



**TEKNOTHERM**  
MARINE



## WATERCOOLED CONDENSER

**Type SK8:** Shell & Tube design for halocarbon refrigerants, cooled by seawater or freshwater. (Type SKN for ammonia on request.)

**Condenser Shell:** This is made of seamless steel tubes in marine quality P235GH according to Det Norske Veritas' and mostly other classification societies' requirements.

**Tube End Plates:** These are plates in stainless steel AISI 316L and are electrically welded to the condenser shell. The holes for the tubes are exactly made with grooves to assure a safe tightening when tubes are rolled in.

**The tubes** are made of aluminium-brass in the well known alloy for sea water, 76% copper, 2% aluminium and 22% zinc. This alloy has turned out to be extremely qualified in resisting corrosion from sea water and brackish water. The tubes are in high capacity construction with external fins and internal grooves made from the tube itself. Outside surface is then increased considerably, and thereby efficiency is increased, and we get a compact, efficient condenser.

**Supporting Plates:** For support of the tubes and to avoid vibration and noise, supporting plates are mounted in the condenser.

**Water end covers:** The water end covers are in standard design in cast iron, and are made for flange connections. For corrosion protection the water end covers are equipped with corrosion plugs. If wanted, the water end covers can be delivered in marine brass.

**Connections:** For the refrigerant side, the condensers are prepared with steel connections for welding steel tubes. For the water connections standard flanges are used, PN 10 - 16 for the bigger types, and PN 6 for the smallest. The condensers are further equipped with connections for safety valve, for gas equalization to possible receiver, for liquid level glass and for water valve.

**Pressure and leakage testing:** This is performed according to Det Norske Veritas' and mostly other classification societies' requirements. After testing, the condenser is sealed and charged with nitrogen gas with a small overpressure. The condenser external surface is painted with rust protecting paint.

2-pass												
SK8-8.5/8" F-45												
L	L tot	A	B	C	D	E	F	G	H	Weight appr. kg	Pump down capacity dm <sup>3</sup>	Internal net volume ltr.
1500	1700						DN 50			140	25.8	30.3
2000	2200						PN 6			175	34.5	40.6
2500	2700	75	75	219,1	71	282	DIN 2631	48,3	48,3	215	43.4	51.0
2750	2950									230	47.7	56.1
3000	3200									250	52.1	61.3
SK8-10.3/4" F-72												
1500	1700						DN 50			205	40.9	48,1
2000	2200						PN 16			255	54.8	64.5
2500	2700	75	75	273,0	85	336	DIN 2633	60,3	48,3	310	68.8	80.9
3000	3200									365	82.6	97.2
SK8-12.3/4" F-105												
1500	1700						DN 65			290	56.7	66.7
2000	2200						PN 16			360	76.0	89.4
2500	2700	85	77	323,9	96	380	DIN 2633	76,1	60,3	440	95.3	112.1
2750	2950									475	105.0	123.5
3000	3200									515	114.6	134.8
SK8-14" F-134												
1500	1700						DN 80			360	65.5	77.0
2000	2200						PN 6			450	87.7	103.2
2500	2700	85	78	355,6	103	408	DIN 2633	76,1	60,3	615	110.0	129.4
2750	2950									595	120.7	142.5
3000	3200									640	132.3	155.6
SK8-16" F-175												
2000	2250						DN 100			590	115.3	135.6
2500	2750	95	100	406,4	111	442	PN 16	88,9	76,1	715	144.5	170.0
2750	3000						DIN 2633			775	159.2	187.3
3000	3250									835	173,8	204.5
SK8-18" F-227												
3000	3250						DN 125			1085	215,3	253,3
3500	3750	125	125	457	127,5	523	PN 16	114,3	88,9	1240	251,5	295,9
4000	4250						DIN 2633			1400	287,8	338,6
SK8-22" F-342												
3000	3750						DN 150			1470	326,3	383,9
3500	4250	450	295	559	147,5	635	PN 16	125	100	1690	381,2	448,5
4000	4750						DIN 2633			1920	436,2	513,2
SK8-24" F-424												
3000	3750						DN 150			1470	326,3	383,9
3500	4250	450	295	559	147,5	635	PN 16	125	100	1690	381,2	448,5
4000	4750						DIN 2633			1920	436,2	513,2
4-pass												
SK8-8.5/8" F-28												
1100	1290						DN 32			100	23.8	28.0
1500	1700	75	75	219,1		247	PN 6	42,4	42,4	120	32.3	38.0
							DIN 2631					
SK8-8.5/8" F-40												
1100	1290						DN 32			110	20,4	24,0
1500	1700	75	75	219,1		247	PN 6	42,4	42,4	135	28,1	33,0
2000	2200						DIN 2631			170	37,4	44,0

Consult Teknotherm for full specification for your project.

We reserve the rights to change specification without notice.

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**SK8-condensers from Teknotherm are constructed with the following important details to be observed:**

- Small dimensions** by using high capacity condenser tubes with external finned surface. The ratio inside/outside surface is approx. the same ratio as the heat transfer figures outside/inside.
- Materials in tubes and end plates** against the water side are chosen to give a smallest possible corrosion at the electrolytic action, which arises when seawater is used. The combination of the selected materials, aluminium-brass and stainless steel for the quality used here, gives little voltage difference and thereby little electrolytical corroion. As a further protection the water endcovers are equipped with zinc or soft iron corrosion plugs.
- Gas inlet:** The condenser has one gas inlet only and inside distribution of the gas.
- Liquid outlet:** The condenser has as standard one outlet dimensioned to cover the various types max. capacity.
- Flange-connections on the waterside for all types:**  
The water is going in 2 passes for all bigger sizes of condensers. This is suitable for ship and cooling tower with small temperature rise of water.  
2 types, SK8-8.5/8" F28 with L1100-L1500 and F40 with L100-L1500 and L2000, are made for 4 passes and are well suited at capacities from 20-100 kW.
- All materials** are according to the requirements of Det Norske Veritas and and mostly other classification societies' requirements.  
When ordering, certificate can be delivered according to agreement at cost price.
- Condenser tubes can be replaced.**

**CONDENSER SELECTION**

Rating tables for condenser capacities are worked out covering all conditions. To select a condenser, the following data must be known:

- \* Condenser capacity (kW)
- \* Condensing temperature (°C)
- \* Water temperature inlet (°C)
- \* Water type (Scale factor)
- \* Water amount allowed used (L/min.)

**Selection procedure:**

- Condenser capacity is calculated in kW/°C difference between condensing temperature and water inlet temperature, and we get the condenser loading factor.

$$\text{Condensing loading factor} = \frac{\text{Condenser capacity in kW}}{\text{Cond. temp. - Water inlet temp.}}$$

The capacities are calculated with scale factors 0,000086 and 0,000172 m<sup>2</sup>/°C/W.  
The first figure is for seawater and the second figure is for brackish water and fresh water.

- Entering the tables, the condenser capacity can be determined according to this equation:  
Condenser capacity = loading factor x (condensing temperature - water inlet temperature).

- Water temperature outlet =

$$\text{water temperature inlet} + \frac{\text{Condenser capacity} \times 860}{\text{l/min.} \times 60}$$

The loading factor is for each condenser calculated for 4 different water amounts and K-values. Pressure loss in m. W.G. is given in the table for the water amount in question. Interpolation between loading factor and water amount as well as scale factor is allowed.

Type SK8 2 pass	Cooling surface m <sup>2</sup>	Press. loss m/W.G.	l/min	Cond. loading factor		Type SK8 2 pass	Cooling surface m <sup>2</sup>	Press. loss m/W.G.	l/min	Cond. loading factor	
				0,000086	0,000172					0,000086	0,000172
8.5/8" F45	14,22	0,3	115	5,01	4,54	14" F134	56,46	0,3	336	17,25	15,88
L 1500		0,9	230	7,89	6,70	L 2000		1,2	673	28,17	24,39
		2	346	9,80	8,05			2,6	1009	35,76	29,88
8.5/8" F45	19,37	3,5	461	11,15	8,93	14" F134	71,34	0,4	336	19,08	17,83
L 2000		1,1	230	9,66	8,36	L 2500		1,4	673	32,20	28,35
		2,3	346	12,26	10,25			2,7	1009	41,66	35,36
8.5/8" F45	24,22	4	461	14,15	11,51	14" F134	86,23	0,4	336	19,78	18,61
L 2500		1,2	230	10,97	9,66	L 2750		1,5	673	33,87	30,06
		2,6	346	14,19	12,04			3,1	1009	44,22	37,82
8.5/8" F45	26,79	4,5	461	16,58	13,68	14" F134	86,23	5,4	1345	52,01	43,24
L 2750		1,3	230	11,56	10,25	L 3000		1,5	673	35,35	31,61
		2,8	346	15,08	12,89			3,3	1009	46,56	40,10
8.5/8" F45	29,37	4,8	461	17,73	14,73	16" F175	74	5,6	1345	55,08	46,11
L 3000		0,4	115	6,97	6,59	L 2000		0,3	439	22,53	20,74
		1,2	230	12,08	10,67			1,1	878	36,73	31,85
10.3/4" F72	22,75	2,7	542	15,61	12,83	16" F175	93	2,3	1318	46,71	39,02
L 1500		4,7	723	17,77	14,25	L 2500		2,6	1318	54,41	46,18
		1,4	230	12,54	10,67			4,5	1757	63,60	52,50
10.3/4" F72	31	0,4	181	9,36	8,63	16" F175	103	0,4	439	25,83	24,30
L 2000		1,4	361	18,34	13,30	L 2750		2,8	878	42,05	37,02
		3	542	19,50	16,31			2,8	1318	57,76	49,39
10.3/4" F72	38,75	5,3	723	22,52	18,35	16" F175	113	4,8	1757	67,92	56,47
L 2500		0,4	181	10,29	9,83	L 3000		1,4	878	26,60	25,17
		1,6	361	17,40	15,33			3	1318	46,17	41,28
10.3/4" F72	42,87	3,4	542	22,53	19,14	16" F175	132	5,1	1757	60,90	52,37
L 2750		0,4	181	10,67	10,05	L 3000		1,6	878	29,46	28,40
		1,6	361	18,31	16,27			3,3	1318	52,13	47,36
10.3/4" F72	47	6,1	723	25,17	23,45	16" F175	151	6,1	1757	68,83	59,95
L 3000		0,5	181	10,99	10,41	L 4000		1,5	878	28,62	27,61
		1,7	361	19,12	17,11			3,6	1318	51,94	47,68
12.3/4" F105	32,58	6,4	723	29,86	26,02	18" F227	145	6,4	1757	70,49	62,35
L 1500		0,3	264	11,48	10,39	L 3000		0,4	565	34,20	32,37
		1,1	527	18,06	15,35			1,3	1129	59,36	53,07
12.3/4" F105	44,24	2,4	791	22,45	18,44	18" F227	170	2,9	1694	78,17	67,34
L 2000		4,2	1054	25,53	20,45	L 3000		4,9	2259	92,49	77,42
		0,3	264	12,52	12,44			0,4	565	35,73	34,17
12.3/4" F105	55,90	1,3	527	22,08	19,11	18" F227	195	3,2	1694	63,52	57,59
L 2500		2,8	791	28,02	23,41	L 4000		1,5	1129	68,78	61,30
		4,8	1054	32,33	26,30			5,4	2259	101,69	86,24
12.3/4" F105	61,74	0,4	264	14,95	13,97	22" F342	225	0,5	565	36,50	35,50
L 2750		1,4	527	25,23	22,21	L 3000		1,4	1129	66,78	61,30
		3,1	791	32,65	27,71			3,5	1694	90,63	80,17
12.3/4" F105	67,57	5,3	1054	38,16	31,50	22" F342	264	6	2259	109,58	94,08
L 3000		0,4	264	15,90	14,58	L 3500		0,4	878	53,20	50,35
		1,5	527	25,54	23,55			1,4	1129	92,34	82,56
14" F134	41,58	3,2	791	34,65	29,63	22" F342	303	2,9	2635	121,60	104,75
L 1500		5,6	1054	40,75	33,88	L 4000		4,9	3514	143,87	120,43
		0,4	264	15,96	15,10			0,4	878	55,57	53,15
		1,6	527	27,70	24,77		1,5	1129	98,81	89,58	
		3,4	791	36,48	31,42		3,2	2635	132,20	115,45	
		5,8	1054	43,16	36,13		5,5	3514	158,18	134,14	
		1,1	573	23,05	19,59		0,5	878	57,24	55,23	
		2,3	1009	28,65	23,53		1,7	1757	103,88	95,36	
		4	1345	32,59	26,11		3	2635	140,95	124,70	
							6	3514	170,46	146,35	
							0,4	878	55,57	53,15	
							1,4	1757	98,81	89,58	
							2,9	2635	132,20	115,45	
							4,9	3514	158,18	134,14	
							0,4	1757	103,88	95,36	
							1,5	2635	140,98	124,70	
							3,2	3514	170,46	146,35	
							5,5	4392	194,75	163,52	
							0,5	0	0,00	0,00	
							1,7	0	0,00	0,00	
							3,5	0	0,00	0,00	
							6	0	0,00	0,00	

Type SK8 4 pass	Cooling surface m <sup>2</sup>	Press. loss m/W.G.	l/min	Cond. loading factor		Type SK8 4 pass	Cooling surface m <sup>2</sup>	Press. loss m/W.G.	l/min	Cond. loading factor	
				0,000086	0,000172					0,000086	0,000172
8.5/8" F28	6,09	0,4	35	1,83	1,69	8.5/8" F40	8,70	0,4	100	4,29	3,72
L 1100		1,4	70	3,00	2,60	L 1100		1,5	151	5,46	4,57
		3	105	3,82	3,20			3,2	201	6,30	5,14
8.5/8" F28	8,85	5,2	141	4,41	3,60	8.5/8" F40	12,64	0,5	50	2,02	1,85
L 1500		1,6	35	2,12	2,00	L 1500		1,7	100	4,02	3,67
		3,5	105	4,82	4,14			3,7	151	6,88	5,92
		6	141	5,69	4,76		6,4	201	8,13	6,80	
							0,6	50	2,27	2,15	
							2,1	100	5,93	5,44	
							4,4	151	8,04	7,11	
							7,5	201	9,71	8,34	

**Notes:**

The connections for refrigerant for the gas- and liquid side are pipe connections intended for welding. Flanges for welding or soldering can be delivered at an additional price. For connections for water, all types are delivered with flange connections. Pumping down capacity is based on appr. 85% free volume.