Carrier s.a.

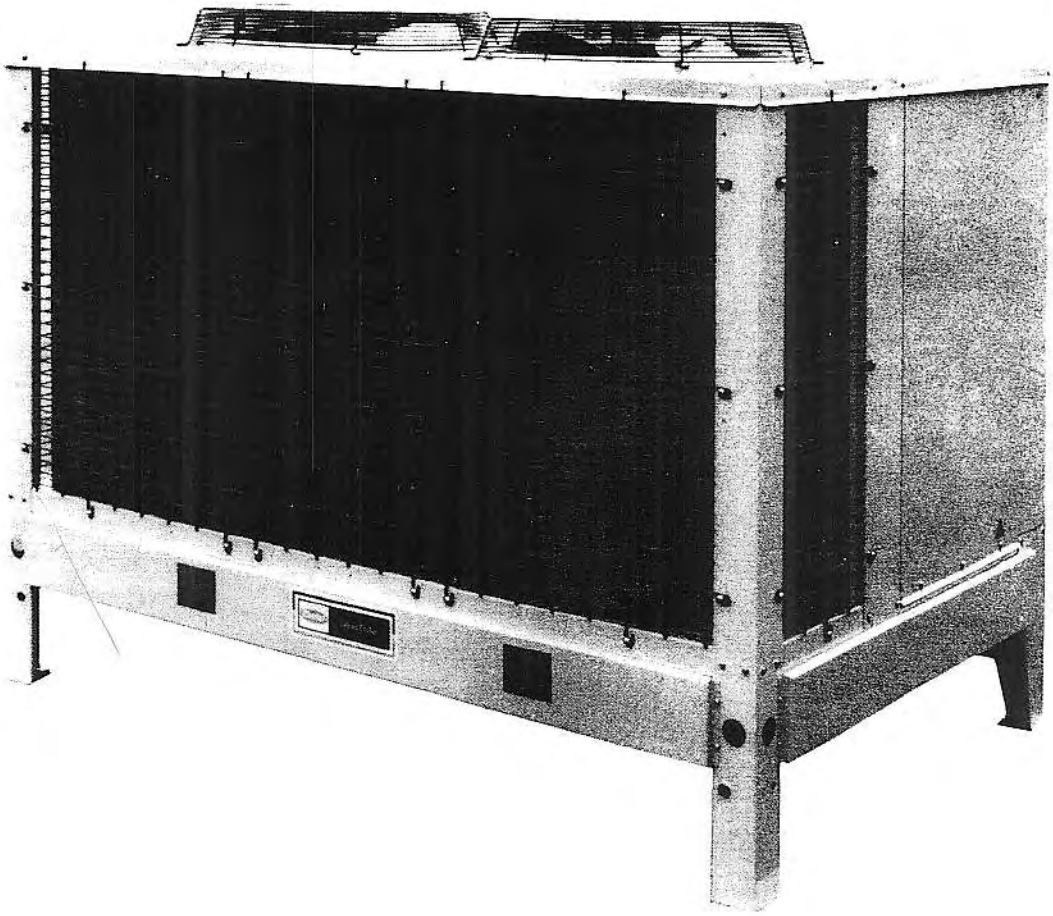
Carrier

Subsidiary of Carrier Corporation

30 GC 009-035

Air-cooled liquid Chillers 50 Hz

Installation, start-up and maintenance instructions



QUALITY ASSURANCE

CERTIFICAT N° 1989/029

AFAQ

ASSOCIATION FRANÇAISE POUR L'ASSURANCE DE LA QUALITÉ

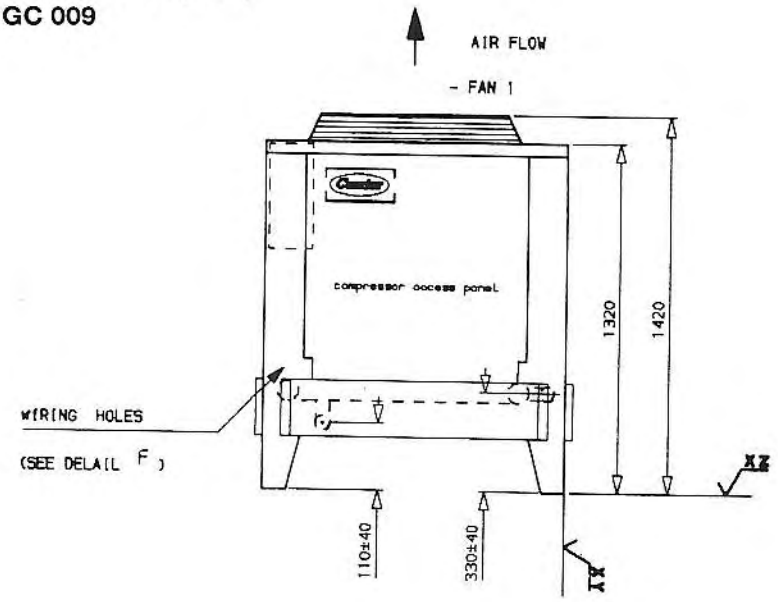
ISO 9001 Lloyd's Quality Assured Firm

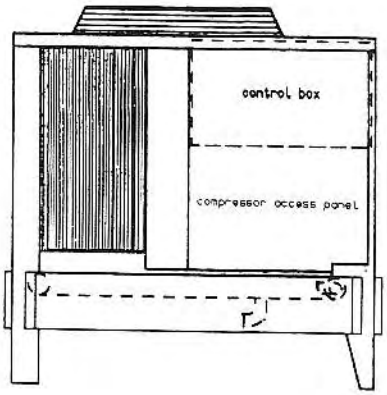
NATIONAL ACCREDITATION OF CERTIFICATION BODIES

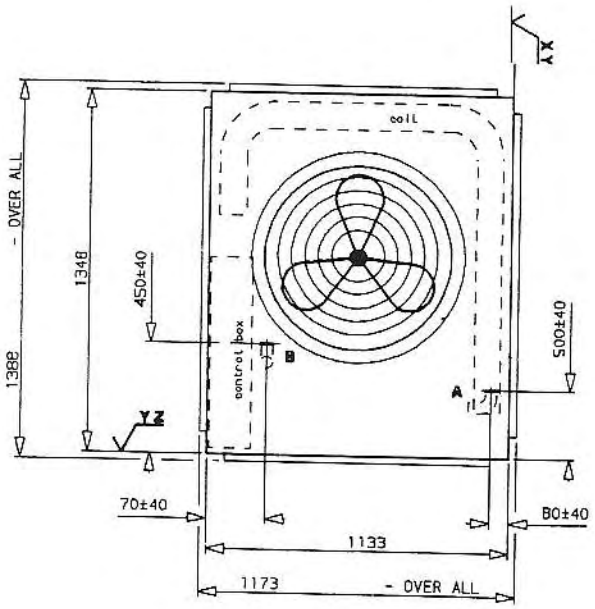
APPROVALS
BS 5750 Part 1
NFX 50131
ISO 9001

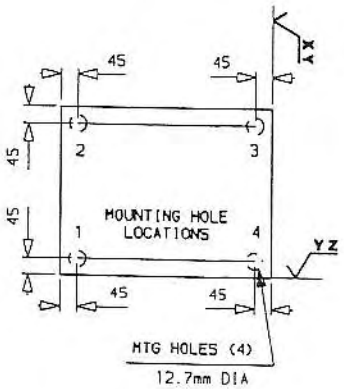
DIMENSIONS (mm)

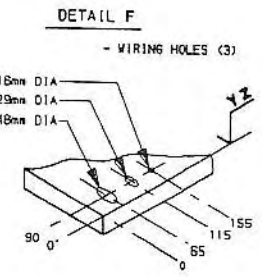
30GC 009

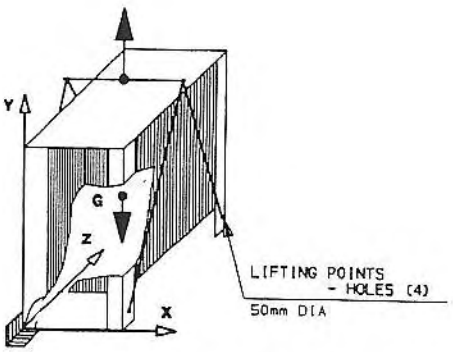












Note :
Service and air flow clearance required.

Front	1200 mm
End and sides	1000 mm
Top	1800 mm

Lifting of the unit must be done carefully.
Attaching cables at the 4 corners with a spreader bar at the top.
Alternate lifting can be done by fork-lift truck.

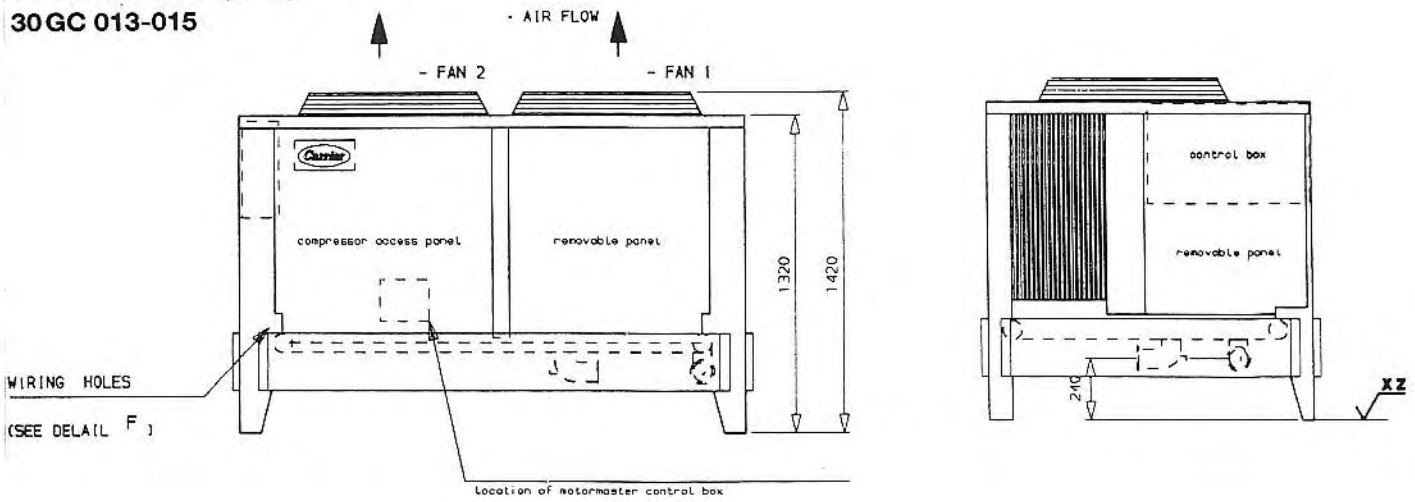
UNIT	Approximate operating weight	Water connections 1 1/4" FT GAS		Center of gravity G ±40 mm			Weight distribution points			
		Inlet	Outlet	X	Y	Z	1	2	3	4
30GC 009	315 kg	A	B	480	700	520	150 kg	70 kg	40 kg	55 kg

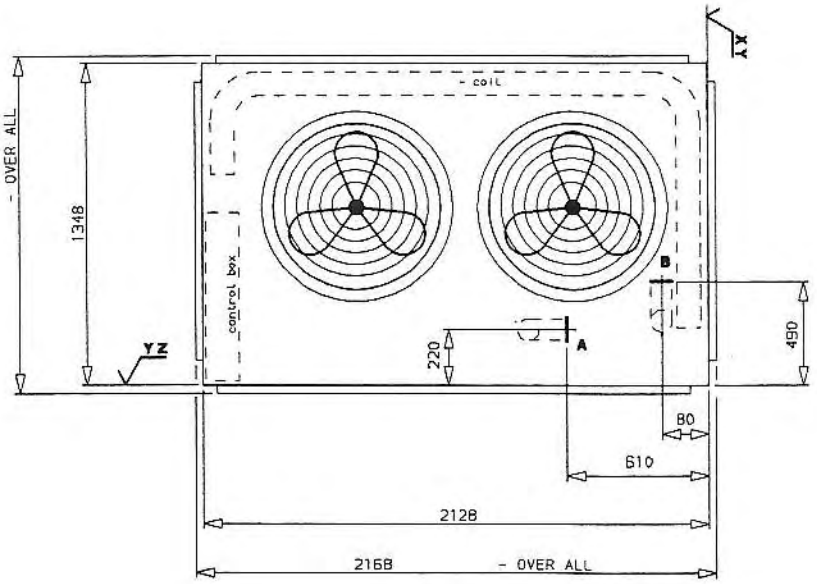
Use only current drawings available from your Carrier distributor when designing an installation

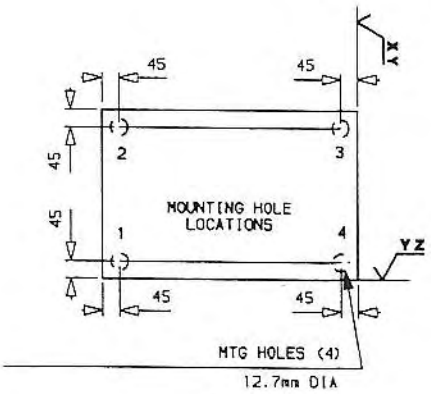
Fig. 1

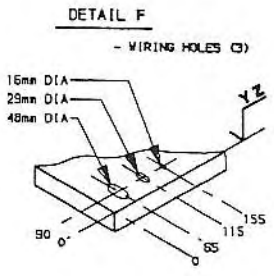
DIMENSIONS (mm)

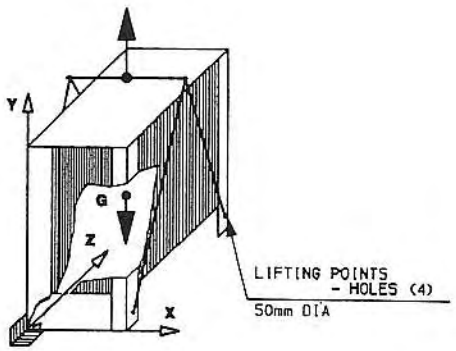
30GC 013-015











Note :
Service and air flow clearance required.

Front	1200 mm
End and sides	1000 mm
Top	1800 mm

Lifting of the unit must be done carefully.
Attaching cables at the 4 corners with a spreader bar at the top.
Alternate lifting can be done by fork-lift truck.
Water connection locations ± 40 mm.

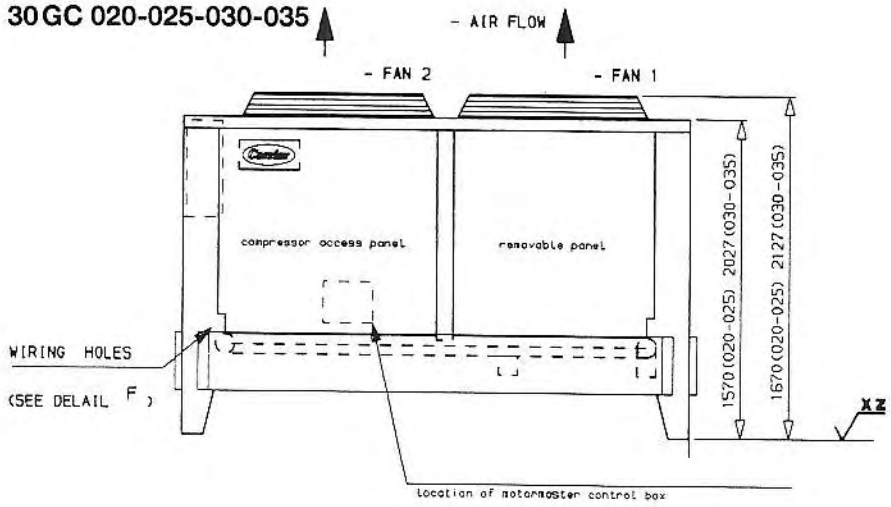
UNIT	Approximate operating weight	Water connections 1 1/2" FT GAS		Center of gravity G ±40 mm			Weight distribution points			
		Inlet	Outlet	X	Y	Z	1	2	3	4
30GC 013	450 kg	A	B	450	650	1280	200 kg	100 kg	70 kg	80 kg
30GC 015	530 kg	A	B	440	660	1320	240 kg	120 kg	80 kg	90 kg

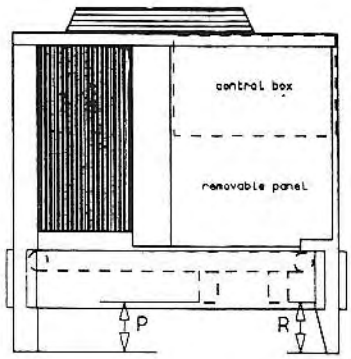
Use only current drawings available from your Carrier distributor when designing an installation

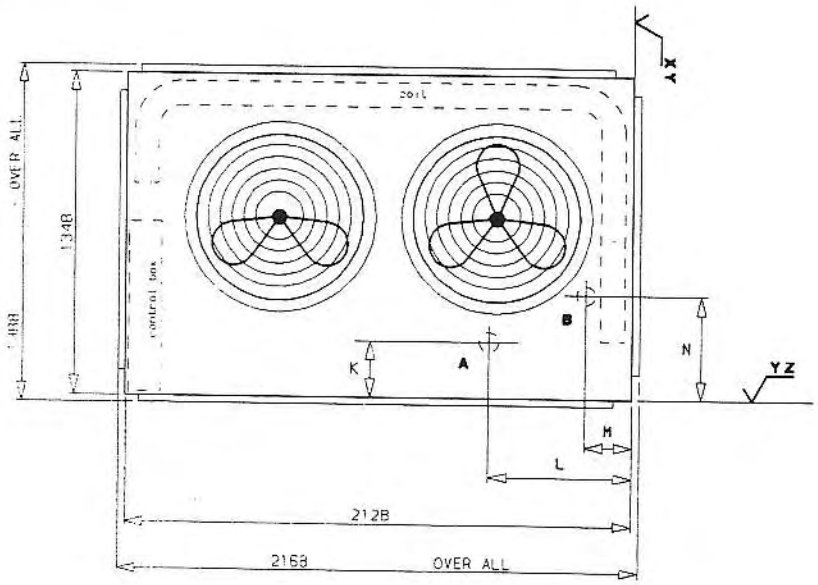
Fig. 2

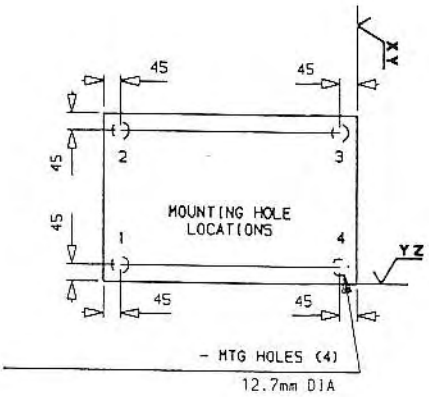
DIMENSIONS (mm)

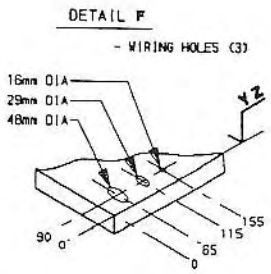
30GC 020-025-030-035

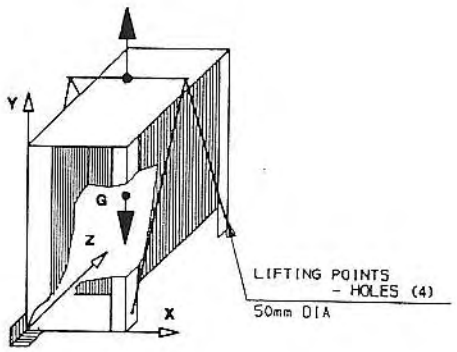












Note :
Service and air flow clearance required.

Front	1200 mm
End and sides	1000 mm
Top	1800 mm

Lifting of the unit must be done carefully.
Attaching cables at the 4 corners with a spreader bar at the top.
Alternate lifting can be done by fork-lift truck.

UNIT	Approximate operating weight	Water connections 2 1/2" FT GAS		Center of gravity G ±40 mm			Weight distribution points				Water connection locations ± 40 mm					
		Inlet	Outlet	X	Y	Z	1	2	3	4	K	L	M	N	P	R
30GC 020	800 kg	A	B	430	670	1320	320 kg	180 kg	140 kg	160 kg	248	904	112	248	272	272
30GC 025	850 kg	A	B	430	670	1320	350 kg	190 kg	140 kg	170 kg	248	904	112	248	272	272
30GC 030	950 kg	B	A	440	860	1350	330 kg	240 kg	180 kg	200 kg	152	312	312	1210	238	150
30GC 035	1000 kg	B	A	440	870	1350	350 kg	260 kg	190 kg	200 kg	152	312	312	1210	238	150

Use only current drawings available from your Carrier distributor when designing an installation

Fig. 3

PHYSICAL DATA

Type 30GC (2)		009	013	015	020	020HAT	025	025HAT	030	030HAT	035	035HAT
Nominal cooling capacity (1)	kW	22.0	33.0	40.4	52.2	54.9	64.4	66	73.1	74.8	92	93
Operating weight	kg	315	450	530	800	800	850	850	950	950	1000	1000
Refrigerant charge	kg	4.8	7.45	9.7	16.7	16.7	16	16	17.6	17.6	21.8	21.8
Compressor (1 per unit)		Hermetic		semi-hermetic								
Type		DQ12AG	DQ12AF	06QD1515 or 06D537	06E 250		06E 265		06E 275		06E 299	
Oil charge	l	3.65	3.65	4.7	6.7	6.7	9	9	9	9	9	9
Capacity control steps (3)		1	1	1/2	2	2	2/3	2/3	2/3	2/3	2/3	2/3
Condenser fans-type		Directly driven, propeller, 15.0 rps										
Number		1	2	2	2	2	2	2	2	2	2	2
Diameter	mm	610	610	610	610	762	660	762	762	762	762	762
Total air flow	l/s	2218	4436	4436	4533	6375	6138	7365	8028	9635	8028	9635
Condenser coil-type		3/8" OD Copper tube										
Number of rows		2	2	3	3	3	3	3	2	2	3	3
Cooler		Tube in tube type										
Net water volume	l	9.6	13.2	13.2	21.7	21.7	21.7	21.7	32.7	32.7	32.7	32.7
Max. design working pressure												
Refrigerant side	kPa	2750	2750	2750	2750	2750	2750	2750	2750	2750	2750	2750
Water side	kPa	980	980	980	980	980	980	980	980	980	980	980
Water connection FT	gas											
Inlet - outlet	in	1 1/4	1 1/2	1 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2

Notes :
(1) Based on 6.7°C LCWT and 35°C condenser entering air temperature (ARI STD 590-76).
(2) HAT – High ambient temperature unit (Option).
(3) 2 or 3 step control is available with accessory unloader.

Table 1

SAFETY CONSIDERATIONS

Installation, start-up and servicing of this equipment can be hazardous due to system pressures, electrical components and location of equipment (roofs, elevated structures, etc ...).

Only trained, qualified installers and service mechanics should install, start-up and service this equipment.

Untrained personnel can perform basic maintenance functions of cleaning coils.

All other operations should be performed by trained service personnel.

When working on the equipment, observe precautions in the literature, tags, stickers and labels attached to the equipment and any other safety precautions that apply.

- Follow all safety codes.
- Wear safety glasses and work gloves.
- Use care in handling, rigging and setting bulky equipment.

Warning : *Be sure power to equipment is shut off before performing maintenance or service to prevent electric shock.*

INSTALLATION

1. Inspect shipment. Inspect unit for damage or missing parts. If unit is damaged, or if shipment is incomplete, file a claim immediately with the shipping company.
2. Be sure that electrical characteristics of available power supply agree with the unit nameplate electrical requirements.

LOCATION FOR INSTALLATION

The following should be duly considered when selecting a location for installation.

1. Location should be able to support unit operating weight listed in fig. 1-3
2. Allow sufficient space for service and air flow around the unit as shown in fig.1-3. Also allow overhead air space of 1.8 m or more.
3. Select a location free of dust or foreign matter which may cause coil clogging.
4. When installing on the ground, select a site not subject to flooding.
5. Avoid installing the unit where snow is likely to drift. In an area where below-freezing temperatures continue for long periods or where much snow falls, use a concrete base and curbs to raise the unit above the ground.
6. Unit is designed to evacuate rain water. To assure this, the unit base must be perfectly level.

TRANSPORTATION

1. To hoist, suspend transport with a forklift, support the unit as specified fig. 1, 2, 3.
2. To prevent damage while in transit, do not unskid the unit until it is at its final location.
3. Never roll or tip the unit more than 15° while being transported.

Important : *Make sure that all unit panels are fixed in place before moving. Raise and set down the unit carefully.*

CHILLED WATER PIPING

See drawings pages 2, 3 and 4 for cooler water connections dimensions and position.

- Piping should not transmit any force or vibrations to the cooler.
- Water should be analysed ; the circuit will be designed and installed according to test results :
  Filters selection, inhibitor, auxiliary exchanger may be necessary (consult Carrier Manual, Part 5 "Water conditionning" and Part 3, Chapter 2, or any other basic manual).

Warning : In winter low temperatures could cause cooler freeze-damage. According to climatic conditions use an appropriate method of protection such as :

- Add ethylene glycol (for detail, see PDD nº 13018 - 76).
- Increase the insulation thickness.
- Do not de-energize the cooler heaters.
- At the end of the cooling season, drain the water from the cooler. Flush the system thoroughly. Replace the drain plug and put 10 l of ethylene glycol in the cooler to prevent any residual water in the cooler from freezing. At the beginning of the next cooling season, refill the cooler and add the recommended inhibitor.

This catalogue is only applicable to installation of Carrier s.a chiller ; auxiliary equipment should be installed according to basic refrigeration and piping practices (especially with respect to minimum and maximum cooler water flow).

ELECTRICAL DATA

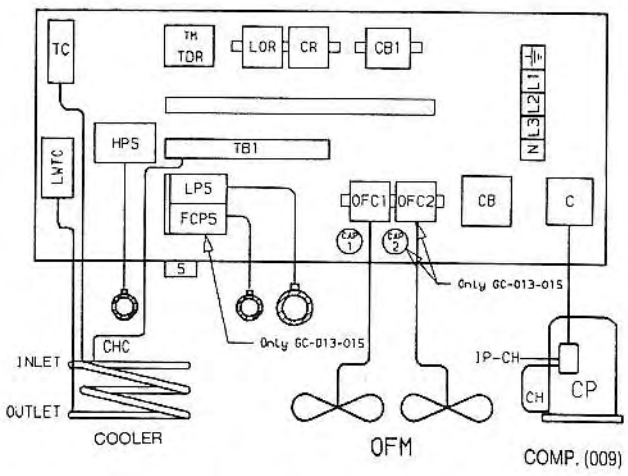
30GC	Unit					Compressors			Fan motors				
	Nominal voltage V-PH-HZ	Voltage range Min.	Max.	WSA	ICF	kW	FLA	LRA	Nbr.	Total kW	PH	Volts	FLA (each)
009	230-3-50	198	264	46	187	9,9	34	184	1	0.6	1	230	3.2
	400-3-50	342	462	29	95	9.9	20	92	1	0.6	1	230	3.2
013	230-3-50	198	264	78	261	15	58	255	2	1.2	1	230	3.2
	400-3-50	342	462	49	134	15	34	128	2	1.2	1	230	3.2
015	230-3-50	198	264	73	206	18	53	200	2	1.2	1	230	3.2
	400-3-50	342	457	44	122	18	30	116	2	1.2	1	230	3.2
020	230-3-50	198	264	84	300	21	62	294	2	1.2	1	230	3.2
	400-3-50	342	457	52	177	21	36	170	2	1.2	1	230	3.2
020 HAT	230-3-50	198	264	87	303	21	62	394	2	2.8	3	230	4.5
	400-3-50	342	457	52	177	21	36	170	2	2.8	3	400	2.6
025	230-3-50	198	264	112.0	372.5	28	83.5	365	1	0.6	1	230	4.5
									1	0.6	3	230	3.0
	400-3-50	342	457	66.3	217.3	28	48	211	1	0.6	1	230	4.5
									1	0.6	3	400	1.73
025 HAT	230-3-50	198	264	111.4	372.0	28	83.5	365	2	1.6	3	230	3.5
	400-3-50	342	457	64.0	215	28	48	211	2	1.6	3	400	2.0
030	230-3-50	198	264	125.0	431.1	32	93.5	423	1	1.0	1	230	4.6
									1	0.8	3	230	3.5
	400-3-50	342	457	74.1	253.6	32	54	247	1	1.0	1	230	4.6
									1	0.8	3	400	2
030 HAT	230-3-50	198	264	126.7	432.8	32	93.5	423	2	2.2	3	230	4.9
	400-3-50	342	457	73.1	252.6	32	54	247	2	2.2	3	400	2.8
035	230-3-50	198	264	176.9	585.1	45	135	577	1	1.0	1	230	4.6
									1	0.8	3	230	3.5
	400-3-50	342	457	102.9	343.6	45	77	337	1	1.0	1	230	4.6
									1	0.8	3	400	2
035 HAT	230-3-50	198	264	178.6	586.8	45	135	577	2	2.2	3	230	4.9
	400-3-50	342	457	101.6	342.6	45	77	337	2	2.2	3	400	2.8

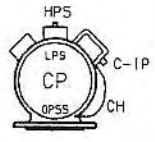
FLA – Full load amps.
ICF – Maximum instantaneous current flow during starting the LRA of the compressor plus the FLA for all fan motors.
LRA – Locked rotor amps.

WSA – Wire sizing amps ; one terminal block per unit. To size wires it is customary to take 125% of the FLA of the largest motor plus 100% of this for the other motors in the unit.
PH – Phase.
HAT – Optional high ambient temperature unit.
kW – kW maximum

Table 2

ARRANGEMENT OF ELECTRICAL COMPONENTS

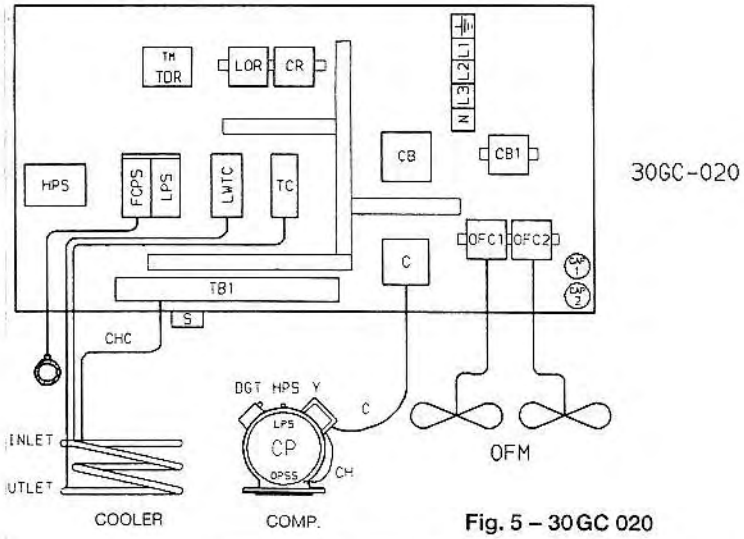




Legend

C	Compressor contactor
CB	Circuit breaker of compressor
CB1	Circuit breaker of fan motor and of control
CH	Crankcase heater
CHC	Cooler heater cable
CR	Control relay
FCPS	Fan cycling pressure switch
HPS	High pressure switch
IP	Internal protector
LPS	Low pressure switch
LOR	Lock out relay
LWTC	Low water temperature cutout
OFC	Outdoor fan contactor
OPSS	Oil pressure safety switch
S	Unit "on-off" switch
TC	Cooling thermostat
TDR	Time delay relay
TM	Timer motor
CAP1,2	Capacitors
TB1	Terminal BLOCK
COMP	Compressor

Fig. 4 – 30GC 009, 013, 015



30GC-020

Fig. 5 – 30GC 020

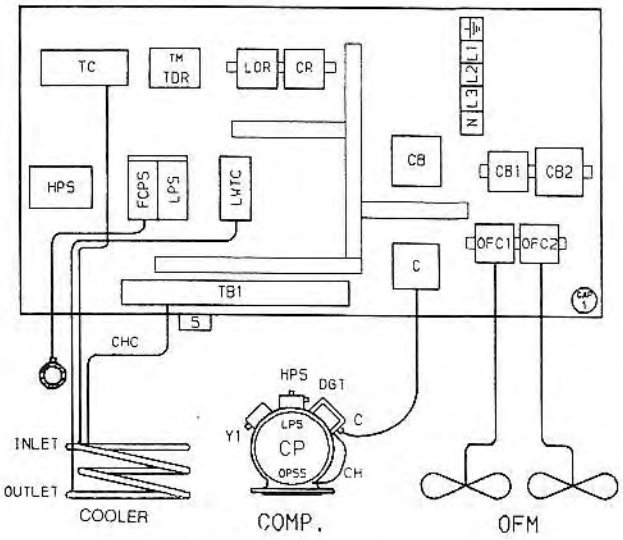
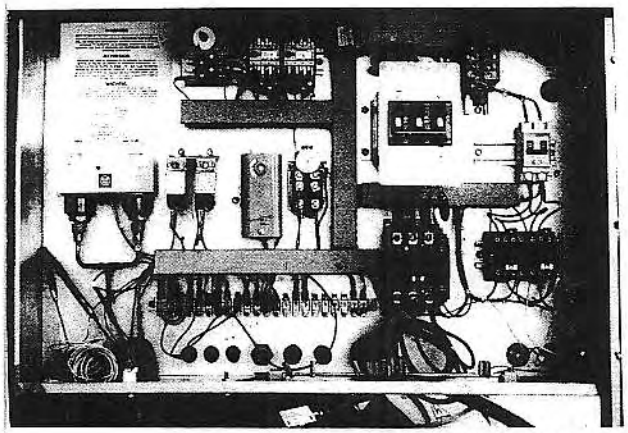


Fig. 6 – 30GC 025-035



Legend

C	Compressor contactor
CB	Circuit breaker of compressor
CB1	Circuit breaker of fan motor and of control
CH	Crankcase heater
CR	Control relay
DGT	Discharge gas thermostat
FCPS	Fan cycling pressure switch
HPS	High pressure switch
LPS	Low pressure switch
LOR	Lock out relay
LWTC	Low water temperature cutout
OFC	Outdoor fan contactor
OPSS	Oil pressure safety switch
S	Unit "on-off" switch
TC	Cooling thermostat
TDR	Time delay relay
TM	Timer motor
Y1	Unloader valve solenoid
CAP1,2	Capacitors
TB1	Terminal block
COMP	Compressor

Fig. 7 **ARRANGEMENT OF ELECTRICAL COMPONENTS**

ELECTRICAL WIRING

POWER SUPPLY

Electrical characteristics of available power supply must agree with unit nameplate rating.
Supply voltage must be within the limits shown in Table 2.

Important : *Operation of unit on improper supply voltage or with excessive phase inbalance constitutes miscise and is not covered by Carrier warranty. If supply voltage phase unbalance is more than 2%, contact your local electric utility company immediately.*

POWER WIRING

All power wiring must comply with applicable local codes.

1. Install field-supplied branch circuit disconnects within sight of the unit readily accessible, but out of the reach of children. Provision for locking switch open (off) is advisable to prevent power from being turned on while unit is being serviced. Breaking capacity of the power circuit breaker is 5000 A. If this is insufficient, high capacity fused disconnect switches must be provided ahead of the existing ones.
2. To determine power wire size, refer to Table 2, Electrical Data.
3. When connecting power supply wire to outdoor unit, open control box cover and connect wire to power supply terminals L1, L2, L3 and N in box.
   Pass wire through the hole on unit side to connect it to power terminals through hole behind box.

CONTROL WIRING

The control circuit is internally wired so that the control voltage (230 V) is supplied through terminals L1 and N (3 phase - 4 wire system).

CONTROL CIRCUIT INTERLOCKS

A water flow switch (accessory) should be installed in the water line to prevent the unit from running when water is not circulating through the cooler. Also, auxiliary contacts for the water pump starter should be installed in the control circuit as additionnal protection against unit operation when the pump is not running.
The flow switch should be electrically connected to terminals 3 and 4 in the control box.

WIRING UP ACCESSORIES

Details for wiring up accessories are given on the unit wiring diagrams, Any other information required for their installation is given in a leaflet included with the accessory packages

MAINTENANCE

GENERAL MAINTENANCE

1. Keep the unit casing and grilles and the area around the unit as clean as possible. Remove all debris.
2. Periodically clean the condenser fins with a soft brush. If the fins are unusually dirty, blow from the inside with compressed air or a jet of water, taking care not to damage the fins.
3. Wipe down all piping with a damp cloth to remove dust and dirt. If this is done regulary, leaks will be spotted more easily and repaired before excessive damage is done to the system.
4. Check the tightness of all bolts, nuts, screws and flanges. Correctly fastened hardware prevents damaging vibration and eliminates leaks.
5. Ensure that all expanded rubber gaskets, foam insulation, fiber glass panel insulation etc... are in place and in good condition.
6. From time to time check that line voltage and phase imbalance are still within specified limits.

SERVICE AND DESCRIPTION OF REFRIGERATION COMPONENTS

Caution : *Turn off all power to unit before proceeding.*

If the refrigerant circuit is opened for any reason, then it must be dehydrated (vacuum), recharged and leak-tested. See paragraph "Oil refrigerant charging procedure" on page 14.

COMPRESSOR

No specific maintenance but check :
- Oil level
- Capillary tightness
- Crankcase heater.

OIL CHARGE

Each compressor is factory charged with oil (see table 1). When additional oil or a complete charge is required, use only approved compressor oil. Approved sources are :

Sun Oil Company	Suniso 3 GS
Texaco. Inc.	Capella BI

Note : *Do not re-use drained oil or use any oil that has been exposed to atmosphere. Refer to Standard Service Techniques Manual, Chapter 1, Refrigerants, for procedures to add or remove oil.*

COMPRESSOR REMOVAL

Switch off the power supply to the unit. Close the compressor discharge and suction valves. Remove the capillary tubes, unbolt and remove the compressors. To reinstall them, follow these instructions in reverse order. Adjust the vibration absorbers as described under "Compressor mounting".

COMPRESSOR MOTOR PROTECTION

Circuit breaker
Calibrated trip manual reset, hydromagnetic breaker protects against motor overload and locked rotor conditions.

Caution : *Do not bypass connections nor increase the size of the breaker to correct trouble.*

Determine the cause and correct before resetting breaker.

Internal overheat protection is used on 30GC 009, 013 and 015.

Discharge thermostat (30GC 020-035)
A sensor in the discharge gas of each compressor reacts to excessively high discharge gas temperature and shuts off the compressor.

Time Guard control
The Time Guard control protects the compressor against short cycling. See "Sequence of operation".

Crankcase heater is used to prevent refrigerant dilution of oil when the compressor is not running. This ensures that the compressor starts up under correct lubrication conditions. Source of 230 volts power is the auxiliary control power, independant of the main unit power. This assures compressor protection even when main unit power disconnect switch is off.

Accessory oil pressure safety switch installation
Accessory for GC 015-035 units only.
(N° 06QA 900 252 EE : one required per compressor).
Switch includes a reverse contact for field connection of an alarm device.

Before initial start-up and at scheduled intervals thereafter, the time-delay switch should be tested.

Before testing, shield the control to prevent moving air from contacting the time-delay switch, as this is a thermal device and air will affect the timing.

Disconnect main (230 V) control circuit breaker and all compressor circuit breakers. Remove all oil pressure safety switch (OPSS) covers and disconnect the wire at the 240 V terminal of each OPSS. Check each control as follows : Reconnect the wire to 240 V terminal of OPSS and close 230 V control circuit breaker. Energize the control circuit by pressing "RB" button. Sequencer will energize compressor contactors and indicator light ; heater in OPSS is now energized. In approximately 45 seconds warp switch in the control should open, de-energizing the contactors and light. If contactors remain energized more than 60 seconds, the control should be replaced.

Allow approximately 5 minutes for the thermal switch to cool then manually reset the control. Open the 230 V control circuit breaker and disconnect the wire from the 240 V terminal.

Repeat the test procedure for each remaining OPSS control.

Caution : *Be sure the wire to the 240 V terminal is disconnected from every switch except the one being tested.*

When test has been completed, reconnect OPSS controls at 240 V terminal and replace covers.

Do not attempt to field repair a control that requires service. Contact your local sales representative.

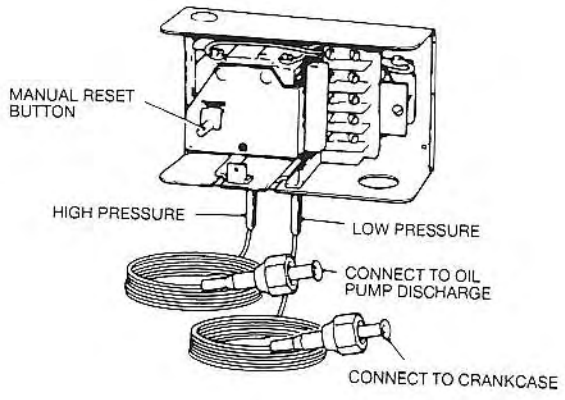


Fig. 8 – Oil pressure safety switch

ligh-pressure switch – protects compressor from xcessive condensing pressures.

he high pressure switch has fixed non-adjustable settings.

o check – Slowly close discharge shut-off valve until ompressor shuts down. This should be at the cutout ressure indicated. When pressure drops to cut-in setting, eset the switch. Unit is restarted by moving "ON-OFF" witch to "OFF" then back to "ON". At this point the Time uard circuit will cycle and in 5.5 minutes the compressor estart.

ow-pressure switch – protects against loss of charge nd evaporator freeze-up.

he low pressure switch settings are indicated in table elow.

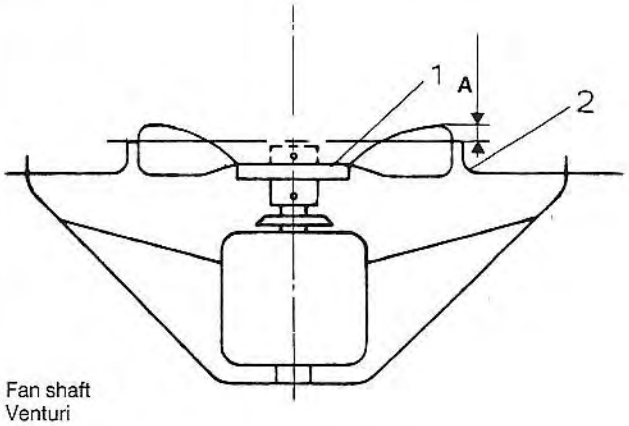
o check – Slowly close suction shut-off valve and allow ompressor to pump down. Wait for at least 3 minutes fter cycle to be completed before closing the valve. **Do ot allow compressor to pump down below 13.7 kPa 2 psig).** Compressor should shut-down when suction ressure drops to cutout pressure in table and should estart when pressure builds up to cut-in pressure shown, fter cycling of the Time Guard.

Unit size 30GC			009	013	015	020-035
High pressure switch	cut-out	kPa	2500	2500	2700	2750
non adjustable	cut-in	kPa	2200	2200	2400	2450
Low pressure switch	cut-out	kPa	200±20	200±20	200±20	200±20
Adjustable	cut-in	kPa	400	400	400	400

able 3 – Pressure switches setting

ONDENSER FANS

ach fan is supported by a formed-wire mount bolted to ne fan deck and covered with a wire guard. The exposed nd of the fan motor shaft is protected from the weather by rubber cap. Figure 9 shows the proper position of the ounted fan. Fan motors have permanently lubricated earings.



. Fan shaft
. Venturi

Fig. 9 – Fan adjustment

AN MOTOR REPLACEMENT

espect safety considerations. Fan motors can be easily emoved through the top of the unit. Take care not to lamage propeller.

UNIT	ADJUSTMENT "A" (mm)
30GC 009-020	35
30GC 025 (Single phase motor)	40
30GC 025 (Three phase motor)	30 ±2
30GC 030-035	8 to 13

able 4 – Fan adjustment

HEAD PRESSURE CONTROL

Head pressure control by means of fan cycling is a standard feature of 30CG 013 through 035 units. The No. 2 fan cycles in response to changes in the refrigerant liquid line pressure. The switch cycles the fan off at 880 kPa gauge as pressure decreases and cycles back on at 1720 kPa gauge.

MINIMUM AND MAXIMUM OUTDOOR TEMPERATURE LIMITS

	Outdoor mini. °C MM	STD	Air temperature max. STD °C	Option HAT max. °C
009	–20	15	48	–
013	–20	7	50	–
015	–20	7	50	–
020	–20	7	46	50
025	–20	7	46	50
030	–20	7	46	50
035	–20	7	46	50

MM = Motormaster HAT = Hight ambient temperature unit

Table 5

ACCESSORY MOTORMASTER INSTALLATION

The Motormaster control consists of a solid state circuit control box to be fastened to a panel of the unit as indicated on fig. 11 and a sensor assembly to be mounted to a tube hair pin on the unit condensing coil (see fig. 10 for the location of Motormaster sensor).

A wire from the sensor is connected to the circuit board control box with wire nuts.

50 hertz unit Motormaster control requires a 230 volt motor. Consult 32LT installation, operation and maintenance leaflet shipped with this accessory for other installation details.

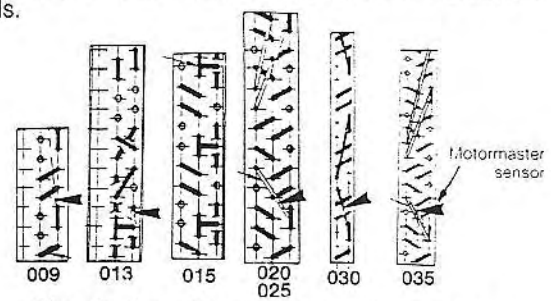


Fig. 10 – Location of Motormaster sensors

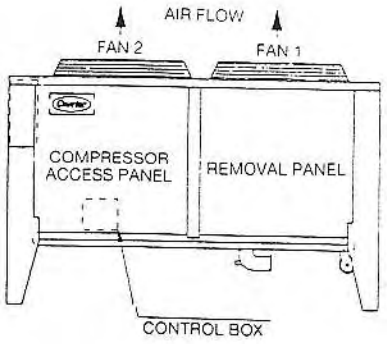


Fig. 11 – Location of Motormaster control box

WINTER START ACCESSORY

It bypasses the low pressure switch (LPS) for 2.5 minutes at the unit start-up to prevent nuisance LPS trips at low ambient temperature. Installation instructions and wiring details are shipped with this accessory.

COOLER SECTION

COOLER MAINTENANCE

Check from time to time the condition of :
- Cooler insulation
- Heater wiring
- Water side cleanliness

The tube in tube type cooler is protected against freezing ourdoor temperatures by a strip heater. The heater is energized by thermostat LWTC (see wiring diagram).

Periodically check circuit continuity.
Resistance of heater = 252 ohms.
Heating capacity = 210 Watt.
(see also recommendation on protection against freezing page 5).
A water drain is fitted on the cooler. It can be either free or covered by insulation foam. In that case, you must get it rid of this foam.

Drain location :

30 GC 009	water inlet
30 GC 013-015	water outlet, on the tube sheet
30 GC 020-025	water outlet, on the tube sheet
30 GC 030-035	water inlet, on the tube sheet

FLOW SWITCH (accessory)

Fig. 12 – Flow switch

A water flow switch (accessory) should be installed in the water line to prevent the unit from running when water is not circulating through the cooler. Also, auxiliary contacts for the water pump starter should be installed in the control circuit as additional protection against unit operation when the pump is not running.

The flow switch should be electrically connected to terminals 3 and 4 in the control box.

Flow switch should be checked periodically.

SAFETY THERMOSTAT (LWTC)

(freezestat or low water temperature cutout).

The sensing bulb is installed in the leaving chilled water nozzle.

Before replacing the bulb, half fill the well with light mineral oil for better heat conduction (refrigeration oil can be used). Then insert the bulb entirely into the well recess.

The thermostat is set to break the control circuit at 2.2° C ± 1.6° C, locking out the unit. After the leaving chilled water temperature rises above 5° C manually reset the thermostat. The adjustment is for normal chilled water application. For glycols or brines settings must be changed. The operation of the control should be checked at installation and at least once during each operating season. To check, insert a screw-driver into the adjusting slot and turn the dial assembly until the desired compressor stop temperature is directly under the fixed indicator. Then immerse the sensing bulb in a container filled with a mixture of water and crushed ice.

THERMOSTATIC EXPANSION VALVES

One for each refrigerant circuit are factory set to maintain 4.4° C to 5.5° C superheat of vapor leaving cooler to control flow of liquid refrigerant into the cooler. Superheat can be reset but this should be done only if absolutely necessary.

MOISTURE-LIQUID INDICATOR

Clear flow of liquid refrigerant indicates sufficient charge in the system. Bubbles indicate undercharged system or presence of noncondensables. Moisture in the system changes the colour of indicator, small amount (45 – 180 ppm) to dangerous level (above 180 ppm).

Important : *Unit must be in operation at least 12 hours before moisture indicator can give an accurate reading. With unit running, indicating element must be in contact with liquid refrigerant to give true reading.*

FILTER-DRIER

Whenever the moisture-liquid indicator shows presence of moisture, replace filter-drier core. Refer to Standard Service Techniques Manual, Chapter 1, Refrigerants, for details on servicing filter-driers.

FUSIBLE PLUG

Evacuates refrigerant charge if ambient temperature exceeds 94° C.

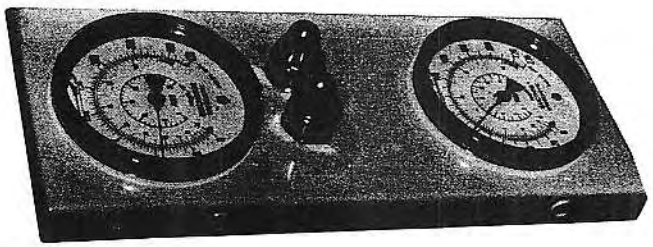
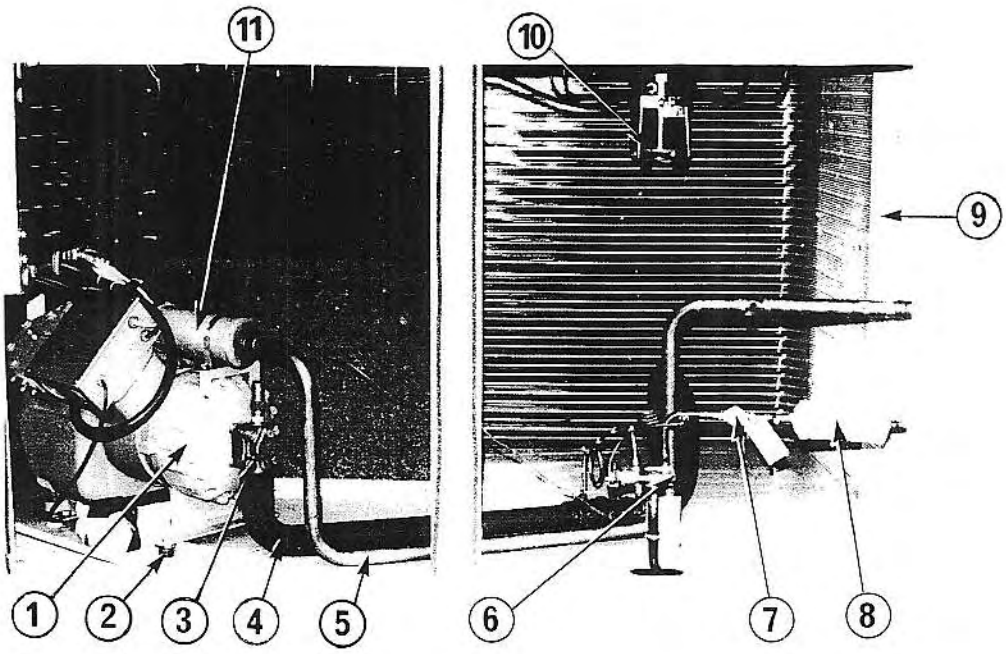


Fig. 13 – Gauge panels

PRESSURE GAUGE PANEL ACCESSORY

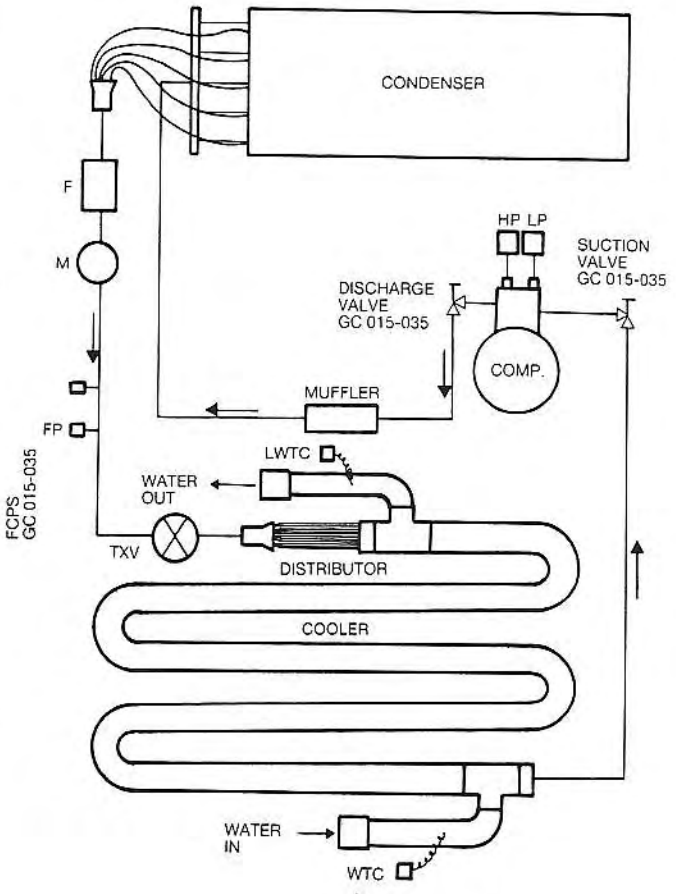
This is used to give constant indication of high and low system pressure.



Legend :

① Compressor
② Compressor mounting assembly
③ Suction valve
④ Suction line
⑤ Discharge line
⑥ Thermal expansion valve (TXV)
⑦ Moisture liquid indicator
⑧ Filter drier
⑨ Condenser coil
⑩ Fan motor
⑪ Muffler

Fig. 14 – Unit main component location



Legend

Comp – Compressor
FCPS – Fan cycling pressure switch
FP – Fusible plug
HP – High-pressure switch
HWTC – High water temp. cutout
LP – Low-pressure switch
LWTC – Low water temp. cutout
TXV – Thermal expansion valve
WTC – Multiple step thermostat
F – Filter drier
M – Moisture liquid indicator

Fig. 15 – Refrigerant piping diagram

ACTUAL START-UP

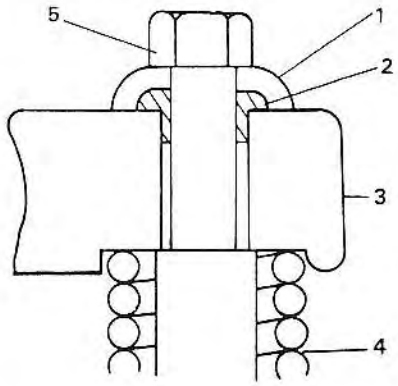
INITIAL CHECK

Caution : *Never open any switch or disconnect that will de-energize the crankcase heater unless the unit is being serviced or is to be shut down for a prolonged period. After a prolonged shutdown or a service job, energize the crankcase heaters for 24 hours before starting the compressors.*

Do not attempt to start the liquid chiller, even momentarily, until the following steps have been completed :

1. Check all auxiliary components such as chilled water circulating pump, air handling equipment, or other equipment to which the chiller supplies liquid. Consult the manufacturer's instructions. Auxiliary contacts for chilled water pump starter must be properly interlocked in the control circuit (see wiring diagram).
2. Backseat (open) compressor suction and discharge shutoff valves. Close valves one turn to allow pressure to reach test gauges (GC 015-035).
3. Open liquid line valves (GC 025-035).
4. Set temperature controller (see "Multiple step controller" page 13).
5. Check tightness of all electrical connections.
6. Compressor oil should be visible in bull's eye (see "Oil charge" page 8).
7. Be sure there are no refrigerant leaks (see "Leak test and dehydration" page 14).
8. Electrical power source must agree with unit nameplate rating.
9. Crankcase heaters must be firmly locked into compressor crankcases.
10. Make sure that compressors float freely on the mounting springs. See "Compressor mounting".
11. Check for proper fan rotation (clockwise viewled from above).

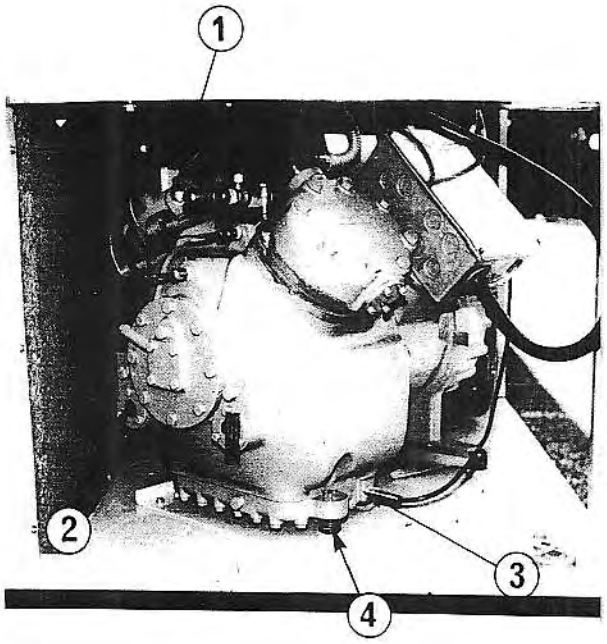
Compressor Mounting – As shipped, compressor is held down by special self-locking bolts and plain lock washers. After unit is installed, remove the self-locking bolts one at a time and reassemble with flanged washers and neoprene snubbers. Special flanged washers and neoprene snubbers are shipped in a cloth bag tied to one of the compressor feet. Tighten all 4 bolts. Then, loosen each until the flanged washer can be moved.



Legend
① Snubber flanged washer
② Neoprene snubber
③ Compressor foot
④ Isolation spring
⑤ Self locking bolt

Fig. 16 – Compressor mounting

Warning : *Compressors of 30GC 009 and 013 units are mounted on vibration isolator support.* ***Do not remove or snug the support mounting bolts.***



Legend :
① Discharge shut off valve
② Oil sight glass
③ Crankcase heater
④ Compressor mounting assembly

Fig. 17 – Compressor section

START-UP

Actual start-up should be done only under supervision of qualified refrigeration mechanic.

1. Operate the fan coil units or the air handling unit.
2. Check cooler water flow.
3. Follow the operating sequence shown below, using the wiring diagram.

A. Check that the control circuit breaker CB1 has been closed for at least 24 hours (compressor crankcase heater).

B. Close the CB circuit breaker. At this point in time, two different types of sequence are possible :
a. TC thermostat in the "no cooling demand" position :
– Safety relay LOR is energized with the timer motor TM which runs for 5 minutes 42 seconds, therefore on cooling demand standby and will start as soon as TC demands.

b. TC thermostat in the "cooling demand" position :
– Safety relay LOR is energized with the timer motor TM which, according to its position, will either run for 6 minutes or for 18 seconds and will enable the 2 fan motors to be energized and 16 seconds later, the compressor.
– If the thermostat cuts out, motor TM restarts for a minimum of 5 minutes 42 seconds and the unit stops.

At the next change of state of TC the compressor will start 16 seconds later, and so on...

LOCK-OUT CIRCUIT

The safety devices – compressor internal protector, compressor circuit breaker, low water temperature cut-out, high-low pressure switches, internal compressor motor protection (009, 013, 015 units) and discharge gas thermostat (020-035 units) are wired in series with the lock-out relay. When any one of these safety devices cuts out, the lock-out relay is de-energized ; the compressor will stop and it will never restart unless the control relay is energized by use of the manual reset button (RB).

IULTI-STEPS CONTROLLER

onsists of a multiple step water temperature controller nd electric-bank unloaders. Factory installed stubs are ovided for field installation of the accessory hot gas ypass.

ULTIPLE STEP THERMOSTAT

onsist of load switches which are pressure actuated by essure developed in a temperature sensing bulb, factory stalled in the cooler inlet.

efore replacing the bulb, half fill the well with a heat nductingsealing compound. Replace the sensor in the ell recess.

ne controller is factory set to control from the return water mperature through a cooling range of 5.6° C. The equence switches are factory calibrated and sealed, and ould not need any field modification.

arning : Alteration of factory settings other than the esign set-point, without manufacturer's authorization, ay void the warranty.

a different return water cooling range or a leaving water ntrol is specified, or if brine is to be used, the controller ust be changed. Consult your iocal representative for oper control.

ne return water temperature at which the last step of apacity unloads is indicated by the leaving water mperature design set-point on the adjustable dial (fig. 18). xample : design set-point is 6.7° C.

n a reduction in load, the capacity of the unit will be duced to zero when return water temperature drops to 7° C.

ESIGN SET-POINT ADJUSTMENT

hen the unit is ready for operation, insert a small screw-iver in the adjusting slot (fig. 18) to turn the dial (the dial ay be turned by hand). Rotate until the design set-point r the installation appears directly under the pointer. Insert thermometer in the return water connection and allow e unit to run through a cycle. At the instant the last step capacity unloads (switch No. 1 opens), read the mperature. If it is not the same as the dial reading the ariation can be compensated by shifting the control point ightly.

aution : Do not attempt to force the dial past the stop. his would cause loss of the design set-point and damage e instrument.

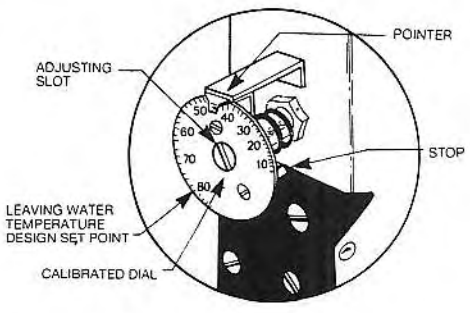


Fig. 18 – Design set-point adjustment

Control step	Return water temperature °C			
	Cut-in		Cut-out	
	009-020	025-035	009-020	025-035
1	8.6	8.3	6.7	6.7
2	11.9	10.3	10.0	8.6
3		12.2		10.5

able 6 – Thermostat step cut-in / cut-out temperatures

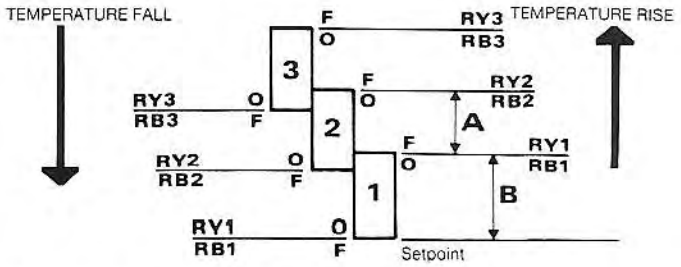


Fig. 19 – Step thermostat

Legend :
A – Stage differential : 1.9°C
B – Switch differential : 1.7°C
R, Y, B – Indentification contacts
O – Open
F – Closed

SEQUENCE OF OPERATION

Before initial start-up or after a prolonged shut-down, be sure that crankcase heater has been energized for ar least 24 hours before attemping to start unit.

The unit will start only if :
- all safety devices are satisfied,
- CB circuit breakers are closed,
- the ON/OFF switch is placed at ON,
- thermostat TC is calling for cooling.

If all safety device contacts are closed, LOR is energized and timer motor TM of TDR starts. 5 minutes and 42 seconds later, relay CR and the fan 1 are energized 16 seconds later, the compressor starts.

When discharge pressure reaches 17.6 bar, the contact in FCPS closes and fan No. 2 starts.

The multi-step thermostat then cycles the compressor on and of and loads or unloads cylinder banks (015-035) in response to the cooling load.

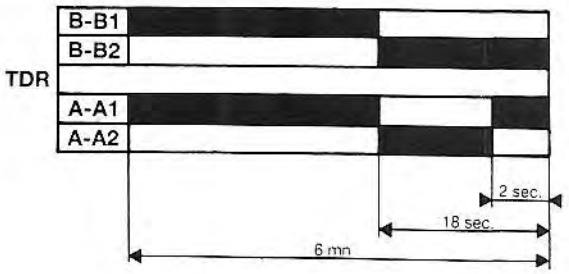


Fig. 20 – Timer cycle

ANTI-SHORT CYCLE TIMER (fig. 20 – Timer cycle)

1. Contacts A-A1/B-B1 :
   B-B1 starts the timer motor. These two contacts remain at the same position.
2. Contacts A-A2/B-B2 :
   B-B2 maintains timer motor supply.
   A-A2 allows CR to self supply. This phase last 16 seconds.
3. Contacts A-A1/B-B2 :
   A-A1 starts compressor. This phase last 2 seconds.
4. Contacts A-A1/B-B1 return to their starting position.
   B-B1 cuts supply to the timer motor.
   A-A1 : compessor runs through this contact.
5. To prevent short cycling due to safety device, contact B-B1 provides a delay of 5 min. 42 sec. before restarting compressor.

CAPACITY CONTROL SYSTEM

30 CG UNIT	Standard equipment	Accessory extra unloaders
009-013	0	0
015	0	1
020	1	0
025-035	1	1

Table 7

Loaded operation (fig. 21)

This capacity control valve is controlled by an electric solenoid. When the solenoid is de-energized, the valve loads the cylinder bank (2 cylinders) as shown in the above figure.

When the suction pressure rises above a set point, an external controller de-energizes the solenoid coil. This closes the capacity control valve port, allowing discharge pressure to build-up behind the unloader piston assembly. A high enough pressure will compress the unloader valve spring, opening the unloader suction port. Suction gas can now be drawn into the cylinders, running the bank fully loaded.

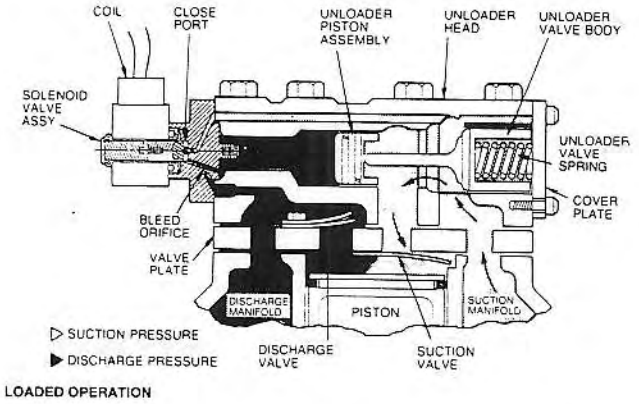


Fig. 21 – Unloading system : loaded operation

Unloaded operation (fig. 22)

As the suction pressure drops below the set point of an external controller, the solenoid coil is energized. This opens the capacity control valve port, allowing the discharge gas behind the unloader piston assembly to vent back to the suction side. The unloader spring at this point can move the unloader valve body to the left, blocking the unloader suction port.

The cylinder bank is now isolated from the compressor suction manifold, unloading these two cylinders. No refrigerant is allowed into the cylinders and no compression takes place.

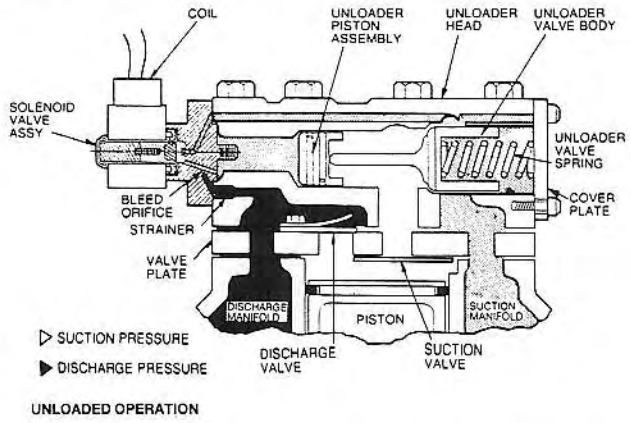


Fig. 22 – Unloading system : unloaded operation

REFRIGERANT CHARGE

Gas tightness testing and dehydration

30 GC units are shipped fully charge with refrigerant 22 ready for operation. If, when the unit is run, symptoms of loss of charge, for example bubbles in the sight-glass, lo pressure switch tripping, or abnormally low cooling capacities are detected, first conduct a leak test followec if necessary, by a gas tightness test using compressed nitrogen. For the latter all refrigerant must be removed from the circuit. Transfer the refrigerant to a storage tank and then rinse circuit. For leak test and dehydration procedures, refer to the Standard Service Techniques Manual, Chapter 1, Refrigerants, Sections 6 and 7.

Warning : *If any brazing is to be done the refrigerant circu must be filled with nitrogen. Combustion of refrigerant produces toxic phosgene gas.*

Charging refrigerant

If the refrigerant leaks are small simply add refrigerant un the sight-glass is free of bubbles.

If the leaks are heavy and oil has been lost the repairs mus be made with the entire circuit purged and charged with refrigerant in the quantities shown in table 1.

With models 30 GC 015-035 let the unit run for at least 20 minutes and check the oil level in the compressor bull eye.

On 30 GC 009 and 013 units all oil must be removed and complete charge of oil added in the quantity shown in table 1.

Important : When additional or complete field charging is required refer to table 1 and use the "Liquid charging method" (see Standard Service Techniques Manual, Chapter 1, Refrigerants, Section 8, for charging procedures). Immediately ahead of the filter-drier is a factory-installed liquid shutoff charging valve. A 1/4 in. flare connection is provided for field charging.

If the compressor is changed check that the new compressor has a complete oil charge and after a few hours of operation check the acidity of the oil/refrigerant mixture.

Warning :

- *Never use a compressor as a vacuum pump.*
- Never charge liquid into low-pressure side of system.
- Do not overcharge.
- During charging or removal of refrigerant, be sure wate is continuously circulating through the cooler to preven freezing.

TROUBLESHOOTING CHART

Symptoms	Cause	Remedy
Compressor does not run	Power line open	Reset circuit breaker.
	Tripped circuit breaker	Check control circuit for ground or short ; repair and reset breaker.
	Safety thermostat tripped	Reset thermostat.
	Contactor stuck open	Replace contactor
	Loose terminal connection	Check connections
	Improperly wired controls	Check wiring and rewire.
	Low line voltage	Check line voltage – determine location of voltage drop and remedy deficiency.
	Compressor motor defective	Check motor winding for open or short Replace compressor, if necessary.
	Seized compressor	Replace compressor
	Chilled water flow switch open	Check chilled water pump. Check switch.
Compressor stops on low-pressure control	Low pressure control erratic in action	Raise differential setting. Check capillary for pinches. Replace control.
	Compressor suction shutoff valve partially closed	Open valve (30GC 015, 035 only)
	Low refrigerant charge	Add refrigerant.
	Plugged compressor suction strainer	Clean strainer.
Compressor cycles on high-pressure control	High-pressure control erratic in action	Check capillary tube for pinches. Set control as required.
	Compressor discharge valve partially closed	Open valve, or replace if defective. (30GC 015, 035 only).
	Air in system	Purge.
	Condenser fan(s) not operating	Check motor and wiring. Repair or replace if defective.
Unit operates long or continuously	Low refrigerant charge	Add refrigerant
	Control contacts fused	Replace control.
	Air in system	Purge.
	Partially plugged or plugged expansion valve or strainer	Clean or replace.
	Defective insulation	Replace or repair.
	Inefficient compressor	Check valves, replace if necessary. (30GC 015, 035 only).
System noises	Piping vibration	Support piping as required. Check for loose pipe connectors.
	Expansion valve hissing	Add refrigerant. Check for plugged liquid line strainer.
	Compressor noisy	Check valve plates for valve noise. Replace compressor (worn bearings). Check for loose compressor hold-down bolts (30GC 015, 035 only).
Compressor loses oil	Leak in system	Repair leak.
	Crankcase heaters not energized during shutdown	Replace heaters, check wiring.
Frosted or sweating suction line	Expansion valve admitting excess refrigerant	Adjust expansion valve.
Hot liquid line	Shortage of refrigerant due to leak	Repair leak and recharge.
	Expansion valve closed too far	Adjust expansion valve
Frosted liquid line	Restricted filter-drier	Remove restriction or replace filter-drier.
Compressor will not unload	Burned out coil	Replace coil (30GC 015, 035 only).
	Leaky bypass piston	Replace (30GC 015, 035 only).
	Miswired solenoid	Wire correctly (30GC 015, 035 only).
	Weak bypass piston spring	Replace (30GC 015, 035 only).
Compressor will not load	Damaged bypass piston	Replace (30GC 015, 035 only).
	Miswired solenoid	Wire correctly (30GC 015, 035 only).
	Plugged bypass port strainer (high side)	Clean (30GC 015, 035 only).

START-UP CHECKLIST

Equipment sold by : ..... Contract n° : .....

Installed by : ..... Contract n° : .....

Site address : .....

Equipment type(s) and serial nos.: .....

Start-up date : .....

Refrigerant : .....

Condenser water/air entering temperature ..... °C, °F

Condenser water/air leaving temperature ..... °C, °F

Supply voltage V

Phase imbalance : Ph.1 ..... V, Ph.2 ..... V, Ph.3 ..... V .....

Current draw : Ph.1 ..... A, Ph.2 ..... A, Ph.3 ..... A .....

Main circuit breaker rating ..... A

Control circuit voltage V

Control circuit fuse ..... A

Cooler water entering temperature ..... °C, °F

Cooler chilled water leaving temperature ..... °C, °F

Suction pressure ..... kPa, kg/cm², lb/in²

Discharge pressure ..... kPa, kg/cm², lb/in²

Control thermostat cut-out ..... °C, °F

Control thermostat cut-in ..... °C, °F

Safety thermostat cut-out ..... °C, °F

Safety thermostat cut-in ..... °C, °F

Low pressure switch cut-out ..... kPa, kg/cm², lb/in²

Low pressure switch cut-in ..... kPa, kg/cm², lb/in²

High pressure switch cut-out ..... kPa, kg/cm², lb/in²

High pressure switch cut-in ..... kPa, kg/cm², lb/in²

Pressure drop through evaporator ..... kPa, mWG, in WG

Pressure drop through condenser ..... kPa, mWG, in WG

Oil level .....

Oil visible in sight glass ? .....

Colour of humidity indicator .....

Air bubbles visible in sight glass ? .....

Commissioning engineer (NAME) .....

Carrier s.a.

Carrier

Subsidiary of Carrier Corporation

BP 6 - Route de Thil
01120 Montluel France
Phone : 72 01 36 36
Telex : 900386
Fax : 78 06 23 45

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