



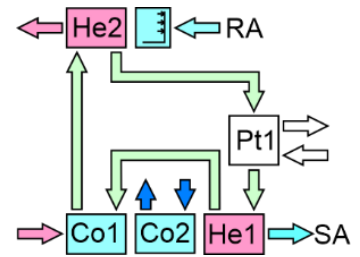
Correctly cooler calculation

In many industrial processes, you are dependent on dry air, otherwise the products to be manufactured, such as medicines, absorb moisture and become unusable. If a lot of moisture has to be removed from the air, part of the output can be achieved via cold recovery, provided that the exhaust air is pre-cooled adiabatic or even hybrid.

CCSF dehumidification system

A large proportion of cooling capacity and dehumidification must be cooled with cold water via the finned air cooler (Co2). For a long time, this system was in the foreground, with the finned air cooler (Co2) causing high air-side pressure drops throughout the year, i.e. even when it is not in operation. This leads to additional operating costs, because the supply air fan has to do more. It is also important to note, that effective condensate separation must take place after the aftercooler (Co2), otherwise the condensate will enter the re-heater. **Sisyphus sends his regards!**

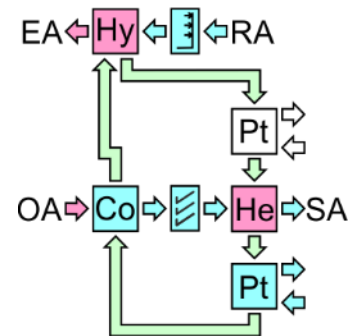
Software CCSF Split



CCSH dehumidification system

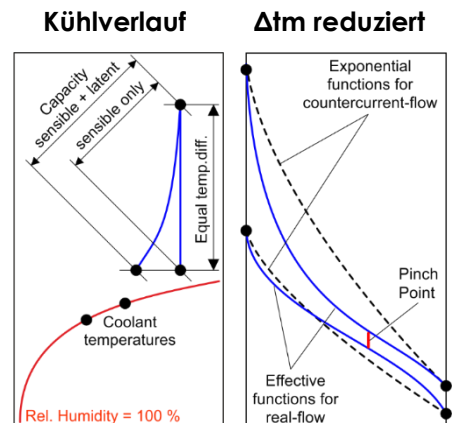
Recently, instead of a finned cooler (Co2), a plate heat exchanger (Pt) has been integrated into the glycol circuit, which is operated with cold water. In this way, the operating costs of the supply air fan can be significantly reduced. However, another problem arises in, that not all manufacturers of finned heat exchangers can show a type examination, for example by the TÜEV Süd in Munich, and do not have the slightest idea, how such a large cooler with a high proportion of latent capacity is to be calculated. On the other hand, thanks to an absolutely useless calculation, the price is very cheap. **But is that enough?**

Software CCSH Split



Counterflow in finned heat exchangers only exists in the imagination of a few manufacturers with insufficient training, who don't give a shit whether the offered cooling capacity is achieved. Only those who calculate the cooling process with finite elements in the direction of the air understand something. The exponential temperature gradients in the diagram below do not apply, because at the begin only sensitive capacity is dissipated and only towards the end latent capacity. The temperature curve changes. The effective Δt_m can be understood as the area between the two temperature curves and is reduced extremely, even in counter flow, which has been confirmed by measurements in laboratories. **Latent capacity reduces the Δt_m enormously and requires larger heat exchangers!**

In Switzerland, too, there is such a producer of finned heat exchangers, who has no idea, how to calculate air coolers with a high latent capacity component. Instead, they boast of having invented heat recovery, so to speak. Furthermore, only fins of 60 mm width can be produced and brazenly claims that 10 such packages, i.e. a finned depth of 600 mm with 20 butt edges, can be easily cleaned with water under high pressure. For good payment, a doctor from a German institute was asked to carry out experiments, probably on clean, flattened heat exchangers, by spraying water at high pressure into the fins at the top and it came out at the bottom, well, where else! **An absolute miracle of technology!**



CC-System in summer		SA-Co	RA-Hy	SA-He
Capacity	kW	265.678	84.870	53.640
Surface reserve	%	0.288	0.000	0.796
Present surface	m ²	1980.185	1980.185	355.952
Temp. in (26.000)	°C	32.000	19.356	12.660
Rel. humidity in (54.175)	%	40.000	100.000	99.333
Abs. humidity in (11.500)	g/kg	12.014	14.261	9.173
Temp. out	°C	12.660	28.655	18.000
Rel. humidity out	%	99.333	57.280	70.565
Abs. humidity out	g/kg	9.173	14.261	9.173
Velocity	m/s	2.006	1.826	1.954
Pressure drop	Pa	214.000	155.699	34.396



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Definition

Height over sea level	m	106.000
Pressure	hPa	1000.564
Temp.	°C	20.000
Rel. humidity	%	40.000
Supply air	m ³ /h	30000.000
Return air	m ³ /h	27000.000

25 V% Et.glycol CC-System

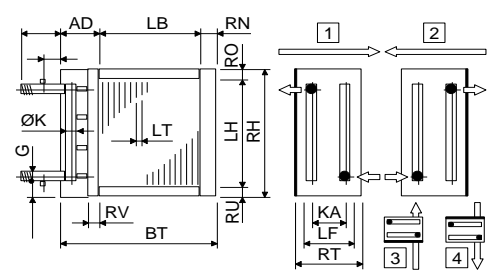
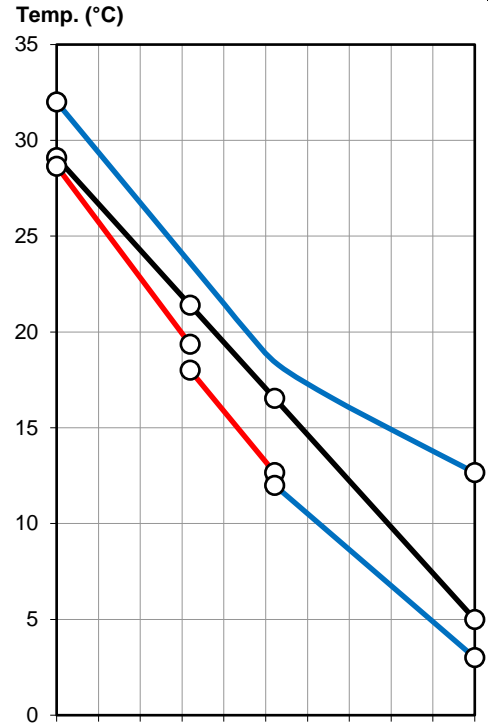
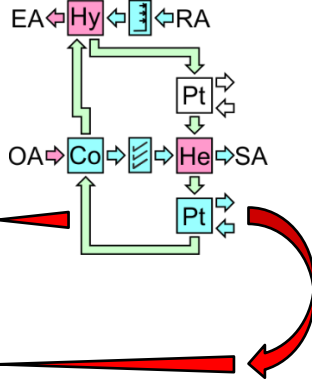
Temp. in	°C	5.000
Temp. out	°C	29.100
Volume flow	m ³ /h	10.262
Pressure drop total	kPa	427.601

Water Pt

Capacity	kW	127.168
Temp. in	°C	3.000
Temp. out	°C	12.000
Volume flow	m ³ /h	12.120

Technical data

		SA-Co	RA-Hy	SA-He
Tubes blank	Piece	0	0	0
Int. vent./drains	Piece	9	9	1
Tube rows on the depth	Piece	20	20	4
Tube rows on the height	Piece	54	54	54
Number of circuits (NC)	Piece	27	27	27
Volume	l	317	317	70
Weight	kg	1001	1001	219
Connections	G	2"	2"	2"
Frame height	RH	1680	1680	1680
Frame width	BT	2800	2800	2800
Frame depth	RT	610	610	200
Finned height	LH	1620	1620	1620
Finned width	LB	2604	2604	2604
Frame on top	RO	30	30	30
Frame on bottom	RU	30	30	30
Frame in front	RV	30	30	30
Frame on back (~53/53/53)	RN	53	53	53
Collector covering	AD	143	143	143
Fin spacing	LT	2.500	2.500	2.800
Fin thickness	LD	0.200	0.200	0.200
Tube diameter	DA	12.400	12.400	12.400
Tube diameter	da	12.400	12.400	12.400
Tube thickness	S	0.400	0.400	0.400
Tube interval on the height	S1	30.000	30.000	30.000
Tube interval on the depth	S2	25.981	25.981	25.981
Tubes		Cu	Cu	Cu
Tubes		smooth	smooth	smooth
Tubes		staggered	staggered	staggered
Tubes	Type	circular	circular	circular
Collector		Cu	Cu	Cu
Connections		Rg7	Rg7	Rg7
Fins		Al	Al	Al
Fins	Wave structure	Wave structure	Wave structure	Wave structure
Frame		AISI 304	AISI 304	AISI 304
Protection		without	without	without
Protection		---	---	---
Price	EUR	17385.00	17385.00	3814.00



Delivery: 5-6 weeks
Validity: 12 weeks
Condit.: net, prepaid address
Payment: 30 days net

Price total: EUR 38584.00

Energy recovery / Year (Service at 100% Air flow = 5667 Hours)



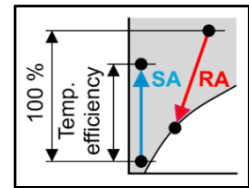
No	Outside air		CCSB		Return air		Exhaust air		Efficiency %	Capacity kW	Energy MWh
	°C	%	°C	%	°C	%	°C	%			
1	-7.2	83.3	14.7	16.6	21.1	34.5	0.8	98.1	77.34	216.41	30.66
2	-1.7	82.3	15.6	24.6	21.2	35.0	3.9	93.6	75.63	171.94	24.36
3	0.0	81.2	16.0	27.3	21.3	35.4	5.0	92.0	75.15	158.95	22.52
4	1.2	77.2	16.3	27.9	21.4	35.8	5.8	90.8	74.88	149.94	21.24
5	2.2	77.0	16.6	29.3	21.5	36.2	6.5	90.0	74.66	142.96	20.25
6	3.0	76.5	16.9	30.3	21.6	36.7	7.0	89.3	74.51	137.61	19.49
7	3.8	75.7	17.1	31.2	21.7	37.1	7.6	88.7	74.35	132.55	18.78
8	4.4	77.4	17.3	32.9	21.8	37.5	8.0	88.2	74.23	128.26	18.17
9	5.1	76.7	17.6	33.7	21.9	38.0	8.5	87.6	74.12	124.01	17.57
10	5.8	75.7	17.8	34.4	22.0	38.4	9.0	86.9	74.00	119.42	16.92
11	6.4	77.8	18.0	36.3	22.1	38.8	9.4	86.3	73.90	115.60	16.38
12	7.0	77.3	18.2	37.1	22.2	39.2	9.9	85.7	73.82	111.86	15.85
13	7.6	78.5	18.5	38.7	22.3	39.7	10.3	84.9	73.76	108.17	15.32
14	8.1	76.5	18.7	38.6	22.4	40.1	10.8	84.1	73.75	105.07	14.89
15	8.7	74.8	18.9	38.5	22.5	40.5	11.2	83.0	73.75	102.05	14.46
16	9.2	76.1	19.1	40.2	22.6	40.9	11.7	81.7	73.74	98.47	13.95
17	9.8	74.7	19.3	40.5	22.7	41.4	12.2	80.5	73.74	95.07	13.47
18	10.4	74.4	19.6	41.3	22.8	41.8	12.7	79.3	73.74	91.71	12.99
19	10.9	73.0	19.8	41.5	22.9	42.2	13.1	78.1	73.74	88.30	12.51
20	11.6	73.2	19.9	42.7	23.0	42.7	13.7	76.6	73.74	83.53	11.83
21	12.1	73.5	19.8	43.9	23.1	43.1	14.2	75.5	73.73	76.65	10.86
22	12.7	71.0	19.7	43.3	23.2	43.5	14.6	74.5	73.74	69.87	9.90
23	13.3	72.7	19.5	45.5	23.3	43.9	15.1	73.4	73.72	62.76	8.89
24	13.9	69.4	19.4	44.5	23.5	44.4	15.6	72.1	73.73	55.32	7.84
25	14.5	69.5	19.3	45.6	23.6	44.8	16.1	71.0	73.72	48.10	6.81
26	15.1	69.7	19.1	46.9	23.7	45.2	16.6	69.7	73.71	40.53	5.74
27	15.7	69.4	19.0	47.9	23.8	45.7	17.2	68.5	73.70	32.94	4.67
28	16.3	67.2	18.9	47.5	23.9	46.1	17.7	67.4	73.71	25.57	3.62
29	17.0	64.3	18.7	46.7	24.0	46.5	18.2	66.1	73.73	17.55	2.49
30	17.7	62.2	18.6	46.5	24.1	46.9	18.8	64.6	73.73	9.09	1.29
31	18.4	62.6	18.4	48.1	24.2	47.4	19.4	63.2	73.71	0.56	0.08
32	19.0	64.6	17.4	71.2	16.9	100.0	18.6	89.8	73.86	-15.60	-2.21
33	19.7	61.6	17.7	69.5	17.0	100.0	19.2	87.4	73.88	-19.48	-2.76
34	20.4	57.7	18.0	66.9	17.2	100.0	19.8	84.8	73.88	23.94	3.39
35	21.3	58.5	18.4	70.1	17.4	100.0	20.6	81.8	73.85	29.36	4.16
36	22.2	57.2	18.7	70.8	17.5	100.0	21.3	78.8	73.84	34.90	4.94
37	23.2	54.3	19.1	69.8	17.7	100.0	22.2	75.6	73.84	41.12	5.83
38	24.4	52.3	19.5	70.4	17.8	100.0	23.2	71.8	73.83	48.97	6.94
39	26.2	50.2	20.1	72.3	18.0	100.0	24.7	66.4	73.80	61.01	8.64
40	29.9	46.8	21.2	78.3	18.1	100.0	27.8	55.8	73.68	88.02	12.47

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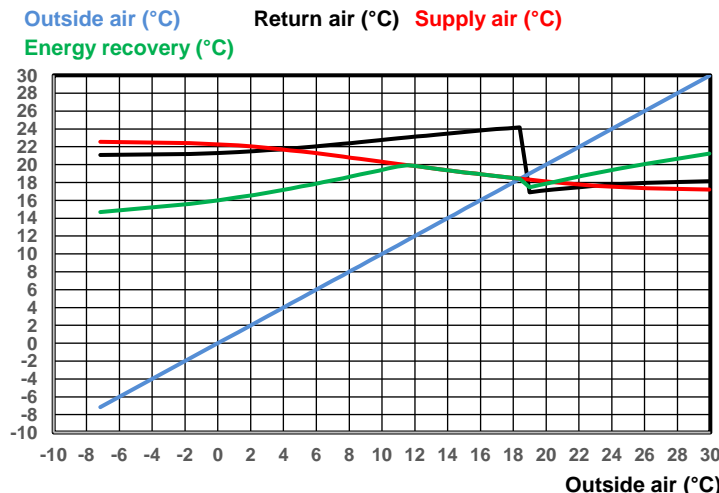
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Object
Position



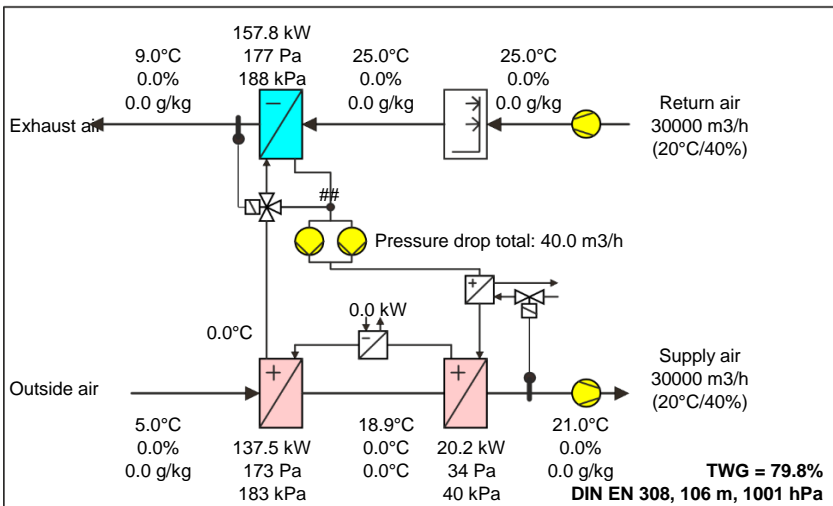
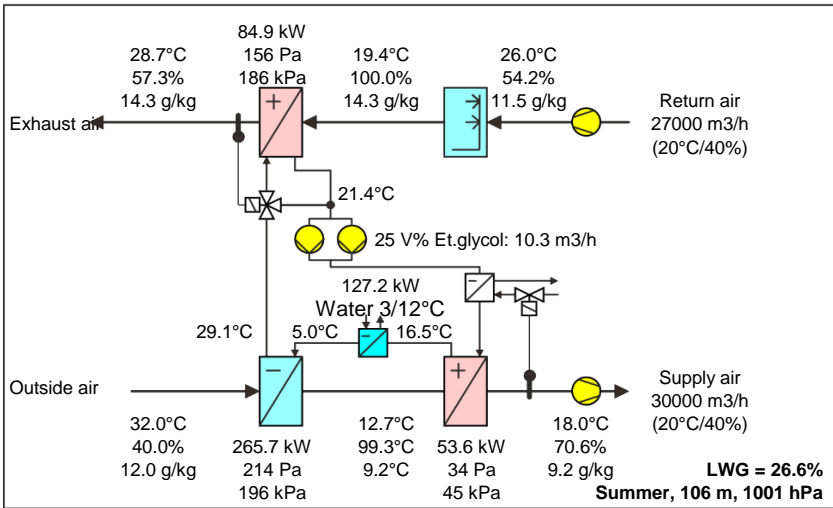
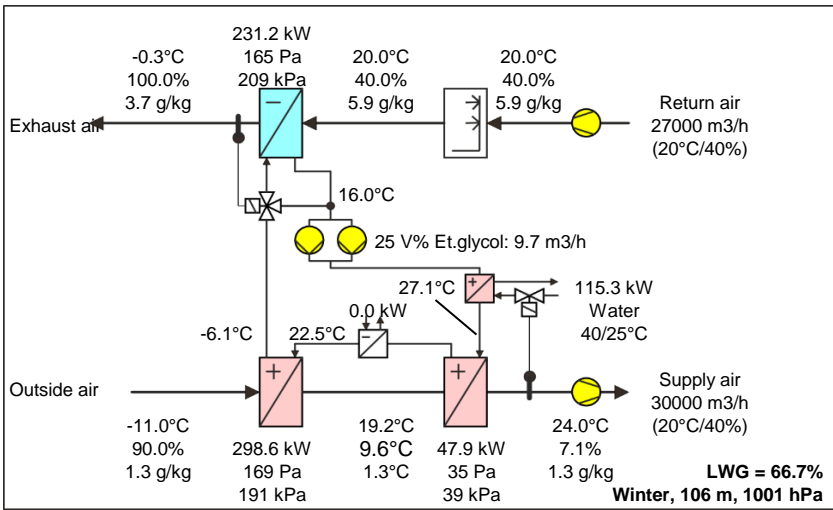
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Air (%)	Service (h/a)
100.00	4000
66.67	2000
33.33	1000
▼	▼
100.00	5667

EU: Energy recovery: Heat energy	MWh	413.78	EUR	24827.00	(60.00 EUR/MWh)
EU: Energy recovery: Cold energy	MWh	41.40	EUR	3312.00	(80.00 EUR/MWh)
EU: 2 Fan + Glycol pump	MWh	-36.05	EUR	-3605.00	(100.00 EUR/MWh)
EU: Energy recovery: Net useful ratio / Year	MWh	419.13	EUR	24534.00	(58.54 EUR/MWh)
EU: Need of energy total / Year	MWh	719.37	EUR	50289.22	(69.91 EUR/MWh)
EU: Net useful ratio / Year	%	58.26	%	48.79	TWG = 79.43%
CH: Guidelines from associations such as SIA and SWKI: TWG>70.00% & JNG>75.00% & ETV>15.00					JNG = 73.90%
					ETV = 14.81



Station	Frankfurt am Mai	
Height over sea level	m	106.00
Pressure	hPa	1000.56
Outside air	m3/h	30000.00
Return air	m3/h	27000.00
Adiabatic return air cooling	h/a	1275.00
Service at 100% Air flow	h/a	5666.65
Capital interest	%	1.00
Energy increase	%	1.00
Inflation	%	1.00
Support costs	%	5.00
Costs without CC-System	EUR	86000.00
Costs with CC-System	EUR	169000.00
Additional costs	EUR	83000.00
BEP (Break even point) after	Years	4.10



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Price total: EUR 40200.00

Delivery: 5-6 weeks
Validity: 12 weeks
Condit.: net, prepaid address
Payment: 30 days net

Conformity

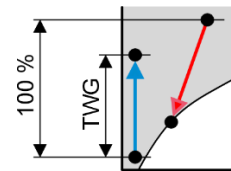
VDI 6022
VDI 3803-5



Economy

EU: Net useful ratio / Year (MWh) 58.26%
EU: Net useful ratio / Year (EUR) 48.79%

CH: TWG = 79.43%
CH: JNG = 73.90%
CH: ETV = 14.81

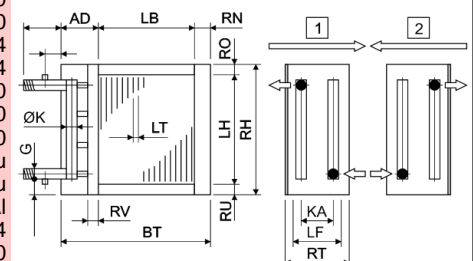


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		ply air 1	ply air 2	urn air 1	urn air 2	Heater
Heat exchanger	---	---	---	---	---	4
Tube rows	---	10	10	10	10	70
Volume	---	l	162	162	162	219
Weight	---	kg	519	519	540	219
Connections	G	---	2"	2"	2"	2"
Frame height	RH	mm	1680	1680	1680	1680
Frame width	BT	mm	2800	2800	2800	2800
Frame depth	RT	mm	350	350	350	200
Finned height	LH	mm	1620	1620	1620	1620
Finned width	LB	mm	2604	2604	2604	2604
Finned depth	LF	mm	260	260	260	104
Fin spacing	LT	mm	2.50	2.50	2.30	2.30
Fin thickness	LD	mm	0.20	0.20	0.20	0.20
Tube thickness	S	mm	0.40	0.40	0.40	0.40
Tubes	---	---	Cu	Cu	Cu	Cu
Collector	---	---	Cu	Cu	Cu	Cu
Fins	---	---	Al	Al	Al	Al
Frame	---	---	AISI 304	AISI 304	AISI 304	AISI 304
Price	---	EUR	8970.00	8970.00	9223.00	9223.00

Heat exchanger

Two-piece in the supply air
Two-piece in the exhaust air
One-piece in the supply air

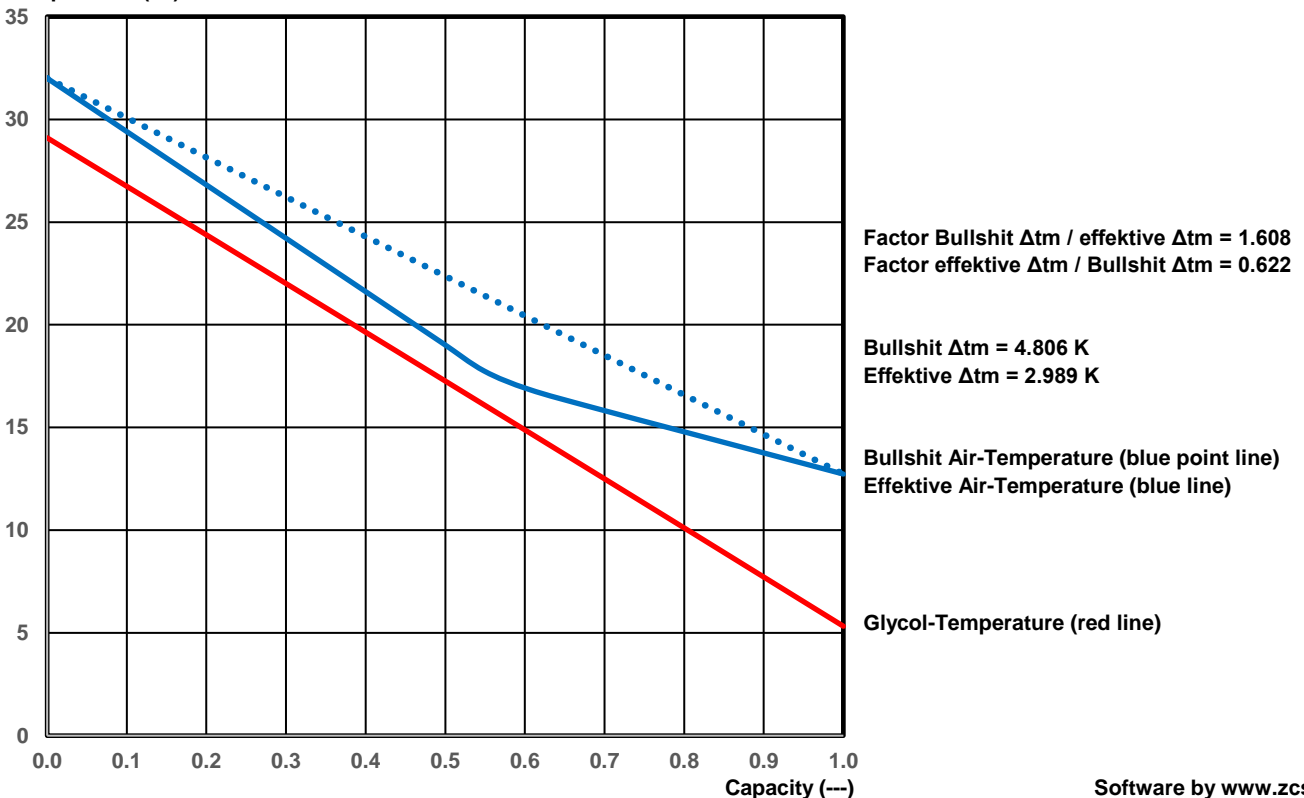


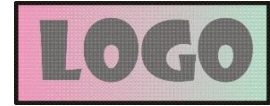
Air cooler calculation with 12 units à 2 tube rows = 24 tube rows total

As already mentioned, there is also a producer of finned heat exchangers in Switzerland, who always offers air coolers that are far too small, but cannot show any type testing, for example from TUEV Süd in Munich. He calculates his air coolers so simply, that he is at least 40% cheaper than competitors with seriously calculated air coolers. In this example, we calculated an air cooler with 12 finite elements, each with 2 tube rows in air direction, which results in a total of 24 tube rows. If you study the effective and the bullshit temperature curve in the diagram below, you can immediately see, where the difference is. Our calculation process with 12 finite elements can be seen in the values below and on the following pages.

2RR-Units Piece	RR total Piece	Sensible kW	Latent kW	Total kW	Air inlet °C	Air outlet °C	Glycol in °C	Glycol out °C	Δtm K	Cap x Δtm kW/K	
1	2	23.442	0.000	23.442	32.000	29.680	26.991	29.100	2.530	59.308	
2	4	21.566	0.000	21.566	29.680	27.545	25.048	26.991	2.352	50.723	
3	6	19.869	0.000	19.869	27.545	25.578	23.255	25.048	2.189	43.493	
4	8	18.339	0.000	18.339	25.578	23.762	21.599	23.255	2.040	37.412	
5	10	16.951	0.000	16.951	23.762	22.084	20.067	21.599	1.904	32.275	
6	12	15.689	0.000	15.689	22.084	20.530	18.647	20.067	1.780	27.926	
7	14	14.543	0.000	14.543	20.530	19.090	17.329	18.647	1.665	24.214	
8	16	13.497	0.000	13.497	19.090	17.754	16.105	17.329	1.560	21.055	
9	18	9.065	5.762	14.827	17.754	16.855	14.760	16.105	1.706	25.295	
10	20	9.098	12.422	21.520	16.855	15.953	12.805	14.760	2.465	53.047	
11	22	12.963	19.793	32.756	15.953	14.666	9.823	12.805	3.775	123.654	
12	24	19.398	29.848	49.246	14.666	12.735	5.328	9.823	5.796	285.430	
Total		194.420	67.825	262.245	Total (n)				Total (m)	783.832	
										Effektive Δtm = m / n	2.989
Position ---	Capacity kW	Capacity ---	Air °C	Glycol °C	Position ---	Air °C	x = Air in- Glckol out y = Air out - Glycol in			2.900	
0	0.000	0.000	32.000	29.100	0.000	32.000	Bullshit Δtm = (x-y) / ln(x/y)			7.407	
1	23.442	0.089	29.680	26.991	0.083	30.395	Factor Bullshit Δtm / effektive Δtm			1.608	
2	45.008	0.172	27.545	25.048	0.167	28.789	Factor effektive Δtm / Bullshit Δtm			0.622	
3	64.877	0.247	25.578	23.255	0.250	27.184					
4	83.216	0.317	23.762	21.599	0.333	25.578					
5	100.167	0.382	22.084	20.067	0.417	23.973					
6	115.856	0.442	20.530	18.647	0.500	22.368					
7	130.399	0.497	19.090	17.329	0.583	20.762					
8	143.896	0.549	17.754	16.105	0.667	19.157					
9	158.723	0.605	16.855	14.760	0.750	17.551					
10	180.243	0.687	15.953	12.805	0.833	15.946					
11	212.999	0.812	14.666	9.823	0.917	14.340					
12	262.245	1.000	12.735	5.328	1.000	12.735					
					0.083	1.605					

Temperature (°C)





Capacity	kW	23.442	----- sensible:	23.442
Surface reserve	%	0.009	latent:	0.000
Present surface	m2	198.019	frost:	0.000
Required surface	m2	198.001		
k-coeff.	W/m2K	46.794		
Average temp. diff. (90.58 %)	K	2.530		

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Air humid (ff = 0.00005 m2K/W)		Inlet	Outlet	Definition
Height over sea level	m			106.000
Pressure	hPa			1000.564
Temp.	°C	32.000	29.680	20.000
Rel. humidity	%	40.000	45.647	40.000
Abs. humidity	g/kg	12.014	12.014	5.858
Density humid	kg/m3	1.134	1.143	1.185
Enthalpy humid	kJ/kg	62.962	60.573	34.992
Volume flow humid	m3/h	31534.040	31294.280	30000.000
Mass flow dry	kg/h	35331.241	35331.241	35331.241
Condensate flow	kg/h		0.000	
Surface temperature	°C	30.057	27.892	
Velocity	m/s	2.076	2.061	1.975
Pressure drop (dry 20 Pa)	Pa		20.470	

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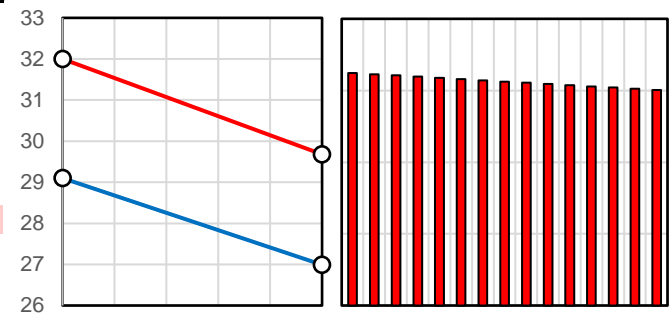
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Plant
Object
Position

25 V% Et.glycol (ff = 0.00005 m2K/W)

Temp. Inlet	°C	26.991
Temp. Outlet	°C	29.100
Temp. Selection	°C	27.761
Density	kg/m3	1034.691
Spec. heat	kJ/kgK	3.751
Heat cond.	W/mK	0.484
Viscosity	Pas	1.540E-03
Mass flow	kg/h	10666.583
Velocity	m/s	1.004
Reynolds	---	7820.834
Pressure drop (T/C = 1.938)	kPa	27.022

Temp. (°C)

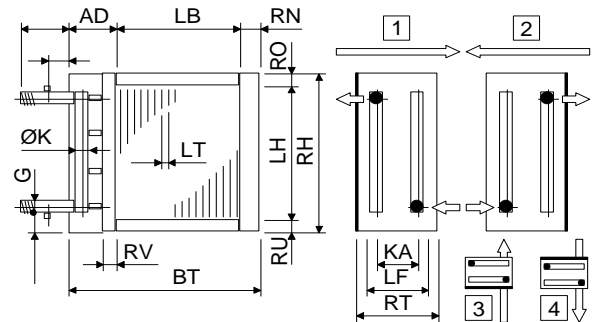


Technical data

Tubes total	Piece	108
Tubes blank	Piece	0
Int. vent./drains	Piece	0
Tube rows on the depth	Piece	2
Tube rows on the height	Piece	54
Tube coupling in series	Piece	4
Number of circuits (NC)	Piece	27
Volume	l	39
Weight	kg	134
Connections	G	2"
Frame height	RH	mm 1680
Frame width	BT	mm 2782
Frame depth	RT	mm 160
Finned height	LH	mm 1620
Finned width	LB	mm 2604
Finned depth	LF	mm 52
Frame on top	RO	mm 30
Frame on bottom	RU	mm 30
Frame in front	RV	mm 30
Frame on back (~53mm)	RN	mm 53
Collector-Diameter	K	mm 54
Collector covering	AD	mm 125
Collector distance	KA	mm 74
Fin spacing	LT	mm 2.500
Fin thickness	LD	mm 0.200
Tube diameter	DA	mm 12.400
Tube diameter	da	mm 12.400
Tube thickness	S	mm 0.400
Tube interval on the height	S1	mm 30.000
Tube interval on the depth	S2	mm 25.981

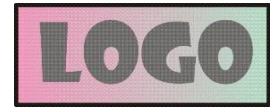


Tubes:	Cu
Tubes:	smooth
Tubes:	staggered
Tubes:	circular
Collectors:	1.40 m/s Cu
Connections:	1.40 m/s Rg7
Fins:	Al
Fins:	Wave structure
Circulations:	1 Default
Frame:	2.0 mm AISI 304
Protection:	without
Protection:	---
Air flow direction:	horizontal



Delivery:	5-6 weeks
Validity:	12 weeks
Condit.:	net, prepaid address
Payment:	30 days net
Price net:	EUR 2269.00

Capacity	kW	21.566	----- sensible:	21.566
Surface reserve	%	0.001	latent:	0.000
Present surface	m ²	198.019	frost:	0.000
Required surface	m ²	198.016		
k-coeff.	W/m ² K	46.315		
Average temp. diff. (90.73 %)	K	2.352		



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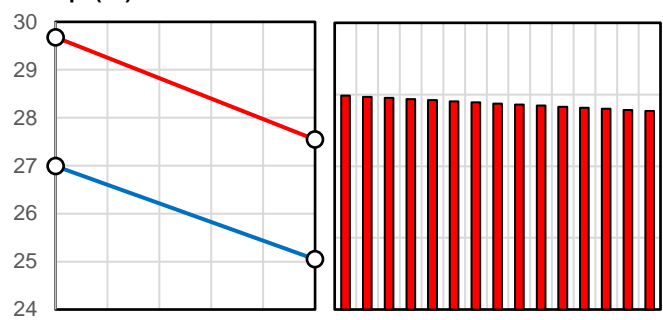
Plant
Object
Position

Air humid (ff = 0.00005 m²K/W)

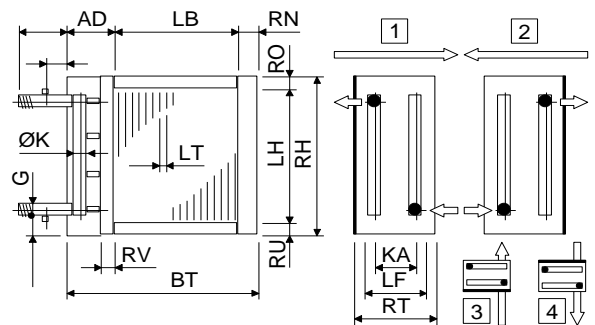
	Inlet	Outlet	Definition
Height over sea level	m		106.000
Pressure	hPa		1000.564
Temp.	°C	29.680	27.545
Rel. humidity	%	45.647	51.649
Abs. humidity	g/kg	12.014	12.014
Density humid	kg/m ³	1.143	1.151
Enthalpy humid	kJ/kg	60.573	58.375
Volume flow humid	m ³ /h	31294.278	31073.676
Mass flow dry	kg/h	35331.241	35331.241
Condensate flow	kg/h		0.000
Surface temperature	°C	27.893	25.898
Velocity	m/s	2.061	2.046
Pressure drop (dry 20 Pa)	Pa		20.305

25 V% Et.glycol (ff = 0.00005 m²K/W)

Temp. Inlet	°C	25.048
Temp. Outlet	°C	26.991
Temp. Selection	°C	25.757
Density	kg/m ³	1035.479
Spec. heat	kJ/kgK	3.746
Heat cond.	W/mK	0.481
Viscosity	Pas	1.617E-03
Mass flow	kg/h	10666.505
Velocity	m/s	1.003
Reynolds	---	7449.698
Pressure drop (T/C = 1.951)	kPa	27.231

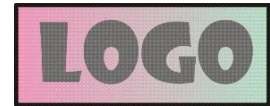
Temp. (°C)**Technical data**

Tubes total	Piece	108	Tubes:	Cu
Tubes blank	Piece	0	Tubes:	smooth
Int. vent./drains	Piece	0	Tubes:	staggered
Tube rows on the depth	Piece	2	Tubes:	circular
Tube rows on the height	Piece	54	Collectors:	1.40 m/s Cu
Tube coupling in series	Piece	4	Connections:	1.40 m/s Rg7
Number of circuits (NC)	Piece	27	Fins:	Al
Volume	l	39	Fins:	Wave structure
Weight	kg	134	Circulations:	1 Default
Connections	G	---	Frame:	2.0 mm AISI 304
Frame height	RH	mm 1680	Protection:	without
Frame width	BT	mm 2782	Protection:	---
Frame depth	RT	mm 160	Air flow direction:	horizontal
Finned height	LH	mm 1620		
Finned width	LB	mm 2604		
Finned depth	LF	mm 52		
Frame on top	RO	mm 30		
Frame on bottom	RU	mm 30		
Frame in front	RV	mm 30		
Frame on back (~53mm)	RN	mm 53		
Collector-Diameter	K	mm 54		
Collector covering	AD	mm 125		
Collector distance	KA	mm 74		
Fin spacing	LT	mm 2.500		
Fin thickness	LD	mm 0.200		
Tube diameter	DA	mm 12.400		
Tube diameter	da	mm 12.400		
Tube thickness	S	mm 0.400		
Tube interval on the height	S1	mm 30.000		
Tube interval on the depth	S2	mm 25.981		



Delivery:	5-6 weeks
Validity:	12 weeks
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Price net:	EUR 2269.00

Capacity	kW	19.869	----- sensible:	19.869
Surface reserve	%	0.020	latent:	0.000
Present surface	m ²	198.019	frost:	0.000
Required surface	m ²	197.978		
k-coeff.	W/m ² K	45.848		
Average temp. diff. (90.87 %)	K	2.189		



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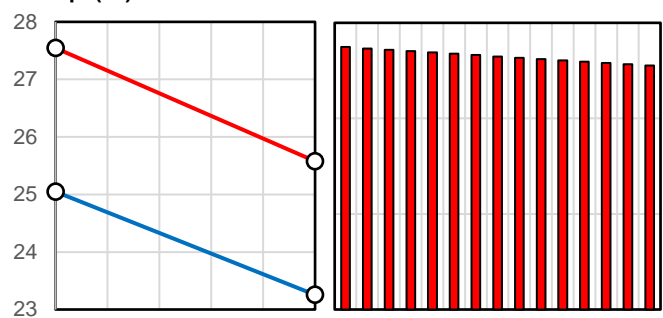
Plant
Object
Position

Air humid (ff = 0.00005 m²K/W)

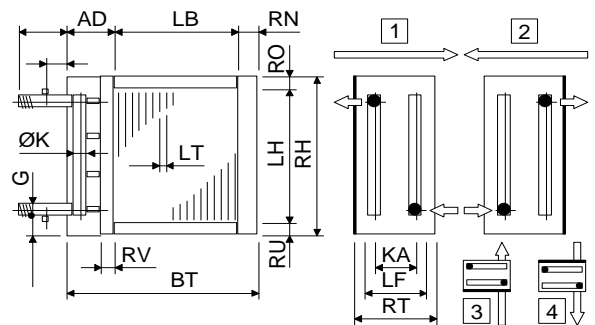
	Inlet	Outlet	Definition
Height over sea level	m		106.000
Pressure	hPa		1000.564
Temp.	°C	27.545	20.000
Rel. humidity	%	51.649	40.000
Abs. humidity	g/kg	12.013	5.858
Density humid	kg/m ³	1.151	1.185
Enthalpy humid	kJ/kg	58.375	34.992
Volume flow humid	m ³ /h	31073.674	30000.000
Mass flow dry	kg/h	35331.241	35331.241
Condensate flow	kg/h		0.000
Surface temperature	°C	25.898	24.059
Velocity	m/s	2.046	1.975
Pressure drop (dry 20 Pa)	Pa		20.154

25 V% Et.glycol (ff = 0.00005 m²K/W)

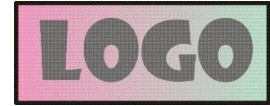
Temp. Inlet	°C	23.255
Temp. Outlet	°C	25.048
Temp. Selection	°C	23.910
Density	kg/m ³	1036.189
Spec. heat	kJ/kgK	3.741
Heat cond.	W/mK	0.479
Viscosity	Pas	1.693E-03
Mass flow	kg/h	10666.608
Velocity	m/s	1.002
Reynolds	---	7115.274
Pressure drop (T/C = 1.963)	kPa	27.433

Temp. (°C)**Technical data**

Tubes total	Piece	108	Tubes:	Cu
Tubes blank	Piece	0	Tubes:	smooth
Int. vent./drains	Piece	0	Tubes:	staggered
Tube rows on the depth	Piece	2	Tubes:	circular
Tube rows on the height	Piece	54	Collectors:	1.40 m/s Cu
Tube coupling in series	Piece	4	Connections:	1.40 m/s Rg7
Number of circuits (NC)	Piece	27	Fins:	Al
Volume	l	39	Fins:	Wave structure
Weight	kg	134	Circulations:	1 Default
Connections	G	2"	Frame:	2.0 mm AISI 304
Frame height	RH	mm 1680	Protection:	without
Frame width	BT	mm 2782	Protection:	---
Frame depth	RT	mm 160	Air flow direction:	horizontal
Finned height	LH	mm 1620		
Finned width	LB	mm 2604		
Finned depth	LF	mm 52		
Frame on top	RO	mm 30		
Frame on bottom	RU	mm 30		
Frame in front	RV	mm 30		
Frame on back (~53mm)	RN	mm 53		
Collector-Diameter	K	mm 54		
Collector covering	AD	mm 125		
Collector distance	KA	mm 74		
Fin spacing	LT	mm 2.500		
Fin thickness	LD	mm 0.200		
Tube diameter	DA	mm 12.400		
Tube diameter	da	mm 12.400		
Tube thickness	S	mm 0.400		
Tube interval on the height	S1	mm 30.000		
Tube interval on the depth	S2	mm 25.981		



Delivery:	5-6 weeks
Validity:	12 weeks
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Capacity	kW	18.339	----- sensible:	18.339
Surface reserve	%	0.007	latent:	0.000
Present surface	m2	198.019	frost:	0.000
Required surface	m2	198.005		
k-coeff.	W/m2K	45.393		
Average temp. diff. (91.01 %)	K	2.040		

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Air humid (ff = 0.00005 m2K/W)		Inlet	Outlet	Definition
Height over sea level	m			106.000
Pressure	hPa			1000.564
Temp.	°C	25.578	23.762	20.000
Rel. humidity	%	57.978	64.605	40.000
Abs. humidity	g/kg	12.014	12.014	5.858
Density humid	kg/m3	1.158	1.165	1.185
Enthalpy humid	kJ/kg	56.351	54.482	34.992
Volume flow humid	m3/h	30870.416	30682.789	30000.000
Mass flow dry	kg/h	35331.241	35331.241	35331.241
Condensate flow	kg/h		0.000	
Surface temperature	°C	24.059	22.359	
Velocity	m/s	2.033	2.020	1.975
Pressure drop (dry 20 Pa)	Pa		20.014	

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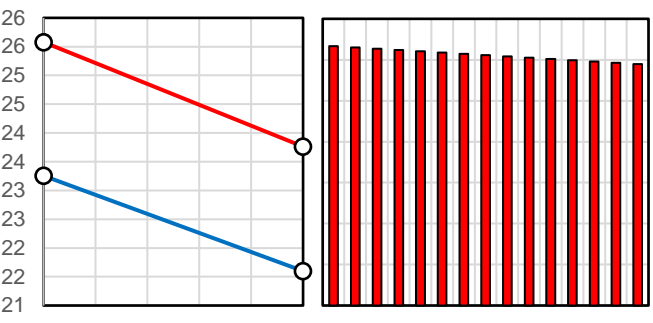
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Plant
Object
Position

25 V% Et.glycol (ff = 0.00005 m2K/W)

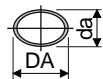
Temp. Inlet	°C	21.599
Temp. Outlet	°C	23.255
Temp. Selection	°C	22.204
Density	kg/m3	1036.830
Spec. heat	kJ/kgK	3.737
Heat cond.	W/mK	0.477
Viscosity	Pas	1.768E-03
Mass flow	kg/h	10666.731
Velocity	m/s	1.002
Reynolds	---	6813.006
Pressure drop (T/C = 1.975)	kPa	27.627

Temp. (°C)

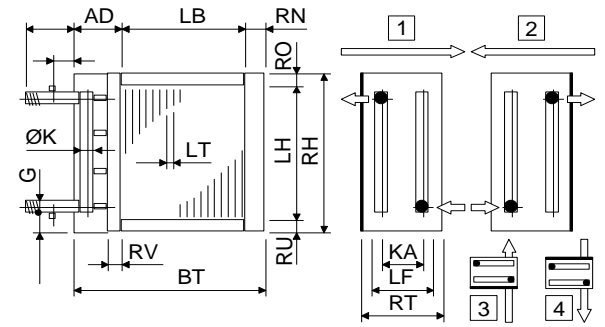


Technical data

Tubes total	Piece	108
Tubes blank	Piece	0
Int. vent./drains	Piece	0
Tube rows on the depth	Piece	2
Tube rows on the height	Piece	54
Tube coupling in series	Piece	4
Number of circuits (NC)	Piece	27
Volume	l	39
Weight	kg	134
Connections	G	2"
Frame height	RH	mm 1680
Frame width	BT	mm 2782
Frame depth	RT	mm 160
Finned height	LH	mm 1620
Finned width	LB	mm 2604
Finned depth	LF	mm 52
Frame on top	RO	mm 30
Frame on bottom	RU	mm 30
Frame in front	RV	mm 30
Frame on back (~53mm)	RN	mm 53
Collector-Diameter	K	mm 54
Collector covering	AD	mm 125
Collector distance	KA	mm 74
Fin spacing	LT	mm 2.500
Fin thickness	LD	mm 0.200
Tube diameter	DA	mm 12.400
Tube diameter	da	mm 12.400
Tube thickness	S	mm 0.400
Tube interval on the height	S1	mm 30.000
Tube interval on the depth	S2	mm 25.981

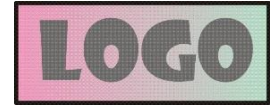


Tubes:	Cu
Tubes:	smooth
Tubes:	staggered
Tubes:	circular
Collectors:	1.40 m/s Cu
Connections:	1.40 m/s Rg7
Fins:	Al
Fins:	Wave structure
Circulations:	1 Default
Frame:	2.0 mm AISI 304
Protection:	without
Protection:	---
Air flow direction:	horizontal



Delivery:	5-6 weeks
Validity:	12 weeks
Condit.:	net, prepaid address
Payment:	30 days net
Price net:	EUR 2269.00

Capacity	kW	16.951	----- sensible:	16.951
Surface reserve	%	0.003	latent:	0.000
Present surface	m ²	198.019	frost:	0.000
Required surface	m ²	198.013		
k-coeff.	W/m ² K	44.950		
Average temp. diff. (91.15 %)	K	1.904		



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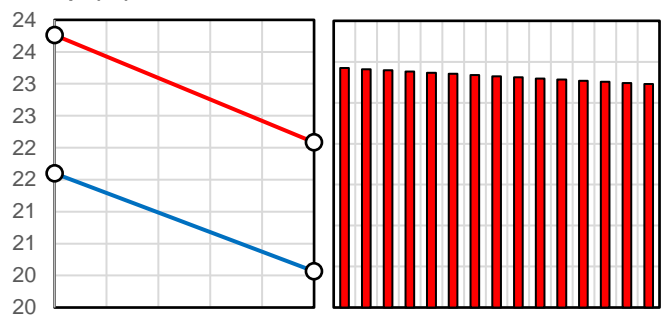
Plant
Object
Position

Air humid (ff = 0.00005 m²K/W)

	Inlet	Outlet	Definition
Height over sea level	m		106.000
Pressure	hPa		1000.564
Temp.	°C	23.762	22.084
Rel. humidity	%	64.605	71.498
Abs. humidity	g/kg	12.014	12.014
Density humid	kg/m ³	1.165	1.172
Enthalpy humid	kJ/kg	54.482	52.755
Volume flow humid	m ³ /h	30682.791	30509.351
Mass flow dry	kg/h	35331.241	35331.241
Condensate flow	kg/h		0.000
Surface temperature	°C	22.359	20.785
Velocity	m/s	2.020	2.009
Pressure drop (dry 20 Pa)	Pa		19.885

25 V% Et.glycol (ff = 0.00005 m²K/W)

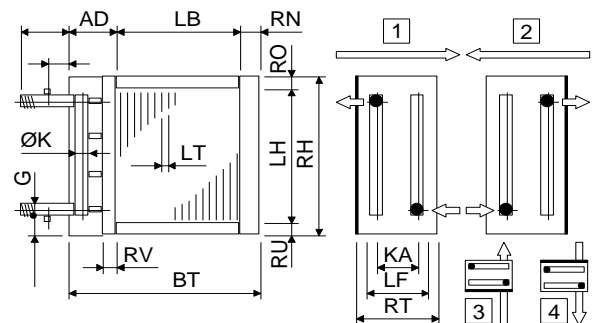
Temp. Inlet	°C	20.067
Temp. Outlet	°C	21.599
Temp. Selection	°C	20.626
Density	kg/m ³	1037.410
Spec. heat	kJ/kgK	3.733
Heat cond.	W/mK	0.475
Viscosity	Pas	1.842E-03
Mass flow	kg/h	10666.668
Velocity	m/s	1.001
Reynolds	---	6538.967
Pressure drop (T/C = 1.986)	kPa	27.812

Temp. (°C)**Technical data**

Tubes total	Piece	108	
Tubes blank	Piece	0	
Int. vent./drains	Piece	0	
Tube rows on the depth	Piece	2	
Tube rows on the height	Piece	54	
Tube coupling in series	Piece	4	
Number of circuits (NC)	Piece	27	
Volume	l	39	
Weight	kg	134	
Connections	G	2"	
Frame height	RH	mm	1680
Frame width	BT	mm	2782
Frame depth	RT	mm	160
Finned height	LH	mm	1620
Finned width	LB	mm	2604
Finned depth	LF	mm	52
Frame on top	RO	mm	30
Frame on bottom	RU	mm	30
Frame in front	RV	mm	30
Frame on back (~53mm)	RN	mm	53
Collector-Diameter	K	mm	54
Collector covering	AD	mm	125
Collector distance	KA	mm	74
Fin spacing	LT	mm	2.500
Fin thickness	LD	mm	0.200
Tube diameter	DA	mm	12.400
Tube diameter	da	mm	12.400
Tube thickness	S	mm	0.400
Tube interval on the height	S1	mm	30.000
Tube interval on the depth	S2	mm	25.981

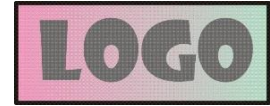


Tubes:	Cu
Tubes:	smooth
Tubes:	staggered
Tubes:	circular
Collectors:	1.40 m/s Cu
Connections:	1.40 m/s Rg7
Fins:	Al
Fins:	Wave structure
Circulations:	1 Default
Frame:	2.0 mm AISI 304
Protection:	without
Protection:	---
Air flow direction:	horizontal



Delivery:	5-6 weeks
Validity:	12 weeks
Condit.:	net, prepaid address
Payment:	30 days net
Price net:	EUR 2269.00

Capacity	kW	15.689	----- sensible:	15.689
Surface reserve	%	0.007	latent:	0.000
Present surface	m ²	198.019	frost:	0.000
Required surface	m ²	198.005		
k-coeff.	W/m ² K	44.521		
Average temp. diff. (91.28 %)	K	1.780		



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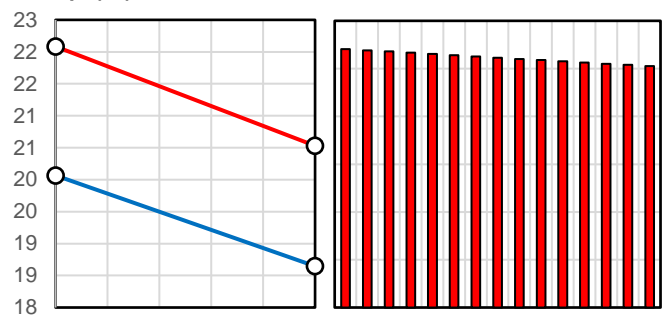
Plant
Object
Position

Air humid (ff = 0.00005 m ² K/W)		Inlet	Outlet	Definition
Height over sea level	m			106.000
Pressure	hPa			1000.564
Temp.	°C	22.084	20.530	20.000
Rel. humidity	%	71.498	78.623	40.000
Abs. humidity	g/kg	12.014	12.014	5.858
Density humid	kg/m ³	1.172	1.178	1.185
Enthalpy humid	kJ/kg	52.755	51.157	34.992
Volume flow humid	m ³ /h	30509.354	30348.811	30000.000
Mass flow dry	kg/h	35331.241	35331.241	35331.241
Condensate flow	kg/h		0.000	
Surface temperature	°C	20.785	19.327	
Velocity	m/s	2.009	1.998	1.975
Pressure drop (dry 20 Pa)	Pa		19.765	

25 V% Et.glycol (ff = 0.00005 m²K/W)

Temp. Inlet	°C	18.647
Temp. Outlet	°C	20.067
Temp. Selection	°C	19.165
Density	kg/m ³	1037.937
Spec. heat	kJ/kgK	3.729
Heat cond.	W/mK	0.474
Viscosity	Pas	1.915E-03
Mass flow	kg/h	10666.561
Velocity	m/s	1.000
Reynolds	---	6290.006
Pressure drop (T/C = 1.996)	kPa	27.989

Temp. (°C)

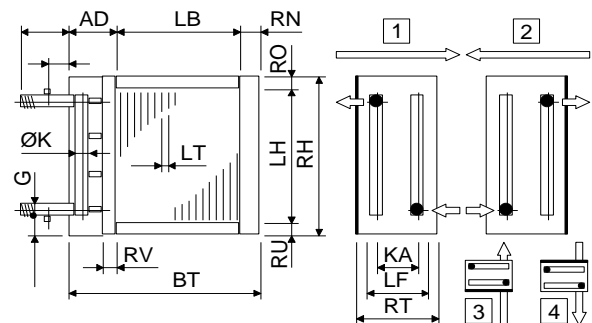


Technical data

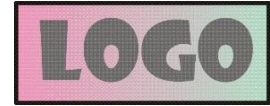
Tubes total	Piece	108
Tubes blank	Piece	0
Int. vent./drains	Piece	0
Tube rows on the depth	Piece	2
Tube rows on the height	Piece	54
Tube coupling in series	Piece	4
Number of circuits (NC)	Piece	27
Volume	l	39
Weight	kg	134
Connections	G	2"
Frame height	RH	mm 1680
Frame width	BT	mm 2782
Frame depth	RT	mm 160
Finned height	LH	mm 1620
Finned width	LB	mm 2604
Finned depth	LF	mm 52
Frame on top	RO	mm 30
Frame on bottom	RU	mm 30
Frame in front	RV	mm 30
Frame on back (~53mm)	RN	mm 53
Collector-Diameter	K	mm 54
Collector covering	AD	mm 125
Collector distance	KA	mm 74
Fin spacing	LT	mm 2.500
Fin thickness	LD	mm 0.200
Tube diameter	DA	mm 12.400
Tube diameter	da	mm 12.400
Tube thickness	S	mm 0.400
Tube interval on the height	S1	mm 30.000
Tube interval on the depth	S2	mm 25.981



Tubes:	Cu
Tubes:	smooth
Tubes:	staggered
Tubes:	circular
Collectors:	1.40 m/s Cu
Connections:	1.40 m/s Rg7
Fins:	Al
Fins:	Wave structure
Circulations:	1 Default
Frame:	2.0 mm AISI 304
Protection:	without
Protection:	---
Air flow direction:	horizontal



Delivery:	5-6 weeks
Validity:	12 weeks
Condit.:	net, prepaid address
Payment:	30 days net
Price net:	EUR 2269.00



Capacity	kW	14.543	----- sensible:	14.543
Surface reserve	%	0.004	latent:	0.000
Present surface	m2	198.019	frost:	0.000
Required surface	m2	198.011		
k-coeff.	W/m2K	44.107		
Average temp. diff. (91.41 %)	K	1.665		

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Air humid (ff = 0.00005 m2K/W)		Inlet	Outlet	Definition
Height over sea level	m			106.000
Pressure	hPa			1000.564
Temp.	°C	20.530	19.090	20.000
Rel. humidity	%	78.623	85.948	40.000
Abs. humidity	g/kg	12.014	12.014	5.858
Density humid	kg/m3	1.178	1.184	1.185
Enthalpy humid	kJ/kg	51.157	49.675	34.992
Volume flow humid	m3/h	30348.811	30199.991	30000.000
Mass flow dry	kg/h	35331.241	35331.241	35331.241
Condensate flow	kg/h		0.000	
Surface temperature	°C	19.327	17.974	
Velocity	m/s	1.998	1.989	1.975
Pressure drop (dry 20 Pa)	Pa		19.655	

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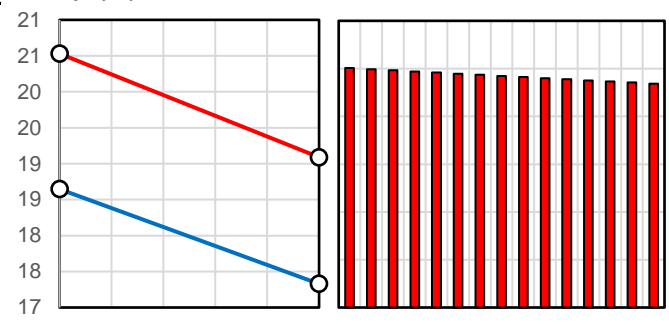
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Plant
Object
Position

25 V% Et.glycol (ff = 0.00005 m2K/W)

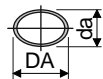
Temp. Inlet	°C	17.329
Temp. Outlet	°C	18.647
Temp. Selection	°C	17.810
Density	kg/m3	1038.415
Spec. heat	kJ/kgK	3.726
Heat cond.	W/mK	0.472
Viscosity	Pas	1.987E-03
Mass flow	kg/h	10666.651
Velocity	m/s	1.000
Reynolds	---	6063.436
Pressure drop (T/C = 2.006)	kPa	28.160

Temp. (°C)

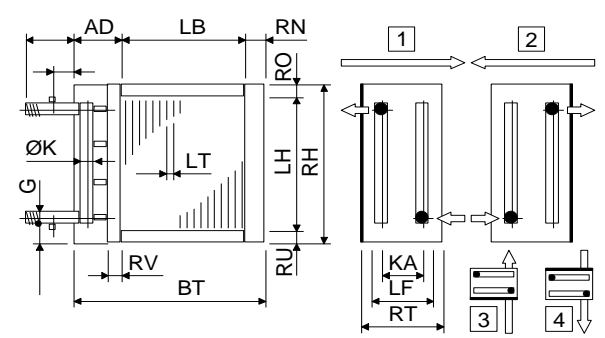


Technical data

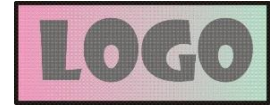
Tubes total	Piece	108
Tubes blank	Piece	0
Int. vent./drains	Piece	0
Tube rows on the depth	Piece	2
Tube rows on the height	Piece	54
Tube coupling in series	Piece	4
Number of circuits (NC)	Piece	27
Volume	l	39
Weight	kg	134
Connections	G	2"
Frame height	RH	mm 1680
Frame width	BT	mm 2782
Frame depth	RT	mm 160
Finned height	LH	mm 1620
Finned width	LB	mm 2604
Finned depth	LF	mm 52
Frame on top	RO	mm 30
Frame on bottom	RU	mm 30
Frame in front	RV	mm 30
Frame on back (~53mm)	RN	mm 53
Collector-Diameter	K	mm 54
Collector covering	AD	mm 125
Collector distance	KA	mm 74
Fin spacing	LT	mm 2.500
Fin thickness	LD	mm 0.200
Tube diameter	DA	mm 12.400
Tube diameter	da	mm 12.400
Tube thickness	S	mm 0.400
Tube interval on the height	S1	mm 30.000
Tube interval on the depth	S2	mm 25.981



Tubes:	Cu
Tubes:	smooth
Tubes:	staggered
Tubes:	circular
Collectors:	1.40 m/s Cu
Connections:	1.40 m/s Rg7
Fins:	Al
Fins:	Wave structure
Circulations:	1 Default
Frame:	2.0 mm AISI 304
Protection:	without
Protection:	---
Air flow direction:	horizontal



Delivery:	5-6 weeks
Validity:	12 weeks
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Capacity	kW	13.497	----- sensible:	13.497
Surface reserve	%	0.008	latent:	0.000
Present surface	m2	198.019	frost:	0.000
Required surface	m2	198.003		
k-coeff.	W/m2K	43.706		
Average temp. diff. (91.53 %)	K	1.560		

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Air humid (ff = 0.00005 m2K/W)		Inlet	Outlet	Definition
Height over sea level	m			106.000
Pressure	hPa			1000.564
Temp.	°C	19.090	17.754	20.000
Rel. humidity	%	85.948	93.438	40.000
Abs. humidity	g/kg	12.014	12.014	5.858
Density humid	kg/m3	1.184	1.189	1.185
Enthalpy humid	kJ/kg	49.675	48.300	34.992
Volume flow humid	m3/h	30199.994	30061.870	30000.000
Mass flow dry	kg/h	35331.241	35331.241	35331.241
Condensate flow	kg/h		0.000	
Surface temperature	°C	17.974	16.717	
Velocity	m/s	1.989	1.980	1.975
Pressure drop (dry 20 Pa)	Pa		19.552	

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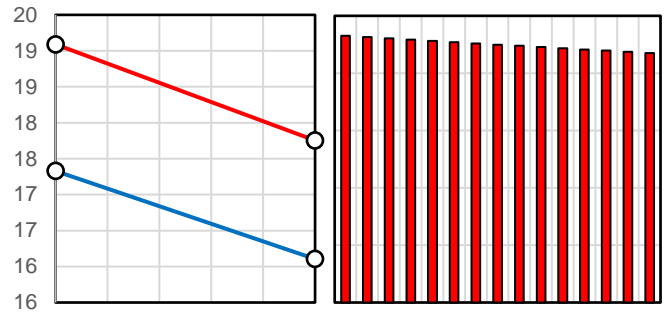
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Plant
Object
Position

25 V% Et.glycol (ff = 0.00005 m2K/W)

Temp. Inlet	°C	16.105
Temp. Outlet	°C	17.329
Temp. Selection	°C	16.552
Density	kg/m3	1038.852
Spec. heat	kJ/kgK	3.722
Heat cond.	W/mK	0.470
Viscosity	Pas	2.057E-03
Mass flow	kg/h	10666.566
Velocity	m/s	1.000
Reynolds	---	5856.593
Pressure drop (T/C = 2.015)	kPa	28.322

Temp. (°C)

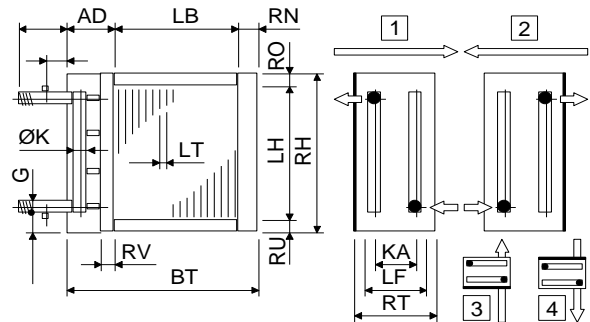


Technical data

Tubes total	Piece	108
Tubes blank	Piece	0
Int. vent./drains	Piece	0
Tube rows on the depth	Piece	2
Tube rows on the height	Piece	54
Tube coupling in series	Piece	4
Number of circuits (NC)	Piece	27
Volume	l	39
Weight	kg	134
Connections	G	2"
Frame height	RH	mm 1680
Frame width	BT	mm 2782
Frame depth	RT	mm 160
Finned height	LH	mm 1620
Finned width	LB	mm 2604
Finned depth	LF	mm 52
Frame on top	RO	mm 30
Frame on bottom	RU	mm 30
Frame in front	RV	mm 30
Frame on back (~53mm)	RN	mm 53
Collector-Diameter	K	mm 54
Collector covering	AD	mm 125
Collector distance	KA	mm 74
Fin spacing	LT	mm 2.500
Fin thickness	LD	mm 0.200
Tube diameter	DA	mm 12.400
Tube diameter	da	mm 12.400
Tube thickness	S	mm 0.400
Tube interval on the height	S1	mm 30.000
Tube interval on the depth	S2	mm 25.981

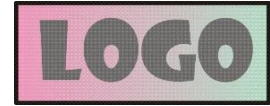


Tubes:	Cu
Tubes:	smooth
Tubes:	staggered
Tubes:	circular
Collectors:	1.40 m/s Cu
Connections:	1.40 m/s Rg7
Fins:	Al
Fins:	Wave structure
Circulations:	1 Default
Frame:	2.0 mm AISI 304
Protection:	without
Protection:	---
Air flow direction:	horizontal



Delivery:	5-6 weeks
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Price net:	EUR 2269.00

Capacity	kW	14.828	----- sensible:	9.065
Surface reserve	%	0.009	latent:	5.762
Present surface	m ²	198.019	frost:	0.000
Required surface	m ²	198.001		
k-coeff.	W/m ² K	43.900		
Average temp. diff. (91.58 %)	K	1.706		



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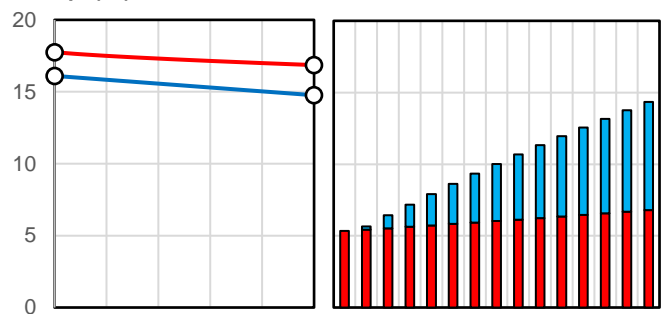
Plant
Object
Position

Air humid (ff = 0.00005 m²K/W)

	Inlet	Outlet	Definition
Height over sea level	m		106.000
Pressure	hPa		1000.564
Temp.	°C	17.754	16.855
Rel. humidity	%	93.438	97.010
Abs. humidity	g/kg	12.014	11.782
Density humid	kg/m ³	1.189	1.193
Enthalpy humid	kJ/kg	48.300	46.789
Volume flow humid	m ³ /h	30061.869	29958.100
Mass flow dry	kg/h	35331.241	35331.241
Condensate flow	kg/h		8.189
Surface temperature	°C	16.726	15.560
Velocity	m/s	1.980	1.973
Pressure drop (dry 20 Pa)	Pa		22.944

25 V% Et.glycol (ff = 0.00005 m²K/W)

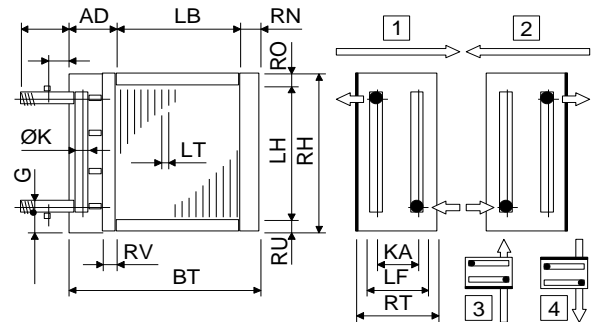
Temp. Inlet	°C	14.760
Temp. Outlet	°C	16.106
Temp. Selection	°C	15.251
Density	kg/m ³	1039.295
Spec. heat	kJ/kgK	3.719
Heat cond.	W/mK	0.469
Viscosity	Pas	2.133E-03
Mass flow	kg/h	10666.283
Velocity	m/s	0.999
Reynolds	---	5646.241
Pressure drop (T/C = 2.025)	kPa	28.493

Temp. (°C)**Technical data**

Tubes total	Piece	108
Tubes blank	Piece	0
Int. vent./drains	Piece	0
Tube rows on the depth	Piece	2
Tube rows on the height	Piece	54
Tube coupling in series	Piece	4
Number of circuits (NC)	Piece	27
Volume	l	39
Weight	kg	134
Connections	G	---
Frame height	RH	mm
Frame width	BT	mm
Frame depth	RT	mm
Finned height	LH	mm
Finned width	LB	mm
Finned depth	LF	mm
Frame on top	RO	mm
Frame on bottom	RU	mm
Frame in front	RV	mm
Frame on back (~53mm)	RN	mm
Collector-Diameter	K	mm
Collector covering	AD	mm
Collector distance	KA	mm
Fin spacing	LT	mm
Fin thickness	LD	mm
Tube diameter	DA	mm
Tube diameter	da	mm
Tube thickness	S	mm
Tube interval on the height	S1	mm
Tube interval on the depth	S2	mm

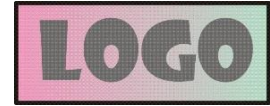


Tubes:	Cu
Tubes:	smooth
Tubes:	staggered
Tubes:	circular
Collectors:	1.40 m/s
Connections:	1.40 m/s
Fins:	Al
Fins:	Wave structure
Circulations:	1
Frame:	2.0 mm
Protection:	without
Protection:	---
Air flow direction:	horizontal



Delivery:	5-6 weeks
Validity:	12 weeks
Condit.:	net, prepaid address
Payment:	30 days net
Price net:	EUR 2269.00

Capacity	kW	21.520	----- sensible:	9.098
Surface reserve	%	0.003	latent:	12.422
Present surface	m ²	198.019	frost:	0.000
Required surface	m ²	198.013		
k-coeff.	W/m ² K	44.091		
Average temp. diff. (95.31 %)	K	2.465		



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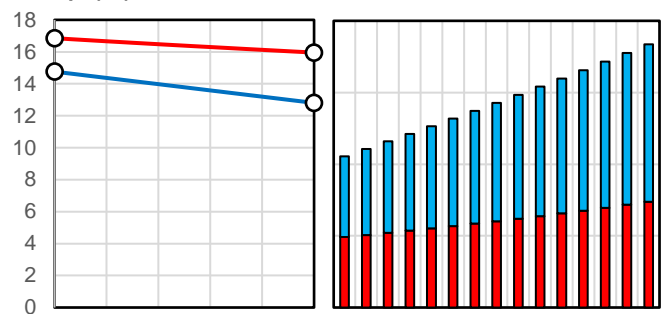
Plant
Object
Position

Air humid (ff = 0.00005 m ² K/W)		Inlet	Outlet	Definition
Height over sea level	m			106.000
Pressure	hPa			1000.564
Temp.	°C	16.855	15.953	20.000
Rel. humidity	%	97.010	98.448	40.000
Abs. humidity	g/kg	11.782	11.282	5.858
Density humid	kg/m ³	1.193	1.197	1.185
Enthalpy humid	kJ/kg	46.789	44.596	34.992
Volume flow humid	m ³ /h	29958.098	29841.341	30000.000
Mass flow dry	kg/h	35331.241	35331.241	35331.241
Condensate flow	kg/h		17.665	
Surface temperature	°C	15.574	14.056	
Velocity	m/s	1.973	1.965	1.975
Pressure drop (dry 19 Pa)	Pa		25.864	

25 V% Et.glycol (ff = 0.00005 m²K/W)

Temp. Inlet	°C	12.805
Temp. Outlet	°C	14.760
Temp. Selection	°C	13.518
Density	kg/m ³	1039.873
Spec. heat	kJ/kgK	3.715
Heat cond.	W/mK	0.466
Viscosity	Pas	2.242E-03
Mass flow	kg/h	10666.306
Velocity	m/s	0.999
Reynolds	---	5372.122
Pressure drop (T/C = 2.039)	kPa	28.730

Temp. (°C)

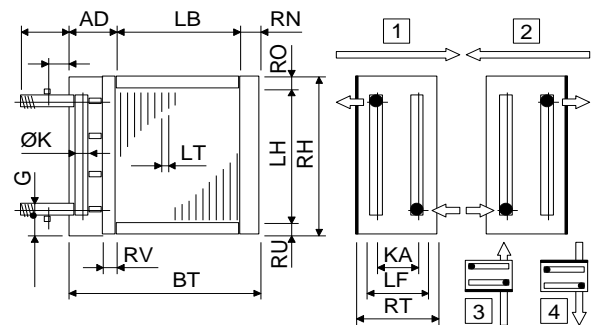


Technical data

Tubes total	Piece	108
Tubes blank	Piece	0
Int. vent./drains	Piece	0
Tube rows on the depth	Piece	2
Tube rows on the height	Piece	54
Tube coupling in series	Piece	4
Number of circuits (NC)	Piece	27
Volume	l	39
Weight	kg	134
Connections	G	2"
Frame height	RH	mm 1680
Frame width	BT	mm 2782
Frame depth	RT	mm 160
Finned height	LH	mm 1620
Finned width	LB	mm 2604
Finned depth	LF	mm 52
Frame on top	RO	mm 30
Frame on bottom	RU	mm 30
Frame in front	RV	mm 30
Frame on back (~53mm)	RN	mm 53
Collector-Diameter	K	mm 54
Collector covering	AD	mm 125
Collector distance	KA	mm 74
Fin spacing	LT	mm 2.500
Fin thickness	LD	mm 0.200
Tube diameter	DA	mm 12.400
Tube diameter	da	mm 12.400
Tube thickness	S	mm 0.400
Tube interval on the height	S1	mm 30.000
Tube interval on the depth	S2	mm 25.981

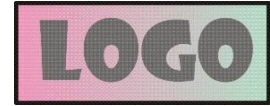


Tubes:	Cu
Tubes:	smooth
Tubes:	staggered
Tubes:	circular
Collectors:	1.39 m/s Cu
Connections:	1.39 m/s Rg7
Fins:	Al
Fins:	Wave structure
Circulations:	1 Default
Frame:	2.0 mm AISI 304
Protection:	without
Protection:	---
Air flow direction:	horizontal



Delivery:	5-6 weeks
Validity:	12 weeks
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Capacity	kW	32.756	----- sensible:	12.963
Surface reserve	%	0.003	latent:	19.793
Present surface	m ²	198.019	frost:	0.000
Required surface	m ²	198.013		
k-coeff.	W/m ² K	43.817		
Average temp. diff. (95.94 %)	K	3.775		



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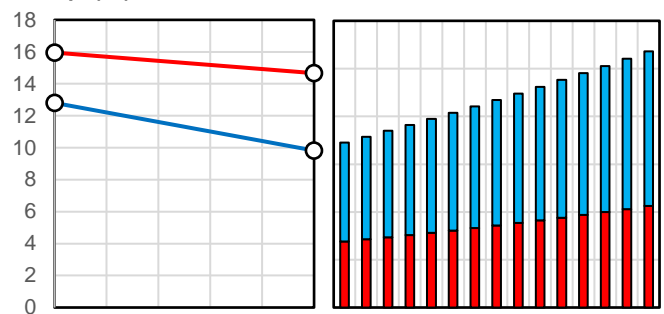
Plant
Object
Position

Air humid (ff = 0.00005 m ² K/W)		Inlet	Outlet	Definition
Height over sea level	m			106.000
Pressure	hPa			1000.564
Temp.	°C	15.953	14.666	20.000
Rel. humidity	%	98.448	99.480	40.000
Abs. humidity	g/kg	11.282	10.485	5.858
Density humid	kg/m ³	1.197	1.203	1.185
Enthalpy humid	kJ/kg	44.596	41.258	34.992
Volume flow humid	m ³ /h	29841.340	29671.065	30000.000
Mass flow dry	kg/h	35331.241	35331.241	35331.241
Condensate flow	kg/h		28.165	
Surface temperature	°C	14.074	11.848	
Velocity	m/s	1.965	1.954	1.975
Pressure drop (dry 19 Pa)	Pa		26.355	

25 V% Et.glycol (ff = 0.00005 m²K/W)

Temp. Inlet	°C	9.823
Temp. Outlet	°C	12.805
Temp. Selection	°C	10.911
Density	kg/m ³	1040.715
Spec. heat	kJ/kgK	3.708
Heat cond.	W/mK	0.463
Viscosity	Pas	2.422E-03
Mass flow	kg/h	10666.817
Velocity	m/s	0.998
Reynolds	---	4972.550
Pressure drop (T/C = 2.061)	kPa	29.108

Temp. (°C)

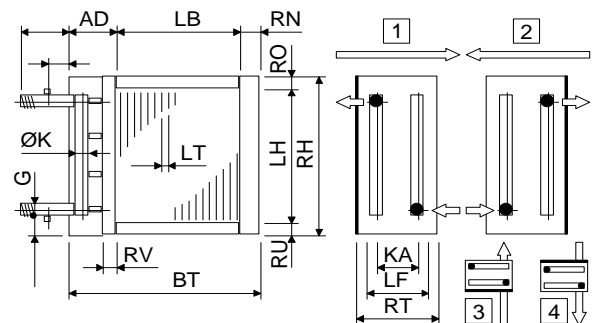


Technical data

Tubes total	Piece	108
Tubes blank	Piece	0
Int. vent./drains	Piece	0
Tube rows on the depth	Piece	2
Tube rows on the height	Piece	54
Tube coupling in series	Piece	4
Number of circuits (NC)	Piece	27
Volume	l	39
Weight	kg	134
Connections	G	2"
Frame height	RH	mm 1680
Frame width	BT	mm 2782
Frame depth	RT	mm 160
Finned height	LH	mm 1620
Finned width	LB	mm 2604
Finned depth	LF	mm 52
Frame on top	RO	mm 30
Frame on bottom	RU	mm 30
Frame in front	RV	mm 30
Frame on back (~53mm)	RN	mm 53
Collector-Diameter	K	mm 54
Collector covering	AD	mm 125
Collector distance	KA	mm 74
Fin spacing	LT	mm 2.500
Fin thickness	LD	mm 0.200
Tube diameter	DA	mm 12.400
Tube diameter	da	mm 12.400
Tube thickness	S	mm 0.400
Tube interval on the height	S1	mm 30.000
Tube interval on the depth	S2	mm 25.981



Tubes:	Cu
Tubes:	smooth
Tubes:	staggered
Tubes:	circular
Collectors:	1.39 m/s Cu
Connections:	1.39 m/s Rg7
Fins:	Al
Fins:	Wave structure
Circulations:	1 Default
Frame:	2.0 mm AISI 304
Protection:	without
Protection:	---
Air flow direction:	horizontal



Delivery:	5-6 weeks
Validity:	12 weeks
Condit.:	net, prepaid address
Payment:	30 days net
Price net:	EUR 2269.00



Capacity	kW	49.246	----- sensible:	19.398
Surface reserve	%	0.003	latent:	29.848
Present surface	m ²	198.019	frost:	0.000
Required surface	m ²	198.012		
k-coeff.	W/m ² K	42.908		
Average temp. diff. (96.06 %)	K	5.796		

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Air humid (ff = 0.00005 m ² K/W)		Inlet	Outlet	Definition
Height over sea level	m			106.000
Pressure	hPa			1000.564
Temp.	°C	14.666	12.735	20.000
Rel. humidity	%	99.480	100.000	40.000
Abs. humidity	g/kg	10.485	9.281	5.858
Density humid	kg/m ³	1.203	1.212	1.185
Enthalpy humid	kJ/kg	41.258	36.241	34.992
Volume flow humid	m ³ /h	29671.066	29415.967	30000.000
Mass flow dry	kg/h	35331.241	35331.241	35331.241
Condensate flow	kg/h		42.513	
Surface temperature	°C	11.881	8.669	
Velocity	m/s	1.954	1.937	1.975
Pressure drop (dry 19 Pa)	Pa		26.274	

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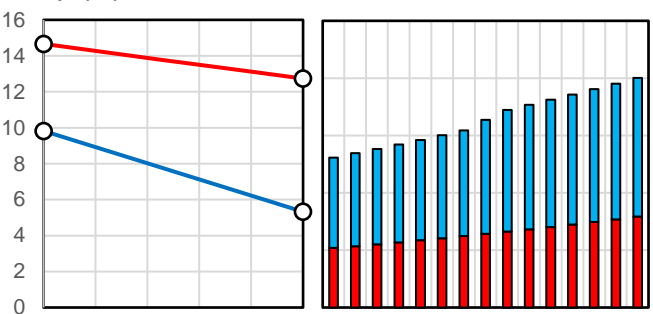
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Plant
Object
Position

25 V% Et.glycol (ff = 0.00005 m²K/W)

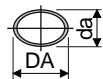
Temp. Inlet	°C	5.328
Temp. Outlet	°C	9.823
Temp. Selection	°C	6.969
Density	kg/m ³	1041.925
Spec. heat	kJ/kgK	3.698
Heat cond.	W/mK	0.458
Viscosity	Pas	2.739E-03
Mass flow	kg/h	10666.648
Velocity	m/s	0.997
Reynolds	---	4396.859
Pressure drop (T/C = 2.103)	kPa	29.787

Temp. (°C)

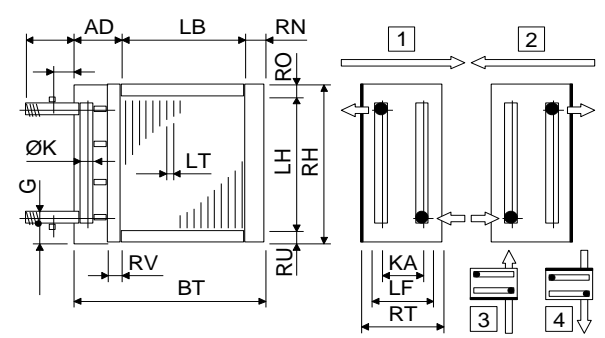


Technical data

Tubes total	Piece	108
Tubes blank	Piece	0
Int. vent./drains	Piece	0
Tube rows on the depth	Piece	2
Tube rows on the height	Piece	54
Tube coupling in series	Piece	4
Number of circuits (NC)	Piece	27
Volume	l	39
Weight	kg	134
Connections	G	2"
Frame height	RH	mm 1680
Frame width	BT	mm 2782
Frame depth	RT	mm 160
Finned height	LH	mm 1620
Finned width	LB	mm 2604
Finned depth	LF	mm 52
Frame on top	RO	mm 30
Frame on bottom	RU	mm 30
Frame in front	RV	mm 30
Frame on back (~53mm)	RN	mm 53
Collector-Diameter	K	mm 54
Collector covering	AD	mm 125
Collector distance	KA	mm 74
Fin spacing	LT	mm 2.500
Fin thickness	LD	mm 0.200
Tube diameter	DA	mm 12.400
Tube diameter	da	mm 12.400
Tube thickness	S	mm 0.400
Tube interval on the height	S1	mm 30.000
Tube interval on the depth	S2	mm 25.981



Tubes:	Cu
Tubes:	smooth
Tubes:	staggered
Tubes:	circular
Collectors:	1.39 m/s Cu
Connections:	1.39 m/s Rg7
Fins:	Al
Fins:	Wave structure
Circulations:	1 Default
Frame:	2.0 mm AISI 304
Protection:	without
Protection:	---
Air flow direction:	horizontal



Delivery:	5-6 weeks
Validity:	12 weeks
Condit.:	net, prepaid address
Payment:	30 days net
Price net:	EUR 2269.00