30HXC 080-375
30GX 082-358

Screw Compressor
Water-Cooled Liquid Chillers and
Air-Cooled Liquid Chillers

30HXC Nominal cooling capacity 290-1325 kW
30GX Nominal cooling capacity 285-1205 kW
50 Hz

GLOBAL CHILLER

Installation, operation and maintenance instructions

Quality Management System Approval

1 - INTRODUCTION

Prior to initial start-up of the 30HXC and 30GX unit, those involved in the start-up, operation, and maintenance should be thoroughly familiar with these instructions and other necessary job data. This book provides an overview so that you may become familiar with the control system before performing start-up procedures. Procedures in this manual are arranged in the sequence required for proper machine start-up and operation.

2 - SAFETY CONSIDERATIONS

30HXC and 30GX liquid chillers are designed to provide safe and reliable service when operated within design specifications. When operating this equipment, use good judgment and safety precautions to avoid damage to equipment and property or injury to personnel.
Be sure you understand and follow the procedures and safety precautions contained in the machine instructions as well as those listed in this guide.

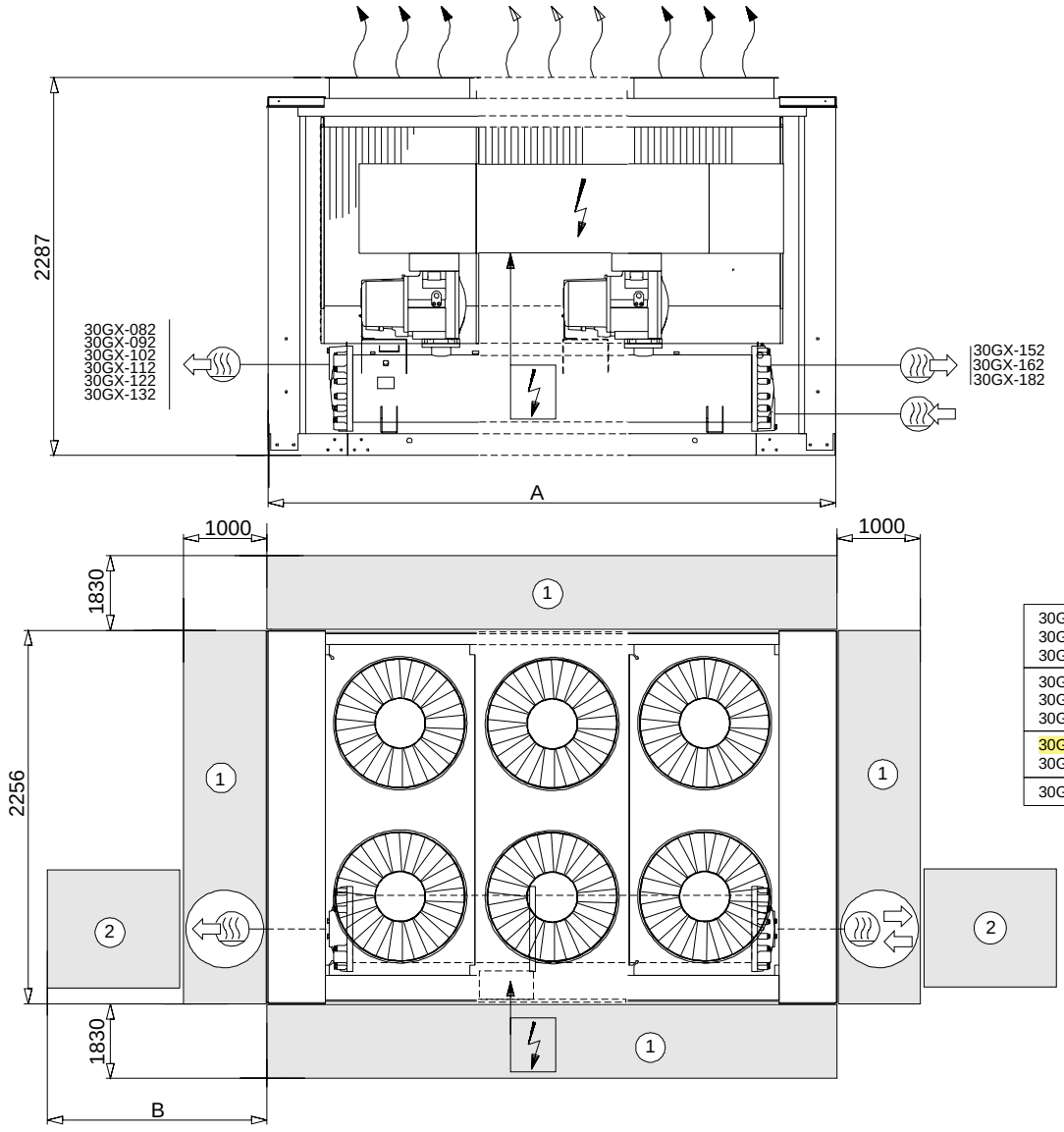
DANGER
DO NOT VENT refrigerant relief valves within a building. Outlet from relief valve must be vented outdoors. The accumulation of refrigerant in an enclosed space can displace oxygen and cause asphyxiation or explosions.
PROVIDE adequate ventilation, especially for enclosed and low overhead spaces. Inhalation of high concentrations of vapor is harmful and may cause heart irregularities, unconsciousness, or death. Vapor is heavier than air and reduces the amount of oxygen available for breathing. Product causes eye and skin irritation. Decomposition products are hazardous.
DO NOT USE OXYGEN to purge lines or to pressurize a machine for any purpose. Oxygen gas reacts violently with oil, grease, and other common substances.
NEVER EXCEED specified test pressures, VERIFY the allowable test pressure by checking the instruction literature and the design pressures on the equipment nameplate.
DO NOT USE air for leak testing. Use only refrigerant or dry nitrogen.
DO NOT VALVE OFF any safety device.
BE SURE that all pressure relief devices are properly installed before operating any machine.

WARNING
DO NOT WELD OR FLAMECUT any refrigerant line or vessel until all refrigerant (liquid and vapor) has been removed from chiller. Traces of vapor should be displaced with dry air nitrogen and the work area should be well ventilated. Refrigerant in contact with an open flame produces toxic gases.
DO NOT work on energized equipment unless you are a skilled electrician.
DO NOT WORK ON electrical components, including control panels, switches, relays etc, until you are sure ALL POWER IS OFF and residual voltage can leak from capacitors or solid state components.
LOCK OPEN AND TAG electrical circuits during servicing. IF WORK IS INTERRUPTED, check that all circuits are de-energized before resuming work.
DO NOT siphon refrigerant.
AVOID SPILLING liquid refrigerant on skin or getting it into the eyes. USE SAFETY GOGGLES. Wash any spills from the skin with soap and water. If liquid refrigerant enters the eyes, IMMEDIATELY FLUSH EYES with water and consult a physician.
NEVER APPLY an open flame or live steam to refrigerant container. Dangerous overpressure can result. If it is necessary to heat refrigerant, use only warm water.
DO NOT REUSE disposable (non-returnable) cylinders or attempt to refill them. It is DANGEROUS AND ILLEGAL. When cylinders are emptied, evacuate remaining gas pressure, loosen the collar and unscrew and discard the valve stem. DO NOT INCINERATE.
CHECK THE REFRIGERANT TYPE before adding refrigerant to the machine. The introduction of the wrong refrigerant can cause damage or malfunction to this machine.
DO NOT ATTEMPT TO REMOVE fittings, components, etc., while machine is under pressure or while machine is running. Be sure pressure is at 0 kPa before breaking refrigerant connection.
CAREFULLY INSPECT all relief devices, AT LEAST ONCE A YEAR. If machine operates in a corrosive atmosphere, inspect the devices at more frequent intervals.
DO NOT ATTEMPT TO REPAIR OR RECONDITION any relief device when corrosion or build-up of foreign material (rust, dirt, scale, etc.) is found within the valve body or mechanism. Replace the device.
DO NOT install relief devices in series or backwards.

CAUTION
DO NOT STEP on refrigerant lines. Broken lines can whip about and release refrigerant, causing personal injury.
DO NOT climb over a machine. Use platform, or staging.
USE MECHANICAL EQUIPMENT (crane, hoist, etc.) to lift or move heavy components. Even if components are light, use mechanical equipment when there is a risk of slipping or losing your balance.
BE AWARE that certain automatic start arrangements CAN ENGAGE TOWER FAN, OR PUMPS. Open the disconnect ahead of the tower fans, or pumps.
USE only repair or replacement parts that meet the code requirements of the original equipment.
DO NOT VENT OR DRAIN water boxes containing industrial brines, without the permission of a competent body.
DO NOT LOOSEN water box bolts until the water box has been completely drained.
DO NOT LOOSEN a packing gland nut before checking that the nut has a positive thread engagement.
PERIODICALLY INSPECT all valves, fittings, and piping for corrosion, rust, leaks, or damage.
PROVIDE A DRAIN connection in the vent line near each pressure relief device to prevent a build-up of condensate or rain water.

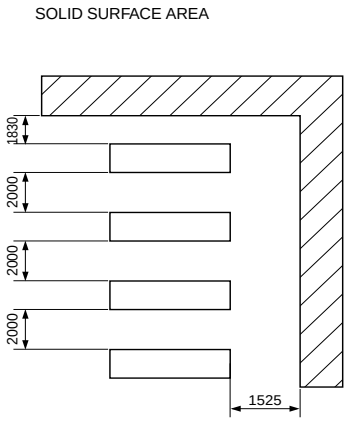
3 - DIMENSIONS, CLEARANCES, WEIGHT DISTRIBUTION (CONT.)

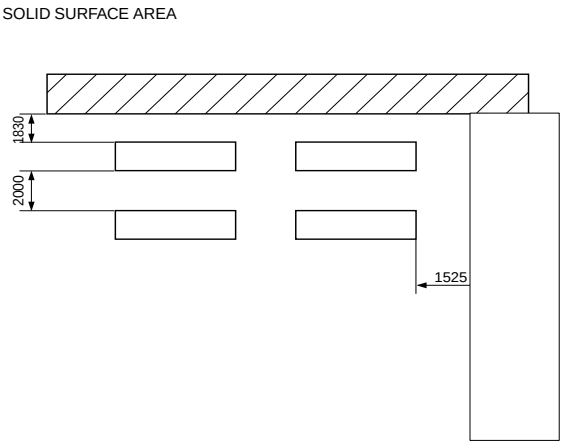
3.3 - 30GX 082-182



	A mm	B mm	kg
30GX082 30GX092 30GX102	2970	2215	3116 3157 3172
30GX112 30GX122 30GX132	3427	2045	3515 3531 3633
30GX152 30GX162	4342	2835	3920 3936
30GX182	5996	1820	4853

Multiple chiller installation (see note 2)





Notes:

1. Unit must have clearances for air flow as follows: Top: do not restrict in any way
2. In case of multiple chillers (up to four units), the respective clearance between them should be increased from 1830 to 2000 mm for the side space requirement.
3. Clearances sre required for cooler tube removal.

NOTE: Refer to the certified dimensional drawings supplied with the unit, when designing an installation.

7 - PHYSICAL DATA 30GX

30GX		082	092	102	112	122	132	152	162	182	207	227	247	267	298	328	358
Net cooling capacity*	kW	285	309	332	388	417	450	505	536	602	687	744	810	910	1003	1103	1207
Operating weight	kg	3116	3157	3172	3515	3531	3633	3920	3936	4853	5540	5570	6134	6365	7354	7918	8124
Refrigerant charge		HFC-134a															
Circuit A/B	kg	55/55	58/50	54/53	55/53	60/57	63/60	75/69	75/75	80/80	130/85	130/85	155/98	170/104	162/150	162/165	175/175
Oil		Polyolester oil CARRIER SPEC: PP 47-32															
Circuit A/B	l	20/20	20/20	20/20	20/20	20/20	20/20	20/20	20/20	20/20	40/20	40/20	40/20	40/20	40/40	40/40	40/40
Compressors		Hermetic twin-screw Power[3]															
Circ.A, nom. size per compressor**		46	46	56	56	66	66	80	80	80+	66/56	80/66	80/80	80+/80+	80/80	80/80	80+/80+
Circ.B, nom. size per compressor**		39	46	46	56	56	66	66	80	80+	80	80	80	80+	66/66	80/802	80+/80+
Control type		PRO-DIALOG Plus control															
Number of capacity steps		6	6	6	6	6	6	6	6	6	8	8	8	8	10	10	10
Minimum capacity	%	19	21	19	21	19	21	19	21	21	16	14	14	14	9	10	10
Evaporator		Shell and tube type, with internally finned copper tubes															
Net water volume	l	65	73	73	87	87	101	91	91	109	140	140	165	181	203	229	229
Water connections		Factory-supplied flat flange, to be welded on site															
Inlet and outlet	in.	4	4	4	5	5	5	5	5	5	6	6	6	6	8	8	8
Drain and vent (NPT)	in.	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8
Maximum water-side operating pressure	kPa	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Condensers		Copper tubes and aluminium fins															
Fans		Axial FLYING BIRD 2 fan with rotating shroud															
Quantity		4	4	4	6	6	6	8	8	8	10	10	12	12	14	16	16
Speed	r/s	15.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8
Total air flow	l/s	21110	21110	21110	31660	31660	31660	42220	42220	42220	52770	52770	63330	63330	73880	84440	84440

* Standardised Eurovent conditions: evaporator entering/leaving water temperatures = 12°C/7°C, outside air temperature = 35°C
Net cooling capacity: Gross cooling capacity minus the water pump heat against the internal evaporator pressure drop.
** The compressor size corresponds to the nominal capacity in tons (1 ton = 3.517 kW).

8 - ELECTRICAL DATA 30GX

30GX		082	092	102	112	122	132	152	162	182	207	227	247	267	298	328	358
Power circuit																	
Nominal power supply	V-ph-Hz	400-3-50															
Voltage range	V	360-440															
Control circuit supply		The control circuit is supplied via the factory-installed transformer															
Nominal power input*	kW	98	109	123	133	150	166	179	196	214	246	281	292	332	364	394	449
Nominal current drawn *	A	180	200	223	256	273	290	326	352	388	449	492	528	582	642	704	776
Maximum power input**	kW	127	141	154	175	191	207	234	253	286	319	355	380	429	462	506	572
Circuit A	kW	-	-	-	-	-	-	-	-	-	193	228	253	286	253	253	286
Circuit B	kW	-	-	-	-	-	-	-	-	-	127	127	127	143	209	253	286
Cosine phi, unit at full load		0.85	0.85	0.85	0.85	0.85	0.85	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Maximum current drawn (Un - 10%)***	A	237	262	287	323	353	383	429	464	524	585	650	696	786	847	928	1048
Circuit A	A	-	-	-	-	-	-	-	-	-	353	418	464	524	464	464	524
Circuit B	A	-	-	-	-	-	-	-	-	-	232	232	232	262	383	464	524
Maximum current drawn (Un)***	A	217	240	263	297	324	351	394	426	480	537	596	639	721	777	852	961
Circuit A	A	-	-	-	-	-	-	-	-	-	324	383	426	480	426	426	480
Circuit B	A	-	-	-	-	-	-	-	-	-	213	213	213	240	351	426	480
Max. starting current, standard unit**** **(Un)**	A	334	357	401	435	468	495	590	622	662	1338	1631	1674	1767	1812	1887	2008
Circuit A***	A	-	-	-	-	-	-	-	-	-	1125	1418	1461	1527	1461	1461	1527
Circuit B***	A	-	-	-	-	-	-	-	-	-	1248	1248	1248	1287	1152	1461	1527
Max. starting current/max. current draw ratio, unit		1.54	1.49	1.53	1.47	1.44	1.41	1.50	1.46	1.38	2.49	2.74	2.62	2.45	2.33	2.22	2.09
Max. starting current/max. current draw ratio, circuit A		-	-	-	-	-	-	-	-	-	3.47	3.70	3.43	3.18	3.43	3.43	3.18
Max. starting current/max. current draw ratio, circuit B		-	-	-	-	-	-	-	-	-	5.86	5.86	5.86	5.36	3.28	3.43	3.18
Max. starting current - reduced current start**** **(Un)**	A	std.	std.	std.	std.	std.	std.	std.	std.	std.	878	955	998	1102	1136	1211	1343
Circuit A	A	std.	std.	std.	std.	std.	std.	std.	std.	std.	665	742	785	862	785	785	862
Circuit B	A	std.	std.	std.	std.	std.	std.	std.	std.	std.	572	572	572	622	692	785	862
Max.starting current - red. current start/max. current draw ratio, unit		std.	std.	std.	std.	std.	std.	std.	std.	std.	1.64	1.60	1.56	1.53	1.46	1.42	1.40
Circuit A		std.	std.	std.	std.	std.	std.	std.	std.	std.	2.05	1.94	1.84	1.79	1.84	1.84	1.79
Circuit B		std.	std.	std.	std.	std.	std.	std.	std.	std.	2.69	2.69	2.69	2.39	1.97	1.84	1.79
Three-phase short-circuit holding current	kA	25	25	25	25	25	25	25	25	25	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Circuit A	kA	-	-	-	-	-	-	-	-	-.	25	25	25	25	25	25	25
Circuit B	kA	-	-	-	-	-	-	-	-	-	25	25	25	25	25	25	25
Customer standby capacity, unit or circuit A, for evaporator water pump connections †	kW	4	4	4	5.5	5.5	5.5	7.5	7.5	7.5	7.5	9	9	9	15	15	15

* Standard Eurovent conditions: Evaporator entering/leaving water temperature 12°C and 7°C. Outdoor air temperature 35°C.
** Power input, compressor and fan, at unit operating limits (evaporator water entering/leaving temperature = 15°C/10°C, outdoor air temperature = 46°C) and a nominal voltage of 400 V (data given on the unit name plate).
*** Maximum unit operating current at maximum unit power input.
**** Maximum instantaneous starting current (maximum operating current of the smallest compressor(s) + fan current + locked rotor current or reduced starting current of the largest compressor).
† Current and power inputs not included in the values above
N/A Not advailable

Compressors

Reference	Size	I nom.	MHA	LRA	LRA (Y)	LRA (S) 1 cp.	LRA (S) 2 cp.
06NA2146S7N	39	70	95	605	191	220	-
06NA2174S7N	46	90	120	715	226	260	-
06NA2209S7N	56	113	145	856	270	330	420
06NA2250S7N	66	130	175	960	303	380	500
06NA2300S5N	80	156	210	1226	387	445	550
06NA2300S5E	80+	174	240	1265	400	460	600

Legend:

06NA	- Compressor for air-cooled units
N	- Non-economized compressor
E	- Economized compressor
INOM	- Average current draw of the compressor at Eurovent conditions
MHA	- Must hold amperes (maximum operating current) at 360 V
LRA	- Locked rotor current with across-the-line start
LRA (Y)	- Locked rotor current at reduced current (star/delta start-up mode)
LRA (S) 1 cp.	- Start-up with reduced current with electronic starter (start-up duration 3 seconds max.) for one compressor per circuit
LRA (S) 2 cp.	- Start-up with reduced current with electronic starter (start-up duration 3 seconds max.) for two compressors per circuit

9 - APPLICATION DATA

9.1 - Unit operating range

Evaporator		Minimum	Maximum
Evaporator entering water temperature	°C	6.8*	21
Evaporator leaving water temperature	°C	4**	15
Condenser (water-cooled)		**Minimum**	**Maximum**
Condenser entering water temperature	°C	20***	42
Condenser leaving water temperature	°C	25	45
Outside ambient operating temperature 30HXC	°C	6	40
Condenser (air-cooled)		**Minimum**	**Maximum**
Outdoor ambient operating temperature	°C	0	46
Available static pressure	kPa		0

Notes:

* For application requiring operation at less than 6.8°C, contact Carrier s.a. for unit selection using the Carrier electronic catalog.

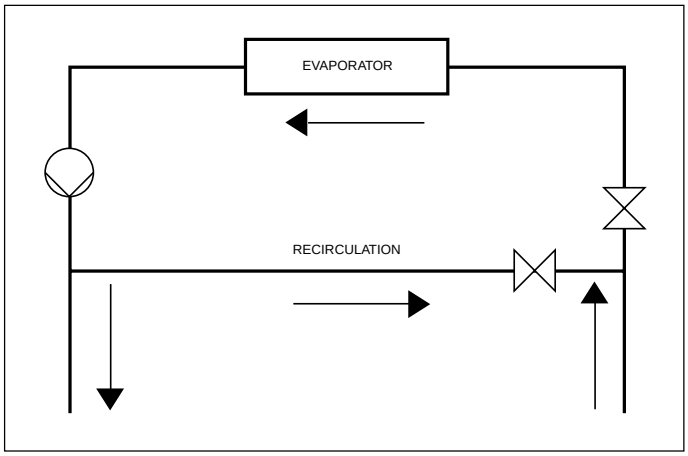
** For application requiring operation at less than 4°C, the units require the use of antifreeze.

*** Water-cooled units (30HXC) operating at full load and below 20°C condenser entering water temperature require the use of a head pressure control with analogue water control valves (see paragraph on head pressure control).

In temporary operating modes (start-up and at part load) the unit can operate with a condenser entering air temperature of 13°C.

9.2 - Minimum chilled water flow

The minimum chilled water flow is shown in the table on the next page. If the flow is less than this, the evaporator flow can be recirculated, as shown in the diagram. The temperature of the mixture leaving the evaporator must never be less than 2.8 K lower than the chilled water entering temperature.



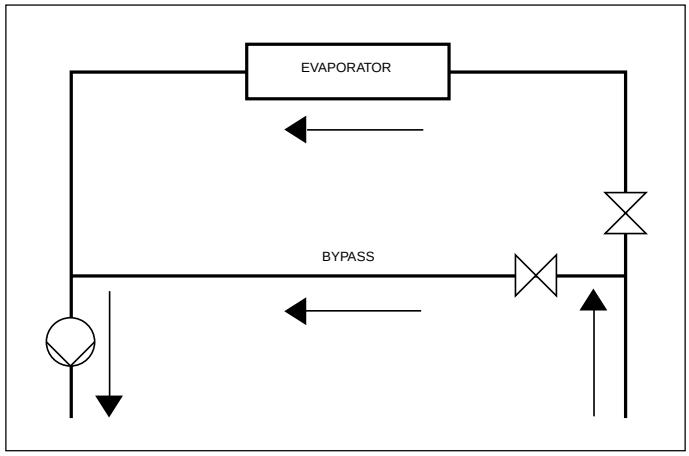
FOR MINIMUM CHILLED WATER FLOW RATE

9.3 - Maximum chilled water flow

The maximum chilled water flow is limited by the maximum permitted pressure drop in the evaporator. It is provided in the table on the next page. If the flow exceeds the maximum value, two solutions are possible:

a - Select a non-standard evaporator with one water pass less which will allow a higher maximum water flow rate.

b - Bypass the evaporator as shown in the diagram to obtain a highter temperature difference with a lower evaporator flow rate.



FOR MAXIMUM CHILLED WATER FLOW RATE

9.4 - Variable flow evaporator

Variable evaporator flow can be used in standard 30HXC and 30GX chillers. The chillers maintain a constant leaving water temperature under all flow conditions. For this to happen, the minimum flow rate must be higher than the minimum flow given in the table of permissible flow rates and must not vary by more than 10% per minute. If the flow rate changes more rapidly, the system should contain a minimum of 6.5 liters of water per kW instead of 3.25 l/kW.

9.5 - System minimum water volume

Whichever the system, the water loop minimum capacity is given by the formula:
Capacity = Cap (kW) x N Liters

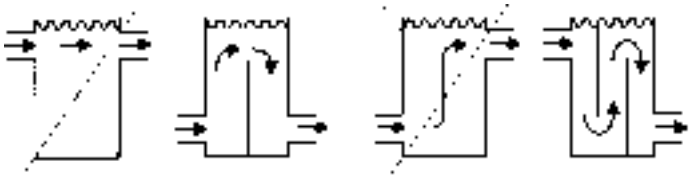
Application	N
Normal air conditioning	3.25
Process type cooling	6.5

Where Cap is the nominal system cooling capacity (kW) at the nominal operating conditions of the installation.

This volume is necessary for stable operation and accurate temperature control.

It is often necessary to add a buffer water tank to the circuit in order to achieve the required volume. The tank must itself be internally baffled in order to ensure proper mixing of the liquid (water or brine). Refer to the examples below.

NOTE: The compressor must not restart more than 6 times in an hour.



9.6 - Cooler flow rate (l/s)

30HXC	Min.*	Max.**
080-090	5.7	22.7
100	6.0	24.1
110	6.9	27.5
120-130	8.3	33.0
140-155	10.0	39.5
175-190	10.7	42.7
200	13.4	53.7
230	13.4	60.6
260-285	17.0	68.1
310	19.4	77.8
345-375	21.3	85.3

30GX	Min.*	Max.**
082	5.7	22.7
092-102	6.0	24.1
112-122	6.9	27.5
132	8.4	33.7
152-162	10.0	39.9
182	10.7	42.7
207-227	13.4	53.7
247	15.1	60.6
267	17.0	68.1
298	19.4	77.8
328-358	21.3	85.3

* Based on a water velocity of 0.9 m/s.
** Based on a water velocity of 3.6 m/s.

9.7 - Condenser flow rate (l/s)

30HXC	Min.*		Max.**
	Closed loop	Open loop	
080-110	2.5	7.5	29.9
120-130	3.1	9.3	37.3
140-155	3.8	11.4	45.5
175-190	4.6	13.8	55.2
200	5.0	14.9	59.6
230-285	6.7	20.1	80.3
310-375	7.3	22.0	88.0

* Based on a water velocity of 0.3 m/s in a closed loop and 0.9 m/s in an open loop.
** Based on a water velocity of 3.6 m/s.

Environmental Management System Approval

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