Italian mafiosi air conditioning

In Turin, for example, at 231 meters above sea level, there is a demand for fresh air of 30,000 m3/h in a hospital all year round, although only integrated circular systems are permitted for energy recovery in hospitals, which is prescribed throughout the EU.

EU regulations also require a minimum temperature efficiency of 70% and a maximum speed of 2.0 m/s for energy recovery, based on the finned inflow area of the heat exchangers.

Nevertheless, air conditioning units can be found in Italy, that do not include energy recovery and the airside speeds are massively exceeded. Why is that? Because certain planning engineers in this country don't care about the EU regulations, they don't give a bullshit about.

In addition, although they sit in the EU, they orient themselves towards the USA in terms of guidelines, but only partially. ASHRAE (American Society of Heating, Refrigerating, Air-Conditioning Engineers). AHRI (Air-Conditioning, Heating, Refrigeration Institute). ASHRAE defines technical standards and guidelines for buildings. AHRI is a manufacturers' association, that tests and ensures the performance of these devices through certification programs.

If one were consistent in Italy, one would have to use the USA units instead of the SI units, for example not °C, but °F and not kW, but BTU/h.

Let's start, for example, with the Italian manufacturers of fin coil heat exchangers, who produce fins of 0.1 mm that are much too thin and have to emboss them so strongly, that minimal stability is achieved, which results in far too high pressure drops and thus also far too high operating costs.

The same applies to air coolers on the water side, where far too high pressure drops are expected. The fact, that such thin fins cannot be cleaned with high-pressure devices without irreversible damage to the fins has been proven all too often in practice.

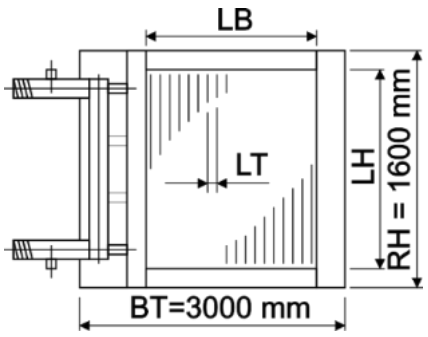
Furthermore, there seems to be a real competition regarding the manipulation of the k-values among these producers, which has nothing to do with measurements in neutral laboratories. This lousy clientele doesn't care, whether the performance is achieved or not, always in the hope, that no remeasurements will be taken.

Why this Italian misery? Because there are far too many producers of fin coil heat exchangers in Italy, who want to undercut each other in terms of price, their customers, i.e. the brain amputee buyers of manufacturers of air handling units, only look at the price!

Let's continue, for example, with the Italian manufacturers of air handling units, of which there are also far too many, who therefore also want to undercut each other in terms of price, since their clientele, i.e. far too many brain amputee planning engineers, only looks at the price, in order to then put this bullshit out to tender!

Which brings us to the end users, who then have to find out, that the fin coil heat exchangers do not reach the guaranteed performance, the operating costs are astronomical and thus amortization is impossible.

Here is just a small example of a conventional air cooler, which was requested as follows: Installation site Turin (231 meters above sea level), air volume 30,000 m3/h at 20°C/40%, air from 24°C/95% to 12°C/100%. Water from 6°C to 12°C, frame height RH = 1600 mm, frame width including collectors BT = 3000 mm. On average, you have to wait 2 to 3 weeks, until an offer is delivered, which then contains only incomplete data, as these miserable Italian mafiosi producers do not want to announce too much. In addition, some of these Italian mafiosi producers do not offer, what we want, for example, that the air cooler would not cool to the required 12°C, but even to 11.23°C, which means, that the required performance is not right.



Italian mafiosi producers offer galvanized steel frames with a condensation rate of 327 liters per hour or 5.45 liters per minute. You can already watch the frame rust in the first week of operation!

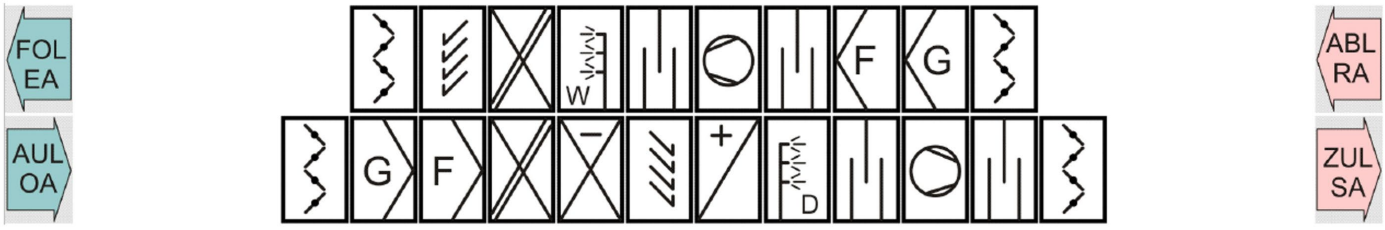
In order to find out, how much or how little area the offer contains, in order to calculate the upwardly manipulated k-values, or how thin the tubes and fins are, it is sometimes necessary, to ask with several e-mails. Only then does it become clear, what unreasonable bullshit was offered. **Eurovent performance-tested, what a mockery!**

This average cost of a simple air cooler alone shows the insanity of the disastrous Italian mafiosi behavior of the producers of fin coil heat exchangers.

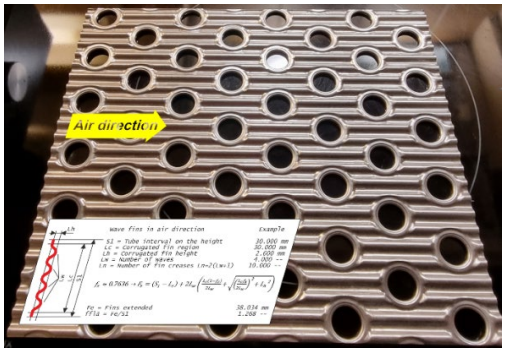
If you make the same calculations about the air handling unit, even laymen can see, what bullshit you have in your system, far too high operating costs and an energy recovery system, instead of the required temperature efficiency of 70%, only their measly 45%! Smeared by the Italian mafiosi air conditioning industry thanks to brain amputee buyers and planning engineers, who suffer from whale syndrome: Small brain, huge snout and all the power in the tail!

Heat exchanger producer	**---**	**TPS-IMP**	**Walter Roller**	**Italian mafiosi 1**	**Italian mafiosi 2**	**Italian mafiosi 3**
Heigh over sea level	m	231.00	231.00	0.00	0.00	0.00
Air pressure	hPa	985.73	985.73	1'013.25	1'013.25	1'013.25
Capacity	kW	349.82	349.82	343.97	341.58	343.97
Present surface	m2	565.18	820.83	**1'037.70**	**560.43**	**497.15**
Required surface	m2	558.20	805.08	**1'087.95**	**812.30**	**1063.05**
Average temp. diff.	K	8.58	8.58	8.58	8.00	8.40
k-value according producer	W/m2K	73.08	50.67	**38.63**	**76.19**	**85.37**
k-value according ZCS	W/m2K	73.08	50.67	**36.37**	**52.17**	**38.51**
Surface reserve	%	+1.25	+1.96	**-3.48**	**-31.01**	**-53.23**
Air volume flow	m3/h	30'000.00	30'000.00	30'000.00	30'000.00	30'000.00
Air inlet	---	24°C/95%	24°C/95%	24°C/90%	24°C/95%	24°C/95%
Air outlet	---	12°C/100%	12°C/100%	12°C/100%	12°C/100%	12°C/100%
Air velocity	m/s	2.00	2.00	**2.66**	**2.54**	2.06
Air pressure drop	Pa	73.14	112.08	**567.21**	**194.85**	108.04
Condensate flow	kg/h	326.96	326.96	316.18	316.8	318.19
Water inlet	°C	6.00	6.00	6.00	7.00	6.00
Water outlet	°C	12.00	12.00	12.00	12.00	12.00
Water volume flow	m3/h	50.03	50.03	49.85	58.64	49.19
Pressure drop acc. producer	kPa	37.08	20.51	**35.10**	**34.74**	**9.00**
Pressure drop acc. ZCS	kPa	37.08	20.51	**46.75**	**40.02**	**18.29**
Fin type	---	sinusoidal	smooth	ribbed	ribbed	ribbed
Fin structure to the air	---	parallel	---	cross	cross	cross
Aluminum fin thickness	mm	0.20	0.20	**0.10**	**0.11**	**0.10**
Copper tube thickness	mm	0.35	0.40	0.35	0.35	0.35
Frame material	---	AISI 304	AISI 304	**???**	**FeZn**	**FeZn**
Frame height	mm	1'600.00	1'600.00	1'660.00	1'500.00	1'560.00
Frame width	mm	3'000.00	3'000.00	2'192.00	2'512.00	2'932.00
Weight empty	kg	344.00	442.00	376.00	264.00	222.00
Prix net	EUR	6'222.00	7'211.00	6'348.00	5'573.00	4'439.00
Efficiency pomp & fan	%	70.00	70.00	70.00		
Operation time	h/a	8'760.00	8'760.00	8'760.00	**Due to the fact, that heat exchangers are far too small and never achieve the required output, a profitability calculation is really impossible.**	
Electro energy demand	MWh	14.08	15.26	**67.25**		
Electro price	EUR/MWh	100.00	100.00	100.00		
Operating costs	EUR/a	1'407.62	1'525.53	**6'725.21**		
Costs on 15 years	EUR	27'336.27	30'093.97	**101'227.68**		
Operation costs	EUR/a	1'822.42	2'006.26	**7'148.51**		

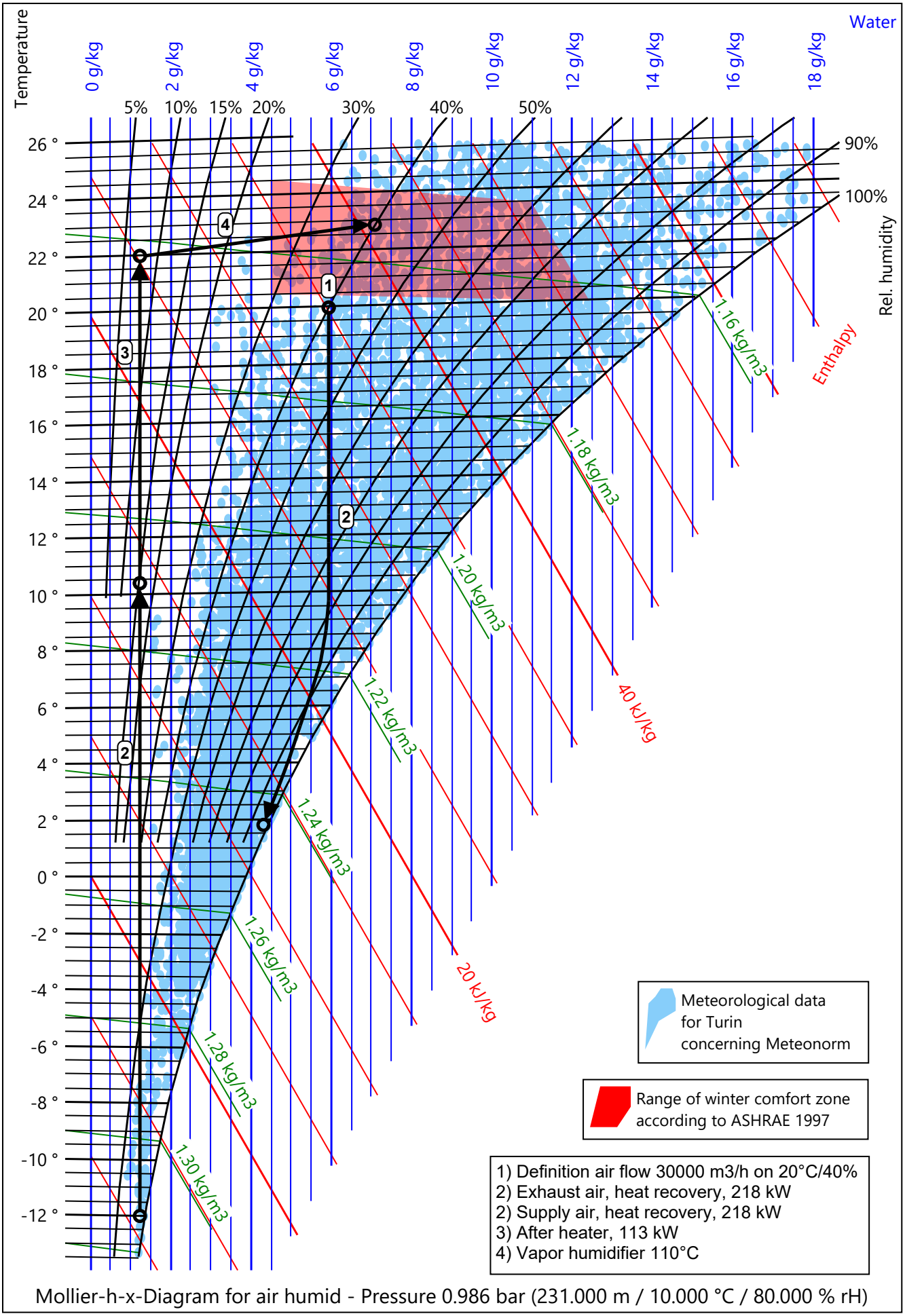
Therefore, the following is a serious calculation, as is standard in Germany and Switzerland, for example. Planning engineers with whale syndrome can stop reading here! First of all, all the necessary components for the air handling unit are put together, which can be carried out in the project phase with the AHH-AHU software via drag and drop in a few minutes. Steam humidification was chosen for humidifying the supply air in winter because it was already available on the system. For adiabatic high-pressure humidification of the exhaust air in summer, the water must be demineralized, otherwise a humidity of 100% cannot be achieved.



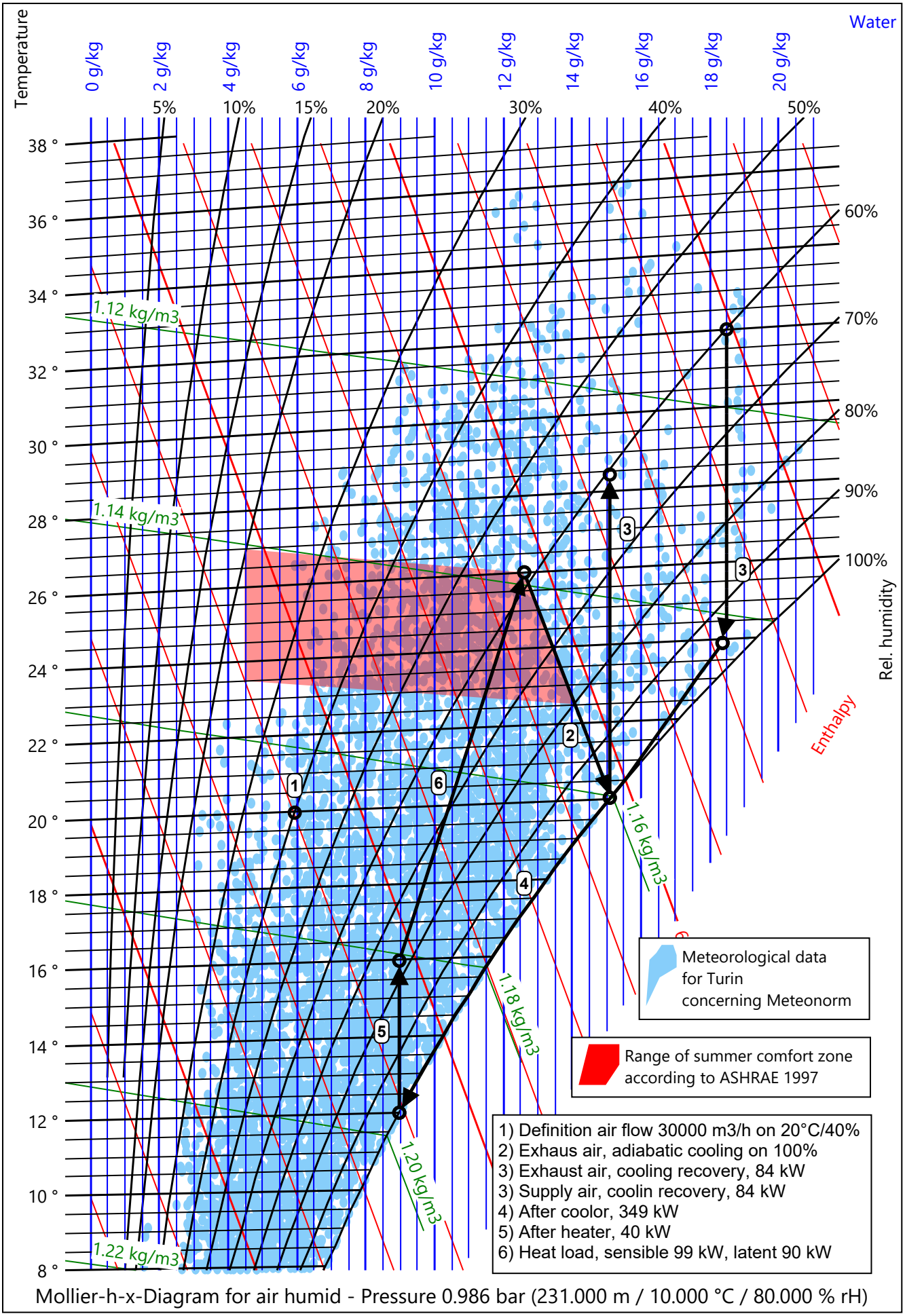
A reputable product in every respect, regarding fin coil heat exchangers, is the one from www.walterroller.de in Germany, type-tested by TUEV South in Munich. Unfortunately, it is still not possible to offer sinusoidal fins with high embossing in the direction of air. In order to achieve efficiencies of 70%, more than 12 tube rows are therefore required and these must be split into 2 packages, as a result of the requirement of the VDI 6022 guideline, which has a negative impact on the price and installation depth. We have therefore calculated the energy recovery with the also absolutely reputable products of the company www.tps-imp.si in Slovenia, which has been able to produce this for several years and is therefore very successful in Germany and Switzerland.



This is followed by several pages with the Mollier-HX-Diagrams for winter and summer, the calculations of energy recovery in winter and summer and its amortization in 2 years, as well as the air heater.



Mollier-h-x-Diagram for air humid - Pressure 0.986 bar (231.000 m / 10.000 °C / 80.000 % rH)



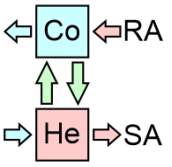
Mollier-h-x-Diagram for air humid - Pressure 0.986 bar (231.000 m / 10.000 °C / 80.000 % rH)

CC-System in winter		SAHe	RACo	Definition
Height over sea level	m			231.000
Pressure	hPa			985.731
Efficiency	%	72.700	58.561	
Capacity sensible	kW	226.796	183.746	
Capacity latent	kW	0.000	41.772	
Capacity frost	kW	---	1.279	
Capacity total	kW	226.796	226.797	
Surface reserve	%	0.397	0.286	
Present surface	m²	1328.518	1328.518	

SAHe		Inlet	Outlet	Definition
Temp.	°C	-12.000	11.264	20.000
Rel. humidity	%	90.000	14.525	40.000
Abs. humidity	g/kg	1.226	1.226	5.946
Volume flow humid	m³/h	26524.506	28887.295	30000.000
Velocity	m/s	1.714	1.866	1.938
Pressure drop	Pa		85.249	

RACo		Inlet	Outlet	Definition
Temp.	°C	20.000	1.260	20.000
Rel. humidity	%	40.000	99.543	40.000
Abs. humidity	g/kg	5.946	4.243	5.946
Volume flow humid	m³/h	30000.000	28006.162	30000.000
Velocity	m/s	1.938	1.809	1.938
Pressure drop	Pa		102.622	

25 V% Et.glycol			SAHe	RACo
Temp.	in	°C	14.600	-4.920
Temp.	out	°C	-4.920	14.600
Volume flow		m³/h	10.867	10.871
Velocity		m/s	1.221	1.221
Reynolds		---	5025.135	4908.768
Pressure drop		kPa	195.319	196.474



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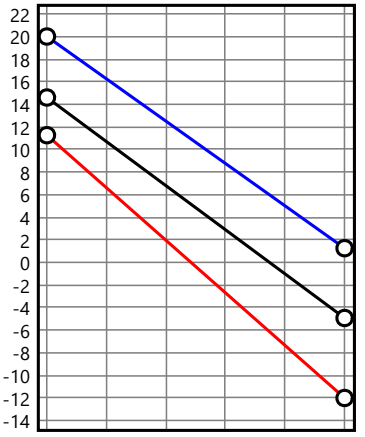
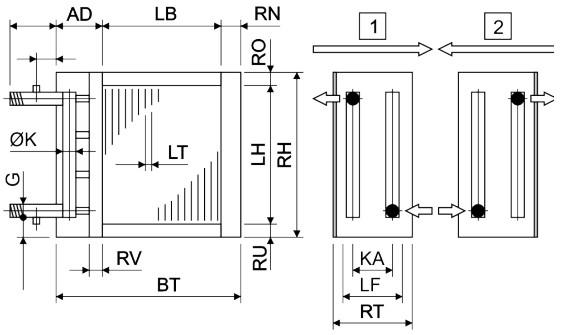
Representative

Plant
Object
Position

Temperature (°C)



Technical data			SAHe	RACo			
Tubes total		Piece	552	552	Tubes:	Cu	Cu
Tubes blank		Piece	0	0	Tubes:	smooth	smooth
Int. vent./drains		Piece	5	5	Tubes:	staggered	staggered
Tube rows on the depth		Piece	12	12	Tubes:	circular	circular
Tube rows on the height		Piece	46	46	Collectors:	Cu	Cu
Tube coupling in series		Piece	24	24	Collectors:	1.48 m/s	1.48 m/s
Number of circuits (NC)		Piece	23	23	Connections:	Rg7	Rg7
Volume		l	180	180	Connections:	1.48 m/s	1.48 m/s
Weight		kg	612	612	Fins:	Al	Al
Connections	G	---	2"	2"	Fins:	Wave structure	Wave structure
Frame height	RH	mm	1600	1600	Frame:	AISI304	AISI304
Frame width	BT	mm	3000	3000	Frame:	2.00 m/s	2.00 mm
Frame depth	RT	mm	430	430	Protection:	without	without
Finned height	LH	mm	1533	1533	Protection:	---	---
Finned width	LB	mm	2804	2804			
Finned depth	LF	mm	346	346			
Frame on top	RO	mm	33	33			
Frame on bottom	RU	mm	34	34			
Frame in front	RV	mm	30	30			
Frame on back	RN	mm	53	53			
Collector-Diameter	K	mm	54	54			
Collector covering	AD	mm	143	143			
Collector distance	KA	mm	347	347			
Fin spacing	LT	mm	2.500	2.500			
Fin thickness	LD	mm	0.200	0.200			
Tube diameter	DA	mm	12.400	12.400			
Tube diameter	da	mm	12.400	12.400			
Tube thickness	S	mm	0.350	0.350			
Tube interval on the height	S1	mm	33.333	33.333			
Tube interval on the width	S2	mm	28.867	28.867			



SAHe: 33/29/12-12R-46T-2804A-2.5PA-23C-Cu/Al/AISI304 **SAHe: EUR 9857.00**

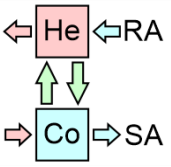
RACo: 33/29/12-12R-46T-2804A-2.5PA-23C-Cu/Al/AISI304 **RACo: EUR 9857.00**

CC-System in summer		RAHe	SACo	Definition
Height over sea level	m			231.000
Pressure	hPa			985.731
Efficiency	%	71.494	69.923	
Capacity sensible	kW	85.826	84.455	
Capacity latent	kW	0.000	1.370	
Capacity frost	kW	---	0.000	
Capacity total	kW	85.826	85.825	
Surface reserve	%	0.021	-0.286	
Present surface	m²	1328.518	1328.518	

RAHe		Inlet	Outlet	Definition
Temp.	°C	20.000	28.579	20.000
Rel. humidity	%	100.000	59.872	40.000
Abs. humidity	g/kg	15.080	15.080	5.946
Volume flow humid	m³/h	30436.346	31327.057	30000.000
Velocity	m/s	1.966	2.024	1.938
Pressure drop	Pa		98.622	

SACo		Inlet	Outlet	Definition
Temp.	°C	32.000	23.609	20.000
Rel. humidity	%	60.000	97.517	40.000
Abs. humidity	g/kg	18.473	18.418	5.946
Volume flow humid	m³/h	31850.927	30972.471	30000.000
Velocity	m/s	2.058	2.001	1.938
Pressure drop	Pa		101.031	

25 V% Et.glycol			RAHe	SACo
Temp.	in	°C	29.669	22.340
Temp.	out	°C	22.340	29.669
Volume flow		m³/h	10.867	10.869
Velocity		m/s	1.221	1.221
Reynolds		---	9202.091	8989.392
Pressure drop		kPa	170.288	170.735



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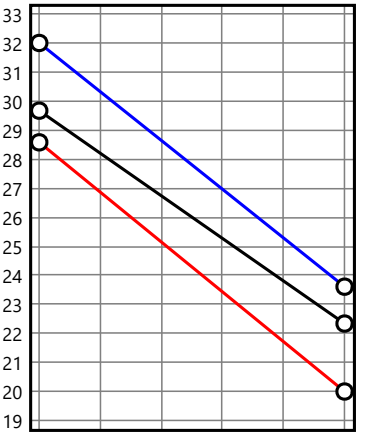

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Finned height	LH	mm	1533	1533	Protection:	---	---
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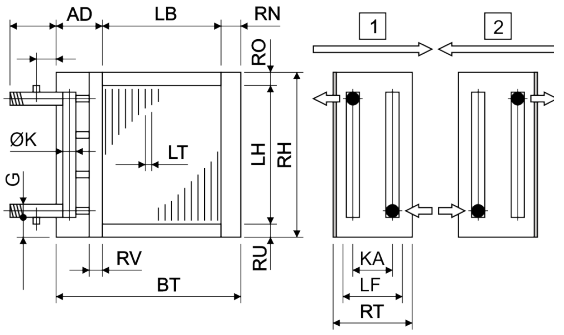

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SACo: 33/29/12-12R-46T-2804A-2.5PA-23C-Cu/Al/AISI304 **SACo:** **EUR** **9857.00**

Energy recovery / Year (Service at 100% Air flow = 8760 Hours)

No	Outside air °C	Outside air %	CCSB °C	CCSB %	Return air °C	Return air %	Exhaust air °C	Exhaust air %	Efficiency %	Capacity kW	Energy MWh
1	-6.1	81.1	12.8	20.0	20.9	33.7	3.9	88.8	70.1	184.7	40.4
2	-2.0	80.7	13.9	26.3	21.0	34.1	6.0	84.3	69.3	155.6	34.1
3	-0.6	80.1	14.4	28.5	21.1	34.6	6.9	82.9	69.1	146.5	32.1
4	0.6	78.0	14.8	29.6	21.2	35.1	7.6	81.7	69.0	139.2	30.5
5	1.5	77.0	15.2	30.6	21.3	35.6	8.2	80.8	68.9	133.4	29.2
6	2.4	77.6	15.5	32.0	21.5	36.1	8.7	80.1	68.8	128.7	28.2
7	3.1	74.8	15.8	31.9	21.6	36.5	9.2	79.6	68.8	124.3	27.2
8	3.8	73.8	16.1	32.5	21.7	37.0	9.7	78.9	68.7	120.1	26.3
9	4.6	71.7	16.4	32.7	21.8	37.5	10.2	78.1	68.7	115.5	25.3
10	5.4	70.5	16.7	33.2	21.9	38.0	10.7	77.3	68.6	111.2	24.4
11	6.0	70.6	17.0	34.2	22.0	38.5	11.1	76.6	68.6	107.6	23.6
12	6.7	69.5	17.3	34.6	22.1	38.9	11.6	75.8	68.6	103.9	22.7
13	7.5	68.3	17.6	35.2	22.3	39.4	12.2	74.6	68.6	99.4	21.8
14	8.2	69.6	17.9	37.0	22.4	39.9	12.7	73.4	68.6	95.3	20.9
15	8.9	69.7	18.2	38.1	22.5	40.4	13.2	72.3	68.6	91.4	20.0
16	9.6	69.7	18.5	39.3	22.6	40.9	13.8	71.2	68.6	87.3	19.1
17	10.4	67.4	18.8	39.1	22.7	41.4	14.3	70.1	68.6	83.2	18.2
18	11.2	71.0	19.2	42.5	22.8	41.8	14.9	68.8	68.6	78.8	17.3
19	11.8	70.8	19.5	43.6	23.0	42.3	15.4	67.9	68.6	74.9	16.4
20	12.6	68.0	19.8	43.0	23.1	42.8	15.9	66.9	68.6	71.0	15.5
21	13.3	71.5	19.8	46.5	23.2	43.3	16.4	65.7	68.5	63.5	13.9
22	14.0	74.3	19.6	49.8	23.3	43.8	16.9	64.8	68.5	55.1	12.1
23	14.7	68.7	19.4	47.1	23.4	44.2	17.4	63.9	68.5	46.9	10.3
24	15.3	70.0	19.3	49.2	23.5	44.7	17.9	63.2	68.5	39.2	8.6
25	15.9	69.0	19.1	49.6	23.6	45.2	18.4	62.4	68.5	31.5	6.9
26	16.6	70.5	19.0	51.9	23.8	45.7	18.8	61.8	68.5	23.9	5.2
27	17.2	71.9	18.8	54.2	23.9	46.2	19.3	60.9	68.5	15.7	3.4
28	17.9	68.4	18.7	52.9	24.0	46.6	19.8	60.1	68.5	7.4	1.6
29	18.6	70.2	18.5	55.6	24.1	47.1	20.3	59.4	68.5	0.5	0.1
30	19.2	70.2	17.5	77.8	16.8	100.0	18.4	90.1	68.6	16.4	3.6
31	19.9	67.1	17.9	76.1	17.0	100.0	19.0	88.1	68.6	20.0	4.4
32	20.6	67.0	18.2	77.8	17.1	100.0	19.5	86.1	68.6	23.8	5.2
33	21.3	65.7	18.6	77.8	17.3	100.0	20.0	84.3	68.6	27.2	6.0
34	22.1	62.9	18.9	76.4	17.5	100.0	20.6	82.2	68.6	31.3	6.9
35	22.9	61.1	19.3	76.3	17.6	100.0	21.3	79.9	68.6	36.0	7.9
36	23.8	60.0	19.7	77.1	17.8	100.0	21.9	77.6	68.6	41.0	9.0
37	24.9	56.5	20.2	75.4	18.0	100.0	22.7	74.7	68.6	47.3	10.4
38	26.2	52.9	20.7	73.9	18.2	100.0	23.7	71.3	68.6	55.1	12.1
39	27.9	50.1	21.3	74.0	18.3	100.0	24.9	67.2	68.6	65.1	14.3
40	30.8	44.9	22.4	73.7	18.5	100.0	26.9	60.1	68.6	84.1	18.4

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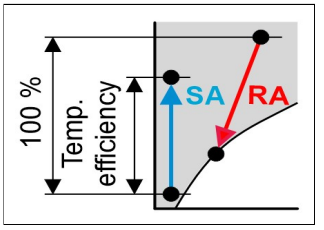
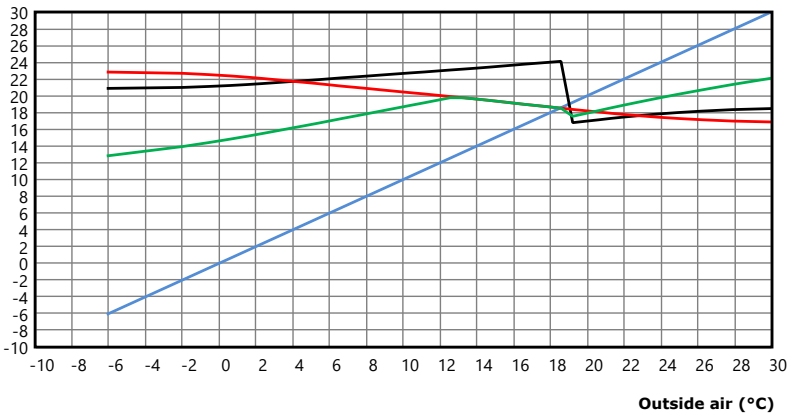
Position



Air (%)	Service (h/a)
100.00	8760
0.00	0
0.00	0
▼	▼
100.00	8760

EU: Energy recovery: Heat energy	MWh	555.36	EUR	33322.00	(60.00 EUR/MWh)
EU: Energy recovery: Cold energy	MWh	97.94	EUR	7836.00	(80.00 EUR/MWh)
EU: 2 Fan: Glycol pump	MWh	-39.16	EUR	-3916.00	(100.00 EUR/MWh)
EU: Energy recovery: Net useful ratio / Year	MWh	614.15	EUR	37242.00	(60.64 EUR/MWh)
EU: Need of energy total / Year	MWh	1124.48	EUR	79479.08	(70.68 EUR/MWh)
EU: Net useful ratio / Year	%	54.62	%	46.86	TWG = 72.70%
CH: Guidelines from associations such as SIA and SWKI: TWG>70.00% & JNG>75.00% & ETV>15.00					JNG = 68.64%
					ETV = 20.26

Outside air (°C) **Return air (°C)** **Supply air (°C)** **Energy recovery (°C)**



Station		Turin
Height over sea level	m	231.00
Pressure	hPa	985.73
Outside air	m³/h	30000.00
Return air	m³/h	30000.00
Adiabatic return air cooling	h/a	2409.00
Service at 100% Air flow	h/a	8760.00
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	153000.00
Additional costs	EUR	67000.00
BEP (Break even point) after	**Years**	**2.00**

Cooler: 40/35/15-8R-38T-2760A-2.6PA-76C-Cu/Al/AISI304		
Capacity sensible	kW	118.704
Capacity latent	kW	231.119
Capacity frost	kW	0.000
Capacity total	kW	349.824
Surface reserve	%	1.957
Present surface	m²	820.834
Required surface	m²	805.082
k-coeff.	W/m²K	50.668
Average temp. diff. (99.07 %)	K	8.576

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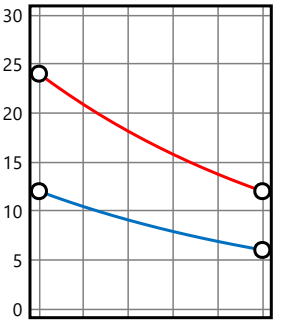
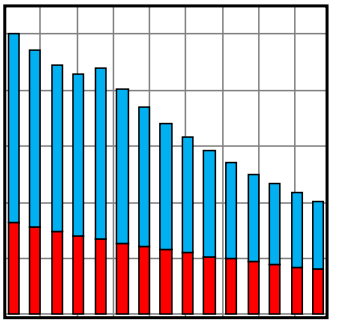
Here you have the option of entering any text with automatic line wrapping.

Air humid		**Inlet**	**Outlet**	**Definition**
Fouling outside	m²K/W			5.000E-05
Height over sea level	m			231.000
Pressure	mbar			985.731
Temp.	°C	24.000	12.000	20.000
Rel. humidity	%	95.000	100.000	40.000
Abs. humidity	g/kg	18.366	8.972	5.946
Density humid	kg/m³	1.143	1.198	1.167
Enthalpy humid	kJ/kg	70.893	34.707	35.214
Volume flow humid	m³/h	31010.766	29321.945	30000.000
Mass flow dry	kg/h	34802.540	34802.540	34802.540
Condensate flow	kg/h		326.964	
Surface temperature	°C	15.728	7.864	
Velocity	m/s	2.053	1.942	1.986
Pressure drop dry	Pa		78.362	
Pressure drop wet	Pa		112.079	

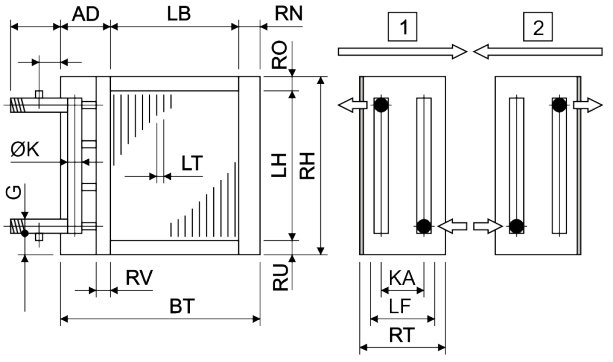
Water		
Fouling inside	m²K/W	5.000E-05
Temp. Inlet	°C	6.000
Temp. Outlet	°C	12.000
Temp. Selection	°C	8.190
Density	kg/m³	999.850
Spec. heat	kJ/kgK	4.196
Heat cond.	W/mK	0.577
Viscosity	Pas	1.378E-03
Volume flow	m³/h	50.031
Velocity	m/s	1.092
Pressure drop (Factor T/C)	---	3.460
Pressure drop	kPa	20.809

Temperature (°C)





Technical data					
Tubes total		Piece	304	Tubes:	Cu
Tubes blank		Piece	0	Tubes:	smooth
Int. vent./drains		Piece	0	Tubes:	staggered
Tube rows on the depth		Piece	8	Tubes:	circular
Tube rows on the height		Piece	38	Collectors:	Cu
Tube coupling in series		Piece	4	Collectors:	2.45 m/s
Number of circuits (NC)		Piece	76	Connections:	Rg7
Volume		l	166	Connections:	2.45 m/s
Weight		kg	442	Fins:	Al
Connections	G	---	3"	Fins:	smooth
Frame height	RH	mm	1600	Frame:	AISI304
Frame width	BT	mm	3000	Frame:	2.00 mm
Frame depth	RT	mm	360	Protection:	without
Finned height	LH	mm	1520	Protection:	---
Finned width	LB	mm	2760	Circulations:	2 parallel
Finned depth	LF	mm	280	Air flow direction:	horizontal
Frame on top	RO	mm	40		
Frame on bottom	RU	mm	40		
Frame in front	RV	mm	30		
Frame on back	RN	mm	65		
Collector-Diameter	K	mm	89		
Collector covering	AD	mm	175		
Collector distance	KA	mm	245		
Fin spacing	LT	mm	2.600		
Fin thickness	LD	mm	0.200		
Tube diameter	DA	mm	15.400		
Tube diameter	da	mm	15.400		
Tube thickness	S	mm	0.400		
Tube interval on the height	S1	mm	40.000		
Tube interval on the width	S2	mm	35.000		



Price net: **EUR** **7211.00**

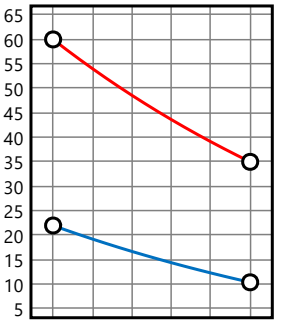
Heater: 33/29/12-2R-46T-2822A-5.0PA-23C-Cu/Al/AISI304

Capacity	kW	113.137
Surface reserve	%	20.401
Present surface	m²	116.477
Required surface	m²	96.742
k-coeff.	W/m²K	39.682
Average temp. diff. (95.64 %)	K	29.471

Air humid		Inlet	Outlet	Definition
Fouling outside	m²K/W			5.000E-05
Height over sea level	m			231.000
Pressure	hPa			985.731
Temp.	°C	10.400	22.000	20.000
Rel. humidity	%	15.380	7.352	40.000
Abs. humidity	g/kg	1.226	1.226	5.946
Density humid	kg/m³	1.210	1.162	1.167
Enthalpy humid	kJ/kg	13.555	25.258	35.214
Volume flow humid	m³/h	28799.539	29977.684	30000.000
Mass flow dry	kg/h	34802.540	34802.540	34802.540
Velocity	m/s	1.849	1.924	1.926
Pressure drop	Pa		10.883	

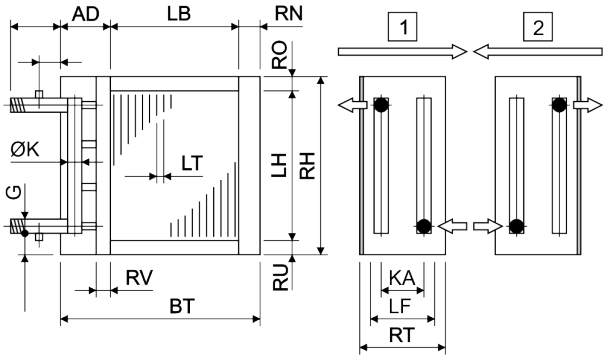
Water		
Fouling inside	m²K/W	5.000E-05
Temp. Inlet	°C	60.000
Temp. Outlet	°C	35.000
Temp. Selection	°C	46.951
Density	kg/m³	989.376
Spec. heat	kJ/kgK	4.179
Heat cond.	W/mK	0.640
Viscosity	Pas	5.761E-04
Volume flow	m³/h	3.941
Velocity	m/s	0.443
Pressure drop (T/C)	---	3.190
Pressure drop	kPa	4.446

Temperature (°C)



Technical data

Tubes total		Piece	92	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	46	Collectors:	Cu
Tube coupling in series		Piece	4	Collectors:	0.54 m/s
Number of circuits (NC)		Piece	23	Connections:	Rg7
Volume		l	36	Connections:	0.54 m/s
Weight		kg	106	Fins:	Al
Connections	G	---	2"	Fins:	wave structure
Frame height	RH	mm	1600	Frame:	AISI304
Frame width	BT	mm	3000	Frame:	2.00 mm
Frame depth	RT	mm	160	Protection:	without
Finned height	LH	mm	1533	Protection:	---
Finned width	LB	mm	2822	Circulations:	1 default
Finned depth	LF	mm	58	Air flow direction:	horizontal
Frame on top	RO	mm	33		
Frame on bottom	RU	mm	34		
Frame in front	RV	mm	30		
Frame on back	RN	mm	53		
Collector-Diameter	K	mm	54		
Collector covering	AD	mm	125		
Collector distance	KA	mm	74		
Fin spacing	LT	mm	5.000		
Fin thickness	LD	mm	0.200		
Tube diameter	DA	mm	12.400		
Tube diameter	da	mm	12.400		
Tube thickness	S	mm	0.350		
Tube interval on the height	S1	mm	33.333		
Tube interval on the width	S2	mm	28.867		



Price net: **EUR** **1814.00**

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Eurovent membership necessity or not

Anyone who manufactures air handling units or associated components in the EU and Switzerland needs a membership of Eurovent to be successful, one can often hear. This raises the question, why you can't find under Members - Eurovent companies like www.sevenair.com, www.mountair.com and www.weger.it , which dominate the Swiss market or why a company like www.howatherm.de left years ago, all legitimate questions or not? Well, on the other hand, Eurovent is said to be poorer than a church mouse and writes:

Von: *Igor Sikonczyk (Eurovent) <igor.sikonczyk@eurovent.eu>*
Gesendet: *Dienstag, 4. Februar 2025 16:24*
An: *info@zcs.ch*
Betreff: *AHH software*

Dear Mr. Zeller,

I am technical manager at Eurovent association and I am responsible for our ventilation-related product groups. We publish many industry recommendations and papers which reach out to the broad HVAC industry community (see https://www.eurovent.eu/publications/). Currently, we are preparing a new recommendation on moisture recovery in air-conditioning systems where I will have to demonstrate several processes on the mollier-diagram. I was wondering if you would be interested to offer us a free-licence copy of your AHH software to produce these diagrams. Of course, in return they would be properly marked (e.g. diagrams curtesy of Zeller Consulting) as the form of advertising for you. In my previous job I was using your licensed AHH software, which I still find as one of the best on the market. Unfortunately, as a non-profit organization we cannot afford to buy such software, especially for occasional use. Thank you for your feedback.

Kind regards,

Igor Sikonczyk

We have often been in contact with people from Eurovent, who wanted free software from us, an unparalleled imposition from a club that has a budget of millions and yet complains pitifully, which is why our answer was immediately as follows:

Dear Mr. Sikonczyk,

We are sending you some of our published reports on the subject of air dehumidification with the attachments. You can find more on our homepage. We have been in contact with people from Eurovent several times and they always said, that you can't spend money on software, what a macabre joke! All of these people, who work for this association, receive princely salaries and expenses! So, it must still be possible, to get a network license for 1 client // for CHF 1,800, as far as I'm concerned, under expenses or out of petty cash!

Kind regards,
Marin Zeller

Of course, this meant, that the interest in our software at the Eurovent Beggars' Association once again died out abruptly, which we don't care about, but rather **don't give a shit** . For this purpose, we support small engineering offices, consisting of only 1 air conditioning expert, who would like to have our AHH software installed on the office PC and on the field service laptop. Such people get 2 and pay only 1 license. Coming back to what is really necessary, which is of some use to the air handling unit customer: Complete an exam at the TUEV and get the stamp **type tested**, which is sorely needed not only for finned heat exchangers.