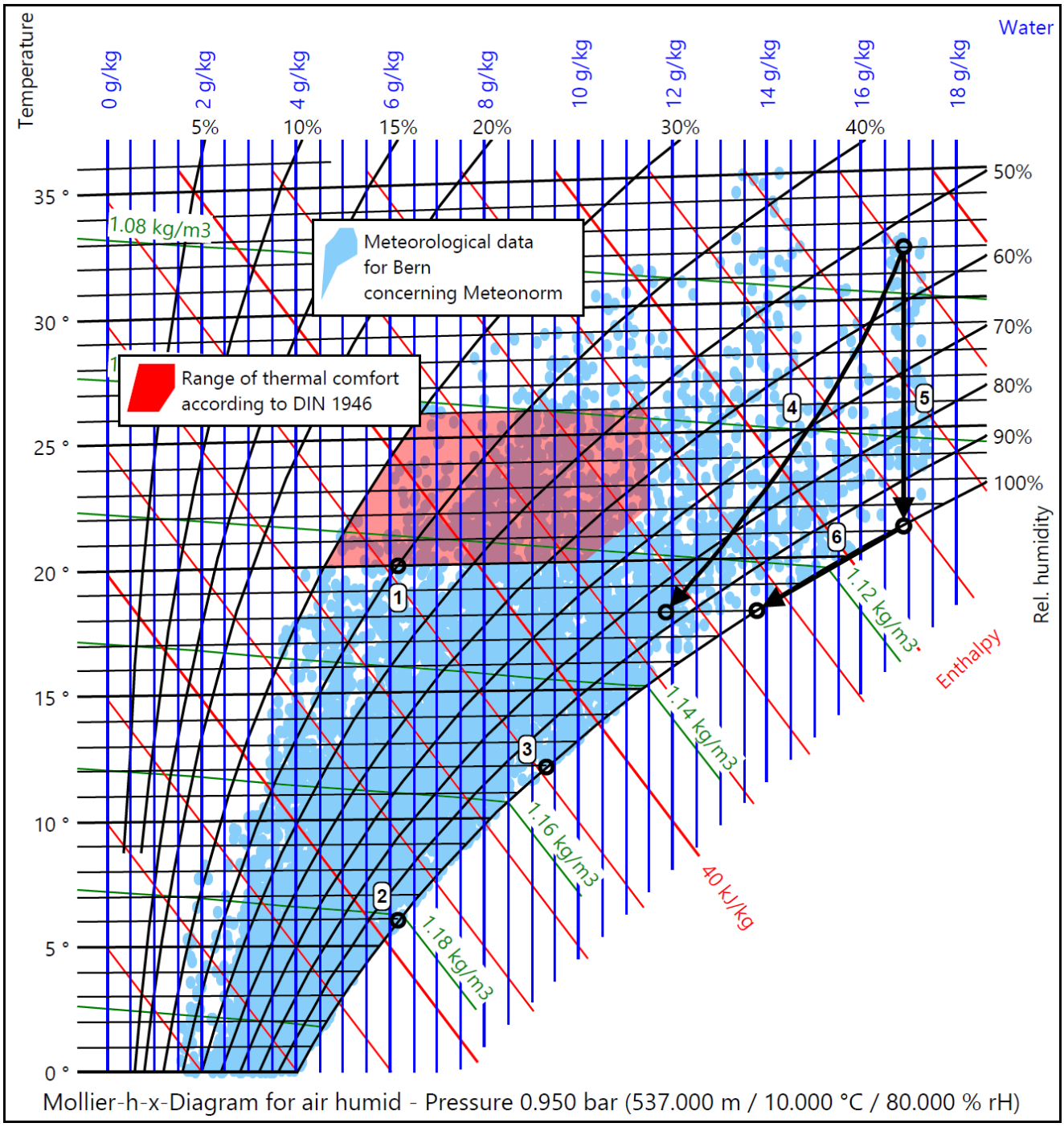
How to correctly calculate air coolers

We want to explain once more, or for the thousandth time, how to calculate an air cooler correctly on the basis of a typical query. In Bern (537 meter above sea level), the aim is to cool 25,000 m3/h of air, based on standard conditions of 20°C/40% **(1)**, from 32°C/53% at an inflow velocity of maximum 2 m/s to 18°C with water from 6°C **(2)** to 12°C **(3)** with a maximum pressure drop of 35 kPa. You get several quotes and find out, that there are already considerable differences between 174 kW **(5-6)** and 212 kW **(4)** in the cooling capacity, which is of course also noticeable in different prices. Only on closer inspection does one notice, that the outlet humidity is given as 100% **(5-6)** in the first offer and 86% **(4)** in the second offer. A first cursory glance at the Mollier HX diagram, would be enough for the connoisseur of the matter to know, that something must be wrong with the process control **(5-6)** of the cheap product and the low capacity, because philistine software is used. Those who calculate wit finite elements with www.zcs.ch software, excrete much more condensate, which increases the latent capacity, which has been proven many times in measurements at TUEV Süd in Munich and proven by type examination.



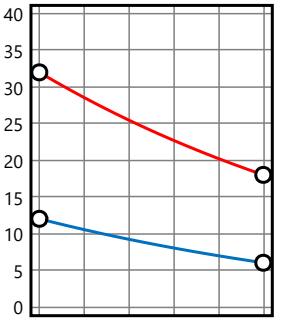
Below we provide you with a correct calculation (4)!

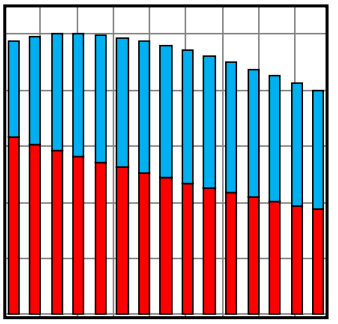
Cooler: 40/35/15-4R-37T-2451A-2.9PA-36C-Cu/Al/AISI304					Company
Capacity sensible	kW	111.791			Branch
Capacity latent	kW	100.637			Street
Capacity frost	kW	0.000	Danger of freezing		Country / ZIP / City
Capacity total	kW	212.428			
Surface reserve	%	0.517			Phone: xxxxxxxxxx
Present surface	m²	321.162			Fax: xxxxxxxxxx
Required surface	m²	319.510			E-Mail
k-coeff.	W/m²K	43.777			Homepage
Average temp. diff. (96.98 %)	K	15.187			

Air humid		**Inlet**	**Outlet**	**Definition**	30-01-2025
Fouling outside	m²K/W			5.000E-05	With the compliments of
Height over sea level	m			537.000	
Pressure	mbar			949.999	Representative
Temp.	°C	32.000	18.000	20.000	Direct dialing
Rel. humidity	%	53.000	86.021	40.000	
Abs. humidity	g/kg	16.890	11.824	6.171	
Density humid	kg/m³	1.074	1.128	1.125	Plant
Enthalpy humid	kJ/kg	75.442	48.072	35.787	Object
Volume flow humid	m³/h	26467.314	25052.840	25000.000	Position
Mass flow dry	kg/h	27940.779	27940.779	27940.779	
Condensate flow	kg/h		141.548		
Surface temperature	°C	18.011	9.607		
Velocity	m/s	2.027	1.918	1.914	Here you have the option of entering any text with automatic line wrapping.
Pressure drop dry	Pa		34.748		
Pressure drop wet	Pa		43.029		

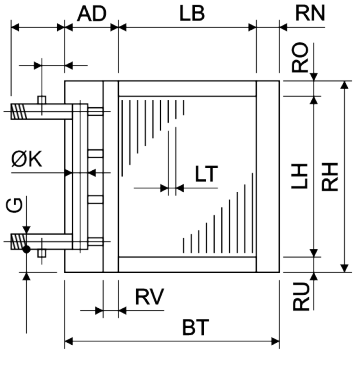
25 V% Et.glycol		
Fouling inside	m²K/W	5.000E-05
Temp. Inlet	°C	6.000
Temp. Outlet	°C	12.000
Temp. Selection	°C	8.190
Density	kg/m³	1041.558
Spec. heat	kJ/kgK	3.701
Heat cond.	W/mK	0.459
Viscosity	Pas	2.635E-03
Volume flow	m³/h	33.066
Velocity	m/s	1.503
Pressure drop (Factor T/C)	---	7.751
Pressure drop	kPa	34.318

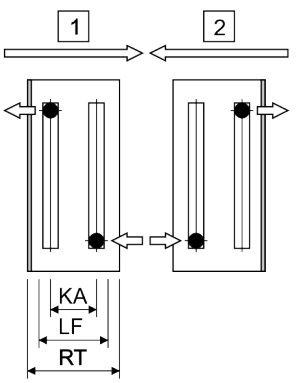
Temperature (°C)





Technical data					
Tubes total		Piece	148	Tubes:	Cu
Tubes blank		Piece	4	Tubes:	smooth
Int. vent./drains		Piece	0	Tubes:	staggered
Tube rows on the depth		Piece	4	Tubes:	circular
Tube rows on the height		Piece	37	Collectors:	Cu
Tube coupling in series		Piece	4	Collectors:	1.10 m/s
Number of circuits (NC)		Piece	36	Connections:	Rg7
Volume		l	92	Connections:	1.10 m/s
Weight		kg	214	Fins:	Al
Connections	G	---	4"	Fins:	ribbed
Frame height	RH	mm	1560	Frame:	AISI304
Frame width	BT	mm	2710	Frame:	2.00 mm
Frame depth	RT	mm	260	Protection:	without
Finned height	LH	mm	1480	Protection:	---
Finned width	LB	mm	2451		
Finned depth	LF	mm	140		
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	108		
Collector covering	AD	mm	194		
Collector distance	KA	mm	128		
Fin spacing	LT	mm	2.900		
Fin thickness	LD	mm	0.200		
Tube diameter	DA	mm	15.400		
Tube diameter	da	mm	15.400		
Tube thickness	S	mm	0.350		
Tube interval on the height	S1	mm	40.000		
Tube interval on the width	S2	mm	35.000		





Price net: **EUR** **3507.00**