



# Exam versus practice

Some people have also wondered, why fin coil heat exchangers do not achieve the offered performance in practice, even though the offers are stamped by TÜV or EUROVENT. Some people have also wondered, why the offers differ by up to 35% in terms of prices, space and pressure drops. If you have never asked yourself such questions, you should not read any further and confidently consider the cheapest offer and never measure it. However, if you have ever wondered why **XYZ** always seems to be the absolute leader on the market, you should perhaps take a more critical look at this dubious matter or even better measure it on the system. **It could be that you have passed a type examination, but in retrospect you don't give a damn about it in offers and no longer do risk management until you can.** We would like to explain this in more detail with an example. Unfortunately, a customer, who manufactures air conditioners, has only given us certain information about a dubious offer by phone, with the request to check it with our TÜV-tested neutral software, which can calculate all geometries. It is a high-performance circuit connected heat recovery system, as shown in the picture below on the left.

Air pressure 1.013 bar  
 Temperature efficiency 66%.  
 Heat recovery capacity 178 kW

Supply air 25000 m<sup>3</sup>/h, -12°C/90% to 9.1°C/19%, pressure drop 177 Pa  
 25%Et.Glycol, 7.75 m<sup>3</sup>/h, 14.7°C to -6.6°C, pressure drop 190 kPa

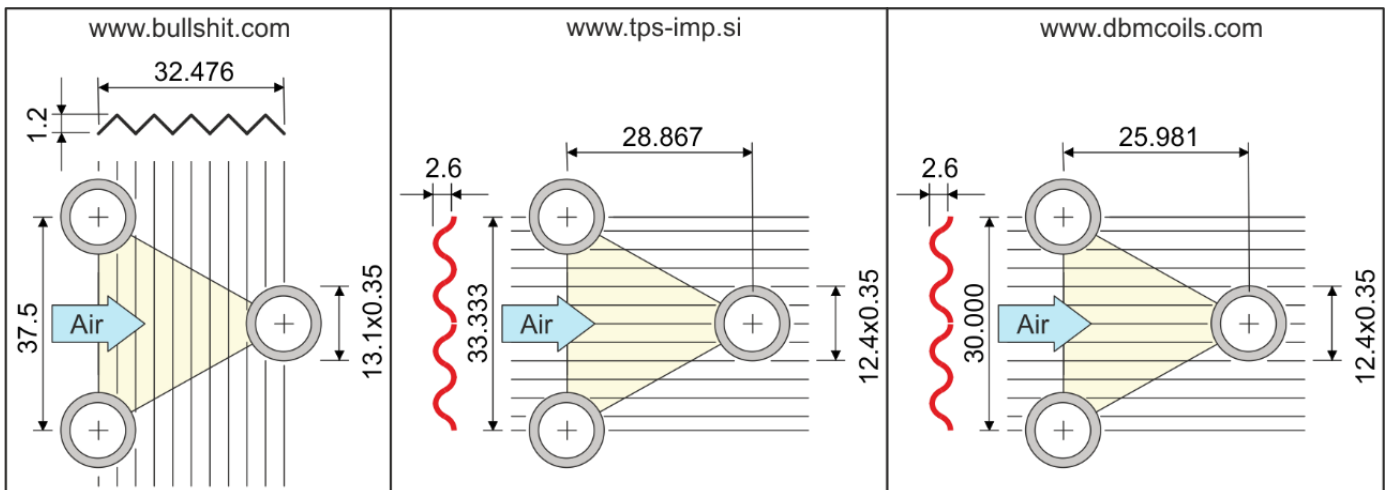
Exhaust air 25000 m<sup>3</sup>/h, 20°C/20% to -1°C/82%, pressure drop 177 Pa  
 25%Et.Glycol, 7.75 m<sup>3</sup>/h, -6.6°C to 14.7°C, pressure drop 190 kPa

2 identic heat exchanger with staggered tubes, each:

Surface 809 m<sup>2</sup>, weight 438 kg, volume 130 liter  
 Finned height, with, depth 2025, 1625, 390 mm  
 Aluminum fins 0.2 mm, embossed transversely to the direction of air  
 Tube rows on the depth 12 pieces, tubes on the height 54 pieces  
 Tubes total 648 pieces, tubes to collector 16 pieces  
 Copper tubes 12.7x0.35 mm, expanded 13.1x0.35 mm



The first thing that should be immediately noticeable to any reasonably sensible employee, is the far too high air-side pressure drops of 177 Pa per heat exchanger, which would trigger far too high annual recurring operating costs as a result of the fan power required for this. These much too high **airside pressure drops are due to the much too high corrugated fins perpendicular to the air direction, which we have calculated with our software in the absence of information in order to arrive at these high pressure drops.** What should immediately catch the eye of any reasonably reasonable employee as a second criterion are the 12 pipe rows, where competitors with similar geometry have offered 16 pipe rows. **A recalculation on page 2 shows a space deficit of 20% and 26%, which means, that this manufacturer is engaged in dubious risk management at the expense of the buyer, in the hope, that no measurements will be taken.** Page 3 and 4 shows a serious calculation with waved fins to keep the airside pressure drop and the associated operating costs low. **Much more sensible would be waved fins in the direction of air, according to 2 pictures on the bottom right, which corresponds to today's modern state.**



CC-System in winter		SA-He	RA-Co	Definition
Height over sea level	m			0.000
Pressure	hPa			1013.250
Efficiency	%	66.000	65.757	
Capacity sensible	kW	176.400	176.337	
Capacity latent	kW	---	0.063	
Capacity frost	kW	---	0.000	
Capacity total	kW	176.400	176.400	
Surface reserve	%	-20.049	-25.818	
Present surface	m2	847.022	843.945	



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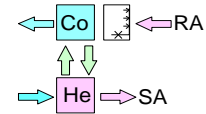
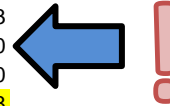
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Plant  
Object  
Position

SA-He ( ff = 0.00005 m2K/W )		Inlet	Outlet	Definition
Temp.	°C	-12.000	9.120	20.000
Rel. humidity	%	90.000	16.756	40.000
Abs. humidity	g/kg	1.193	1.193	5.784
Volume flow humid	m3/h	22108.309	23896.207	25000.000
Velocity	m/s	1.866	2.017	2.110
Pressure drop	Pa		176.330	

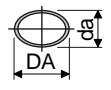
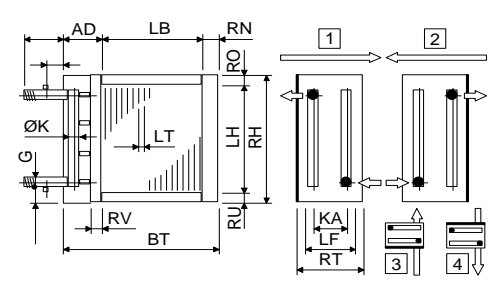
RA-Co ( ff = 0.00005 m2K/W )		Inlet	Outlet	Definition
Temp.	°C	20.000	-1.042	20.000
Rel. humidity	%	20.000	83.173	40.000
Abs. humidity	g/kg	2.879	2.876	5.784
Volume flow humid	m3/h	24884.343	23098.108	25000.000
Velocity	m/s	2.101	1.950	2.110
Pressure drop wet	Pa		176.889	

25 V% Et.glycol ( ff = 0.00005 / 0.00005 m2K/W )		SA-He	RA-Co	
Temp.	in °C	14.700	-6.600	
Temp.	out °C	-6.600	14.700	
Volume flow	m3/h	7.748	7.748	
Velocity	m/s	1.114	1.114	
Reynolds	---	4774.895	4787.876	
Pressure drop	kPa	189.887	189.760	



Software by www.zcs.ch

Technical data		SA-He	RA-Co	SA-He	RA-Co	
Tubes total	Piece	648	648	Tubes:	Cu	
Tubes blank	Piece	8	8	Tubes:	smooth	
Int. vent./drains	Piece	5	5	Tubes:	staggered	
Tube rows on the depth	Piece	12	12	Tubes:	circular	
Tube rows on the height	Piece	54	54	Collectors:	Cu	
Tube coupling in series	Piece	40	40	Collectors:	2.68 m/s	
Number of circuits (NC)	Piece	16	16	Connections:	Rg7	
Volume	l	139	139	Connections:	2.68 m/s	
Weight	kg	415	415	Finns:	Al	
Connections	G	---	1 1/4"	Finns:	ribbed	
Frame height	RH	mm	2130	2130	Frame:	FeZn
Frame width	BT	mm	1804	1804	Air flow direction:	horizontal
Frame depth	RT	mm	420	420	Protection:	without
Finned height	LH	mm	2025	2025	Protection:	---
Finned width	LB	mm	1625	1625		
Finned depth	LF	mm	390	390		
Frame on top	RO	mm	52	52		
Frame on bottom	RU	mm	53	53		
Frame in front	RV	mm	30	30		
Frame on back (~42/42mm)	RN	mm	50	50		
Collector-Diameter	K	mm	35	35		
Collector covering	AD	mm	129	129		
Collector distance	KA	mm	361	361		
Fin spacing	LT	mm	3.000	3.000		
Fin thickness	LD	mm	0.200	0.200		
Tube diameter	DA	mm	13.100	13.100		
Tube diameter	da	mm	13.100	13.100		
Tube thickness	S	mm	0.350	0.350		
Tube interval on the height	S1	mm	37.500	37.500		
Tube interval on the depth	S2	mm	32.476	32.476		



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

SA-He: 38/32/13-12R-54T-1625A-3.0PA-16C-Cu/Al/FeZn      SA-He: EUR 6653.00  
RA-Co: 38/32/13-12R-54T-1625A-3.0PA-16C-Cu/Al/FeZn      RA-Co: EUR 6653.00

CC-System in winter		SA-He	RA-Co	Definition
Height over sea level	m			0.000
Pressure	hPa			1013.250
Efficiency	%	66.000	65.780	
Capacity sensible	kW	176.400	176.400	
Capacity latent	kW	---	0.000	
Capacity frost	kW	---	0.000	
Capacity total	kW	176.400	176.400	
Surface reserve	%	0.504	0.543	
Present surface	m2	945.186	945.186	



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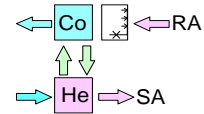
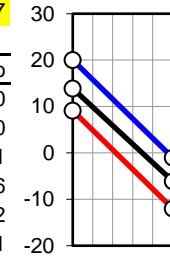
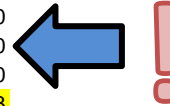
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Plant  
Object  
Position

SA-He ( ff = 0.00005 m2K/W )		Inlet	Outlet	Definition
Temp.	°C	-12.000	9.120	20.000
Rel. humidity	%	90.000	16.756	40.000
Abs. humidity	g/kg	1.193	1.193	5.784
Volume flow humid	m3/h	22108.309	23896.207	25000.000
Velocity	m/s	1.894	2.047	2.142
Pressure drop	Pa		99.595	

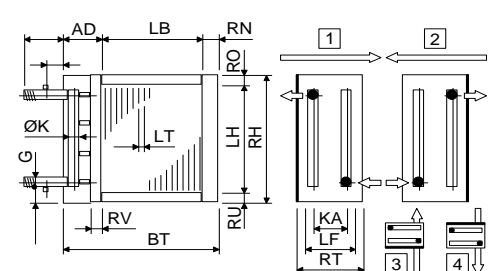
RA-Co ( ff = 0.00005 m2K/W )		Inlet	Outlet	Definition
Temp.	°C	20.000	-1.050	20.000
Rel. humidity	%	20.000	83.312	40.000
Abs. humidity	g/kg	2.879	2.879	5.784
Volume flow humid	m3/h	24884.343	23097.583	25000.000
Velocity	m/s	2.132	1.979	2.142
Pressure drop wet	Pa		104.497	

25 V% Et.glycol ( ff = 0.00005 / 0.00005 m2K/W )		SA-He	RA-Co	
Temp.	in °C	13.880	-6.100	
Temp.	out °C	-6.100	13.880	
Volume flow	m3/h	8.260	8.261	
Velocity	m/s	1.186	1.186	
Reynolds	---	4766.557	4720.172	
Pressure drop	kPa	189.549	190.051	



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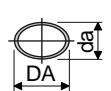
Technical data		SA-He	RA-Co	SA-He	RA-Co	
Tubes total	Piece	720	720	Tubes:	Cu	
Tubes blank	Piece	0	0	Tubes:	smooth	
Int. vent./drains	Piece	5	5	Tubes:	staggered	
Tube rows on the depth	Piece	12	12	Tubes:	circular	
Tube rows on the height	Piece	60	60	Collectors:	Cu	
Tube coupling in series	Piece	40	40	Collectors:	1.12 m/s	
Number of circuits (NC)	Piece	18	18	Connections:	Rg7	
Volume	l	141	141	Connections:	1.12 m/s	
Weight	kg	463	463	Fins:	Al	
Connections	G	---	2"	Fins:	Wave structure	
Frame height	RH	mm	2130	2130	Frame:	FeZn
Frame width	BT	mm	1804	1804	Air flow direction:	horizontal
Frame depth	RT	mm	430	430	Protection:	without
Finned height	LH	mm	2000	2000	Protection:	---
Finned width	LB	mm	1621	1621		
Finned depth	LF	mm	346	346		
Frame on top	RO	mm	65	65		
Frame on bottom	RU	mm	65	65		
Frame in front	RV	mm	30	30		
Frame on back (~40/40mm)	RN	mm	40	40		
Collector-Diameter	K	mm	54	54		
Collector covering	AD	mm	143	143		
Collector distance	KA	mm	347	347		
Fin spacing	LT	mm	2.700	2.700		
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 depth	S2	mm	28.867	28.867		



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

SA-He: 33/29/12-12R-60T-1621A-2.7PA-18C-Cu/Al/FeZn  
RA-Co: 33/29/12-12R-60T-1621A-2.7PA-18C-Cu/Al/FeZn

SA-He: EUR 7416.00  
RA-Co: EUR 7416.00



CC-System in winter		SA-He	RA-Co	Definition
Height over sea level	m			0.000
Pressure	hPa			1013.250
Efficiency	%	66.000	65.780	
Capacity sensible	kW	176.400	176.400	
Capacity latent	kW	---	0.000	
Capacity frost	kW	---	0.000	
Capacity total	kW	176.400	176.400	
Surface reserve	%	2.764	2.203	
Present surface	m2	849.396	849.396	



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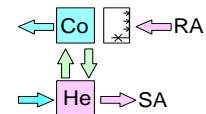
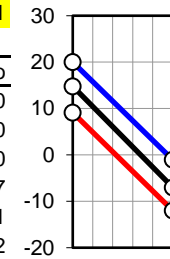
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Plant  
Object  
Position

SA-He ( ff = 0.00005 m2K/W )		Inlet	Outlet	Definition
Temp.	°C	-12.000	9.120	20.000
Rel. humidity	%	90.000	16.756	40.000
Abs. humidity	g/kg	1.193	1.193	5.784
Volume flow humid	m3/h	22108.309	23896.207	25000.000
Velocity	m/s	1.830	1.978	2.070
Pressure drop	Pa		101.684	

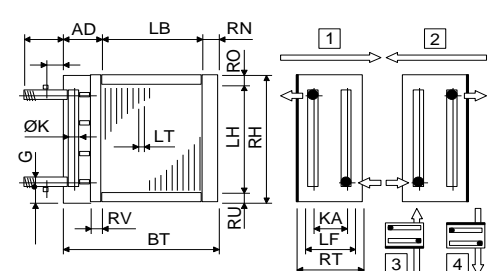
RA-Co ( ff = 0.00005 m2K/W )		Inlet	Outlet	Definition
Temp.	°C	20.000	-1.050	20.000
Rel. humidity	%	20.000	83.312	40.000
Abs. humidity	g/kg	2.879	2.879	5.784
Volume flow humid	m3/h	24884.343	23097.583	25000.000
Velocity	m/s	2.060	1.912	2.070
Pressure drop wet	Pa		106.681	

25 V% Et.glycol ( ff = 0.00005 / 0.00005 m2K/W )		SA-He	RA-Co	
Temp.	in °C	14.800	-7.000	
Temp.	out °C	-7.000	14.800	
Volume flow	m3/h	7.571	7.570	
Velocity	m/s	1.087	1.087	
Reynolds	---	4372.228	4409.011	
Pressure drop	kPa	186.237	185.812	



Software by www.zcs.ch

Technical data		SA-He	RA-Co	SA-He	RA-Co	
Tubes total	Piece	828	828	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	69	69	Collectors: Cu	Cu	
Tube coupling in series	Piece	46	46	Collectors: 1.03 m/s	1.03 m/s	
Number of circuits (NC)	Piece	18	18	Connections: Rg7	Rg7	
Volume	l	161	161	Connections: 1.03 m/s	1.03 m/s	
Weight	kg	452	452	Finns: Al	Al	
Connections	G	---	2"	Finns: Wave structure	Wave structure	
Frame height	RH	mm	2130	2130	Frame: FeZn	FeZn
Frame width	BT	mm	1804	1804	Air flow direction: horizontal	horizontal
Frame depth	RT	mm	400	400	Protection: without	without
Finned height	LH	mm	2070	2070	Protection: ---	---
Finned width	LB	mm	1621	1621		
Finned depth	LF	mm	312	312		
Frame on top	RO	mm	30	30		
Frame on bottom	RU	mm	30	30		
Frame in front	RV	mm	30	30		
Frame on back (~40/40mm)	RN	mm	40	40		
Collector-Diameter	K	mm	54	54		
Collector covering	AD	mm	143	143		
Collector distance	KA	mm	321	321		
Fin spacing	LT	mm	2.800	2.800		
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	30.000	30.000		
Tube interval on the depth	S2	mm	25.981	25.981		



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

SA-He: 30/26/12-12R-69T-1621A-2.8PA-18C-Cu/Al/FeZn SA-He: EUR 7807.00  
RA-Co: 30/26/12-12R-69T-1621A-2.8PA-18C-Cu/Al/FeZn RA-Co: EUR 7807.00

