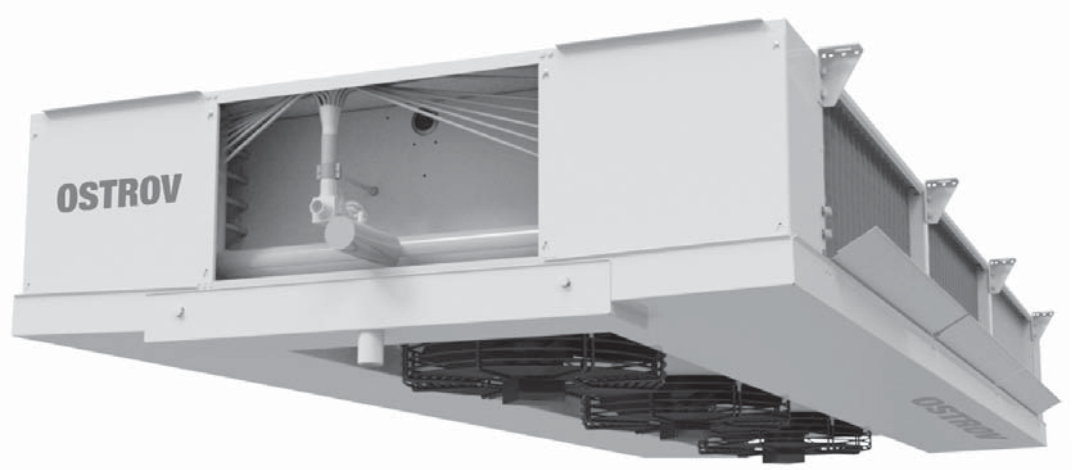
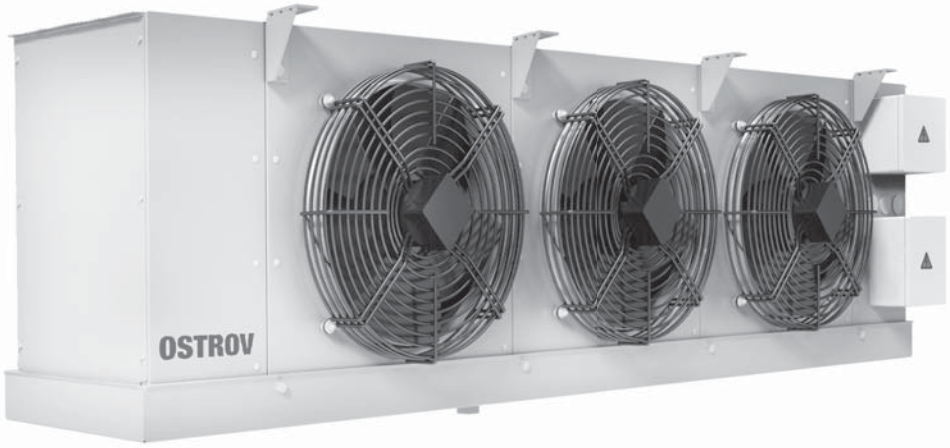
OSTROV

refrigeration

Unit Coolers





selection guide

02.2018

INTRODUCTION

A unit cooler is one of the four main components of a compression refrigerating machine. It is located inside a cold room and cools the air passing through it in order to provide the required temperature and humidity.

Initial data for selecting a unit cooler:

- Dimensions of a cold room, location of doors, gates, beams, columns;
- Stored products;
- Packaging;
- Location of products in the cold room;
- Required temperature in the cold room;
- Required humidity in the cold room;
- Required cooling capacity.

In order to select the appropriate unit cooler, carry out the following:

(1) Difference between evaporating temperature and inlet air temperature.

1. Determination of the temperature difference DT1

Decrease of the evaporating temperature (t_0), i.e. growth of the temperature difference, results in increased moisture content in the air. Theoretically, this moisture can accumulate on the unit cooler's coil in the form of condensate or frost (ice). As a result of this process, the humidity in the cold room reaches a value corresponding to the air temperature and the evaporating temperature.

Figure 1 represents the diagram for determination of the temperature difference Dt1 needed to maintain the required relative air humidity.

Determination of temperature difference Dt1

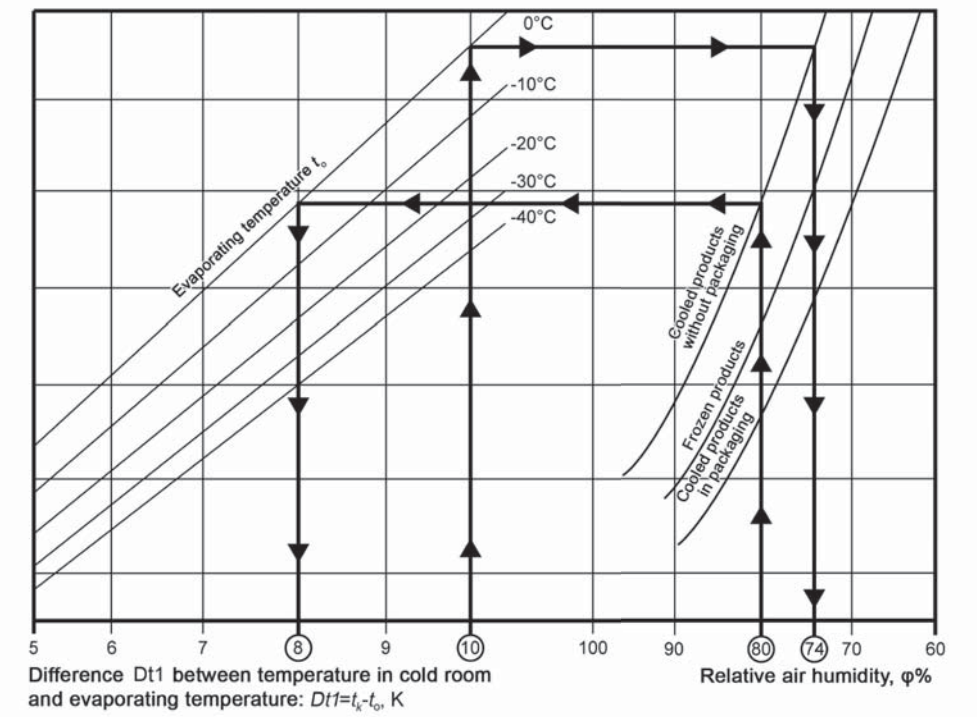


Fig. 1

An example of using this diagram:

This example shows a cold room designed for storage of cooled products without packaging at a relative humidity of 80% and at a storage temperature (t_k) +8°C.

Find a point corresponding to 80% relative humidity; this point is situated in the right part of the horizontal axis (see Fig. 1). Draw a line, perpendicular to the horizontal axis, starting from the point φ=80% to the intersection with the curve "Cooled products without packaging"; then draw a horizontal line to the intersection with the line t_0 corresponding to 0°C (this intersection is on the left side of the diagram). In the left part of the horizontal axis, you can find a temperature difference value equal to 8K.

Let's check it using the formula $t_k = t_0 + Dt1 = 0 + 8 = +8°C$. The required condition is satisfied!
Consequently, the temperature difference Dt1 you need is 8K.

This diagram shows that the relative humidity in the cold room at a temperature difference of 10K will be equal to 74%.

Thus, if the cold room is operated within the limits of t_k = +8..+10°C and Dt1 = 8..10K the relative humidity range will be between 80 and 74%.

2. Determination of the fin spacing

Determination of the fin spacing has the biggest influence on the unit cooler's operating cycle as well as on the length and frequency of defrost periods.
Icing of the coil lowers heat transfer, obstructs the area between the fins, and decreases the air flow through the unit cooler. As a consequence, the unit cooler's capacity and the evaporating temperature become reduced. (see Fig. 2)

Frost formation on unit cooler surface

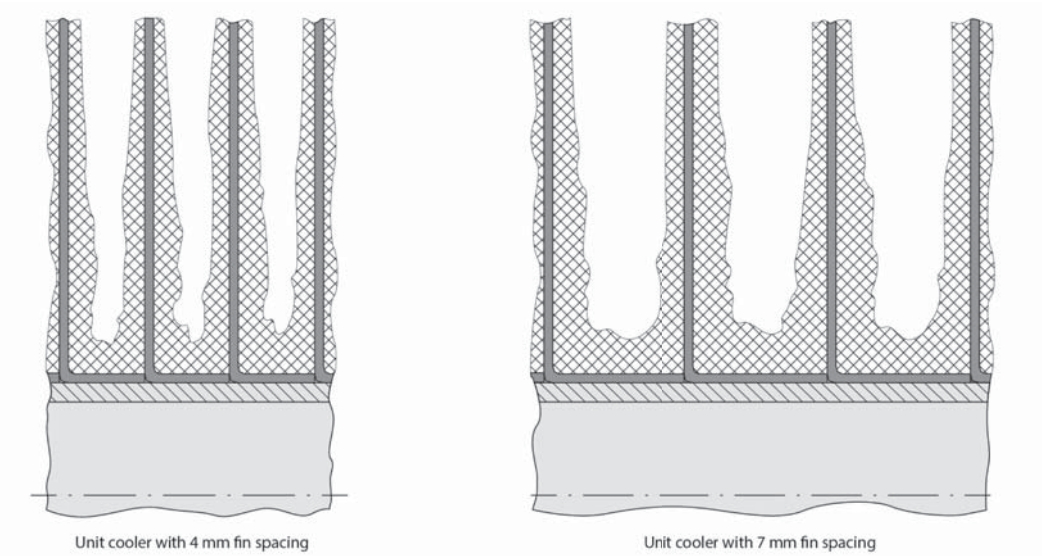


Fig. 2

Selecting a unit cooler with large fin spacing allows to increase the intervals between defrost periods. On the other hand, increased fin spacing results in increased unit cooler dimensions, internal volume, and cost.

Table 1 contains recommendations how to select the appropriate fin spacing. These recommendations are based on the experience of using unit coolers for different applications.

Table 1. Recommendations for determination of fin spacing

	4.0mm		5.5mm		7.0mm		
Dt1	6..8K	10K	8K	6..8K	7K	6..7K	6K
Relative humidity	80..92%	70..80%	80..85%	80..95%	85..92%	90..95%	
Temperature in cold room	+5..+10°C	+10..+12°C	0..+5°C	+2..+5°C	-10..-25°C		-1..+3°C
State of products	Cooled	-	Cooled		Frozen		Cooled
Packaging	Without packaging	-	Packaged	Without packaging	Packaged	Without packaging	
Cold room intended for	Storage	Industrial air conditioning	Storage		Storage		
Products	Fresh vegetables, fruit	-	All	Fresh vegetables, fruit, meat	All	Meat, fish	Meat, fish, vegetables, fruit

3. Determination of the number and location of unit coolers

The design capacity of the unit cooler may only be reached if the air in the cold room circulates properly. The optimal air circulation means that the air flow is not restricted by improperly located products or building constructions.
For each type of cold rooms, it is necessary to avoid situations when the primary air flow leaving the unit cooler directly faces stored products. The best solution is when the air flow streams above the products, almost under the ceiling. The speed with which the primary air flow comes to the opposite wall should be from 0.25 to 0.5 m/s. (see Fig. 3)

Air circulation in cold room

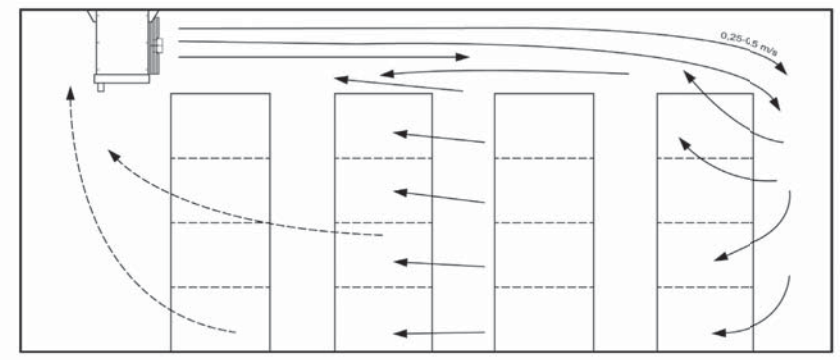


Fig. 3

When determining the number and location of the unit coolers in the cold room, take into account the following:

- Air throw (the air throw of a unit cooler is the distance from this unit cooler's fan to a point where the air velocity decreases to avalue of 0.25 m/s);
- When the cold room has ceiling beams, locate the unit coolers between the beams and provide air flow along them;
- When the cold room has columns, it is desirable to locate the unit coolers in each area between them;
- When the cold room has many-tier storage racks, the unit coolers should be placed between them; the air flow should bedirected along the passages;
- In order to provide even air distribution throughout the cold room, air ducts may be used;
- It is not recommended to locate unit coolers direct above doors and gates.

Recommended placement of unit coolers

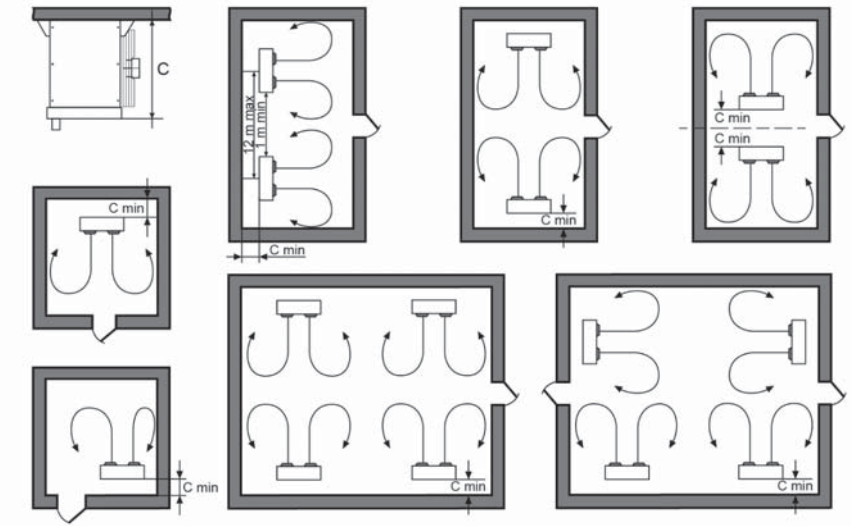


Fig. 4

4. Calculation of the required cooling capacity under standard conditions SC2

In order to select a suitable unit cooler from manufacturers' catalogues, it is necessary to calculate the required cooling capacity under SC2 (standard conditions in accordance with EN 328).

$$Q_o^{SC2} = \frac{Q_o}{k_1 * k_2}$$, where

Q_o - required cooling capacity;
Q_o^{SC2} - required cooling capacity under SC2;
k_1 - correction factor depending on inlet air temperature and temperature difference Dt1;
k_2 - correction factor depending on refrigerant used and inlet air temperature.

Table 1. Conditions in compliance with EN 328

Standard conditions	Inlet air temperature	Evaporating temperature	Temperature difference Dt1	Relative humidity	Wet conditions factor
	°C	°C	K	%	
SC1	+10	0	10	85	1.35
SC2	0	-8	8	85	1.15
SC3	-18	-25	7	95	1.05

Table 3. k_1 - correction factor depending on inlet air temperature and temperature difference Dt1

Dt1, K	Inlet air temperature, °C										
	-35	-30	-25	-20	-15	-10	-5	0	5	10	12
10	1.087	1.087	1.099	1.129	1.159	1.190	1.220	1.250	1.467	1.467	1.467
9	0.978	0.978	0.989	1.016	1.043	1.071	1.098	1.125	1.321	1.321	1.321
8	0.870	0.870	0.879	0.903	0.928	0.952	0.976	1.000	1.174	1.174	1.174
7	0.761	0.761	0.769	0.790	0.812	0.833	0.854	0.875	1.027	1.027	1.027
6	0.652	0.652	0.659	0.678	0.696	0.714	0.732	0.750	0.880	0.880	0.880
5	0.543	0.543	0.550	0.565	0.580	0.595	0.610	0.625	0.734	0.734	0.734
4	0.435	0.435	0.440	0.452	0.464	0.476	0.488	0.500	0.587	0.587	0.587

Table 4. k_2 - correction factor depending on refrigerant used and inlet air temperature

Refrigerant	Inlet air temperature, °C										
	-35	-30	-25	-20	-15	-10	-5	0	5	10	12
R507A	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
R404A	1	1	1	1	1	1	1	1	1	1	1
R134a	*	*	*	*	0.86	0.88	0.89	0.91	0.92	0.93	0.93
R22	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95

5. Selection of the required unit cooler model

5.1 Example. Selection of unit cooler of required cooling capacity OH201

Initial data:

- Product – frozen meat;
- Packaged;
- Inlet air temperature T_k = -20°C;
- Required capacity Q_o = 16kW;
- Refrigerant R507A.

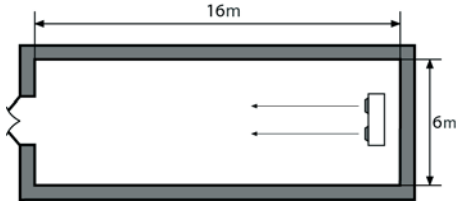


Fig. 5.1

Selection of the appropriate unit cooler:

1. According to the diagram shown in Figure 1, determine the required temperature difference: Dt1 = 7 K;
2. According to the data in Table 1, select 7 mm fin spacing;
3. Based on the cold room dimensions (see Fig. 5), we need one unit cooler with an air throw of not less than 16 m;
4. Determine the correction factors in line with Table 3 and Table 4
   k_1=0.790
   k_2=0.97

$$Q_o^{SC2} = \frac{Q_o}{k_1 * k_2} = \frac{16}{0.790 * 0.97} = 20.9 \text{ kW} \Rightarrow \begin{cases} \textbf{OH201–250S1A–E70} & 22.0 \text{ kW} \\ \textbf{OH201–250S1A–G70} & 25.2 \text{ kW} \\ \textbf{OH201–350S1A–E70} & 33.8 \text{ kW} \end{cases}$$

5. In accordance with the cooling capacity Q_o^{SC2} and the fin spacing, select suitable unit cooler models from the table «Parameters» in the technical catalogue «OH201 Unit Coolers».
   Select **OH201–250S1A–G70** model and calculate its capacity under given conditions:

$$Q_o = Q_o^{SC2} * k_1 * k_2 = 25.2 * 0.790 * 0.97 = 19.3 \text{ kW}$$

Table 5.1 Technical data

	Models	Number of fans	Capacity (SC2)(1)	Air flow	Air throw	Heat exchange surface	Internal volume	Fan data			Sound pressure level (3m) (2)	Electric defrost		Connections		Weight
	FIN SPACING 7.0 mm							Fan speed	Power consumption	Rated current		Coil	Drip tray	Inlet	Outlet	
			kW	m³/h	m	m²	dm³	rpm	W	A	dB(A)	W	W	mm	mm	kg
Ø 350 mm	OH201-135S1A-C70	1	3.0	2500	17	12.4	2.1	1290	174	0.8	50	1152	384	12	22	29
	OH201-135S1A-E70	1	3.9	2300	16	18.6	3.3	1290	174	0.8	50	1536	384	12	22	32
	OH201-235S1A-C70	2	6.1	5000	19	24.8	4.4	1290	348	1.6	53	2816	704	12	28	38
	OH201-235S1A-E70	2	7.5	4500	18	37.2	6.5	1290	348	1.6	53	3520	704	12	28	46
	OH201-335S1A-C70	3	9.1	7500	21	37.2	6.5	1290	522	2.3	55	4096	1024	12	28	58
	OH201-335S1A-E70	3	11.7	6700	20	55.8	9.8	1290	522	2.3	55	5120	1024	16	28	62
	OH201-435S1A-C70	4	12.1	9900	22	49.6	8.7	1290	696	3.1	56	5376	1344	16	35	75
	OH201-435S1A-E70	4	15.2	9000	21	74.4	13.1	1290	696	3.1	56	6720	1344	16	35	86
Ø 400 mm	OH201-140S1A-E70	1	5.4	3300	20	26.8	4.5	1380	219	1.0	52	3136	448	16	28	36
	OH201-140S1A-G70	1	6.7	3000	19	35.7	6.0	1380	219	1.0	52	4032	448	16	28	40
	OH201-240S1A-E70	2	11.5	6500	22	53.6	9.2	1380	438	2.0	55	6656	832	28	35	71
	OH201-240S1A-G70	2	13.4	6000	21	71.5	12.2	1380	438	2.0	55	8320	832	28	35	79
	OH201-340S1A-E70	3	16.2	9700	24	80.4	14.0	1380	657	3.0	57	8512	1216	35	42	105
	OH201-340S1A-G70	3	20.2	8900	23	107.2	18.6	1380	657	3.0	57	12160	1216	35	42	116
	OH201-440S1A-E70	4	23.0	13000	27	107.2	18.6	1380	876	3.9	58	12800	1600	35	42	136
	OH201-440S1A-G70	4	26.8	11900	26	142.9	24.5	1380	876	3.9	58	16000	1600	35	54	152
Ø 450 mm	OH201-145S1A-C70	1	5.0	5600	30	22.6	4.0	1330	479	2.3	54	2400	480	12	28	47
	OH201-145S1A-E70	1	7.9	5200	28	33.9	5.9	1330	479	2.3	54	3840	480	22	28	53
	OH201-145S1A-G70	1	9.5	4700	26	45.2	7.9	1330	479	2.3	54	4800	480	22	28	59
	OH201-245S1A-C70	2	12.2	11100	31	45.2	7.9	1330	958	4.5	57	5376	896	22	28	78
	OH201-245S1A-E70	2	15.8	10300	29	67.7	11.9	1330	958	4.5	57	7168	896	35	42	93
	OH201-245S1A-G70	2	19.1	9400	27	90.3	15.9	1330	958	4.5	57	8960	896	35	42	104
	OH201-345S1A-E70	3	24.6	15300	31	101.6	17.8	1330	1437	6.8	58	10752	1344	35	42	131
	OH201-345S1A-G70	3	28.6	14000	29	135.5	23.8	1330	1437	6.8	58	13440	1344	35	42	147
	OH201-445S1A-E70	4	32.3	20400	32	135.5	23.8	1330	1916	9.0	59	13824	1728	35	54	168
	OH201-445S1A-G70	4	35.9	18600	30	180.7	31.7	1330	1916	9.0	59	19008	1728	35	54	189
Ø 500 mm	OH201-150S1A-C70	1	8.3	7600	37	31.6	5.8	1330	710	3.1	54	3648	608	16	28	54
	OH201-150S1A-E70	1	11.1	7100	36	47.5	8.8	1330	710	3.1	54	4864	608	28	35	61
	OH201-150S1A-G70	1	13.2	6600	34	63.3	11.4	1330	710	3.1	54	6080	608	28	35	68
	OH201-250S1A-C70	2	16.2	15100	38	63.3	11.8	1330	1420	6.2	57	6912	1152	16	35	95
	OH201-250S1A-E70	2	22.0	14100	37	94.9	17.7	1330	1420	6.2	57	10368	1152	28	35	107
	OH201-250S1A-G70	2	25.2	13200	36	126.6	22.9	1330	1420	6.2	57	12672	1152	28	42	121
	OH201-350S1A-E70	3	33.8	21100	39	142.4	25.3	1330	2130	9.3	58	15552	1728	35	42	160
	OH201-350S1A-G70	3	38.1	19700	38	189.8	34.6	1330	2130	9.3	58	20736	1728	35	42	180
	OH201-450S1A-E70	4	42.3	28100	40	189.8	34.5	1330	2840	12.4	59	22400	2240	35	54	204
	OH201-450S1A-G70	4	51.0	26300	39	253.1	45.5	1330	2840	12.4	59	29120	2240	35	54	231

(1) Nominal capacities for R404A according to EN 328.
(2) Sound pressure according to EN13487.

Data sheet for the selected unit cooler (example):

Unit Cooler OH201-250S1A-G70

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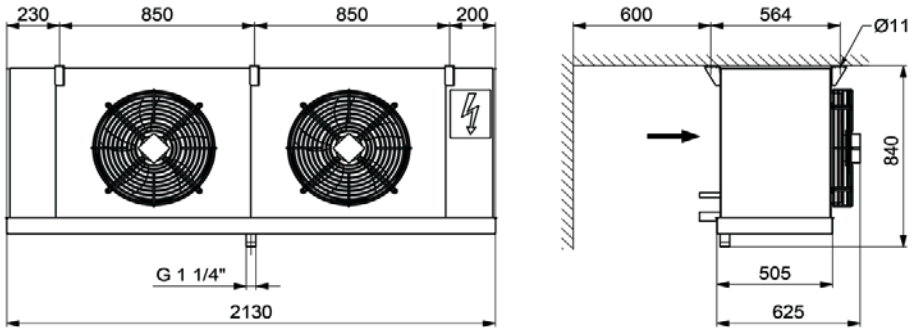
Nominal conditions SC2 according to EN 328:			
Capacity	25.2 kW	Refrigerant	R404A
Evaporation temperature	-8.0 °C	Relative humidity	85 %
Inlet air temperature	0.0 °C	Temperature difference (DT1) (1)	8.0 K
Fans:			
Quantity	2 pcs.	Air flow	13200 m^3/h
Diameter	500 mm	Air throw	36 m
Power supply	~1-230V-50 Hz	Fan speed	1330 rpm
Power consumption	2 x 710 W	Sound pressure level (2)	57 dB(A)
Maximum operating current (4)	6.2 A	Sound power	85 dB(A)
		ErP compliance (3)	Yes
Electric defrost (option):			
Electric defrost coil	~1-230V-50 Hz	11 x 1152 W	
Electric defrost drip tray	~1-230V-50 Hz	1 x 1152 W	
Fan ring heater capacity	~1-230V-50 Hz	2 x 345 W	



Technical data:			
Fin spacing	7.0 mm	Casing material	AlMg
Surface	126.6 m^2	Tube material	Cu
Internal volume	22.9 dm^3	Fin material	Al
Net weight(5)	121 kg	Refrigerant inlet	ø 28 mm
Maximum pressure	31 bar	Refrigerant outlet	ø 42 mm
		Drain	G $1"^1/_4$

Capacity of OH201-250S1A-G70, kW

DT1, K	Inlet air temperature, C^0															
	-35	-30	-27	-25	-20	-15	-10	-5	0	1	2	3	4	5	10	12
10	27.39	27.39	27.39	27.69	28.45	29.21	29.99	30.74	31.50	32.58	33.69	34.78	35.88	36.97	36.97	36.97
9	24.65	24.65	24.65	24.92	25.60	26.28	26.99	27.67	28.35	29.33	30.32	31.32	32.31	33.29	33.29	33.29
8	21.92	21.92	21.92	22.15	22.76	23.39	23.99	24.60	25.20	26.08	26.96	27.82	28.70	29.58	29.58	29.58
7	19.18	19.18	19.18	19.38	19.91	20.46	20.99	21.52	22.05	22.81	23.59	24.34	25.12	25.88	25.88	25.88
6	16.43	16.43	16.43	16.61	17.09	17.54	17.99	18.45	18.90	19.56	20.21	20.87	21.52	22.18	22.18	22.18
5	13.68	13.68	13.68	13.86	14.24	14.62	14.99	15.37	15.75	16.30	16.86	17.39	17.94	18.50	18.50	18.50
4	10.96	10.96	10.96	11.09	11.39	11.69	12.00	12.30	12.60	13.03	13.48	13.91	14.36	14.79	14.79	14.79

(1) Difference between evaporation temperature and inlet air temperature, K

(2) Sound pressure level at 3m distance, dB(A)

(3) Compliance of fans with EU Ecodesign Directive (2009/125/EC)

(4) Operating current may vary depending on air temperature and supply voltage

(5) Demensions and weights are indicated for base models without options

Subject to technical amendments without prior notice

5.2 Example. Selection of unit cooler of required cooling capacity OH221

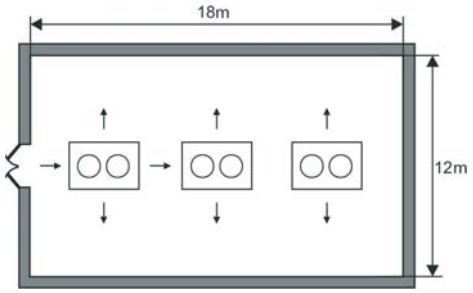


Fig. 5.2

Initial data:

- Product – seed potato in bulk;
- Inlet air temperature T_k = +3°C;
- Required capacity Q_o = 40kW;
- Refrigerant - R507A.

Selection of the appropriate unit cooler:

1. According to the diagram shown in Figure 1, determine the required temperature difference: Dt1 = 7K;
2. According to the data in Table 1, select 7 mm fin spacing;
3. Based on the cold room dimensions (see Fig. 5.2), we need three unit coolers;
4. Determine the correction factors in line with Table 3 and Table 4
   k_1=0.966
   k_2=0.97

$$Q_o^{SC2} = \frac{Q_o}{k_1 * k_2} = \frac{13}{0.966 * 0.97} = 13.9 \text{ kW} \Rightarrow \begin{cases} \textbf{OH221–435S1A–E70} & 15.6 \text{ kW} \\ \textbf{OH221–250S1A–C70} & 16.6 \text{ kW} \\ \textbf{OH221–245S1A–E70} & 15.7 \text{ kW} \end{cases}$$

5. In accordance with the cooling capacity Q_o^{SC2} and the fin spacing, select suitable unit cooler models from the table «Parameters» in the technical catalogue «OH221 Unit Coolers».
   Select **OH221–435S1A–E70** model and calculate its capacity under given conditions:

$$Q_o = 3 * [Q_o^{SC2} * k_1 * k_2] = 3 * 15.6 * 0.966 * 0.97 = 43.9 \text{ kW}$$

Table 5.2 Technical data

	Models	Number of fans	Capacity (SC2)(1)	Air flow	Air throw	Heat exchange surface	Internal volume	Fan data			Sound pressure level (3m)(2)	Electric defrost		Connections		Weight
	FIN SPACING 7.0 mm							Fan speed	Power consumption	Rated current		Two coils	Two drip trays	Inlet	Outlet	
			kW	m³/h	m	m²	dm³	rpm	W	A	dB(A)	W	W	mm	mm	kg
Ø 350 мм	OH221-135S1A-C70	1	2.9	2500	2 x 7	11.9	2.2	1290	174	0.8	50	896	896	12	22	38
	OH221-135S1A-E70	1	3.6	2200	2 x 6	17.9	3.2	1290	174	0.8	50	1792	896	16	22	41
	OH221-235S1A-C70	2	5.9	4900	2 x 9	23.8	4.2	1290	348	1.6	53	1664	1664	16	28	60
	OH221-235S1A-E70	2	7.8	4400	2 x 8	35.7	6.4	1290	348	1.6	53	3328	1664	16	28	65
	OH221-335S1A-C70	3	8.9	7400	2 x 10	35.7	6.4	1290	522	2.3	55	2432	2432	16	28	82
	OH221-335S1A-E70	3	11.7	6600	2 x 9	53.6	9.4	1290	522	2.3	55	4864	2432	22	35	91
	OH221-435S1A-C70	4	11.9	9800	2 x 12	47.6	8.4	1290	696	3.1	56	3200	3200	22	35	104
	OH221-435S1A-E70	4	15.6	8800	2 x 11	71.5	12.4	1290	696	3.1	56	6400	3200	22	35	115
Ø 400 мм	OH221-140S1A-E70	1	5.2	3200	2 x 8	26.1	4.6	1380	219	1.0	51	2176	1088	16	28	53
	OH221-140S1A-G70	1	6.5	3000	2 x 7	34.7	6.2	1380	219	1.0	51	3264	1088	16	28	57
	OH221-240S1A-E70	2	11.4	6400	2 x 10	52.1	9.2	1380	438	2.0	54	3840	1920	16	35	85
	OH221-240S1A-G70	2	13.2	5900	2 x 9	69.5	12.2	1380	438	2.0	54	5760	1920	22	35	94
	OH221-340S1A-E70	3	17.1	9600	2 x 11	78.2	13.6	1380	657	3.0	56	5632	2816	28	42	118
	OH221-340S1A-G70	3	18.7	8800	2 x 10	104.2	18.2	1380	657	3.0	56	8448	2816	28	42	130
	OH221-440S1A-E70	4	22.4	12800	2 x 12	104.2	18.2	1380	876	3.9	57	7424	3712	28	42	151
	OH221-440S1A-G70	4	24.6	11700	2 x 11	139.0	24.2	1380	876	3.9	57	11136	3712	28	54	168
Ø 450 мм	OH221-145S1A-C70	1	5.9	4900	2 x 11	23.8	4.2	1345	303	1.4	53	1216	1216	16	28	55
	OH221-145S1A-E70	1	7.8	4600	2 x 10	35.7	6.4	1345	303	1.4	53	2432	1216	16	28	61
	OH221-245S1A-C70	2	12.0	9800	2 x 13	47.6	8.4	1345	606	2.7	56	2176	2176	16	35	91
	OH221-245S1A-E70	2	15.7	9100	2 x 12	71.5	12.4	1345	606	2.7	56	4352	2176	28	42	103
	OH221-345S1A-C70	3	17.9	14600	2 x 14	71.5	12.4	1345	909	4.1	57	3200	3200	22	42	128
	OH221-345S1A-E70	3	23.8	13600	2 x 13	107.2	18.6	1345	909	4.1	57	6400	3200	28	54	146
	OH221-445S1A-C70	4	24.0	19500	2 x 16	95.3	16.6	1345	1212	5.4	58	4224	4224	28	54	161
	OH221-445S1A-E70	4	30.3	18100	2 x 15	142.9	24.8	1345	1212	5.4	58	8448	4224	28	54	184
Ø 500 мм	OH221-150S1A-C70	1	8.4	6800	2 x 14	34.7	6.2	1300	530	2.4	54	2816	1408	16	28	70
	OH221-150S1A-E70	1	9.8	6400	2 x 13	52.1	9.2	1300	530	2.4	54	4224	1408	35	42	79
	OH221-150S1A-G70	1	12.7	6100	2 x 12	69.5	12.2	1300	530	2.4	54	5632	1408	35	42	88
	OH221-250S1A-C70	2	16.6	13600	2 x 16	69.5	12.2	1300	1060	4.7	57	5376	2688	35	42	118
	OH221-250S1A-E70	2	22.8	12800	2 x 16	104.2	18.2	1300	1060	4.7	57	8064	2688	35	54	135
	OH221-250S1A-G70	2	26.7	12100	2 x 15	139.0	24.2	1300	1060	4.7	57	10752	2688	35	54	151
	OH221-350S1A-E70	3	33.2	19100	2 x 17	156.3	27.2	1300	1590	7.0	58	11904	3968	35	54	192
	OH221-350S1A-G70	3	40.5	18100	2 x 16	208.4	36.2	1300	1590	7.0	58	15872	3968	35	54	218

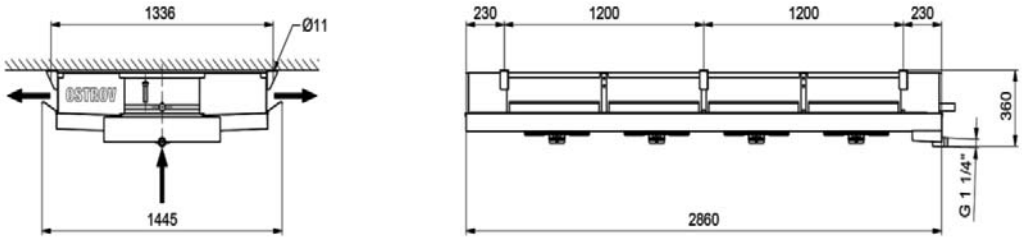
(1) Nominal capacities for R404A according to EN 328.
(2) Sound pressure according to EN13487.

Data sheet for the selected unit cooler (example):

Unit Cooler OH221-435S1A-E70

OSTROV

Nominal conditions SC2 according to EN 328:			
Capacity	15.6 kW	Refrigerant	R404A
Evaporation temperature	-8.0 °C	Relative humidity	85 %
Inlet air temperature	0.0 °C	Temperature difference (DT1) (1)	8.0 K
Fans:			
Quantity	4 pcs.	Air flow	8800 m^3/h
Diameter	350 mm	Air throw	2 x 11 m
Power supply	~1-230V-50 Hz	Fan speed	1290 rpm
Power consumption	4 x 174 W	Sound pressure level (2)	56 dB(A)
Maximum operating current (4)	3.1 A	Sound power level	78 dB(A)
		ErP compliance (3)	Yes
Electric defrost (option):			
Electric defrost coil	~1-230V-50 Hz	4 x 1600 W	
Electric defrost drip tray	~1-230V-50 Hz	2 x 1600 W	



Technical data:			
Fin spacing	7.0 mm	Casing material	AlMg
Surface	71.5 m^2	Tube material	Cu
Internal volume	12.4 dm^3	Fin material	Al
Net weight(5)	115 kg	Refrigerant inlet	ø 22 mm
Maximum pressure	31 bar	Refrigerant outlet	ø 35 mm
		Drain	G $1''^1/_4$

Capacity of OH221-435S1A-E70, kW

DT1, K	Inlet air temperature, C^0												
	0	1	2	3	4	5	6	7	8	9	10	11	12
10	19.50	20.17	20.86	21.53	22.21	22.89	22.89	22.89	22.89	22.89	22.89	22.89	22.89
9	17.55	18.16	18.77	19.39	20.00	20.61	20.61	20.61	20.61	20.61	20.61	20.61	20.61
8	15.60	16.15	16.69	17.22	17.77	18.31	18.31	18.31	18.31	18.31	18.31	18.31	18.31
7	13.65	14.12	14.60	15.07	15.55	16.02	16.02	16.02	16.02	16.02	16.02	16.02	16.02
6	11.70	12.11	12.51	12.92	13.32	13.73	13.73	13.73	13.73	13.73	13.73	13.73	13.73
5	9.75	10.09	10.44	10.76	11.11	11.45	11.45	11.45	11.45	11.45	11.45	11.45	11.45
4	7.80	8.07	8.35	8.61	8.89	9.16	9.16	9.16	9.16	9.16	9.16	9.16	9.16

(1) Difference between evaporation temperature and inlet air temperature, K

(2) Sound pressure level at 3m distance according to EN 13487, dB(A)

(3) Compliance of fans with EU Ecodesign Directive (2009/125/EC)

(4) Operating current may vary depending on air temperature and supply voltage

(5) Demensions and weights are indicated for base models without options

Subject to technical amendments without prior notice

5.3 Example. Selection of unit cooler of required cooling capacity OH222.

Initial data:

- Freezing of semi-finished products on freeze racks;
- Inlet air temperature T_k = -30°C;
- Required capacity Q_o = 45kW;
- Refrigerant - R507A.

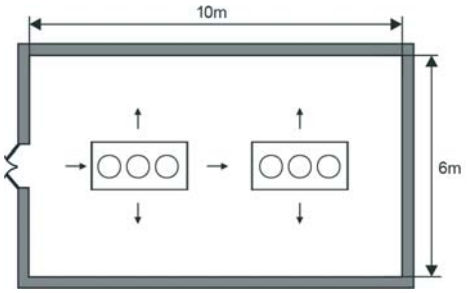


Fig. 5.3

Selection of the appropriate unit cooler:

1. According to the diagram shown in Figure 1, determine the required temperature difference: Dt1 = 6K;
2. According to the data in Table 1, select 10 mm fin spacing;
3. Based on the cold room dimensions (see Fig. 5.3), we need two unit coolers;
4. Determine the correction factors in line with Table 3 and Table 4
   k_1=0.652
   k_2=0.97

$$Q_o^{SC2} = \frac{Q_o}{k_1 * k_2} = \frac{45}{0.652 * 0.97} = 71.2 \text{ kW} \Rightarrow \begin{cases} \textbf{OH222–445S3A–G100} & 39.1 \text{ kW} \\ \textbf{OH222–350S3A–G100} & 39.8 \text{ kW} \end{cases}$$

5. 5. In accordance with the cooling capacity Q_o^{SC2} and the fin spacing, select suitable unit cooler models from the table «Parameters» in the technical catalogue «OH222 Unit Coolers».
   Select **OH222-445S3A-G100** model and calculate its capacity under given conditions:

$$Q_o = 2 * [Q_o^{SC2} * k_1 * k_2] = 2 * 39.1 * 0.652 * 0.97 = 49.5 \text{ kW}$$

Table 5.3 Technical data

	Models	Number of fans	Capacity (SC2) (1)	Air flow	Air throw	Heat exchange surface	Internal volume	Fan data				Sound pressure level (3m) (2)	Electric defrost		Connections		Weight
	FIN SPACING 10.0 mm							Power supply	Fan speed	Power consumption	Rated current		Two coils	Two drip trays	Inlet	Outlet	
			kW	m³/h	m	m²	dm³	φ-V-Hz	rpm	W	A	dB(A)	W	W	mm	mm	kg
Ø 350 мм	OH222-135S3A-C100	1	2.7	2900	2x9	8.6	2.2	3-400-50	1390 (D)	190	0.4	50	896	896	12	22	38
	OH222-135S3A-E100	1	3.6	2600	2x8	12.9	3.2	3-400-50	1390 (D)	190	0.4	50	1792	896	16	22	40
	OH222-235S3A-C100	2	5.4	5700	2x11	17.1	4.2	3-400-50	1390 (D)	380	0.8	52	1664	1664	16	28	62
	OH222-235S3A-E100	2	7.2	5100	2x10	25.7	6.4	3-400-50	1390 (D)	380	0.8	52	3328	1664	16	28	67
	OH222-335S3A-C100	3	8.2	8500	2x12	25.7	6.4	3-400-50	1390 (D)	570	1.3	54	2432	2432	16	28	87
	OH222-335S3A-E100	3	10.8	7600	2x11	38.6	9.4	3-400-50	1390 (D)	570	1.3	54	4864	2432	22	35	96
	OH222-435S3A-C100	4	10.7	11300	2x14	34.3	8.4	3-400-50	1390 (D)	760	1.6	55	3200	3200	22	35	111
	OH222-435S3A-E100	4	14.6	10100	2x13	51.4	12.4	3-400-50	1390 (D)	760	1.6	55	6400	3200	22	35	122
Ø 400 мм	OH222-140S3A-E100	1	4.7	3400	2x10	20.1	5.0	3-400-50	1360 (D)	230	0.5	44	2176	1088	16	28	51
	OH222-140S3A-G100	1	6.2	3200	2x9	26.8	6.6	3-400-50	1360 (D)	230	0.5	44	3264	1088	16	28	56
	OH222-240S3A-E100	2	10.4	6700	2x12	40.2	9.8	3-400-50	1360 (D)	460	1.0	47	4096	2048	16	35	88
	OH222-240S3A-G100	2	12.5	6400	2x11	53.6	13.0	3-400-50	1360 (D)	460	1.0	47	6144	2048	22	35	96
	OH222-340S3A-E100	3	15.7	10000	2x13	60.3	14.6	3-400-50	1360 (D)	690	1.4	49	6016	3008	28	42	124
	OH222-340S3A-G100	3	18.6	9500	2x12	80.4	19.4	3-400-50	1360 (D)	690	1.4	49	9024	3008	28	42	137
	OH222-440S3A-E100	4	20.6	13300	2x14	80.4	19.4	3-400-50	1360 (D)	920	1.9	50	7936	3968	28	42	162
	OH222-440S3A-G100	4	25.0	12700	2x13	107.1	26.0	3-400-50	1360 (D)	920	1.9	50	11904	3968	35	54	180
Ø 450 мм	OH222-145S3A-E100	1	7.9	5900	2x13	27.3	6.6	3-400-50	1350 (D)	540	1.1	50	3648	1216	16	28	63
	OH222-145S3A-G100	1	9.7	5600	2x12	36.4	8.8	3-400-50	1350 (D)	540	1.1	50	4864	1216	16	28	69
	OH222-245S3A-E100	2	15.9	11800	2x15	54.6	13.2	3-400-50	1350 (D)	1080	2.2	53	6912	2304	28	35	111
	OH222-245S3A-G100	2	19.5	11100	2x14	72.9	17.6	3-400-50	1350 (D)	1080	2.2	53	9216	2304	28	42	123
	OH222-345S3A-E100	3	23.9	17600	2x16	82.0	19.8	3-400-50	1350 (D)	1620	3.3	54	10368	3456	35	42	159
	OH222-345S3A-G100	3	28.9	16600	2x15	109.3	26.4	3-400-50	1350 (D)	1620	3.3	54	13824	3456	35	54	177
	OH222-445S3A-E100	4	32.3	23400	2x18	109.3	26.4	3-400-50	1350 (D)	2160	4.4	55	13440	4480	35	54	206
	OH222-445S3A-G100	4	39.1	22100	2x17	145.7	35.2	3-400-50	1350 (D)	2160	4.4	55	17920	4480	35	54	229
Ø 500 мм	OH222-150S3A-C100	1	7.9	8400	2x16	25.0	6.2	3-400-50	1340 (D)	840	1.5	53	4224	1408	16	28	68
	OH222-150S3A-E100	1	9.0	8000	2x15	37.5	9.2	3-400-50	1340 (D)	840	1.5	53	5632	1408	35	42	78
	OH222-150S3A-G100	1	12.3	7500	2x14	50.0	12.2	3-400-50	1340 (D)	840	1.5	53	7040	1408	35	42	86
	OH222-250S3A-C100	2	15.4	16800	2x19	50.0	12.2	3-400-50	1340 (D)	1680	2.9	56	8064	2688	35	42	121
	OH222-250S3A-E100	2	21.9	15800	2x18	75.0	18.2	3-400-50	1340 (D)	1680	2.9	56	10752	2688	35	54	137
	OH222-250S3A-G100	2	26.4	15000	2x17	100.0	24.2	3-400-50	1340 (D)	1680	2.9	56	13440	2688	35	54	152
	OH222-350S3A-E100	3	32.2	23700	2x19	112.5	27.2	3-400-50	1340 (D)	2520	4.4	57	15872	3968	35	54	194
	OH222-350S3A-G100	3	39.8	22400	2x18	150.0	36.2	3-400-50	1340 (D)	2520	4.4	57	19840	3968	35	54	219

(1) Nominal capacities for R404A according to EN 328.
(2) Sound pressure according to EN13487.

Data sheet for the selected unit cooler (example):

Unit Cooler OH222-445S3A-G100

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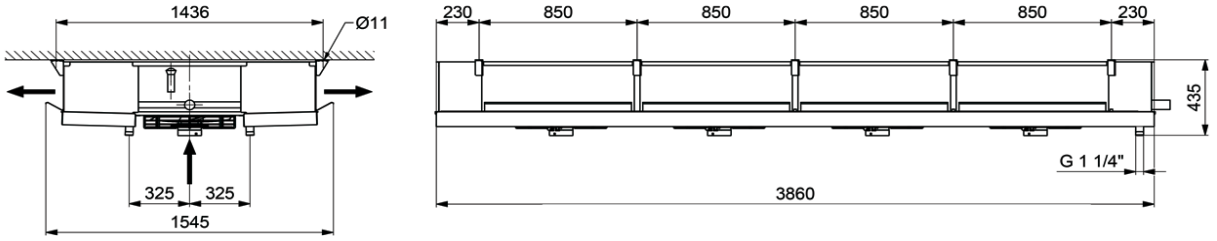
Nominal conditions SC2 according to EN 328:			
Capacity	39.1 kW	Refrigerant	R404A
Evaporation temperature	-8.0 °C	Relative humidity	85 %
Inlet air temperature	0.0 °C	Temperature difference (DT1) (1)	8.0 K
Fans:			
Quantity	4 pcs.	Air flow	22100 m^3/h
Diameter	450 mm	Air throw	2 x 17 m
Power supply	~3-400V-50 Hz	Fan speed	1350 rpm
Power consumption	4 x 540 W	Sound pressure level (2)	55 dB(A)
Maximum operating current (4)	4.4 A	Sound power level	80 dB(A)
		ErP compliance (3)	Yes
Electric defrost (option):			
Electric defrost coil	~1-230V-50 Hz	8 x 2240 W	
Electric defrost drip tray	~1-230V-50 Hz	2 x 2240 W	



Technical data:			
Fin spacing	10.0 mm	Casing material	AlMg
Surface	145.7 m^2	Tube material	Cu
Internal volume	35.2 dm^3	Fin material	Al
Net weight(5)	229 kg	Refrigerant inlet	ø 35 mm
Maximum pressure	31 bar	Refrigerant outlet	ø 54 mm
		Drain	G $1''^1/_4$

Capacity of OH222-445S3A-G100, kW

DT1, K	Inlet air temperature, C^0															
	-35	-30	-27	-25	-20	-15	-10	-5	0	1	2	3	4	5	10	12
10	42.50	42.50	42.50	42.97	44.14	45.32	46.53	47.70	48.88	50.56	52.28	53.96	55.68	57.36	57.36	57.36
9	38.24	38.24	38.24	38.67	39.73	40.78	41.88	42.93	43.99	45.51	47.04	48.6	50.13	51.65	51.65	51.65
8	34.02	34.02	34.02	34.37	35.31	36.28	37.22	38.16	39.10	40.47	41.84	43.17	44.53	45.9	45.9	45.9
7	29.76	29.76	29.76	30.07	30.89	31.75	32.57	33.39	34.21	35.39	36.6	37.77	38.98	40.16	40.16	40.16
6	25.49	25.49	25.49	25.77	26.51	27.21	27.92	28.62	29.33	30.34	31.36	32.37	33.39	34.41	34.41	34.41
5	21.23	21.23	21.23	21.51	22.09	22.68	23.26	23.85	24.44	25.3	26.16	26.98	27.84	28.7	28.7	28.7
4	17.01	17.01	17.01	17.20	17.67	18.14	18.61	19.08	19.55	20.21	20.92	21.58	22.29	22.95	22.95	22.95

(1) Difference between evaporation temperature and inlet air temperature, K

(2) Sound pressure level at 3m distance according to EN 13487, dB(A)

(3) Compliance of fans with EU Ecodesign Directive (2009/125/EC)

(4) Operating current may vary depending on air temperature and supply voltage

(5) Demensions and weights are indicated for base models without options

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