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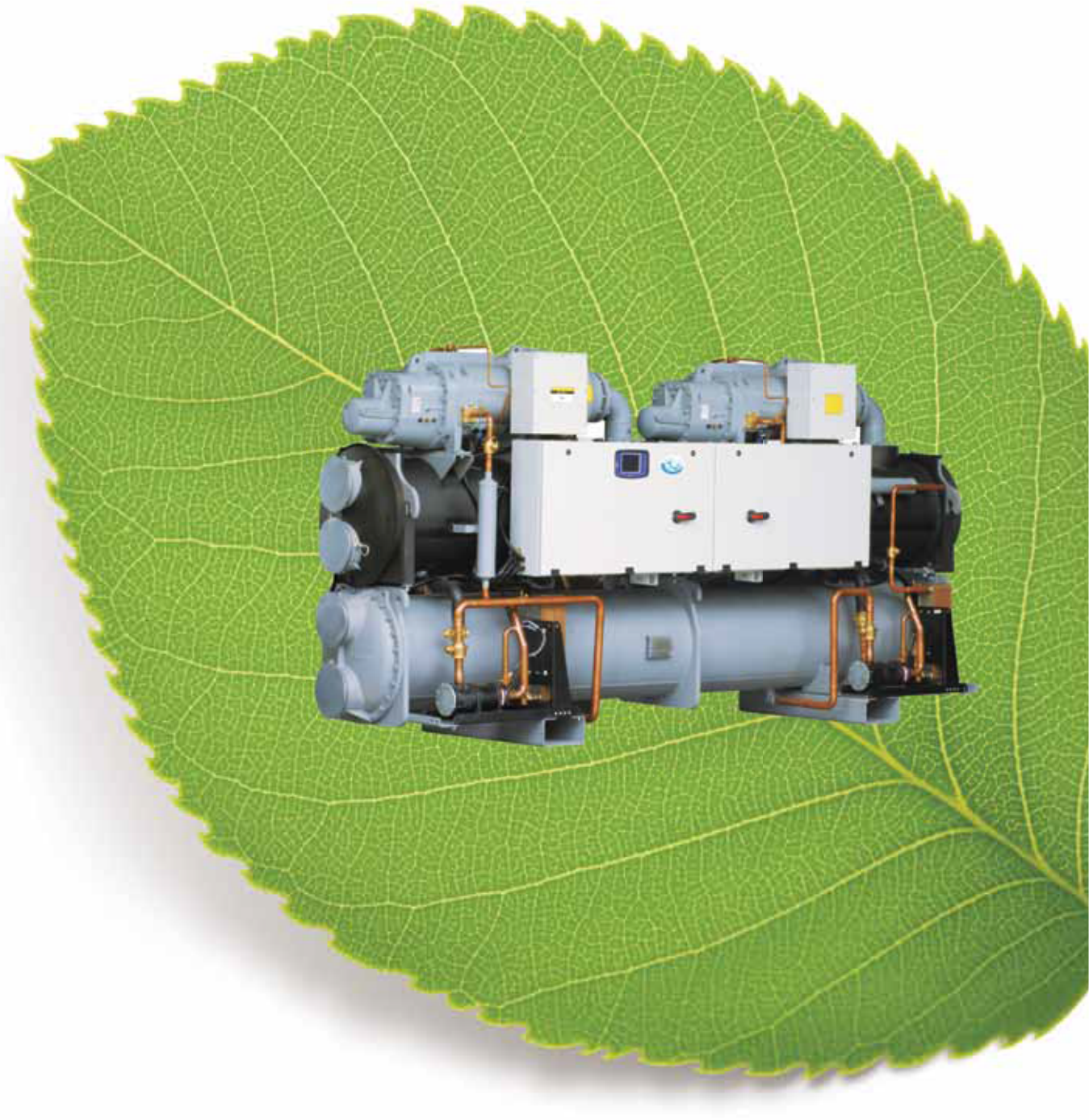


30XW

AQUAFORCE WATER-COOLED LIQUID CHILLER

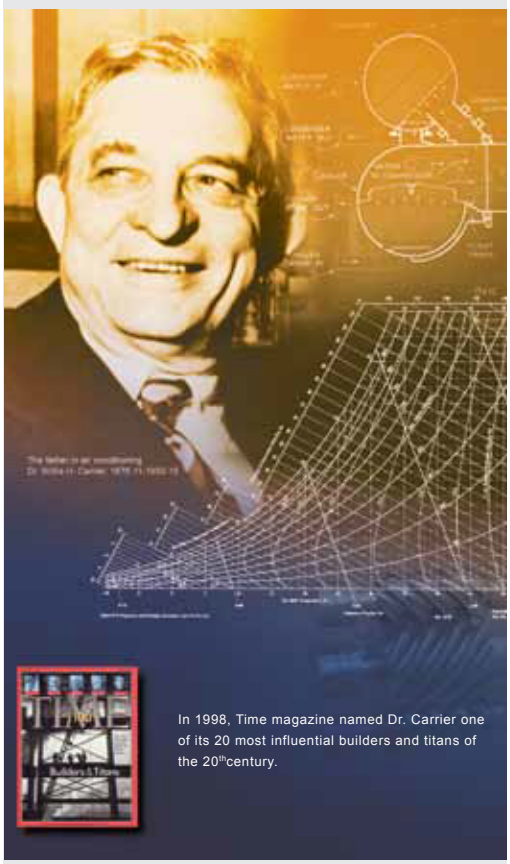
Nominal cooling capacity: 469-3467kW

Carrier

Pioneer in sustainability

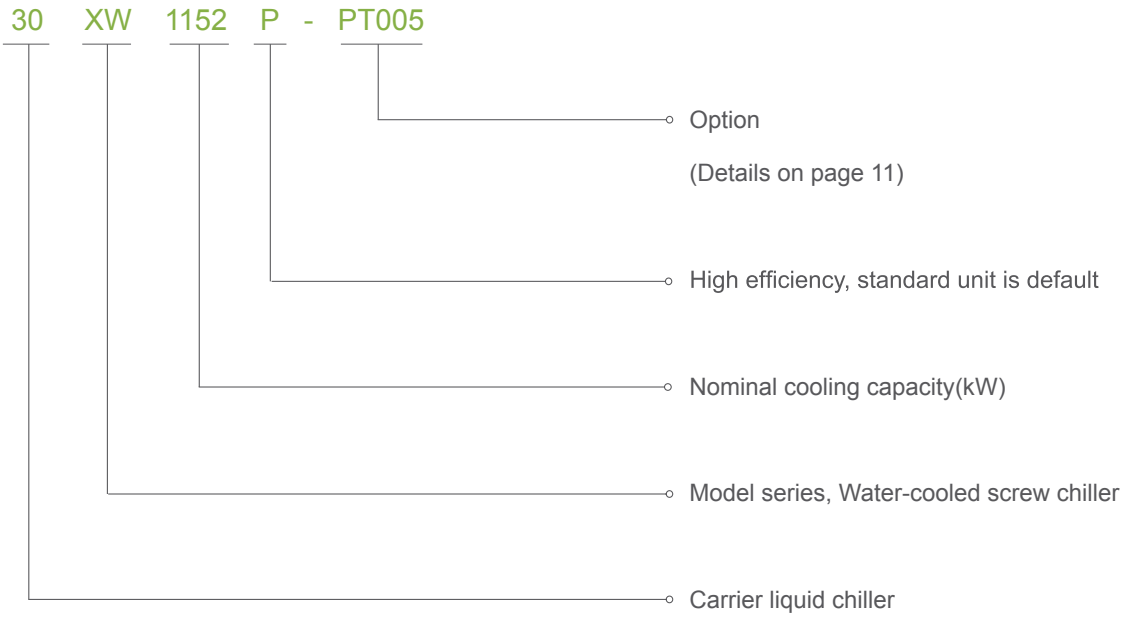
Carrier is the world leader in high technology heating, air-conditioning and refrigeration solutions. A part of United Technologies Corp., a leading provider of aerospace and building systems industries worldwide, Carrier offers sustainable solutions, integrating energy-efficient products, building controls and energy services for residential, commercial and retail customers. Founded by the inventor of modern air conditioning, Carrier provides the world around us through engineered innovation and environmental leadership.

With a broad portfolio of advanced technical patent awards, our global R&D center in Shanghai develops innovative heat, ventilation and air-conditioning (HVAC) solutions.



In 1998, Time magazine named Dr. Carrier one of its 20 most influential builders and titans of the 20th century.

Nomenclature



Operating Range

Cooling/Heating		
Evaporator	Minimum	Maximum
Entering temperature at start-up	-	35℃
Leaving temperature during operation	3.3℃*	20℃*
Entering/leaving temperature difference at full load	2.8℃	11.1℃
Condenser	Minimum	Maximum
Entering temperature at start-up	13℃	-
Leaving temperature during operation	19℃	50℃**
Entering/leaving temperature difference at full load	2.8℃	11.1℃

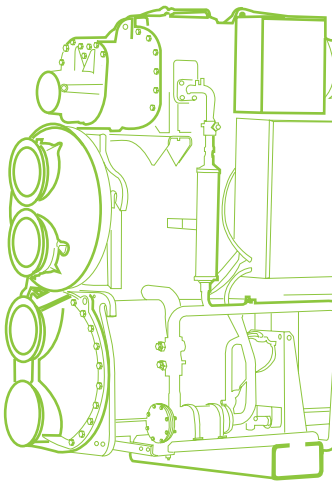
Note:
* Evaporator maximum leaving temperature during operation for PT150A is 15℃
** Condenser maximum leaving temperature during operation for PT150A is 63℃

Cooling Capacity

469~3467kW

Features

- The Aquaforce liquid chillers are the premium solution for industrial and commercial applications where installers, consultants and building owners require optimal performances and maximum quality.
- The Aquaforce liquid chillers are designed to meet current and future compactness. They use the most reliable technologies available today:
  - Twin-rotor screw compressors with a variable capacity valve.
  - Single refrigerant R134a.
  - Touch-screen Pro-Dialog control system(optional).
  - Flooded heat exchangers that are mechanically cleanable.
- To meet to all environmental and economic requirements,the 30XW is available in two efficiency classes:
  - Standard-efficiency 30XW units that offer an optimized balance of technical and economical aspects,
- while at the same time offering superior energy efficiency.
  - High-efficiency 30XW-P units that offer unequalled energy efficiency to satisfy the most stringent demands of building owners wanting to reduce operating costs to the minimum.
- The 30XW Aquaforce range is also split into two versions:
  - 30XW for air conditioning and refrigeration applications.
  - 30XW Heating for heating applications.
- These two versions provide the following performances:
  - High heating temperature, allowing the 30XW Heating Aquaforce to supply water with a condenser leaving water temperature of +63°C (option 150A)
  - Low temperature, allowing the 30XW Aquaforce to operate with an evaporator leaving glycol temperature down to -6°C (option 5) or -12°C (option 6).



Premium full load and part load performance

- New twin-rotor screw compressor specifically designed for HFC-134a equipped with a high-efficiency motor and a variable capacity valve that permits exact matching of the cooling capacity to the load.
- Flooded multi-pipe evaporator and condenser for increased heat exchange efficiency. The evaporator has a low pressure drop which results in reduced cost of water pump.
- Electronic expansion device permitting operation at a lower condensing pressure and improved utilization of the evaporator heat exchange surface (superheat control).
- Economizer system with electronic expansion device for increased cooling capacity (30XW -P).

Absolute reliability

- Screw compressors
  - Industrial type screw compressors with oversized bearings and motor cooled by suction gas.
  - All compressor components are easily accessible on site minimizing down-time.
  - Protection increased by an electronic board.
- Refrigerant circuit
  - Two independent refrigerant circuits (from 800 kW upwards); the second one automatically takes over, if the 1st one develops a fault, maintaining partial cooling under all circumstances.
- Evaporator
  - Electronic paddle-free ow switch. Auto-setting according to cooler size and fluid type.
- Auto-adaptive control
  - Control algorithm prevents excessive compressor cycling (Carrier patent).
  - Automatic compressor unloading in case of abnormally high condensing pressure.
- Exceptional endurance tests
  - Partnerships with specialized laboratories and use of limit simulation tools (nite element calculation) for the design of critical components.
  - Transport simulation test in the laboratory on a vibrating table and then on an endurance circuit.

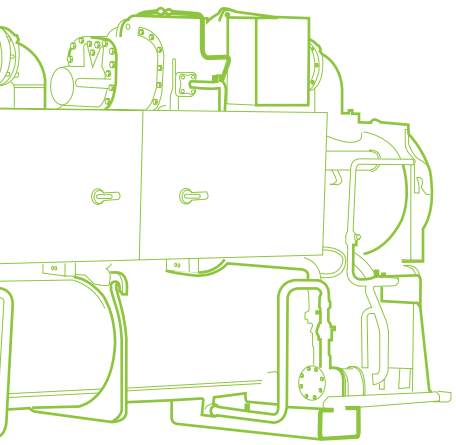
Environmental care

- R134a refrigerant
  - Refrigerant of the HFC group with
- Leak-tight refrigerant circuit
  - Reduction of leaks as no capillary
  - Verication of pressure transducers ferring refrigerant charge.
  - Discharge line shut-off valve and liquid

Easy and fast installation

- Compact design
  - The 30XW units are designed to offer the most compact dimensions on the market.
  - With a width of approximately 1 m up to 1500 kW the units can pass through standard door openings and only require minimum floor space in the plant room.
- Simplied electrical connections
  - Main disconnect switch with high trip capacity.
  - Transformer to supply the integrated control circuit (400/24 V).
- Simplied hydronic connections
  - Victaulic connections on the evaporator and condenser.
  - Practical reference marks for entering and leaving water connections.
  - Possibility to reverse the heat exchanger water inlet and outlet at the factory.
- Fast commissioning
  - Systematic factory operation test before shipment.
  - Quick-test function for step-by-step verication of the instruments, expansion devices and compressors.

Pro-Dialog control



Pro-Dialog combines intelligence with operating simplicity. The control constantly monitors all machine parameters and precisely manages the operation of compressors, electronic expansion devices and of the evaporator water pump for optimum energy efficiency

- Energy management
  - Internal time schedule clock: controls chiller on/off times and operation at a second set-point.
  - Set-point reset based on the return water temperature.
  - Master/slave control of two chillers operating in parallel with operating time equalization and automatic change-over in case of a unit fault.
- Ease-of-use
  - User interface with large touch screen (120 x 99 mm) (optional) for intuitive access to the oper ating parameters. The information is in clear text and can be displayed in local language (please contact your distributor).

Remote management (standard)

The 30XW is equipped with an RS485 serial port that offers multiple remote control, monitoring and diagnostic possibilities. Carrier offers a vast choice of control products, specially designed to control, manage and supervise the operation of an air conditioning system. Please consult your Carrier representative for more information.
The 30XW also communicates with other building management systems via optional communication gateways.
A connection terminal allows remote control of the 30XW by wired cable:

- Start/stop: opening of this contact will shut down the unit.
- Dual set-point: closing of this contact activates a second set-point (example: unoccupied mode).
- Demand limit: closing of this contact limits the maximum chiller capacity to a pre-set value.
- Operation indication: this volt-free contact indicates that the chiller is operating (cooling load) or that it is ready to operate (no cooling load).
- Alert indication: this volt-free contact indicates the necessity to carry out a maintenance operation or the presence of a minor fault.
- Alarm indication: this volt-free contact indicates the presence of a major fault that has led to the shut-down of one or several refrigerant circuits.

ProDialog+(standard)

zero ozone depletion potential.

tubes and are connections are used.
and temperature sensors without trans

line service valve for simplied maintenance.

Performance data

Model			30XW							
			0452	0502	0552	0652	0702	0802	0852	0902
Capacity		kW	469	520	538	662	715	772	826	852
		USRT	133	148	153	188	203	220	235	242
COP		kW/kW	5.45	5.26	5.48	5.45	5.49	5.38	5.52	5.83
Evaporator	Flow rate	L/s	20	22	23	28	31	33	36	37
	Water Connection	DN	125	125	125	150	150	150	150	150
Condenser	Flow rate	L/s	25	28	29	36	38	41	44	46
	Water Connection	DN	125	125	125	150	150	150	200	200
Compressor	Circuit A	No.	1	1	1	1	1	1	1	1
	Circuit B	No.	-	-	-	-	-	-	-	-
	Min. Capacity	%	15	15	15	15	15	15	15	15
Motor	Power	V-Ph-Hz	400-3-50							
	Input Power	kW	86	99	98	122	130	145	150	146
			HFC-134a							
Refrigerant	Circuit A	kg	100	100	110	150	150	150	150	150
	Circuit B	kg	-	-	-	-	-	-	-	-
Shipping weight (with refrigerant)		kg	2946	2983	3032	3770	3770	3778	3958	3977
Operation weight		kg	2580	2617	2666	3486	3486	3493	3711	3923
Dimension	Length	mm	2746	2746	2746	3056	3056	3056	2780	3080
	Width	mm	970	970	970	1119	1119	1119	1085	1135
	Height	mm	1693	1693	1693	1849	1849	1849	1900	1900

Based on AHRI condition: Evaporator leaving water temperature 6.7℃, 0.043 l/s·kW,fouling factor=0.018m²K/kW
Condenser entering water temperature 29.4℃, 0.054 l/s·kW,fouling factor=0.044m²K/kW

Performance data

Model			30XW-P											
			0532P	0552P	0702P	0802P	0852P	0902P	1052P	1152P	1262P	1402P	1412P	1652P	1712P
Capacity		kW	536	572	730	784	852	966	1075	1146	1253	1466	1461	1616	1747
		USRT	152	163	207	223	242	275	306	326	356	417	415	459	497
COP		kW/kW	5.93	5.97	6.02	5.86	5.90	5.95	5.98	5.94	6.14	6.12	6.04	6.17	6.17
Evaporator	Flow rate	L/s	23	25	31	34	37	42	46	49	54	63	68	69	75
	Water Connection	DN	150	150	200	200	200	200	200	200	200	200	200	250	250
Condenser	Flow rate	L/s	29	31	39	42	46	52	58	62	67	79	78	87	94
	Water Connection	DN	150	150	200	200	200	200	200	200	200	250	250	250	250
Compressor	Circuit A	No.	1	1	1	1	1	1	1	1	1	1	1	1	1
	Circuit B	No.	-	-	-	-	-	1	1	1	1	1	1	1	1
	Min. Capacity	%	15	15	15	15	15	8	8	8	8	8	8	8	8
Motor	Power	V-Ph-Hz	400-3-50												
	Input Power	kW	90	96	121	134	145	162	180	193	204	239	242	262	283
			HFC-134a												
Refrigerant	Circuit A	kg	135	135	200	200	200	115	115	130	140	187.5	140	187.5	187.5
	Circuit B	kg	-	-	-	-	-	125	125	140	150	187.5	160	187.5	187.5
Shipping weight (with refrigerant)		kg	3249	3312	4331	4349	4379	6190	6238	6749	8633	9418	9324	9418	9418
Operation weight		kg	2962	3025	4155	4173	4204	6003	6001	6684	7963	9368	8904	9368	9368
Dimension	Length	mm	3055	3055	3286	3286	3286	4695	4695	4694	4761	4783	4761	4783	4783
	Width	mm	1008	1008	1135	1135	1135	1220	1070	1070	1338	1985	1338	1985	1985
	Height	mm	1743	1743	1949	2949	1949	1947	1947	1998	2197	1520	2307	1520	1520

Based on AHRI condition: Evaporator leaving water temperature 6.7℃, 0.043 l/s·kW,fouling factor=0.018m²K/kW
Condenser entering water temperature 29.4℃, 0.054 l/s·kW,fouling factor=0.044m²K/kW

Electrical parameters 30XW

Std. Efficiency Units 30XW		0452	0502	0552	0652	0702	0802	0852	0902
Power Circuit									
Rated Voltage	V-ph-Hz	400-3-50							
Voltage Range	V	360-440							
Control circuit		24V per internal transformer							
Nominal start-up current*									
Circuit A	A	414	414	414	587	587	587	587	587
Circuit B	A	-	-	-	-	-	-	-	-
Maximum start-up current**									
Circuit A	A	414	414	414	587	587	587	587	587
Circuit B	A	-	-	-	-	-	-	-	-
Power Factor									
Nominal ***		0.86	0.87	0.87	0.88	0.89	0.90	0.90	0.90
Maximum+		0.89	0.90	0.90	0.90	0.91	0.92	0.92	0.92
Maximum power draw ++									
Circuit A	kW	134	151	151	184	200	223	223	223
Circuit B	kW	-	-	-	-	-	-	-	-
Nominal current draw***									
Circuit A	A	144	162	162	193	214	232	232	232
Circuit B	A	-	-	-	-	-	-	-	-
Maximum current draw (Un)++									
Circuit A	A	217	242	242	295	317	351	351	351
Circuit B	A	-	-	-	-	-	-	-	-
Maximum current draw (Un-10%)+									
Circuit A	A	230	260	260	304	340	358	358	358
Circuit B	A	-	-	-	-	-	-	-	-

* Instantaneous start -up current (locked rotor current of the largest compressor + the rated load current of other smaller motors at nominal operating conditions)
Values obtained at operating condition: evaporator temperature entry/leave water = 12 C/7 C, condenser temperature entry/leavewater = 30 C/35 C
** Instantaneous start -up current (locked rotor current of the largest compressor + the maximum load current of other smaller motors at maximum unit conditions)
Values obtained at operation with maximum unit power input
*** Values obtained at operating condition: evaporator temperature entry/leave water = 12 C/7 C, condenser temperature entry/leavewater = 30 C/35 C
† Values obtained at operation with maximum unit power input
†† Values obtained at operation with maximum unit power input
Values given on the name plate

Electrical parameters 30XW-P (including option 81)

High efficiency units 30XW-P		0532P	0552P	0702P	0802P	0852P	0902P	1052P	1152P	1262P	1402P	1412P	1652P	1712P
Power circuit														
Rated Voltage	V-ph-Hz	400-3-50												
Voltage Range	V	360-440												
Control circuit		24 V per internal transformer												
Nominal start-up current*														
Circuit A	A	450	414	587	587	587	450	450	414	587	587	587	587	587
Circuit B	A	-	-	-	-	-	450	450	414	450	587	587	587	587
Option 81	A	-	-	-	-	-	594	612	576	749	780	780	801	819
Maximum start-up current **														
Circuit A	A	450	414	587	587	587	450	450	414	587	587	587	587	587
Circuit B	A	-	-	-	-	-	450	450	414	450	587	587	587	587
Option 81	A	-	-	-	-	-	667	692	656	829	882	882	904	938
Power Factor														
Nominal ***		0.87	0.87	0.89	0.89	0.90	0.87	0.87	0.87	0.88	0.88	0.88	0.89	0.90
Maximum †		0.90	0.90	0.90	0.91	0.92	0.91	0.90	0.90	0.90	0.90	0.90	0.91	0.92
Maximum power draw ††														
Circuit A	kW	151	151	184	200	223	134	151	151	184	184	184	200	223
Circuit B	kW	-	-	-	-	-	134	134	151	151	184	184	200	223
Option 81	kW	-	-	-	-	-	268	285	302	335	368		400	446
Nominal current draw ***														
Circuit A	A	162	162	193	214	232	144	162	162	193	193	193	214	232
Circuit B	A	-	-	-	-		144	144	162	162	193	193	214	232
Option 81	A	-	-	-	-		288	306	324	355	386	386	428	464
Maximum current draw (Un) ††														
Circuit A	A	242	242	295	317	351	217	242	242	295	295	295	317	351
Circuit B	A	-	-	-	-		217	217	242	242	295	295	317	351
Option 81	A	-	-	-	-		434	459	484	537	590	590	634	702
Maximum current draw (Un -10%) †														
Circuit A	A	260	260	304	340	358	230	260	260	304	304	304	340	358
Circuit B	A	-	-	-	-		230	230	260	260	304	304	340	358
Option 81	A	-	-	-	-		460	490	520	564	608	608	680	716

* Instantaneous start -up current (locked rotor current of the largest compressor + the rated load current of other smaller motors at nominal operating conditions)
Values obtained at operating condition: evaporator temperature entry/leave water = 12°C/7°C, condenser temperature entry/leavewater = 30°C/35°C

** Instantaneous start -up current (locked rotor current of the largest compressor + the maximum load current of other smaller motors at maximum unit conditions)
Values obtained at operation with maximum unit power input

*** Values obtained at operating condition: evaporator temperature entry/leave water = 12°C/7°C, condenser temperature entry/leavewater = 30°C/35°C

† Values obtained at operation with maximum unit power input

†† Values obtained at operation with maximum unit power input
Values given on the name plate

Options & accessories

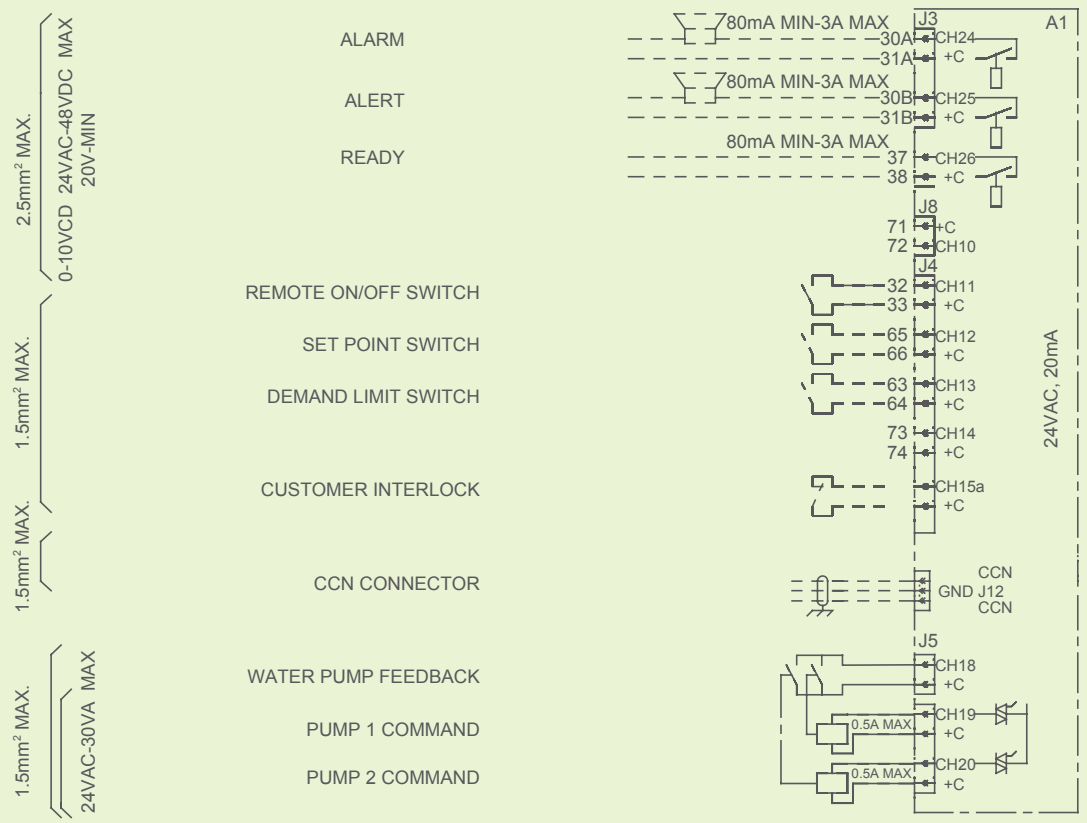
Options	NO	Description	Advantages	Use
Medium Brine	5	Brine application down to -6°C leaving fluid temperature	Covers specific application such as ice storage and industrial processes	30XW0452/0552/0702/0852/0902/1152/1262/1402/1502/1602/1712/2052/2302/2602/2902/3052/3302/3452/0552P
Low Brine	6	Brine application down to -12°C leaving fluid temperature * Use of air-cooled unit compressors * Increase size of electrical componts according to compressor motor electrical characteristics	Covers specific application such as ice storage and industrial processes	30XW1152 30XW0552P
Single power connection	81	This option is required to allow to connect on sin gle power supply line to one single location where std machine require two	Quick and easy installation	30XW1052-3452 30XW0902P-1712P Each module of duplex with PT081
Evaporator & Condenser water pressue 1.6MPa	104	Reinforced evaporator & condenser for extension of the maximum water-side service pressure to 1.6MPa	Covers applications with a high water column(high buildings)	30XW0452-3452 30XW0532P-1712P
Evaporator & Condenser water pressue 2.1MPa	104A16	Reinforced evaporator & condenser for extension of the maximum water-side service pressure to 2.1MPa	Covers applications with a high water column(high buildings)	30XW0452-3452 30XW0532P-1712P
Evaporator with reversed water connection	107E	Evaporator with reversed water inlet/outlet	Simplification of the water piping	30XW0452-1712 30XW0532P-1712P
Condenser with reversed water connection	107C	Condenser with reversed water inlet/outlet	Simplification of the water piping	30XW0452-1712 30XW0532P-1712P
CCN to J bus gateway	148B	Two way protocol converter board between CCN and J-Bus for easy connection to BMS. Consist of: - Electronic board mounted in the unit electrical cabinet - Automatic configuration at start up	Easy connection by communication bus to a building management system	30XW0452-3452 30XW0532P-1712P
CCN to BAC Net/ Modbus gateway	148C	Two way protocol converter board between CCN and BAC Net/ Modbus for easy connection to BMS. Consist of: - Electronic board mounted in the unit electrical cabinet - Automatic configuration at start up	Easy connection by communication bus to a building management system	30XW0452-3452 30XW0532P-1712P
CCN to Lon work gateway	148D	Two way protocol converter board between CCN and Lon walk for easy connection to BMS. Consist of: - Electronic board mounted in the unit electrical cabinet - Automatic configuration at start up	Easy connection by communication bus to a building management system	30XW0452-3452 30XW0532P-1712P
High condensing temperature unit (up to 63 leaving condenser water temperature)	150	Increased condenser leaving water temperature up to 63 . * Use of air-cooled unit compressors * Increase size of electrical componts according to compressor motor electrical characteristics	Allows applications with high condensing temperature(for heat reclaim or dry cooler applications)	30XW0452-3452 30XW0532P-1712P
Heat pump Max condenser leaving temp 63	150A	Heat pump control logic to control condenser LWT * Use of air-cooled unit compressors * Increase size of electrical componts according to compressor motor electrical characteristics * Heat pump control logic * Condenser insulation	Allows heating applications with max condenser leaving temp 63	30XW0452-3452 30XW0532P-1712P
Condenser maxium leaving temperature limited to 45	150B	Control configuration to limit operation at 45°C maximum condenser leaving temperature	Avoids oversizing of the protection elements and the power cables	30XW0452-3452 30XW0532P-1712P
Heat pump Max condenser leaving temp 50	150D	Heat pump control logic to control condenser LWT * Condenser insulation * Heat pump Control logic	Allows heating applications with max condenser leaving temp 50	30XW0452-3452 30XW0532P-1712P
Condenser water valve control (0-10V signal)	152	Output signal (0-10V) to control the condenser water inlet valve Consist of: - One 8DO+4AI/2AO Board - Connector for 3 way valve Note: Power supply for water valve is not included	Used for applications with cold water at the condenser inlet (well water). In this case the valve controls the water entering temperature to maintain an acceptable condensing pressure	30XW0452-3452 30XW0532P-1712P
Energy management module	156	Remote control module. Additional contacts for an extension of the unit control functions (without communication bus) Consist of: - Electrinoc board mounted in the unit electrical cabniet	Easy connection by wired connection to a building management system	30XW0452-3452 30XW0532P-1712P
Touch screen display	158	Touch screen display	Easy operation	30XW0452-3452 30XW0532P-1712P
Evaporator flanged connections	314E	Victaulic to Flange water connections	Easy installation	30XW0452-3452 30XW0532P-1712P
Condenser flanged connections	314C	Victaulic to Flange water connections	Easy installation	30XW0452-3452 30XW0532P-1712P
Nitrogen charge	320	Unit nitrogen factory charged.	Less weight. No refrigerant charged	30XW0452-3452 30XW0532P-1712P
Discharge shut off valve	321	Allows referigerant to be stored inside the chiller during servicing	Reducing refrigerant loss and eliminating time-consuming transfer procedures	30XW0452-3452 30XW0532P-1712P

Options & accessories

Multi-piece shipment	51	"Side-by-side" Units only. Unit shipped in two parts bolted together, flanges on piping connections, no refrigerant charge (Nitrogen holding charge)	Easy Installation	30XW1402P-1712P
Low noise	257	Provide 2 to 4 dBA sound attenuation vs std to meet low noise application * Innovative lagging used	Lower operation sound levels	30XW0452-3452 30XW0532P-1712P
Super low noise	258A	Provide 6 to 8 dBA sound attenuation vs std to meet low noise application * Sound enclosure used *Waterproof, rust prevention features	Lower operation sound levels with waterproof	30XW0452-3452 30XW0532P-1712P

Notes:
1. Compatibility: Medium brine option PT005 is not compatible with PT150/PT150A/PT312A.
   Low Brine options PT006 is not compatible with PT150/PT150A/PT150D/PT312A .
   Australia code PT312A is not compatible with PT005/PT006/PT104/PT104A16/PT150/PT150A .
   IP44 enclosure PT020 is not compatible with PT025/PT258/PT322.
2. Condenser water valve control option is not include 3 way valve and power supply for water valve.

Wiring Diagram



Guide Specifications

General description

Factory assembled single piece water-cooled liquid chiller. Contained within the unit shall be all factory wiring, piping, controls, refrigerant charge (HFC-134a), refrigeration circuits set, screw compressors, electronic expansion valves and equipment required prior to field start-up.

Quality assurance

1. Unit construction shall comply with standard including the following:
   A. Code of design of heating, ventilation and air conditions (GBJ 19-87, GB50019-2003).
   B. GB/T 18430.1-2007, AHRI Standard 550/590.
   C. ISO3746-1996 and ARI575-1987.
2. Unit shall be designed, manufactured and tested in a facility with a quality management system certified ISO 9001 and en vironmental management system ISO 14001.
3. Unit shall be run tested at the factory.
4. Unit components shall be capable of withstanding 60°C (66°C for PT150A) storage without damage, failure, refriger ant loss, or safety risks.

Product features

1. Compressors:
   A. Unit shall have semi-hermetic twin-screw compressors with internal relief valve and check valve to avoid reverse rotation on shut down.
   B. Each compressor shall be equipped with a discharge shut-off valve. (optional)
   C. The discharge shall also be equipped with a muffler to reduce discharge gas pulsations.
   D. Capacity control shall be provided by a variable control slide valve capable of reducing compressor capacity down to 15% of full load. Compressor shall start in unloaded condition.
   E. Motor shall be cooled by suction gas and protected by internal winding temperature sensors. Compressor bearings shall be designed for minimum 73000 hours at maximum operating conditions.
   F. Lubrication oil system shall include pre-filter and external filter capable of filtration to 5 microns.

2. Evaporator:
   A. Unit shall be equipped with a single evaporator.
   B. Evaporator shall be manufactured, tested and stamped in accordance with the GB150-1999.
   C. The maximum refrigerant-side working pressure will be 1500kPa (1750kPa for PT150A), and the maximum waterside pressure will be 1000kPa (1600kPa, 2100kPa as an option).
   D. The evaporator shall be mechanically cleanable, shell-and-tube type with removable heads. Tubes shall be internally and externally grooved, seamless-copper, and shall be rolled into tube sheets. Shell shall be insulated with 19mm closed-cell foam with a maximum K factor of 0.28. Evaporator thermal insulation shall be factory fitted.
   E. The evaporator shall have a drain and vent in each head.
   F. The evaporator shall incorporate an active refrigerant level control system to ensure optimum heat transfer performance under all load conditions.
   G. Design shall incorporate either 1 or 2 independent refrigerant circuits.
   H. Chiller shall have only one water inlet & outlet connection with victaulic couplings to avoid vibrations transmission and accept small misalignment (water connection kit on demand).
   I. Evaporator shall be fitted with electronic auto setting water flow switch. Paddle switches or differential pressure switches shall not be acceptable.

3. **Condenser:**
   A. Unit shall be equipped with a single condenser.
   B. Condenser shall be manufactured, tested and stamped in accordance with the GB150-1999.
   C. The maximum refrigerant-side working pressure will be 1500kPa (2350kPa for PT150A), and the maximum waterside pressure will be 1000kPa (1600kPa, 2100kPa as an option).
   D. The condenser shall be mechanically cleanable shell-and-tube type with removable heads.
   E. Tubes shall be internally and externally grooved, seamless-copper, and shall be rolled into tube sheets.
   F. Design shall incorporate either 1 or 2 independent refrigerant circuits and the oil separator.
   G. The condenser shall have a drain and vent in each head.
   H. Chiller shall have only one water inlet & outlet connection with victaulic couplings to avoid vibrations transmission and accept small misalignment (water connection kit on demand).

4. **Refrigeration circuits:**
   A. Refrigerant circuit components shall include, compressor, oil separator, high and low side pressure relief devices, com-

pressor discharge and liquid line shutoff valves, refrigerant economizer, filter driers, moisture indicating sight glasses, long stroke electronic expansion device, and complete operating charge of both refrigerant HFC-134a and compressor oil.

B. To facilitate service and maintenance and avoid refrigerant charge transfers, it must be possible to isolate the following components and systems independently: filter driers, oil filters, expansion devices and compressor (with service valves option).

5. Controls:

A. Unit controls shall include as a minimum: microprocessor with non-volatile memory, picture guided unit/operator interface, the LOCAL/OFF/REMOTE/CCN selector and a touch-screen display with with multiple language capability.

B. Pressure sensors shall be installed to measure suction, discharge, and oil pressure.

C. Thermistors shall be installed to measure cooler entering and leaving temperatures (on cooler and condenser side).

D. Unit shall be capable of performing the following functions:
- Automatic change-over and cycling of compressors to equalize running hours and number of starts.
- EXV control, based on throttling optimizes evaporator charging, ensuring condenser superheat and sub-cooling.
- Capacity control based on leaving chilled fluid temperature with return fluid temperature sensing.
- Limit the chilled fluid temperature pull-down rate at start-up to an adjustable range of 0.1°C to 1.1°C per minute to prevent excessive demand spikes at start-up.
- Enable reset of leaving chilled water temperature according to the return water temperature or by means of a 0-10V signal.
- Provide a dual set point for the leaving chilled water temperature activated by a remote contact closure signal or by the built in time clock.
- Enable a 2-level demand limit control (between 0 and 100%) or a maximum current drawn limit activated by a remote contact closure or by the built in time clock.
- Control evaporator water pump and the condenser pump.
- Allow two time scheduling programs to enable unit start-up control, demand limit and set-point changes.
- Enable lead lag control of two chillers running in series or parallel.

6. Diagnostics:

A. Display module shall be capable of displaying set points, system status including temperatures, pressures, current for each compressor, run time and percent loading.

B. The control system shall allow a quick test of all machine elements to verify the correct operation of every switch, circuit breaker, contactor etc. before the chiller is started.

7. Safeties:

A. Unit shall be equipped with all necessary components, and in conjunction with the control system shall provide the unit with protection against the following:
- Reverse rotation.
- Low chilled water temperature.
- Low oil pressure (per compressor).
- Current imbalance.
- Compressor thermal overload.
- Automatic compressor unloading in case of excessive condensing temperature.
- High pressure.
- Electrical overload.
- Loss of phase.

B. Control shall provide separate general alert (minor incident) and alarm (circuit down) remote indication.

8. Operating characteristics:

A. Unit shall be capable of starting with 13°C entering water temperature to the condenser.

B. Unit shall be capable of starting with 35°C entering water temperature to the evaoprator.

9. Electrical characteristics:

A. Unit shall operate on 3-phase power supply without neutral.

B. Control voltage shall be supplied by a factory-installed transformer.

C. Unit shall be supplied with factory-installed electrical disconnect/isolator switch integrating main fuses.

D. Unit shall have a factory installed star/delta starter as standard to limit electrical inrush current.

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