Powerstream Turbo

WATER COOLED TURBOCOR-BASED CHILLERS

- OIL-FREE TURBOCOR COMPRESSORS
- R134a/R1234ze REFRIGERANT SELECTION
- CLASS A EER UP TO 6.40

300-4600kW

AVAILABLE IN 7 FRAME SIZES, TOTAL 126 MODELS WITH REFRIGERANT R134A AND LOW-GWP REFRIGERANT R1234ZE

TURBOCOR | WATER COOLED | R134A/R1234ze | FREECOOLING

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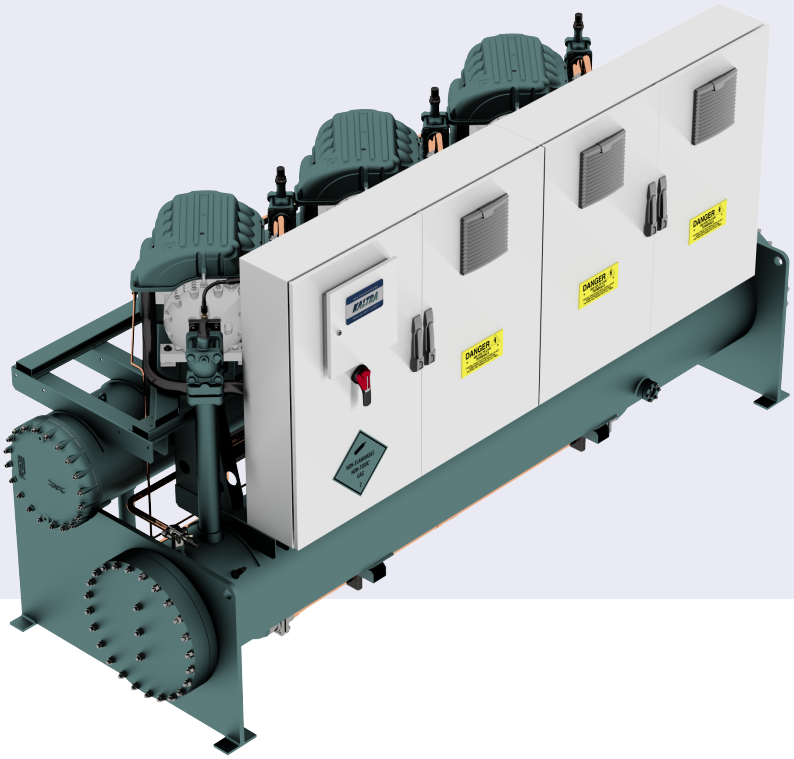
Ultimate water-cooled solution

AN EXCEPTIONALLY ENERGY EFFICIENT WATER-COOLED CHILLER RANGE FEATURING OIL-FREE TURBOCOR COMPRESSORS WITH ECONOMIZERS, FLOODED EVAPORATORS AND OFFERING A GREEN, LOW-GWP R1234ZE REFRIGERANT.

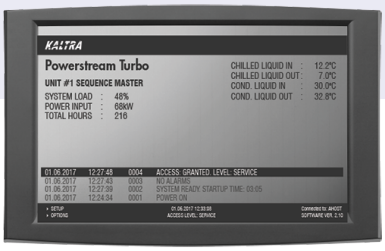
A vast range of Powerstream Turbo models and options provides flexibility, tailored precisely to the customer requirements allowing to design truly efficient cooling solutions for every application. Powerstream Turbo has been designed for year-round mission-critical service. In a 24/7 world, keeping facilities up and running is critical, and we paid special attention to control and monitoring functionality, as well as to operational reliability and ease of maintenance. Due to its excellent efficiency at part-load conditions, Powerstream Turbo is an excellent economy solution for applications where the heat load is not constant and/or expected to grow. The synergy of modern technology, efficiency and reliability enables Powerstream Turbo to be used in the most demanding applications.

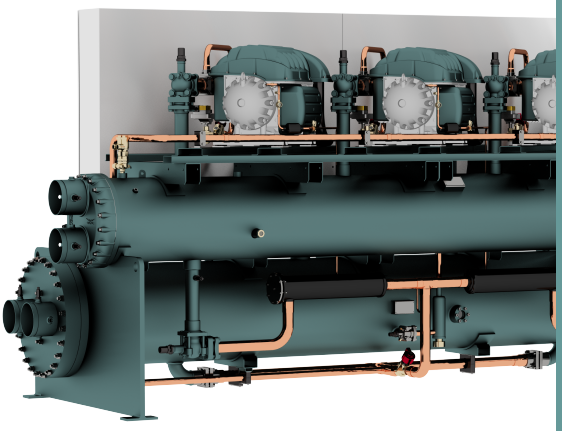


Powerstream

FEATURES & ADVANTAGES

- OIL-FREE TURBOCOR COMPRESSORS
- ECONOMIZERS TO BOOST OUTPUT & EFFICIENCY
- GREEN COOLING WITH R1234ze REFRIGERANT
- EXCELLENT AT FULL AND PARTIAL LOADS
- ESEER UP TO 10.50
- PROVEN RELIABILITY





Green cooling

With environmental-friendly R1234ze refrigerant

Refrigerants with low global warming potential (GWP) are becoming more and more important in the refrigeration and air conditioning industry in Europe and beyond.

R1234ze features low GWP of one and zero ozone depletion potential, thus providing the environmental leadership while achieving the best energy performance levels for applications.

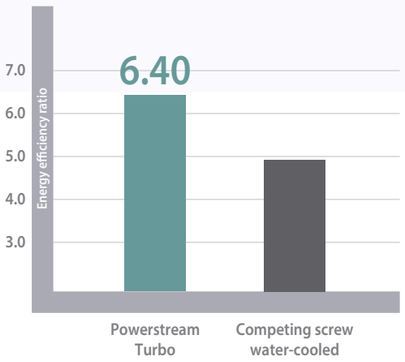
A Turbocor compressors

Save up to 25% in operating costs*

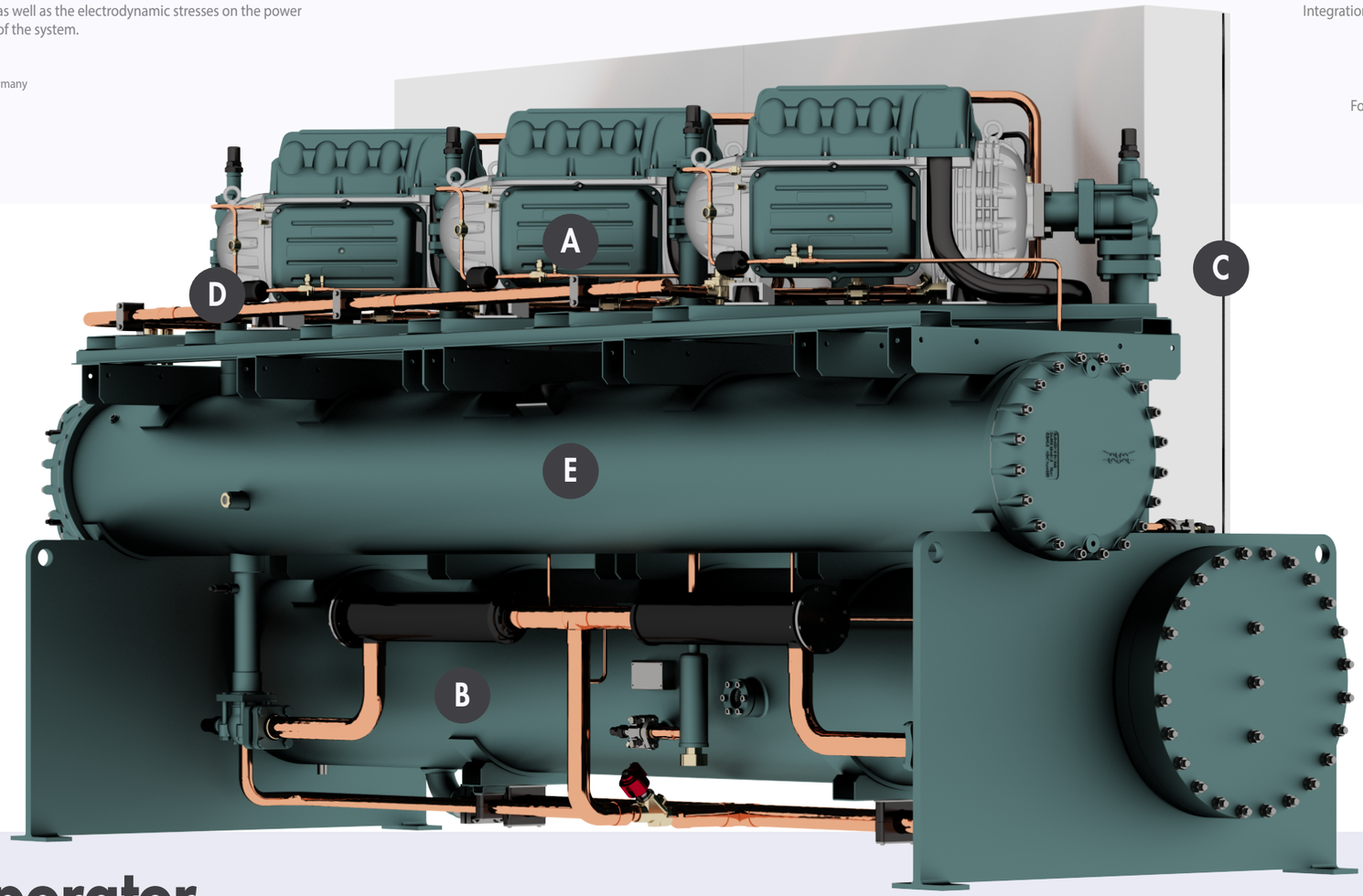
Turbocor compressors offer the outstanding energy savings from digitally controlled, frictionless two-stage centrifugal compression and guarantees significant reductions in operating cost and environmental emissions associated with energy production. The oil-free design of Turbocor compressors eliminates the potential for efficiency-robbing oil contamination and all of the oil management accessories: oil heaters, oil pumps, oil separators, oil filters, plus oil disposal.

Compressor soft-start draws only 2 amps and reduces mechanical stress, as well as the electrodynamic stresses on the power cables and electrical distribution network, extending the overall lifespan of the system.

* compared to leading competitor screw chiller over an annual running in Nuremberg, Germany



ESEER 10.5



Advanced controls C

Intelligent, centralized chilled water plant control

The control hub of Powerstream chillers is a sophisticated controller with advanced software developed for efficient operation of water-cooled chillers. It manages and optimizes the chiller's performance, giving the complete control over the system for plant operator.

Control software can be directly linked to the existing building management system. Integration with a BMS allows collecting and analyzing operating data of chilled water plant and helps to maintain optimal equipment settings, save energy, identifies trouble-prone areas, provides maintenance schedules and generate safety and security alarms.

For the efficient operation of multiple units on a single chilled water plant, the sequencing software permits interlinked operation of the complete system, thus providing optimal temperature control and minimal energy consumption.

Economizer D

Turbocor compressors use two-stage centrifugal compression technology: the first-stage impeller raises the pressure of the refrigerant vapor halfway from the suction pressure to the condenser pressure, and the second-stage impeller raises the pressure the rest of the way. This allows using an interstage economizer, which provides advantages of capacity and efficiency improvements of up to 10% as a result of further subcooling of the liquid refrigerant.

Powerstream chiller offers two types of economizer arrangements: subcooler (standard for compressors with an economizer port) or flashtank (by request).

B Flooded evaporator

- EXCELLENT FOR PART LOAD CONDITIONS
- OPTIMIZED FOR HFC AND HFO REFRIGERANTS
- ALLOWS HIGH EVAPORATION TEMPERATURES

The design of the Powerstream Turbo evaporators provides optimum system efficiency at both full and partial load operation.

The tubes in flooded evaporator are fully immersed in liquid refrigerant and enable a smaller approach temperature between the refrigerant temperature in its shell and chilled water temperature in the tubes to be achieved when compared to other types of evaporators. With flooded evaporator, the compressors operate at higher saturated evaporation temperature and generate more cooling capacity with the same power input.

The control software of Powerstream Turbo chiller maintains the level of refrigerant which is adequate for chilled water tubes to be constantly immersed in it, thus utilizing the full potential of the flooded evaporator even at part load conditions.

Condenser E

OPTIMIZED FOR HFC AND HFO REFRIGERANTS •
HIGH PERFORMANCE •
EASY OF MAINTENANCE •

Powerstream Turbo features newly developed shell-and-tube condensers optimized for HFC and HFO refrigerants to provide the best efficiency. With high-performance tubes, new baffle design and shell, these condensers provide maximum efficiency with a low cost per kW, as well as shorter length and reduced weight compared with competing solutions. Water flow within condenser is optimized to reduce the fouling and erosion risks.

Standard are 2 pass condensers, 4 pass condensers available as an option.

Heat rejection solution

- MCHE/RTPF HEAT EXCHANGER SELECTION
- EVAPORATIVE PRE-COOLING OPTION
- OPTIMIZED FOR WATER-COOLED CHILLERS
- LOW SOUND EMISSION

We recommend using Bora or Mistral series dry coolers with Powerstream chillers. These dry coolers are optimized for water-cooled chillers, offer high performance and enable low water temperature difference.

Bora series is well-suited for urban locations due to their low sound emission, as well as for high-polluted areas and coastal installation due to the high corrosion resistance of microchannel heat exchangers used in the unit design. For the installations in hot climate zones, we recommend Bora dry coolers with evaporative pads.

Mistral series dry coolers equipped with finned tube heat exchangers with internally grooved copper tubes and are ideal for any kind of industrial and commercial applications.

Both dry cooler series feature low operating costs and superb efficiency.

Package, options and accessories

Description		Description		Description	
General					
Anti-vibration mounts	□	Unit enclosure	■	Noise reduction enclosure / compressors	□
Waterside/Refrigerant side					
High-pressure safety switch	■	Service valve on liquid line	■	Temperature probes on evaporator inlet/outlet	■
Electronic expansion valve	■	Water flow switch (loose)	■	Temperature probes on condenser inlet/outlet	■
Variable primary circuit kit	□	Flowmeter	□	Condensation control system	□
Service valves on compressor suction/discharge	■	Refrigerant leak detection	□	Safety valves on high/low refrigerant sides	■
Electric and controls					
BMS connectivity	■	Sequence management	□	Remote monitoring	□
SNMP connectivity	□	Energy monitoring	□	Touchscreen HMI	□

■ Standard feature
□ Optional feature

Model identification

Powerstream Turbo		C	800	E	F	3	/	1	-	R134a
Compressors type	C	Centrifugal oil-free								
Nominal capacity		kW								
Economization	S	Standard								
	E	Economizer								
Evaporator type	F	Flooded shell-and-tube								
Compressors		No. of compressors								
Refrigerant circuits		No. of refrigerant circuits								
Refrigerant		Type								

Frame sizes

Frame size	Length	Width	Height
	mm	mm	mm
F1	2995	995	1950
F2	2995	1695	2250
F3	3695	1695	2250
F4	4695	1695	2250
F5	4695	1895	2450
F6	5695	2395	2450
F7	6695	2395	2450

Technical Specifications
R134a

Powerstream Turbo		C350	C500	C600	C700	C750	C850	C900	C1000	C1050
		F1/1	F1/1	F1/1	F2/1	F1/1	F2/1	F2/1	F2/1	F3/1
Frame size		F1	F1	F1	F1	F1	F2	F2	F2	F3
Cooling capacity[1]	kW	357	494	572	713	744	850	927	987	1062
Total power input	kW	68	90	99	138	122	160	168	181	210
EER	kW/kW	5.21	5.49	5.77	5.19	6.12	5.33	5.52	5.45	5.05
ESEER	kW/kW	9.61	9.42	9.89	9.73	9.59	9.8	9.93	9.86	9.46
Operating weight	kg	2690	2800	2880	4070	2950	5200	5280	5340	7440
Compressor(s)		Turbocor oil-free								
Quantity		1	1	1	2	1	2	2	2	3
Power input	kW	68	90	99	138	122	160	168	181	210
Max absorbed power	kW	93	148	120	93	138	241	213	296	279
Max absorbed current	A	145	231	187	145	216	376	332	462	435
Evaporator		Flooded-type shell-and-tube								
Water flow	m^3/h	61.4	85.1	98.5	122.8	128.2	146.4	159.6	169.9	182.9
Pressure drop	kPa	40.2	40.0	37.3	44.5	49.3	54.6	53.2	54.6	45.2
Water volume	L	82	104	120	132	132	164	176	184	200
Min/max water flow	m^3/h	35/88	50/120	60/145	67/165	67/165	72/180	79/197	83/207	98/223
Condenser		Flooded-type shell-and-tube								
Water flow	m^3/h	72.9	100.3	115.3	146.0	148.7	173.2	187.9	200.5	218.2
Pressure drop	kPa	39.0	38.9	37.2	47.9	48.7	45.9	43.8	44.6	43.3
Water volume	L	82	112	132	152	152	175	195	205	265
Min/max water flow	m^3/h	42/105	57/144	67/170	76/192	76/192	92/231	103/258	108/270	108/270
Refrigeration circuit(s)		R134a								
Quantity		1	1	1	1	1	1	1	1	1
Refrigerant charge	kg	160	175	185	230	190	315	330	330	565

(1) Fluid: Water 100%; Plant water temperatures: 7/12°C; Condenser water temperatures: 30/35°C

Powerstream Turbo		C1500	C1550	C1650	C1700	C1700	C1850	C1900	C2000	C2000
		F3/1	F4/1	F3/1	F4/1	F3/1	F4/1	F3/1	F4/1	F3/1
Frame size		F4	F4	F4	F5	F4	F5	F4	F5	F4
Cooling capacity[1]	kW	1506	1566	1642	1702	1721	1839	1901	1978	1988
Total power input	kW	265	294	286	314	297	336	321	358	331
EER	kW/kW	5.63	5.33	5.74	5.41	5.80	5.47	5.70	5.53	6.01
ESEER	kW/kW	10.00	9.78	10.00	9.78	10.20	9.78	10.20	9.82	10.00
Operating weight	kg	8470	9320	8700	10610	8700	10740	8810	10920	8810
Compressor(s)		Turbocor oil-free								
Quantity		3	4	3	4	3	4	3	4	3
Power input	kW	265	294	286	314	297	336	321	358	331
Max absorbed power	kW	333	427	388	482	360	537	378	592	424
Max absorbed current	A	519	666	605	752	561	838	590	924	663
Evaporator		Flooded-type shell-and-tube								
Water flow	m^3/h	259.2	269.6	282.8	293.0	296.3	316.7	327.3	340.5	342.2
Pressure drop	kPa	63.2	64.0	62.4	75.5	61.4	74.2	67.5	73.0	77.3
Water volume	L	330	340	360	358	380	378	400	398	390
Min/max water flow	m^3/h	118/300	122/307	130/325	122/307	138/344	133/335	145/362	143/363	141/354
Condenser		Flooded-type shell-and-tube								
Water flow	m^3/h	304.0	319.1	331.0	346.0	346.4	373.4	381.7	400.8	398.2
Pressure drop	kPa	50.8	50.9	49.3	51.5	50.4	50.2	56.8	49.8	61.8
Water volume	L	435	455	485	490	505	540	520	580	520
Min/max water flow	m^3/h	153/385	160/401	170/425	173/433	176/441	190/473	183/457	202/506	183/457
Refrigeration circuit(s)		R134a								
Quantity		1	1	1	1	1	1	1	1	1
Refrigerant charge	kg	650	690	670	900	670	910	685	940	685

(1) Fluid: Water 100%; Plant water temperatures: 7/12°C; Condenser water temperatures: 30/35°C

Powerstream Turbo		C1050	C1100	C1150	C1200	C1250	C1300	C1350	C1450	C1500
		F2/1	F2/1	F2/1	F3/1	F2/1	F2/1	F3/1	F3/1	F2/1
Frame size		F2	F2	F2	F3	F2	F2	F3	F3	F2
Cooling capacity[1]	kW	1063	1098	1141	1201	1235	1315	1341	1480	1485
Total power input	kW	189	190	199	234	213	223	257	281	244
EER	kW/kW	5.61	5.77	5.73	5.13	5.81	5.91	5.22	5.27	6.08
ESEER	kW/kW	9.87	9.88	10.20	9.49	9.90	10.10	9.48	9.51	10.20
Operating weight	kg	5410	5350	5330	7590	5340	5420	7750	7370	5310
Compressor(s)		Turbocor oil-free								
Quantity		2	2	2	3	2	2	3	3	2
Power input	kW	189	190	199	234	213	223	257	281	244
Max absorbed power	kW	268	231	240	334	286	258	589	444	276
Max absorbed current	A	418	361	374	521	447	403	607	693	432
Evaporator		Flooded-type shell-and-tube								
Water flow	m^3/h	183.1	189.0	196.4	206.8	212.7	226.4	230.8	254.7	255.6
Pressure drop	kPa	53.3	61.8	52.1	45.3	63.3	61.5	43.2	43.5	67.9
Water volume	L	196	189	209	230	204	220	258	280	227
Min/max water flow	m^3/h	92/226	87/218	99/245	110/251	96/240	104/260	126/288	138/316	111/280
Condenser		Flooded-type shell-and-tube								
Water flow	m^3/h	215.0	221.1	230.0	246.2	248.6	264.1	274.1	302.0	297.0
Pressure drop	kPa	43.0	51.3	41.8	43.6	51.3	49.5	42.1	42.9	56.4
Water volume	L	225	210	245	295	240	260	325	355	270
Min/max water flow	m^3/h	118/296	111/279	129/322	121/302	125/313	136/340	137/345	149/378	143/357
Refrigeration circuit(s)		R134a								
Quantity		1	1	1	1	1	1	1	1	1
Refrigerant charge	kg	340	340	350	580	350	360	610	625	370

(1) Fluid: Water 100%; Plant water temperatures: 7/12°C; Condenser water temperatures: 30/35°C

Powerstream Turbo		C2050	C2050	C2100	C2100	C2200	C2200	C2250	C2300	C2350
		F4/1	F5/1	F3/1	F4/1	F5/1	F4/1	F3/1	F4/1	F5/1
Frame size		F5	F6	F4	F5	F6	F5	F4	F5	F6
Cooling capacity[1]	kW	2054	2063	2070	2076	2200	2214	2240	2294	2337
Total power input	kW	365	378	342	364	398	385	363	395	419
EER	kW/kW	5.63	5.46	6.05	5.70	5.52	5.76	6.17	5.80	5.58
ESEER	kW/kW	9.87	9.90	10.10	9.99	9.91	9.98	10.20	10.00	9.92
Operating weight	kg	11010	13850	8880	11010	14050	11210	9010	11250	14300
Compressor(s)		Turbocor oil-free								
Quantity		4	5	3	4	5	4	3	4	5
Power input	kW	365	378	342	364	398	385	363	395	419
Max absorbed power	kW	564	575	396	453	630	508	414	480	685
Max absorbed current	A	880	897	619	706	983	792	648	748	1069
Evaporator		Flooded-type shell-and-tube								
Water flow	m^3/h	353.7	355.2	356.4	357.4	378.8	381.1	385.7	394.9	402.4
Pressure drop	kPa	75.0	92.1	76.2	72.8	90.4	72.6	80.3	71.7	87.4
Water volume	L	413	658	410	418	692	438	430	448	726
Min/max water flow	m^3/h	148/372	145/363	149/374	152/383	155/390	164/409	155/390	170/430	165/419
Condenser		Flooded-type shell-and-tube								
Water flow	m^3/h	415.2	418.8	414.3	418.9	446.0	446.0	447.2	461.6	473.0
Pressure drop	kPa	50.0	59.6	60.1	49.1	59.7	47.7	66.0	49.0	58.2
Water volume	L	610	1080	550	620	1130	650	570	670	1200
Min/max water flow	m^3/h	212/530	210/525	192/482	215/540	222/558	231/580	200/498	238/597	238/597
Refrigeration circuit(s)		R134a								
Quantity		1	1	1	1	1	1	1	1	1
Refrigerant charge	kg	940	1090	685	940	1105	965	705	975	1125

(1) Fluid: Water 100%; Plant water temperatures: 7/12°C; Condenser water temperatures: 30/35°C

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Technical Specifications
R134a

Powerstream Turbo		C2500	C2450	C2500	C2550	C2600	C2650	C2700	C2700	C2800
		F5/1	F4/1	F4/1	F6/1	F4/1	F4/1	F6/1	F5/1	F5/1
Frame size		F6	F5	F5	F7	F5	F5	F7	F6	F6
Cooling capacity[1]	kW	2474	2475	2479	2562	2594	2646	2700	2724	2806
Total power input	kW	439	421	420	458	431	442	477	469	480
EER	kW/kW	5.63	5.87	5.90	5.59	6.02	5.99	5.65	5.81	5.85
ESEER	kW/kW	9.94	10.10	9.90	10.10	9.96	10.10	10.10	10.10	10.10
Operating weight	kg	14550	11410	11250	18670	11250	11450	18880	14910	15000
Compressor(s)		Turbocor oil-free								
Quantity		5	4	4	6	4	4	6	5	5
Power input	kW	439	421	420	458	431	442	477	469	480
Max absorbed power	kW	740	498	572	723	507	516	778	656	628
Max absorbed current	A	1155	777	894	1128	793	806	1214	1023	979
Evaporator		Flooded-type shell-and-tube								
Water flow	m^3/h	425.9	426.1	426.9	441.0	446.7	455.6	464.9	469.0	483.1
Pressure drop	kPa	87.1	79.9	83.8	83.6	91.8	83.0	84.3	83.6	86.4
Water volume	L	759	463	448	1051	448	473	1091	826	838
Min/max water flow	m^3/h	178/447	175/438	170/430	200/475	170/447	182/456	215/502	200/504	205/512
Condenser		Flooded-type shell-and-tube								
Water flow	m^3/h	500.0	497.3	497.8	518.3	519.5	530.3	545.4	548.2	564.1
Pressure drop	kPa	57.5	51.9	57.0	67.2	59.4	53.4	68.4	60.1	60.5
Water volume	L	1270	700	670	1400	680	730	1440	1345	1370
Min/max water flow	m^3/h	256/638	249/624	238/597	262/648	243/607	257/648	270/665	274/685	282/705
Refrigeration circuit(s)		R134a								
Quantity		1	1	1	1	1	1	1	1	1
Refrigerant charge	kg	1145	975	975	1390	975	995	1405	1180	1185

(1) Fluid: Water 100%; Plant water temperatures: 7/12°C; Condenser water temperatures: 30/35°C

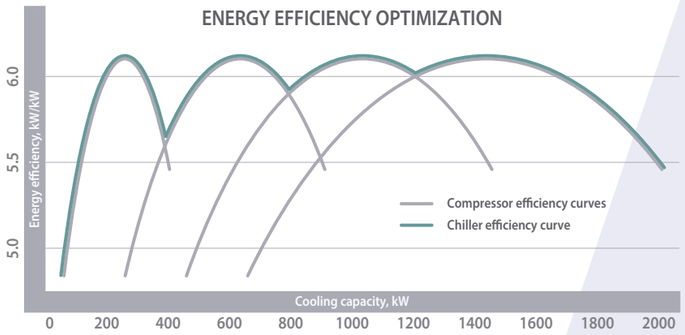
Powerstream Turbo		C3500	C3600	C3700	C3750	C3850	C4000	C4200	C4400	C4550
		F6/1	F5/1	F6/1	F5/1	F6/1	F6/1	F6/1	F6/1	F6/1
Frame size		F7	F6	F7	F6	F7	F7	F7	F7	F7
Cooling capacity[1]	kW	3486	3596	3677	3770	3852	4026	4200	4374	4549
Total power input	kW	583	578	611	599	631	651	670	690	710
EER	kW/kW	5.97	6.22	6.02	6.29	6.11	6.19	6.26	6.34	6.40
ESEER	kW/kW	10.40	10.30	10.40	10.30	10.40	10.40	10.40	10.40	10.50
Operating weight	kg	20410	15730	20580	15890	20750	21010	21180	21350	21560
Compressor(s)		Turbocor oil-free								
Quantity		6	5	6	5	6	6	6	6	6
Power input	kW	583	578	611	599	631	651	670	690	710
Max absorbed power	kW	720	672	738	690	756	774	792	810	828
Max absorbed current	A	1122	1051	1151	1080	1180	1209	1238	1267	1296
Evaporator		Flooded-type shell-and-tube								
Water flow	m^3/h	600.1	619.1	633.1	649.0	663.1	693.1	723.1	753.1	783.1
Pressure drop	kPa	82.8	107.0	84.2	109.0	87.9	91.3	94.1	96.4	98.1
Water volume	L	1333	927	1360	952	1386	1427	1453	1480	1520
Min/max water flow	m^3/h	277/660	235/620	285/680	243/649	295/695	305/722	312/739	320/756	330/784
Condenser		Flooded-type shell-and-tube								
Water flow	m^3/h	698.7	717.0	736.4	750.4	769.8	803.3	836.7	870.1	903.5
Pressure drop	kPa	62.5	66.8	70.5	73.2	71.1	71.0	77.0	75.7	81.6
Water volume	L	1788	1600	1829	1640	1869	1923	1962	2002	2043
Min/max water flow	m^3/h	360/870	332/835	365/900	342/858	380/920	395/950	405/980	415/998	422/1020
Refrigeration circuit(s)		R134a								
Quantity		1	1	1	1	1	1	1	1	1
Refrigerant charge	kg	1500	1235	1510	1250	1520	1540	1550	1560	1575

(1) Fluid: Water 100%; Plant water temperatures: 7/12°C; Condenser water temperatures: 30/35°C

Powerstream Turbo		C2800	C2850	C2900	C3000	C3000	C3100	C3250	C3400	C3400
		F4/1	F6/1	F5/1	F6/1	F4/1	F5/1	F5/1	F6/1	F5/1
Frame size		F5	F7	F6	F7	F5	F6	F6	F7	F6
Cooling capacity[1]	kW	2817	2837	2888	2974	2985	3076	3249	3401	3423
Total power input	kW	463	497	490	517	484	517	538	572	558
EER	kW/kW	6.09	5.70	5.89	5.75	6.16	5.95	6.04	5.94	6.13
ESEER	kW/kW	10.10	10.00	10.30	10.00	10.10	10.30	10.30	10.30	10.30
Operating weight	kg	11580	19150	15180	19400	11580	15330	15420	20240	15500
Compressor(s)		Turbocor oil-free								
Quantity		4	6	5	6	4	5	5	6	5
Power input	kW	463	497	490	517	484	517	538	572	558
Max absorbed power	kW	562	833	600	888	552	618	636	748	654
Max absorbed current	A	879	1300	935	1386	864	964	993	1166	1022
Evaporator		Flooded-type shell-and-tube								
Water flow	m^3/h	485.0	488.4	497.1	512.0	513.9	529.6	559.4	585.5	589.2
Pressure drop	kPa	87.0	83.5	86.5	83.9	95.1	92.5	97.0	82.3	101.0
Water volume	L	483	1132	849	1172	497	871	894	1306	916
Min/max water flow	m^3/h	188/485	223/530	210/520	234/555	194/514	215/539	220/560	268/643	230/590
Condenser		Flooded-type shell-and-tube								
Water flow	m^3/h	563.3	572.4	579.9	599.4	595.9	616.9	650.3	682.2	683.7
Pressure drop	kPa	57.1	68.8	57.2	68.3	63.9	60.9	63.4	65.2	70.1
Water volume	L	740	1507	1440	1561	750	1480	1490	1748	1490
Min/max water flow	m^3/h	263/662	288/705	296/743	300/735	267/670	306/768	311/776	350/850	315/785
Refrigeration circuit(s)		R134a								
Quantity		1	1	1	1	1	1	1	1	1
Refrigerant charge	kg	1015	1425	1195	1440	1015	1205	1220	1490	1230

(1) Fluid: Water 100%; Plant water temperatures: 7/12°C; Condenser water temperatures: 30/35°C

Compressor management system



Powerstream Turbo's advanced control software ensures the optimum efficiency across the whole operating range of the chiller and guarantees the chiller to work within the safe limits.

To achieve the best possible efficiency for multi-compressor chillers, compressor management software constantly monitors the actual cooling demand and selects the most efficient combination of the compressors to match. The software regulates optimum rotation speed and compression ratio, positions the inlet guide vanes and controls bypass valves.

MODELS
126
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The development of Kaltra products and services is continuous and the information in this document may not be up to date. Please check the current position with Kaltra.

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