	36.7	56.3	36.7	45.9	60.5	36.7	63.6
Rec. fuse protection, 3x400V+N 50Hz		A	32	40	32	40	50	40	63	50	50	63	50	80
Refrigerant R410a	circuit 1	kg	9.0	9.0	8.4	8.4	6.9	11.2	10.3	12.8	10.3	10.3	16.2	11.6
	circuit 2	kg	–	–	–	–	4.0	–	4.6	–	6.5	6.5	–	8.2

a) For units with dampers, ePM1-50% (F7) filter supply air, ePM10-60% (*M5) filter extract air, SFPv values with NP rotor, supply air temp 20°C and duct pressure 200 Pa (170+30 Pa). Max. air flow calculated with a minimum 10% spare capacity for fans.*

b) With outdoor temp 26°C, 50% RH and extract air temp 22°C.

7.2 EcoCooler with cooling recovery (code ECX)

Cooling unit			EcoCooler for Envistar Flex and Flexomix (ECX)						
Size			100	150	190	240	300	360	400
Power variant			1V	2V	2V	2V	2V	2V	2V
Air flow	min. (a)	m³/s	0.22	0.33	0.42	0.49	0.57	0.74	0.8
	max. (a)	m³/s	1.01	1.63	2.09	2.44	2.87	3.71	4.00
Max cooling power (b)		kW	18.1	26.7	36.1	37.2	47.9	60.4	67.3
Power need compressor		kW	3.2	4.9	6.1	6.0	8.5	11.6	11.3
No. of compressors		units	1	1	1	1	1	1	1
Max. operating current		A	7.2	10.7	13.5	13.5	21.4	26.1	28.2
Rec. fuse protection, 3×400V+N 50Hz		A	10	16	20	20	25	32	32
Refrigerant R410a	circuit 1	kg	1.9	3.2	4.1	4.6	5.7	6.7	7.3

Cooling unit			EcoCooler for Envistar Flex and Flexomix (ECX)											
Size			480		600			740		850			980	
Power variant			1V	2V	1V	2V	3V	2V	3V	1V	2V	3V	1V	2V
Air flow	min. (a)	m³/s	0.93	0.93	1.16	1.16	1.16	1.42	1.42	1.61	1.61	1.61	1.95	1.95
	max. (a)	m³/s	4.66	4.66	5.78	5.78	5.78	7.08	7.08	8.06	8.06	8.06	9.77	9.77
Max cooling power* (b)		kW	52.2	85.9	65.7	90.4	106.2	97.1	131.8	102.5	123.3	153.7	107.1	164.5
Power need compressor		kW	12.2	17.2	11.9	16.1	19.0	16.2	23.1	15.4	17.3	25.7	15.2	25.4
No. of compressors		units	1	1	1	1	2	1	2	1	2	2	1	2
Max operating current		A	28.2	36.7	28.2	36.7	45.9	36.7	56.3	36.7	45.9	60.5	36.7	63.6
Rec. fuse protection, 3x400V+N 50Hz		A	32	40	32	40	50	40	63	50	50	63	50	80
Refrigerant R410a	circuit 1	kg	9.0	9.0	8.4	8.4	6.9	11.2	10.3	12.8	10.3	10.3	16.2	11.6
	circuit 2	kg	–	–	–	–	4.0	–	4.6	–	6.5	6.5	–	8.2

a) For units with dampers, ePM1-50% (F7) filter supply air, ePM10-60% (*M5) filter extract air, SFPv values with NP rotor, supply air temp 20°C and duct pressure 200 Pa (170+30 Pa). Max. air flow calculated with a minimum 10% spare capacity for fans.*

b) With outdoor temp 26°C, 50% RH and extract air temp 22°C.

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Air handling with focus on LCC

You are welcome to contact us

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Spare parts:	+46 (0) 470 75 88 00	spareparts@ivprodukt.com

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