



EkoAir Heat exchanger selection manual.

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Calculation types.

In our selection program are 4 types of calculations.



Fluid / Fluid

Evaporator

Condenser

Steam

Fluid / fluid is used on heating, hot water, ventilation and other systems where the heat exchange is between two fluids.

Evaporator are used mostly in systems where are refrigerants. In these systems, the Freon is turned from liquid state to vapour state in the heat exchanger.

Condensers are the opposite of evaporators. In these systems, the Freon is condensed from vapour to liquid state.

Processes with steam are on their own. The reason for this, is that steam is a common medium for heat transfer and its physical properties are in the program more detailed than others.

Calculation procedure, calculation example for fluid / fluid.

To start with a calculation, select one of the calculation types. After the selection a new window will appear with the calculation mask.

For every calculation, type there will be a different calculation mask.

This mask can be divided in 6 parts.

First part, calculation type.

There are three kinds of calculations.

1. Verify – In VERIFY mode you have to specify all the exchangers data, so geometry plate, number of plates, number of passes primary and secondary side.
2. Design – In DESIGN mode, you have to specify the following exchangers data, so geometry plate, number of passes primary and secondary side. The software will calculate the best number of plates for the requested parameters, like for example capacity and pressure drops.
3. Selection - In SELECTON mode, you can specify the requested parameters, like for example capacity, max pressure drops, number of passes. The software will calculates the best plate geometry and the number of plates.

Second part, global data.

In this part, you can insert the requested capacity (INPUT, orange field.).

In field, REQ is the capacity that is used in the calculations but in the field, OBT is the max capacity that the heat exchanger is capable to deliver.

In this part, you also can see the oversizing factor and the heat exchange area.

Third and fourth part is primary and secondary side data.

Primary side				
Fluid	Pure Liquid	WATER		
		INPUT		OUTPUT
Pressure	bar A	1	REQ	OBT
Fluid Flow	m ³ /h	0	1.321	1.321
Inlet Temperature	°C	80	80	80
Outlet Temperature	°C	70	70	67.4297
Fouling Factor	(m ² K)/W	0		0.
Total Pressure Drops	kPa	50		34.606
Channel fluid velocity	m/s			0.6795
Velocity inside manifolds	m/s		1.7161	1.7161

In both sides, you can change the fluid. You can change the concentration of a solution (example ethylene glycol 40%).

If you know the work pressure, you can add it in the calculation. If the pressure is not known, use the default setting or follow the instructions.

Fluid flow: In some cases the heat capacity is not known but the flow is. If you input the flow, you can calculate the heat exchanger.

Inlet temperature – mediums temperature in the inlet of heat exchanger.

Outlet temperature – mediums temperature in the exit of the heat exchanger.

Fouling factor – you can limit the max fouling factor for the heat exchanger.

Pressure drop – max allowed pressure drop on the heat exchanger.

Filter by geometry

Select All/Deselect All

GEOMETRY	Filter
LB-238	<input checked="" type="checkbox"/>
NB-328	<input checked="" type="checkbox"/>
LB-468	<input checked="" type="checkbox"/>

Fifth part is selection of geometry.

You can select heat exchangers by their geometry. This means that you can make the calculations for a specific heat exchanger. After the selection, the program will calculate the requested plate number considering the requested parameters.

The sixth part is results of the calculation.

GEOMETRY	Primary circuits	Secondary circuits	Nbr. Of plates	% High perf.	Capacity	Delta	Exchanging surface	Surface / Capacity	Flow primary circuit	Flow secondary circuit	Primary press. Drops	Secondary press. Drops	GEOMETRY	Weight	Price/Capacity
				%	kW	%	m ²	m ² /kW	m ³ /h	m ³ /h	kPa	kPa	€ (EUR)	kg	
NB-536	1	1	10	0	106.22	211.81	0.53	0.00497	3	3	51.21	36.95	0	0	0
LB-238	1	1	16	0	52.12	53.01	0.27	0.0051	3	3	48.64	43.28	0	0	0
NB-138	1	1	14	0	98.4	188.86	0.53	0.00537	3	3	49.72	40.83	0	0	0
NB-328	1	1	18	0	87.95	158.19	0.48	0.00546	3	3	52.2	46.99	0	0	0

In this window will be shown the calculated heat exchangers. Choose the suiting heat exchanger and click on it. After the click you will jump into verify mode and you can check if the heat exchanger suites your parameters.

In verify mode you can also change the connectors and check the pressure drop.

File Offer Archive management View Tools ?

Verify
 Design
 Selection

Fixed DTML

PROJECT Description Project nbr.

INPUT		OUTPUT	
	REQ	OBT	
Capacity kW	34.064	34.064	106.22
Overall K-value duty / operating / clean W/(m ² K)	3226	10058	10058
Oversizing factor %			211.81
Exchanging surface m ²			0.53
DTML °C			20

GEOMETRY
 NB-536

Materials
 Plate: Stainless Steel AISI 316L
 Brazing material: Copper (Cu) 99,99%
 Frame: Zinc coated

Primary side				Secondary side			
Fluid		INPUT		OUTPUT			
		1	REQ	OBT			
Pressure bar A							
Fluid Flow m ³ /h		3	3	3			
Inlet Temperature °C		80	80	80			
Outlet Temperature °C		70	70	61.7231			
Fouling Factor (m ² K)/W		0		0.0001			
Total Pressure Drops kPa		50		51.2055			
Channel fluid velocity m/s				0.9024			
Velocity inside m/s			1.4555	1.4555			

Fluid		INPUT		OUTPUT	
		1	REQ	OBT	
Pressure bar A					
Fluid Flow m ³ /h		0	2.9742	2.9742	
Inlet Temperature °C		50	50	50	
Outlet Temperature °C		60	60	68.2769	
Fouling Factor (m ² K)/W		0		0.0001	
Total Pressure Drops kPa		50		36.945	
Channel fluid velocity m/s				0.7157	
Velocity inside m/s			1.443	1.443	

Nbr. of plates: 10
 Nbr. of circuits: 1
 Automatic channels

Nbr. of circuits: 1
 Automatic channels

Primary side
 DN32 (G1 1/4) H27
 DN32 (G1 1/4) H27

Secondary side
 DN32 (G1 1/4) H27
 DN32 (G1 1/4) H27

If the results are satisfying click print, to make a printout.

Printouts.

After pressing print, there will appear a new window called Print. In this window, you can choose the type of printout you want. You also can add the customer's details on the printout.

Print

Customer

Technical data

Further Technical data

Drawing

Save PDF Save as Word file Save as Excel file Exit

Customer: EKO AIR

Technical data:

Capacity: 34.064 kW

Overall K-value: 3226 W/(m² K)

Primary side: Inlet 80°C, Outlet 70°C, Flow 3 m³/h

Secondary side: Inlet 50°C, Outlet 60°C, Flow 0 m³/h

Pressure drops: 50 kPa (Primary), 51.2055 kPa (Secondary)

Velocities: 1.4555 m/s (Primary), 0.9024 m/s (Secondary)

1. Technical data. In this printout are the basic technical data about the calculation, but this printout does not contain a drawing of the heat exchanger.
2. Further technical data. In this printout are given some additional data that is not essential for the client, but can be useful for tests.
3. Drawing. This printout contains the basic data of the heat exchanger and a drawing with dimensions of it.

Calculation of evaporator.

PROJECT		Description		Project nbr.	
INPUT					
Capacity	kW	50	REQ	0	0
Overall K-value duty / operating / clean	W/(m ² K)	0	REQ	0	0
OUTPUT					
Over sizing factor	%	0	OBT	0	0
Exchanging surface	m ²	0	OBT	0	0
DTML	°C	0	OBT	0	0
Primary side			Secondary side		
Fluid	Pure Liquid	WATER	Refrigerant	R134a	
INPUT					
Pressure	bar A	1	REQ	0	
Fluid Flow	m ³ /h	0	OBT	0	
Inlet Temperature	°C	12	REQ	0	
Outlet Temperature	°C	7	OBT	0	
Fouling Factor	(m ² K)/W	0	REQ	0	
Total Pressure Drops	kPa	50	OBT	0	
Channel fluid velocity	m/s		REQ	0	
Velocity inside	m/s		OBT	0	
OUTPUT					
Refrigerant	R134a				
Fluid Flow	kg/h	0			
Evaporating temperat	°C	2			
Condensing temperat	°C	45			
Overheating	K	5			
Subcooling	K	5			
Fouling Factor	(m ² K)/W	0			
Total Pressure Drops	kPa	50	0		
Channel fluid velocity	m/s	0			
Velocity inside manifolds	m/s	0	0		

This kind of calculation is used with refrigerators. The refrigerator goes in the heat exchanger as liquid and leaves as vapour. These kind of calculations have usually low temperatures, even negative temperatures.

To make this calculations you need to know the refrigerant, its evaporating temperature and if there is a superheating, the superheating temperature. An important factor is pressure drop for the Freon side. Usually it is 50kPa.

For the fluid side you have to choose the fluid. Because the temperatures are low, water could easily freeze. To avoid freezing are used fluids with a lower freezing temperature, for example ethylene glycol 40%. The data input for liquid side is the same as the data input for fluid / fluid calculations.

Calculation of condenser.

PROJECT		Description		Project nbr.	
INPUT					
Capacity	kW	50	REQ	0	0
Overall K-value duty / operating / clean	W/(m ² K)	0	REQ	0	0
OUTPUT					
Over sizing factor	%	0	OBT	0	0
Exchanging surface	m ²	0	OBT	0	0
DTML	°C	0	OBT	0	0
Primary side			Secondary side		
Fluid	Pure Liquid	WATER	Refrigerant	R134a	
INPUT					
Pressure	bar A	1	REQ	0	
Fluid Flow	m ³ /h	0	OBT	0	
Inlet Temperature	°C	30	REQ	0	
Outlet Temperature	°C	35	OBT	0	
Fouling Factor	(m ² K)/W	0	REQ	0	
Total Pressure Drops	kPa	50	OBT	0	
Channel fluid velocity	m/s		REQ	0	
Velocity inside	m/s		OBT	0	
OUTPUT					
Refrigerant	R134a				
Fluid Flow	kg/h	0			
Evaporating temperat	°C	2			
Condensing temperat	°C	45			
Overheating	K	5			
Subcooling	K	5			
Fouling Factor	(m ² K)/W	0			
Total Pressure Drops	kPa	50	0		
Channel fluid velocity	m/s	0			
Velocity inside manifolds	m/s	0	0		

The condensation process is an opposite process to evaporation. In this process, the refrigerant goes in the heat exchanger as vapour, but leaves as liquid. In these kind of calculations the temperatures can be up to 120°C, so the fluid side can be water, sometimes a water solution.

To make the calculations you need to know the refrigerant, condensing temperature and the subcooling temperature if subcooling is needed. As in all calculations, max pressure drop is essential for a precise calculation. For these kind of calculations, usually the pressure drop is 50kPa.

Calculations with steam.

The calculation of steam is similar to calculations of condensers.

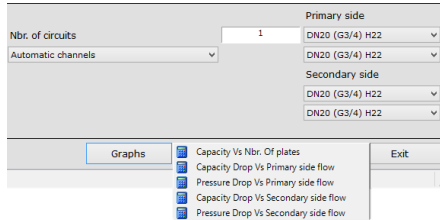
Primary side				Secondary side		
Fluid	Pure Liquid	WATER		Steam Flow	kg/h	0
		INPUT		Saturation Pressure	bar A	1
Pressure	bar A	1	REQ	Saturation Temperature	°C	99.1
Fluid Flow	m³/h	0	4.4238	Overheating	K	0
Inlet Temperature	°C	80	80	Subcooling	K	0
Outlet Temperature	°C	90	90	Fouling Factor	(m² K)/W	0
Fouling Factor	(m² K)/W	0	0	Total Pressure Drops	kPa	50 0
Total Pressure Drops	kPa	50	0	Channel fluid velocity	m/s	0
Channel fluid velocity	m/s		0	Velocity inside manifolds	m/s	0 0
Velocity inside	m/s		0 0			

In calculations with steam, you have to know the saturation temperature or the saturation pressure of it. The rest is the same as condenser calculations.

Graphs.

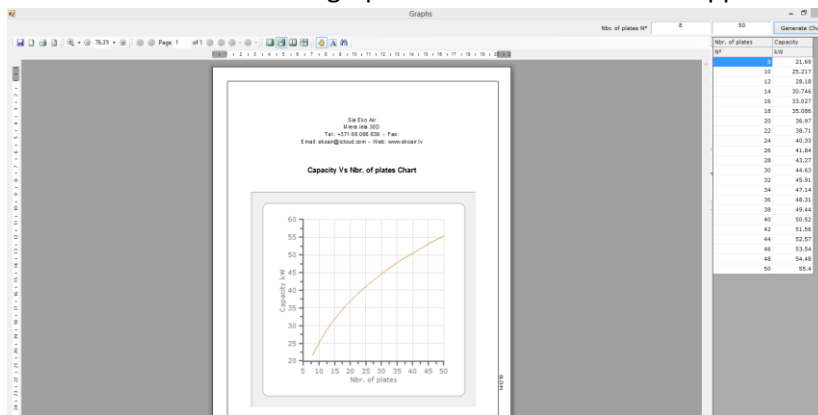
In some cases, the client could ask for some graphs. In the verify calculation you can create some graphs. Clicking on the graph button you will have a choice of five available graphs.

Available graphs are:



1. Capacity vs number of plates.
2. Capacity drop vs primary side flow.
3. Pressure drop vs primary side flow.
4. Capacity drop vs secondary side flow
5. Pressure drop vs secondary side flow

Select one of the available graphs and a new window will appear.



In the new window, you have to define the range of the graph. In the case of capacity vs number of plates you have to define the range of plates. After that, the program will calculate the graph for the specific heat exchanger using the input data.