



# Humidification in front of an Air heater

A frequently asked question is answered as to why the air temperature and relative humidity cannot be entered under **Inlet**. The reason is that adiabatic or even hybrid humidification may take place upstream of the air heater. Therefore, the air intake must be defined **in the yellow fields**. In the example, hybrid humidification is installed upstream of the air heater.

1. Air inlet: 26.000 °C / 54.865 % / 11.500 g/kg
2. Adiabatic humidification with Water from 15.000 °C on 19.496 °C / 100 % / 14.204 g/kg
3. Hybrid humidification with Water from 15.000 °C on 40.000 °C / 37.112 % / 17.204 g/kg

Air humid (ff=0.00005 m2K/W)	Inlet	Outlet	Definition	
Height over sea level	m		0.000	
Pressure	hPa	1013.250		
Temp. ( 26.000 )	°C	40.000	20.000	
Rel. humidity ( 54.865 )	%	100.000	40.000	
Abs. humidity ( 11.500 )	g/kg	14.204	5.784	
Density humid	kg/m3	1.196	1.200	
Enthalpy humid	kJ/kg	55.647	34.805	
Volume flow humid	m3/h	12139.965	13051.757	12000.000
Mass flow dry	kg/h	14313.370	14313.370	14313.370
Velocity	m/s	2.076	2.232	2.053
Pressure drop dry	Pa		42.013	
Pressure drop wet	Pa		46.550	
Evaporation total	kg/h		81.635	(15.000 °C)

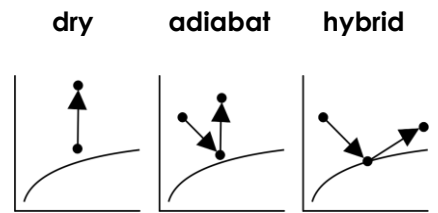
WAHR	Hybrid
3.000	g/kg Moistening flow
WAHR	Latent capacity / Sensible capacity = 0.36 ( Recom. < 2.1 )

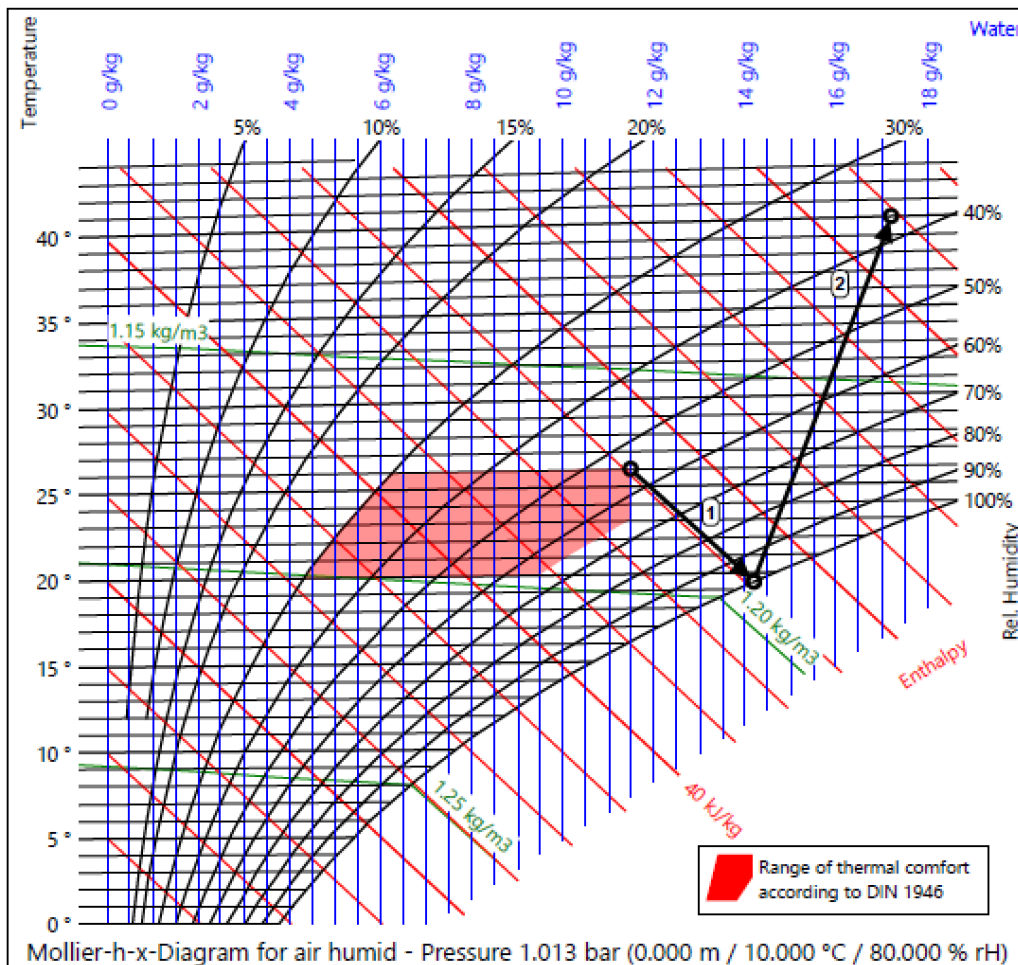
26.000 (°C) Temperature inlet	
54.865 (%) Rel. humidity inlet	
19.496 (°C) temp. after ad. cooling	
100.000 (%) Rel. hum. after ad. cooling	
15.000 °C Moistening temperature	

WAHR	0.980	Efficiency: Tubes-Fins
WAHR	0.941	Heat transfer: Tubes-Fins
WAHR	0.998	Bypass: Air-Tubes-Fins
WAHR	0.920	Efficiency: Heat exchanger total



With adiabatic humidification, water treatment is not absolutely necessary, since only the air in front of the air heater is pre-humidified, for example with a simple contact humidifier. Of course, 100% humidity cannot be achieved in this way. However, if 100% moisture is to be achieved with a high-pressure atomizer, water treatment is required. With hybrid humidification, there is first adiabatic humidification to 100% and then hybrid humidification, which is achieved by injecting water directly into the fins of the air heater via high-pressure atomizers, where it evaporates. It is important to ensure that the water cannot go through the air heater and escape at the back.





Capacity	kW	114.960	----- sensible:	84.253
Surface reserve	%	4.372	latent:	30.706
Present surface	m2	247.859		
Required surface	m2	237.477		
k-coeff.	W/m2K	33.172		
Average temp. diff.	K	14.593		

Company  
Branch  
Street  
Country / ZIP / City

Air humid (ff=0.00005 m2K/W)		Inlet	Outlet	Definition
Height over sea level	m			0.000
Pressure	hPa			1013.250
Temp. ( 26.000 )	°C	19.496	40.000	20.000
Rel. humidity ( 54.865 )	%	100.000	37.112	40.000
Abs. humidity ( 11.500 )	g/kg	14.204	17.204	5.784
Density humid	kg/m3	1.196	1.116	1.200
Enthalpy humid	kJ/kg	55.647	84.561	34.805
Volume flow humid	m3/h	12139.965	13051.757	12000.000
Mass flow dry	kg/h	14313.370	14313.370	14313.370
Velocity	m/s	2.076	2.232	2.053
Pressure drop dry	Pa		42.013	
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Evaporation total	kg/h		81.635	(15.000 °C)

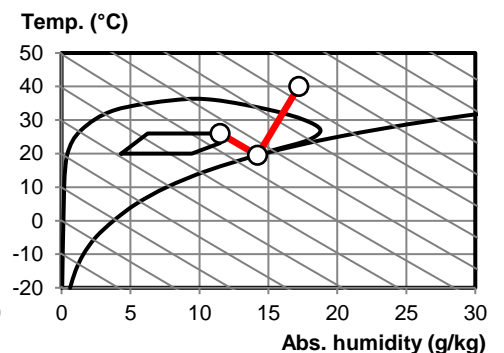
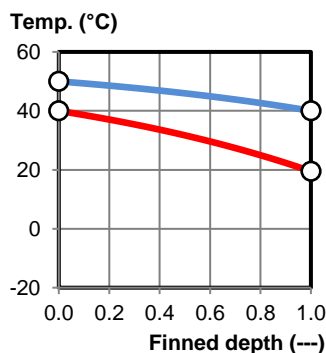
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With the compliments of

Representative  
Direct dialing  
xxxxxxxxxx

Plant  
Object  
Position

Water (ff=0.00005 m2K/W)	
Temp. in	°C 50.000
Temp. out	°C 40.000
Density	kg/m3 990.500
Spec. heat	kJ/kgK 4.178
Heat cond.	W/mK 0.636
Viscosity	Pas 6.036E-04
Volume flow	m3/h 10.001
Velocity	m/s 0.821
Pressure drop ( T/C = 7.739 )	kPa 13.417

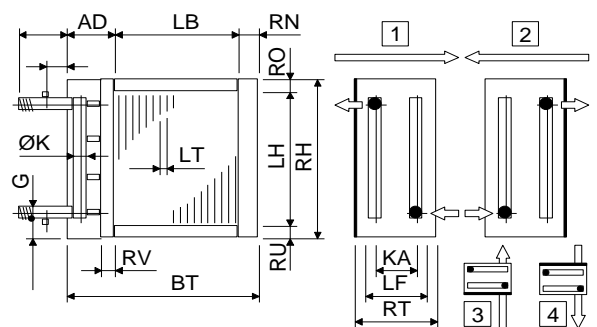


Technical data

Tubes total	Piece	256
Tubes blank	Piece	0
Int. vent./drains	Piece	0
Tube rows on the depth	Piece	8
Tube rows on the height	Piece	32
Tube coupling in series	Piece	8
Number of circuits (NC)	Piece	32
Volume	l	53
Weight	kg	167
Connections	G	2 1/2"
Frame height	RH	mm 1200
Frame width	BT	mm 1650
Frame depth	RT	mm 350
Finned height	LH	mm 1120
Finned width	LB	mm 1450
Finned depth	LF	mm 280
Frame on top	RO	mm 40
Frame on bottom	RU	mm 40
Frame in front	RV	mm 30
Frame on back (~53mm)	RN	mm 53
Collector-Diameter	K	mm 76
Collector covering	AD	mm 147
Collector distance	KA	mm 245
Fin spacing	LT	mm 3.500
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 35.000
Tube interval on the depth	S2	mm 35.000



Tubes:	Cu
Tubes:	smooth
Tubes:	in line
Tubes:	circular
Collectors:	0.68 m/s Cu
Connections:	0.68 m/s Rg7
Fins:	AlMg3
Fins:	smooth
Frame:	2.00 mm FeZn
Circulations:	1 Default
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 2555.00