EkoAir Heat exchanger selection manual.

Table of content

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.

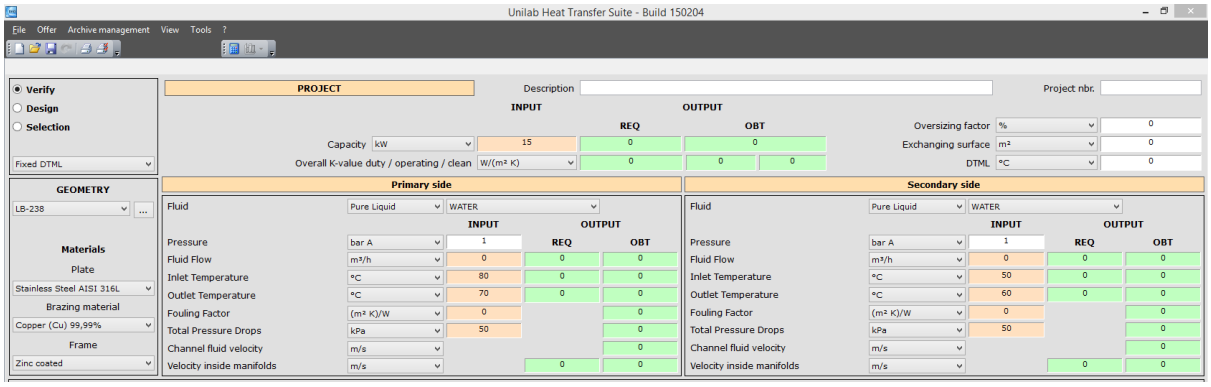
Evaporator are used mostly in systems where are refrigerants. In these systems, the Freon is turned from liquid state to vapour state in the heat exchanger.

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.

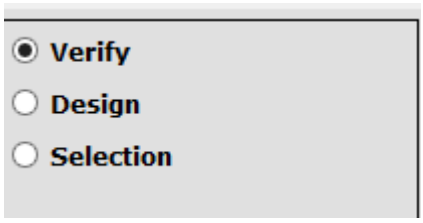
To start with a calculation, select one of the calculation types. After the selection a new window will appear with the calculation mask.



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

This mask can be divided in 6 parts.

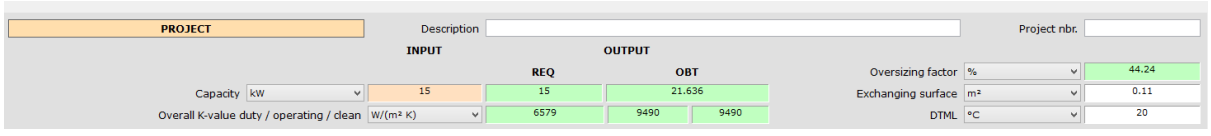
First part, calculation type.



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.

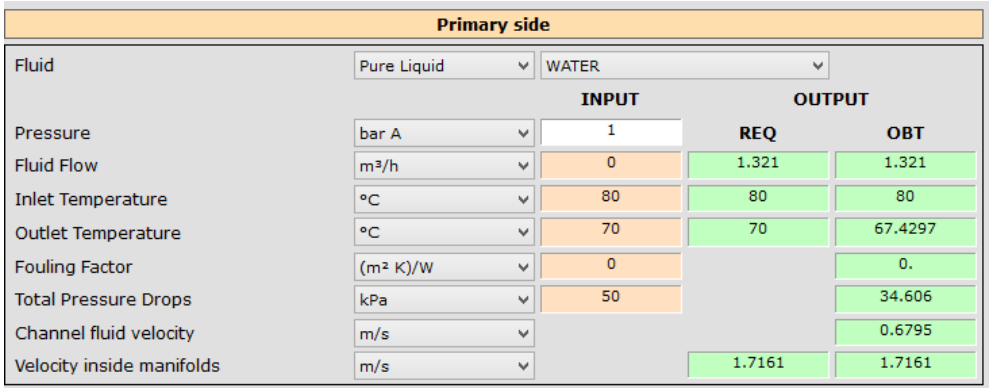


In this part, you can insert the requested capacity (INPUT, orange field.).

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	m³/h	0	1.321	1.321
Inlet Temperature	°C	80	80	80
Outlet Temperature	°C	70	70	67.4297
Fouling Factor	(m² 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 fallow the instructions.

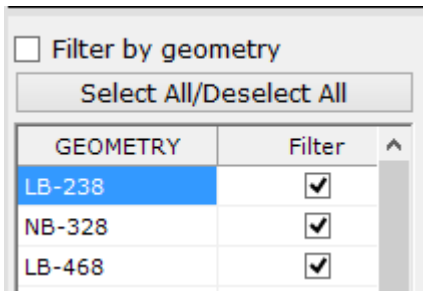
Fluid flow: In some cases the heat capacity is not known but the flow is. If you input the flow, you can calculate the heat exchanger.

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.

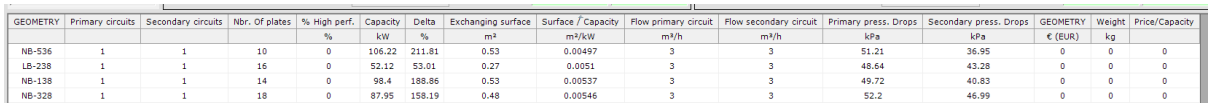
Pressure drop – max allowed pressure drop on the heat exchanger.



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	%	m²	m²/kW	m³/h	m³/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

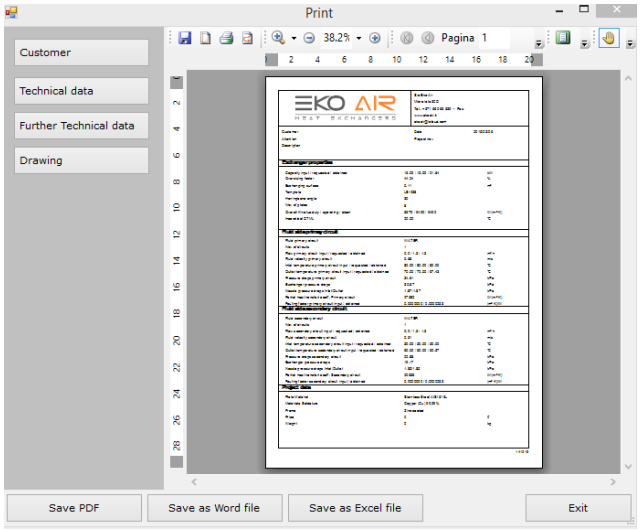
In this window will be shown the calculated heat exchangers. Choose the suiting heat exchanger and click on it. After the click you will jump into verify mode and you can check if the heat exchanger suites your parameters.

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

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

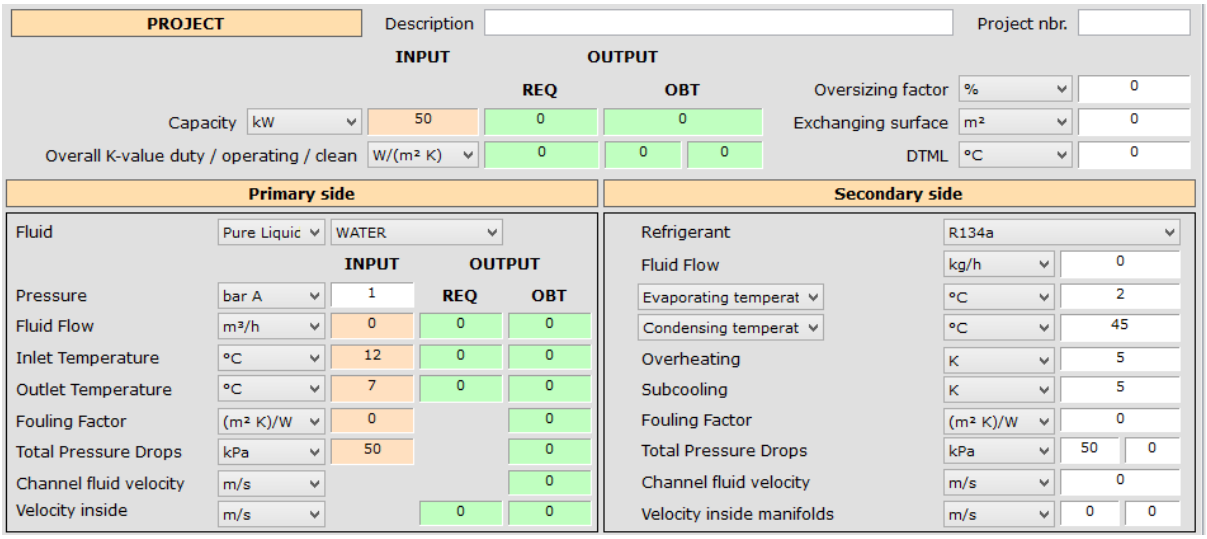
Printouts.

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.



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.

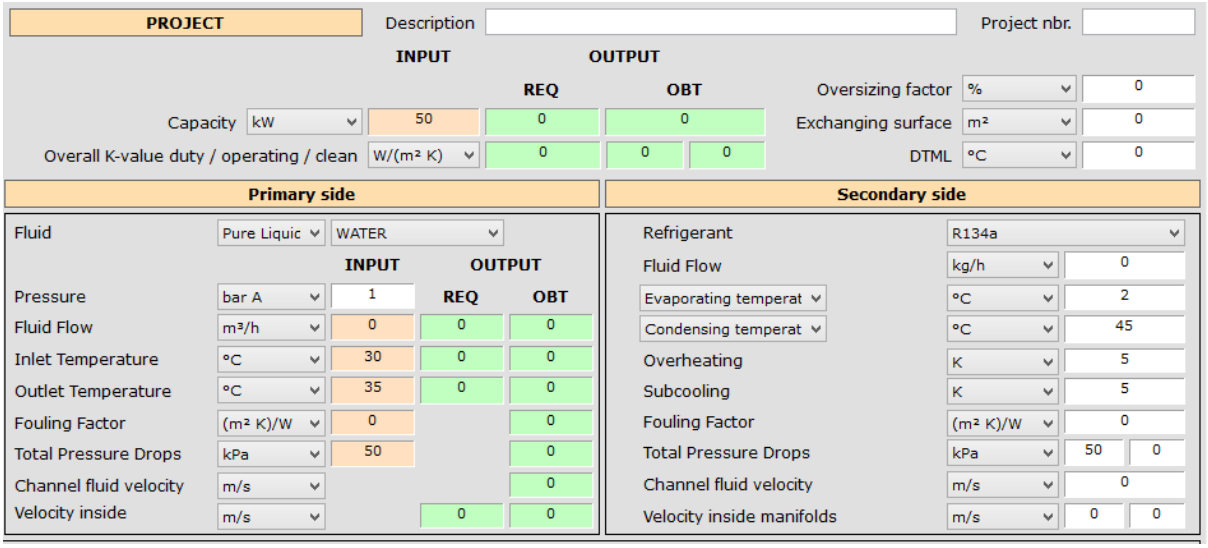
Calculation of evaporator.



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.

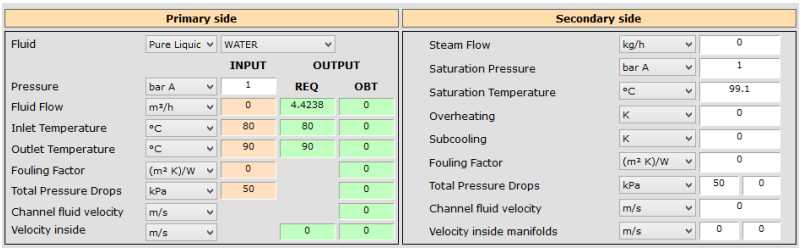


The condensation process is an opposite process to evaporation. In this process, the refrigerant goes in the heat exchanger as vapour, but leaves as liquid. In these kind of calculations the temperatures can be up to 120°C, so the fluid side can be water, sometimes a water solution.

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.

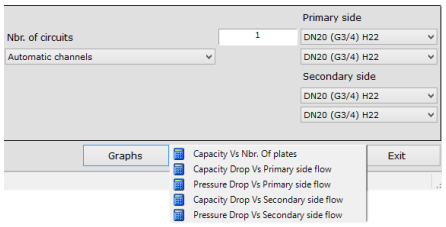


In calculations with steam, you have to know the saturation temperature or the saturation pressure of it. The rest is the same as condenser calculations.

Graphs.

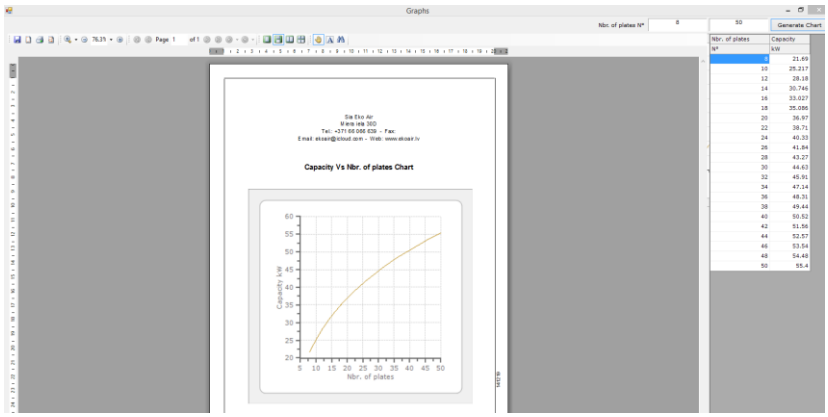
In some cases, the client could ask for some graphs. In the verify calculation you can create some graphs. Clicking on the graph button you will have a choice of five available graphs.

Avaialable 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.