Carrier

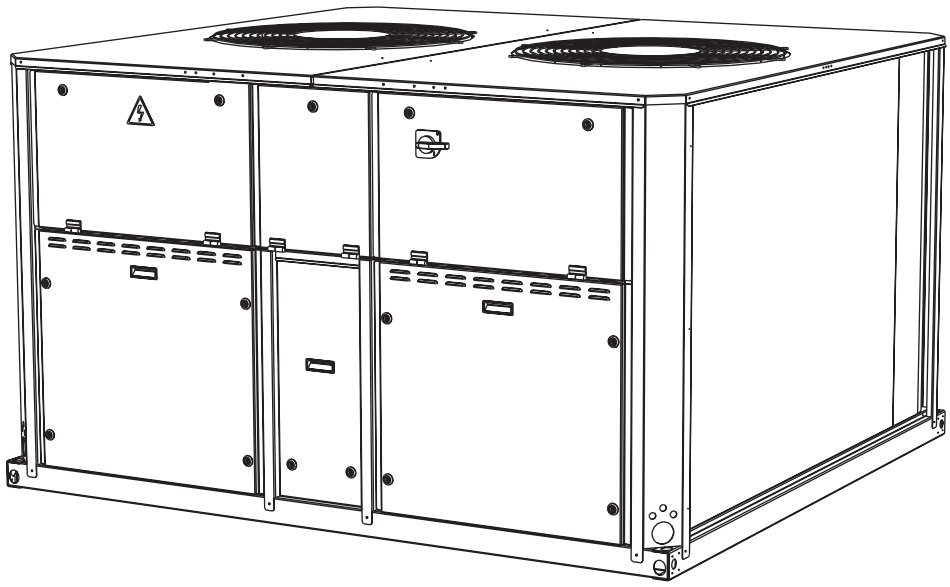
38RA 040-160

Air-Cooled Condensing Units

Nominal cooling capacity 40-151 kW

50 Hz

PRO-DIALOG PLUS



For the operation of the control please refer to the Pro-Dialog PLUS Control manual for the 38RA series

HFC-407C

Installation, operation and maintenance instructions

LLOYD'S REGISTER QUALITY ASSURANCE · ISO9001 · UKAS QUALITY MANAGEMENT 001

Quality Management System Approval

CONTENTS

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1 - INTRODUCTION

Prior to the initial start-up of the 38RA units, the people involved in the on-site installation, start-up, operation, and maintenance of this unit should be thoroughly familiar with these instructions and the specific project data for the installation site.

The 38RA condensing units are designed to provide a very high level of safety during installation, start-up, operation and maintenance. They will provide safe and reliable service when operated within their application range.

This manual provides the necessary information to familiarize yourself with the control system before performing start-up procedures. The procedures in this manual are arranged in the sequence required for machine installation, start-up, operation and maintenance.

Be sure you understand and follow the procedures and safety precautions contained in the instructions supplied with the machine, as well as those listed in this guide.

To find out, if these products comply with European directives (machine safety, low voltage, electromagnetic compatibility, equipment under pressure etc.) check the declarations of conformity for these products.

1.1 - Installation safety considerations

After the unit has been received, when it is ready to be installed or reinstalled, and before it is started up, it must be inspected for damage. Check that the refrigerant circuit(s) is (are) intact. Ensure especially that no components or pipes have shifted (e.g. following a shock). If in doubt, carry out a leak tightness check and verify with the manufacturer that the circuit integrity has not been impaired. If damage is detected upon receipt, immediately file a claim with the shipping company.

Do not remove the skid or the packaging until the unit is in its final position. These units can be moved with a fork lift truck, as long as the forks are positioned in the right place and direction on the unit.

The units can also be lifted with slings, using only the designated lifting points marked at the four corners at the unit base.

These units are not designed to be lifted from above. Use slings with the correct capacity, and always follow the lifting instructions on the certified drawings supplied with the unit.

Safety is only guaranteed, if these instructions are carefully followed. If this is not the case, there is a risk of material deterioration and injuries to personnel.

Never cover any safety devices.

The 38RA units are supplied without a safety relief valve in the refrigerant circuit. During the installation this safety valve must be installed to ensure protection against fire risk. These valves must be selected in accordance with standard EN 13136, and the unit compressor(s) must be taken into consideration. The compressors are regarded as reservoirs that can contain liquid refrigerant.

The safety valves must be connected to discharge pipes. These pipes must be installed in a way that ensures that people and property are not exposed to refrigerant leaks. These fluids may be diffused in the air, but far away from any building air intake, or they must be discharged in a quantity that is appropriate for a suitably absorbing environment.

Periodic check of the safety relief valves: See paragraph "Maintenance safety considerations".

Accumulation of refrigerant in an enclosed space can displace oxygen and cause asphyxiation or explosions.

Inhalation of high concentrations of vapour is harmful and may cause heart irregularities, unconsciousness, or death. Vapour is heavier than air and reduces the amount of oxygen available for breathing. These products cause eye and skin irritation. Decomposition products are hazardous.

1.2 - Equipment and components under pressure

These products incorporate equipment or components under pressure, manufactured by Carrier or other manufacturers. We recommend that you consult your appropriate national trade association or the owner of the equipment or components under pressure (declaration, re-qualification, retesting, etc.). The characteristics of this equipment/these components are given on the nameplate or in the required documentation, supplied with the products.

1.3 - Maintenance safety considerations

Engineers working on the electric or refrigeration components must be authorized, trained and fully qualified to do so.

All refrigerant circuit repairs must be carried out by a trained person, fully qualified to work on these units. He must have been trained and be familiar with the equipment and the installation, and he must wear the necessary protective items (gloves, glasses, protective clothes, safety shoes).

Soldering and welding: Component, piping and connection soldering and welding operations must be carried out using the correct procedures and by qualified operators. Pressurised containers must not be subjected to shocks, nor to large temperature variations during maintenance and repair operations.

Never work on a unit that is still energized.

Never work on any of the electrical components, until the general power supply to the unit has been cut using the disconnect switch in the control box.

If any maintenance operations are carried out on the unit, lock the power supply circuit in the open position ahead of the machine.

If the work is interrupted, always ensure that all circuits are still deenergized before resuming the work.

ATTENTION: Even if the compressor motors have been switched off, the power circuit remains energized, unless the unit or circuit disconnect switch is open. Refer to the wiring diagram for further details. Attach appropriate safety labels.

OPERATING CHECKS:

- ***IMPORTANT INFORMATION REGARDING THE REFRIGERANT USED:***
  This product contains fluorinated greenhouse gas covered by the Kyoto protocol.
  Refrigerant type: R-407C
  Global Warming Potential (GWP): 1653
  Periodic inspections for refrigerant leaks may be required depending on European or local legislation. Please contact your local dealer for more information.
- ***During the life-time of the system, inspection and tests must be carried out in accordance with national regulations.***

The information on operating inspections given in annex C of standard EN378-2 can be used if no similar criteria exist in the national regulations.

Safety device checks (annex C6 – EN378-2):

- ***The safety devices must be checked on site once a year (high-pressure switches), and every five years for external overpressure devices (safety valves).***
- ***Contact Carrier Service for a detailed explanation of the high-pressure switch test method.***

If the machine operates in a corrosive environment, inspect the protection devices more frequently.

Regularly carry out leak tests and immediately repair any leaks.

1.4 - Repair safety considerations

All installation parts must be maintained by the personnel in charge, in order to avoid material deterioration and injuries to people. Faults and leaks must be repaired immediately. The authorized technician must have the responsibility to repair the fault immediately. Each time repairs have been carried out to the unit, the operation of the safety devices must be re-checked.

If a leak occurs or if the refrigerant becomes polluted (e.g. by a short circuit in a motor) remove the complete charge using a recovery unit and store the refrigerant in mobile containers (careful in case the refrigerant decomposes due to high temperature increases, as the decomposition products are dangerous).

If a leak occurs, evacuate all refrigerant, repair the leak detected and recharge the circuit with the correct total R407C charge for the installation. Only charge liquid refrigerant R407C at the liquid line.

Ensure that you are using the correct refrigerant type before recharging the unit.

Charging any refrigerant other than the original charge type (R407C) will impair machine operation and can even lead to a destruction of the compressors. The compressors operating with this refrigerant type are charged with a synthetic polyolester oil.

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 the specified maximum operating pressures. Verify the allowable maximum high- and low-side test pressures by checking the instructions in this manual and the pressures given on the unit name plate.

Do not use air for leak testing. Use only refrigerant or dry nitrogen.

Do not unweld or flamecut the refrigerant lines or any refrigerant circuit component until all refrigerant (liquid and vapour) has been removed from unit. Traces of vapour should be displaced with dry air nitrogen. Refrigerant in contact with an open flame produces toxic gases.

The necessary protection equipment must be available, and appropriate fire extinguishers for the system and the refrigerant type used must be within easy reach.

Do not siphon refrigerant.

Avoid spilling liquid refrigerant on skin or splashing it into the eyes. Use safety goggles. Wash any spills from the skin with soap and water. If liquid refrigerant enters the eyes, immediately and abundantly flush the eyes with water and consult a doctor.

Never apply an open flame or live steam to a refrigerant container. Dangerous overpressure can result. If it is necessary to heat refrigerant, use only warm water.

During refrigerant removal and storage operations follow applicable regulations. These regulations, permitting conditioning and recovery of halogenated hydrocarbons under optimum quality conditions for the products and optimum safety conditions for people, property and the environment are described in standard NFE 29795.

Any refrigerant transfer and recovery operations must be carried out using a transfer unit. A 3/8" SAE connector on the manual liquid line valve is supplied with all units for connection to the transfer station. The units must never be modified to add refrigerant and oil charging, removal and purging devices. All these devices are provided with the units. Please refer to the certified dimensional drawings for the units.

Do not re-use disposable (non-returnable) cylinders or attempt to refill them. It is dangerous and illegal. When cylinders are empty, evacuate the remaining gas pressure, and move the cylinders to a place designated for their recovery. Do not incinerate.

Do not attempt to remove refrigerant circuit components or fittings, while the machine is under pressure or while it is running. Be sure pressure is at 0 kPa before removing components or opening a circuit.

Any manipulation (opening or closing) of a shut-off valve must be carried out by a qualified and authorised engineer. These procedures must be carried out with the unit shut-down.

NOTE: The unit must never be left shut down with the liquid line valve closed, as liquid refrigerant can be trapped between this valve and the expansion device. (This valve is situated on the liquid line before the filter drier box.)

CAUTION: Do not step on refrigerant lines. The lines can break under the weight and release refrigerant, causing personal injury.

No part of the unit must be used as a walkway, rack or support. Periodically monitor and repair or if necessary replace any component or piping that shows signs of damage.

Do not climb on a machine. Use a platform, or staging to work at higher levels.

Use mechanical lifting equipment (crane, hoist, etc.) to lift or move heavy components such as compressors or plate heat exchangers. For lighter components, use lifting equipment when there is a risk of slipping or losing your balance.

Use only original replacement parts for any repair or component replacement. Consult the list of replacement parts that corresponds to the specification of the original equipment.

Periodically inspect all valves, fittings and pipes of the refrigerant circuit to ensure that they do not show any corrosion or any signs of leaks.

2 - PRELIMINARY CHECKS

2.1 - Check equipment received

- Inspect the unit for damage or missing parts. If damage is detected, or if shipment is incomplete, immediately file a claim with the shipping company.
- Confirm that the unit received is the one ordered. Compare the name plate data with the order.
- The unit name plate must include the following information:
  - Version number
  - Model number
  - CE marking
  - Serial number
  - Year of manufacture and test date
  - Refrigerant used and refrigerant class
  - Refrigerant charge per circuit
  - Containment fluid to be used
  - PS: Min./max. allowable pressure (high and low pressure side)
  - TS: Min./max. allowable temperature (high and low pressure side)
  - Safety relief valve setting
  - Pressure switch cut-out pressure
  - Unit leak test pressure
  - Voltage, frequency, number of phases
  - Maximum current drawn
  - Maximum power input
  - Unit net weight

		High pressure		Low pressure	
		Min.	Max.	Min.	Max.
PS	bar	-0,9	32	-0.9	25
TS	°C	-20	72	-20	62
Pressure switch cut-out pressure	bar	29	-	-	-
Test pressure, unit leak test	bar	15	-	-	-

- Confirm that all accessories ordered for on-site installation have been delivered, and are complete and undamaged.
- The unit must be checked periodically during its whole operating life to ensure that no shocks (handling accessories, tools etc.) have damaged it. If necessary, the damaged parts must be repaired or replaced.
- See also chapter “Maintenance”.

2.2 - Moving and siting the unit

2.2.1 - Moving

See chapter "Installation safety considerations"

2.2.2 - Siting the unit

Always refer to the chapter "Dimensions and clearances" to confirm that there is adequate space for all connections and service operations. For the centre of gravity coordinates, the position of the unit mounting holes, and the weight distribution points, refer to the certified dimensional drawing supplied with the unit.

CAUTION: Only use slings at the designated lifting points which are marked on the unit.

Before siting the unit make the following checks:

- Check that the permitted loading at the site is adequate or that appropriate strenghtening measures have been taken.
- The unit must be installed level in both axes (less than 2 mm tolerance per metre).
- Check that there is adequate space around and above the unit for air flow.
- Check that there are adequate support points and that they are in the right places.
- Check that the location is not subject to flooding.
- Where heavy snowfall is likely and long periods of sub-zero temperatures are normal, it is imperative to prevent snow accumulating by raising the unit above the height of drifts normally experienced.
  Baffles may be necessary to deflect strong winds, to prevent snow from blowing directly onto the unit and to ensure that fan speed control at low outdoor temperature can operate correctly. The baffles must however not restrict the unit air flow.

CAUTION: Before lifting the unit, check that all casing panels are securely fixed in place. Lift and set down the unit with great care. Tilting and jarring can damage the unit and impair unit operation.

The 38RA units can be hoisted with rigging. Coils should always be protected against crushing while a unit is being moved. Use struts or spreader bars to spread the slings above the unit. Do not tilt a unit more than 15°.

WARNING: Never push or lever on any of the enclosure panels of the unit. Only the base of the unit frame is designed to withstand such stresses.

Checks before system start-up

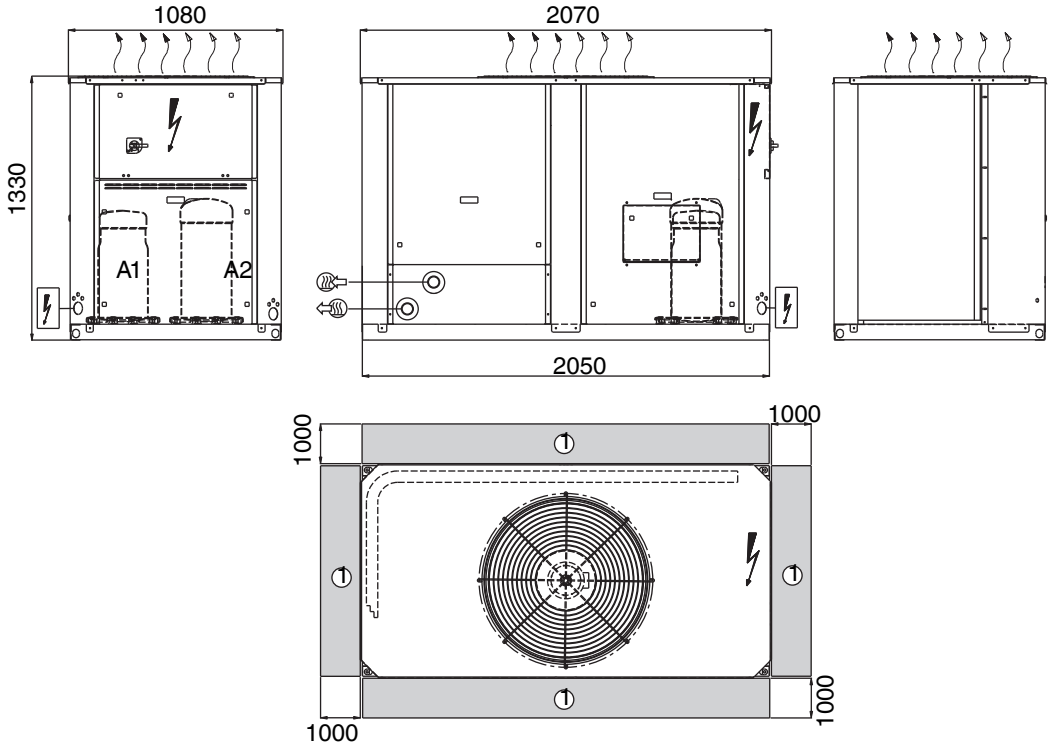
Before the start-up of the refrigeration system, the complete installation, including the refrigeration system must be verified against the installation drawings, dimensional drawings, system piping and instrumentation diagrams and the wiring diagrams. During the installation test national regulations must be followed. If no national regulation exists, paragraph 9-5 of standard EN 378-2 can be used as a guide.

External visual installation checks:

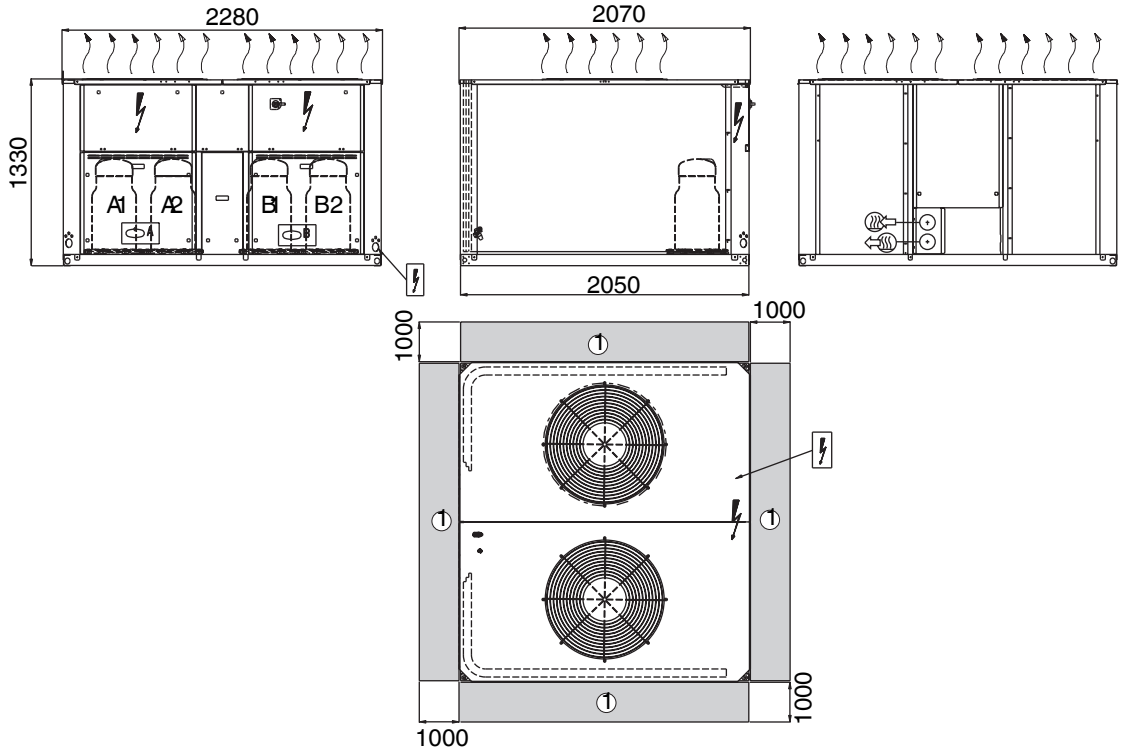
- Compare the complete installation with the refrigeration system and power circuit diagrams.
- Check that all components comply with the design specifications.
- Check that all safety documents and equipments that are required by current European standards are present.
- Verify that all safety and environmental protection devices and arrangements are in place and comply with the current European standard.
- Verify that all document for pressure containers, certificates, name plates, files, instruction manuals that are required documents required by the current European standards are present.
- Verify the free passage of access and safety routes.
- Check that ventilation in the plant room is adequate.
- Check that refrigerant detectors are present.
- Verify the instructions and directives to prevent the deliberate removal of refrigerant gases that are harmful to the environment.
- Verify the installation of connections.
- Verify the supports and fixing elements (materials, routing and connection).
- Verify the quality of welds and other joints.
- Check the protection against mechanical damage.
- Check the protection against heat.
- Check the protection of moving parts.
- Verify the accessibility for maintenance or repair and to check the piping.
- Verify the status of the valves.
- Verify the quality of the thermal insulation and of the vapour barriers.

3 - DIMENSIONS/CLEARANCES

3.1 - 38RA 040-080 (unit shown: 38RA 060)



3.2 - 38RA 090-160 (unit shown: 38RA 160)



Legend:
All dimensions are given in mm.

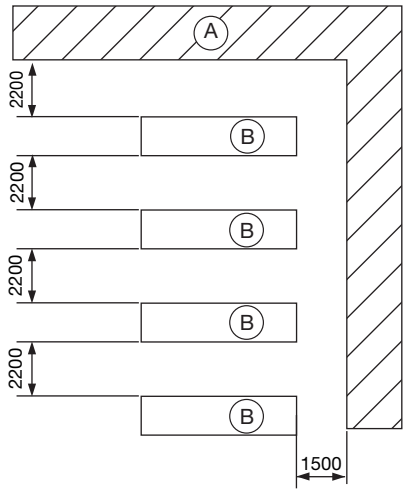
- (1) Required clearances for maintenance
- Refrigerant inlet
- Refrigerant outlet
- Air outlet, do not obstruct
- Power cable entry

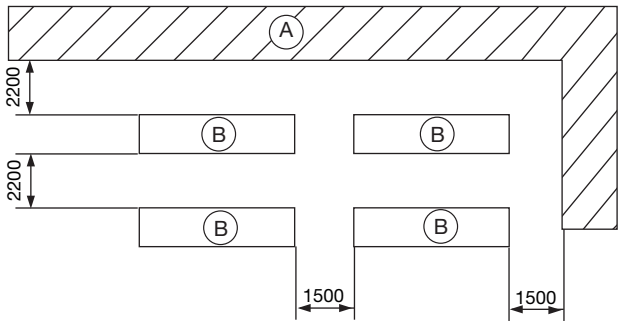
NOTES: Non-certified drawings. Refer to the certified dimensional drawings supplied with the unit or available on request, when designing an installation.

For the location of fixing points, weight distribution and coordinates of the centre of gravity refer to the certified dimensional drawings.

3.3 - Multiple condensing unit installation

NOTE: If the height exceeds 2 m, contact the factory.





Legend:
A Wall
B Units

NOTES:

1. ***Non-certified drawings.***
   Refer to the certified dimensional drawings supplied with the unit or available on request, when designing an installation.
2. ***For the location of fixing points, weight distribution and coordinates of the centre of gravity refer to the certified dimensional drawings.***
3. ***In multiple-unit installations (maximum four units), the side clearance between the units should be increased from 1000 to 2000 mm.***
4. ***The unit must be installed level in both axes (less than 2 mm tolerance***

4 - PHYSICAL DATA

38RA		040	050	060	070	080	090	100	120	140	160
Net nominal cooling capacity*	kW	39.9	49.5	58	68	77	87	95	114	133	151
Operating weight											
(units supplied with a nitrogen holding charge)	kg	479	572	590	601	625	1100	1108	1136	1202	250
Compressors		Hermetic scroll compressor, 48.3 r/s									
Circuit A		A1	A1+A2	A1+A2	A1+A2	A1+A2	A1	A1	A1+A2	A1+A2	A1+A2
Circuit B		-	-	-	-	-	B1+B2	B1+B2	B1+B2	B1+B2	B1+B2
No. of capacity steps		1	2	2	2	2	2	2	2	2	2
Minimum capacity	%	100	46	39	50	50	44	40	50	50	50
Control type		PRO-DIALOG Plus									
Air heat exchangers		Grooved copper tubes, aluminium fins									
Fans		Axial Flying Bird fans with rotating shroud									
Quantity		1	1	1	1	1	2	2	2	2	2
Total air flow (high speed)	l/s	3870	3660	4080	5600	5600	7350	7950	8160	11200	11200
Speed (high/low speed)	r/s	11.5/5.8	11.5/5.8	11.5/5.8	15.6/7.8	15.6/7.8	11.5/5.8	11.5/5.8	11.5/5.8	15.6/7.8	15.6/7.8
Refrigerant connections											
Suction diameter line	In.	1-5/8	1-5/8	1-5/8	1-5/8	2-1/8	1-5/8	1-5/8	1-5/8	1-5/8	2-1/8
Liquid diameter line	In.	7/8	7/8	7/8	7/8	7/8	7/8	7/8	7/8	7/8	7/8

* Net nominal cooling capacity based on nominal conditions: saturated suction temperature (dew-point) 5°C, suction superheat 5 K, subcooling 8.3°C, outdoor air temperature 35°C.

5 - ELECTRICAL DATA

38RA		040	050	060	070	080	090	100	120	140	160
Power circuit											
Nominal power supply	V-Ph-Hz	400-3-50									
Voltage range	V	360-440									
Control circuit supply		The control circuit is supplied by the unit-mounted transformer.									
Maximum unit power inut*	kW	19.2	23.5	27.8	32.8	38.6	42.7	47.0	55.6	65.6	77.2
Nominal unit current draw**	A	27.9	33.5	40.1	48.9	54.1	61.4	68.0	88.1	97.8	108.1
Maximum unit current draw***	A	36.6	45.0	52.5	62.3	71.2	81.6	89.0	104.8	124.5	142.3
Maximalum unit current draw†	A	32.9	40.5	47.2	56.1	64.1	73.4	80.1	94.3	112.1	128.1
Maximum start-up current											
Standard unit††	A	178	151	156	166	210	218	226	204	223	273
With electronic starter option‡	A	117	106	109	119	148	-	-	-	-	-
Three-phase short-circuit holding current	kA	10	10	10	10	10	10	10	10	10	10

* Power input of the compressor(s) + fan(s) at maximum unit operating conditions for each unit: saturated suction temperature = 10°C and maximum air entering temperature of 45°C ± 1 K depending on the unit, and 400 V nominal voltage (values given on the unit name plate).

** Nominal unit current draw at nominal conditions: saturated suction temperature (dew-point) = 5°C, suction superheat = 5 K, subcooling 5 K, outdoor air temperature = 35°C. The current values are given at 400 V nominal voltage.

*** Maximum unit operating current at maximum unit power input and 360 V nominal voltage.

† Maximum unit operating current at maximum unit power input and 400 V nominal voltage (values given on the unit name plate).

†† Maximum instantaneous starting current at 400 V nominal voltage and with compressor in across-the-line-start (maximum operating current of the smallest compressor(s) + fan current + locked rotor current of the largest compressor).

‡ Maximum instantaneous starting current at 400 V nominal voltage and with compressor with electronic starter (maximum operating current of the smallest compressor(s) + fan current + reduced start-up current of the largest compressor).

	Compressor				38RA									
Reference code	**I Nom**	**I Max**	**LRA**	**Circuit**	**040**	**050**	**060**	**070**	**080**	**090**	**100**	**120**	**140**	**160**
DQ 12 CA 001EE	14	19.1	130	A		A1								
				B						B1				
DQ 12 CA 002EE	16.2	22.1	130	A		A2								
				B						B2				
DQ 12 CA 003EE	14.8	20.3	120	A			A1					A1		
				B							B1	B1		
DQ 12 CA 005EE	21.9	28.3	135	A			A2	A1 + A2				A2	A1 + A2	
				B							B2	B2	B1 + B2	
DQ 12 CA 006EE	24.5	32.8	175	A	A1				A1 + A2	A1	A1			A1 + A2
				B										B1 + B2

Legend

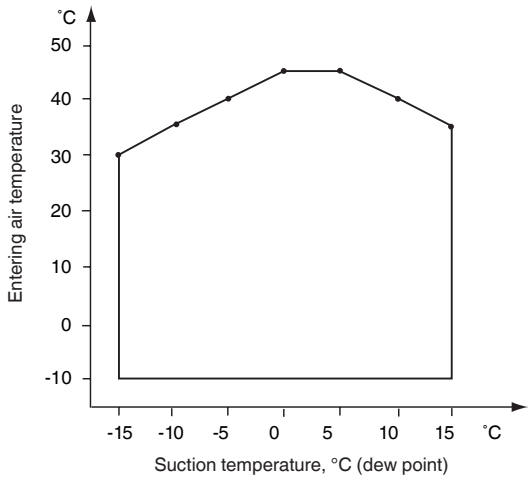
I Nom Nominal current draw at Eurovent conditions (see definition of conditions under nominal unit current draw), A

I Max Maximum operating current at 360 V, A

LRA Locked rotor current, A

6 - APPLICATION DATA

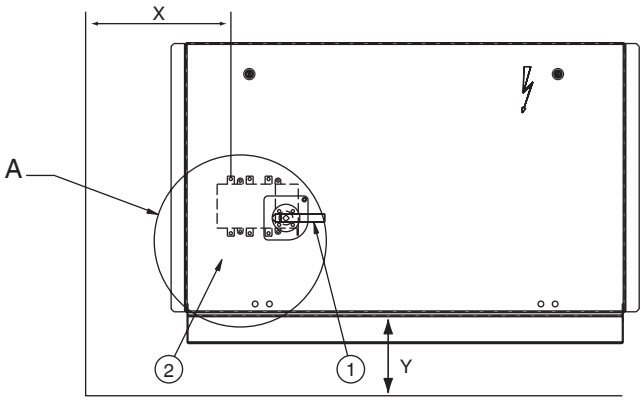
30RA unit operating range

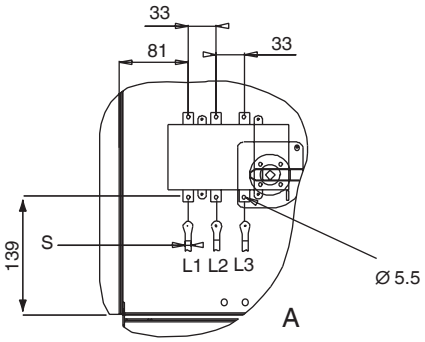


Maximum outside temperature: For transport and storage of the 38RA units the minimum and maximum allowable temperatures are -20°C and +55°C. It is recommended that these temperatures are used for transport by container.

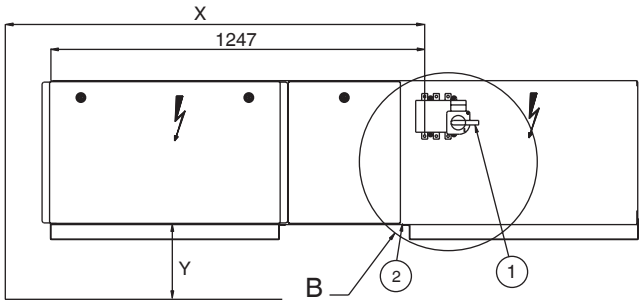
7 - ELECTRICAL CONNECTION

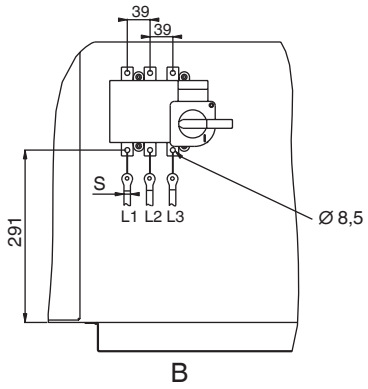
Control box 38RA 040-080





Control box 38RA 090-160





Legend

1 Main disconnect switch
PE Earth connection
S Power supply cable section (see table "Recommended wire sections").
X Disconnect switch position referred to the unit side
Y Control box position referred to the unit base

	X	Y
38RA 040-080	227	809
38RA 090-160	1399	809

NOTES

- ***The 38RA 040-160 units have only one power connection point located at the main disconnect switch.***
- ***Before connecting electric power cables, it is imperative to check the correct order of the 3 phases (L1 - L2 - L3).***
- ***Non-certified drawings.***
  Refer to the certified drawings supplied with the unit or available on request.

7.1 - Power supply

The power supply must conform to the specification on the unit name plate. The supply voltage must be within the range specified in the electrical data table. For connections refer to the wiring diagrams.

WARNING: Operation of the unit with an improper supply voltage or excessive phase imbalance constitutes abuse which will invalidate the Carrier warranty. If the phase imbalance exceeds 2% for voltage, or 10% for current, contact your local electricity supply source at once and ensure that the unit is not switched on until corrective measures have been taken.

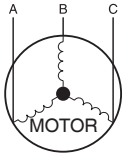
7.2 - Voltage phase imbalance (%)

$$\frac{100 \times \text{max. deviation from average voltage}}{\text{Average voltage}}$$

Example:
On a 400 V - 3 ph - 50 Hz supply, the individual phase voltages were measured to be:
AB = 406 V; BC = 399 V; AC = 394 V

Average voltage = (406 + 399 + 394)/3 = 1199/3
= 399.7 say 400 V

Calculate the maximum deviation from the 400 V average:
(AB) = 406 - 400 = 6
(BC) = 400 - 399 = 1
(CA) = 400 - 394 = 6



The maximum deviation from the average is 6 V. The greatest percentage deviation is: 100 x 6/400 = 1.5%

This is less than the permissible 2% and is therefore acceptable.

Electrical data notes for 38RA units:

- 38RA 040 - 160 units have a single power connection point.
- The control box includes the following standard features:
  - Starter and motor protection devices for each compressor and the fan(s)
  - Control devices
- Field connections:
  All connections to the system and the electrical installations must be in full accordance with all applicable local codes.
- The Carrier 38RA units are designed and built to ensure conformance with these codes. The recommendations of European standard EN 60 204-1 (corresponding to IEC 60204-1) - (machine safety - electrical machine components - part 1: general regulations) are specifically taken into account, when designing the electrical equipment.

IMPORTANT:

- Generally the recommendations of IEC 60364 are accepted as compliance with the requirements of the installation directives. Conformance with EN 60204 is the best means of ensuring compliance with the Machines Directive § 1.5.1.
- Annex B of EN 60204-1 describes the electrical characteristics used for the operation of the machines.

1. The operating environment for the 38RA units is specified below:
   Environment* - Environment as classified in EN 60 721 (corresponding to IEC 60 721):
   - outdoor installation*
   - ambient temperature range: -10°C to +46°C, class 4K3*
   - altitude: ≤ 2000 m
   - presence of hard solids, class 4S2* (no significant dust present)
   - presence of corrosive and polluting substances, class 4C2 (negligible)
   - vibration and shock, class 4M2
2. Competence of personnel, class BA4* (trained personnel - IEC 60364)
3. Power supply frequency variation: ± 2 Hz.
4. The neutral (N) line must not be connected directly to the unit (if necessary use a transformer).
5. Overcurrent protection of the power supply conductors is not provided with the unit.
6. The factory-installed disconnect switch(es) is (are) of a type suitable for power interruption in accordance with EN 60947-3 (corresponding to IEC 60947-3).
7. The units are designed for connection to TN networks (IEC 60364). For IT networks the earth connection must not be at the network earth. Provide a local earth, consult competent local organisations to complete the electrical installation.

   NOTE: If particular aspects of an actual installation do not conform to the conditions described above, or if there are other conditions which should be considered, always contact your local Carrier representative.

* The required protection level for this class is IP43BW (according to reference document IEC 60529). All 38RA units are protected to IP44CW and fulfil this protection condition.

8 - RECOMMENDED WIRE SECTIONS

Wire sizing is the responsibility of the installer, and depends on the characteristics and regulations applicable to each installation site. The following is only to be used as a guide-line, and does not make Carrier in any way liable. After wire sizing has been completed, using the certified dimensional drawing, the installer must ensure easy connection and define any modifications necessary on site. The connections provided as standard for the field-supplied power entry cables to the general disconnect/isolator switch are designed for the number and type of wires, listed in the table below.

The calculations are based on the maximum machine current (see electrical data tables) and the standard installation practices, in accordance with IEC 60364, table 52C.

For 38RA units, installed outside, the following standard installation practises have been maintained:

- No.17: suspended aerial lines
- No. 61: buried conduit with a derating coefficient of 20.
- The calculation is based on PVC or XLPE insulated cables with copper core.
- A maximum ambient temperature of 46°C has been taken into consideration.
- The given wire length limits the voltage drop to < 5% (see table below).

IMPORTANT: Before connection of the main power cables (L1 - L2 - L3) on the terminal block, it is imperative to check the correct order of the 3 phases before proceeding to the connection on the main disconnect/isolator switch.

Field control wiring

For the field control wiring of the following elements refer to the Controls IOM "Pro-Dialog Plus control, 38RA series" and the certified wiring diagram supplied with the unit.

Unit	S Min. (mm^2) by phase	Cable type	L (max.) m	S Max. (mm^2) by phase	Cable type	L (max.) m
38RA 040	1x 6	XLPE Cu	90	1x 16	PVC Cu	245
38RA 050	1x 6	XLPE Cu	80	1x 25	PVC Cu	300
38RA 060	1x 10	XLPE Cu	110	1x 25	PVC Cu	300
38RA 070	1x 10	XLPE Cu	100	1x 35	PVC Cu	310
38RA 080	1x 16	XLPE Cu	125	1x 50	PVC Cu	350
38RA 090	1x 16	XLPE Cu	115	1x 70	PVC Cu	380
38RA 100	1x 25	XLPE Cu	145	1x 70	PVC Cu	380
38RA 120	1x 25	XLPE Cu	135	1x 95	PVC Cu	410
38RA 140	1x 35	XLPE Cu	150	1x 120	PVC Cu	435
38RA 160	1x 50	XLPE Cu	180	1x 150	PVC Cu	450

S Power supply cable section (see the diagram in chapter: "Electrical connection")

9 - REFRIGERANT PIPING

9.1 - Field installation, thermostatic expansion valve (TXV) and solenoid valve

- The thermal expansion valve sensing bulb must be installed after at least two 90° bends at the evaporator outlet.
- Ideally the TXV should be installed in a vertical pipe run. If that is not possible, secure the valve at the 4 o'clock position (6 o'clock being the base of the horizontal pipe).
- The TXV and solenoid valves are installed as shown in Figs. 1, 2 and 3.
- Liquid line solenoid valves are not necessary, if single-circuit evaporators are used and the evaporator has sufficient capacity to hold the whole refrigerant charge.
- Solenoid valves are needed with dual-circuit evaporators to deactivate the upper section of the evaporator coil and reduce the load on the compressor.

9.2 - Installation of piping

IMPORTANT: In order to prevent vibration and possible pipe breaks install proper pipe supports for all pipes at the point where they leave the unit.

On all units, relieve the pressure of the holding charge before opening the circuit.

- ***Open all service valves (suction and liquid line).***
- ***Remove the protective cap from the Schrader port in the liquid line valve and press on the valve depressor to release the holding charge (nitrogen).***
- ***Unsolder the plugs and prepare the pipes for connection.***
- ***Complete the liquid line valve connections between the moisture indicator and the evaporator.***
- ***Complete the low-pressure suction line connections between the compressor and the evaporator. Do this with nitrogen or another inert gas flowing through the pipework to prevent oxidation of the copper.***

9.3 - Evaporator coil selection

38RA 050-080

The circuit of these units includes two compressors, operating in parallel. To ensure oil return to the compressors at low load, it may be necessary to split the evaporator coil into two independent circuits. If this is the case, the following table shows the coil split in % of the cooling capacity for each evaporator circuit.

38RA	Evaporator circuit A1, %	Evaporator circuit A2, %
050	46	54
060	40	60
070	50	50
080	50	50

Fig. 1 - 38RA 040-080 - single evaporator

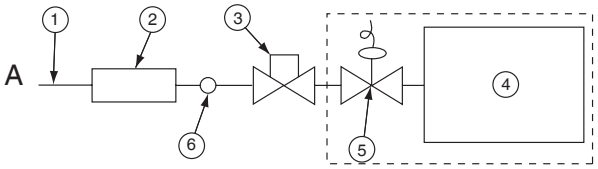
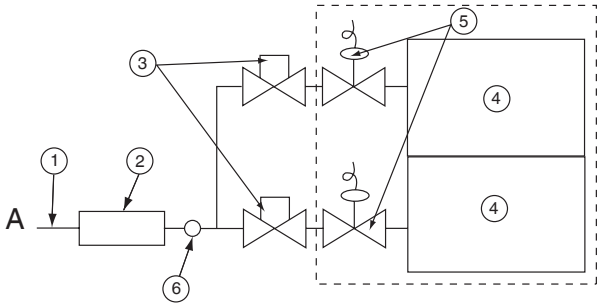


Fig. 2 - 38RA 050-080 - single split evaporator

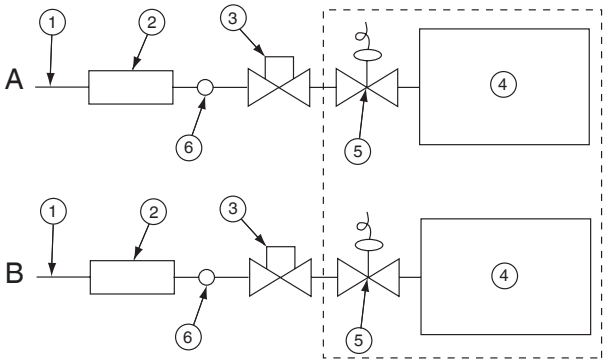


38RA 090-160

These units include two independent refrigerant circuits, and the evaporator coil must be circuited with two independent circuits. The following table shows the coil split in % of the cooling capacity for each evaporator circuit.

38RA	Evaporator circuit A, %	Evaporator circuit B, %
090	45	55
100	40	60
120	50	50
140	50	50
160	50	50

Fig. 3 - 38RA 090-160 - dual evaporator



Legend for Figs.1 - 2 - 3

1 38RA liquid line
2 Filter driers
3 Solenoid valve (supplied not installed)
4 Evaporator
5 Thermostatic expansion valve TXV
6 Moisture sight glass
A Circuit A
B Circuit B
--- Field supplied

10 - REFRIGERANT PIPE SIZING

10.1 - General

Refrigerant pipe sizing must be carried out, taking account of the following constraints:

Oil return to the compressor must be ensured for the majority of applications. Oil return is ensured by entrainment. A minimum refrigerant velocity is required to ensure entrainment. This velocity depends on the pipe diameter, the refrigerant and oil temperature (these are treated as being the same in most cases). A reduction of the pipe diameter permits an increase of the refrigerant velocity. The problem of a minimum entrainment velocity does not exist for the pipes that carry liquid refrigerant as the oil is fully miscible here.

The compressor suction line (pipes linking the evaporator outlet with the compressor inlet) pressure drops must be limited to avoid system performance losses (the compressor power input inceases, and the cooling capacity decreases). As a first estimate, and for standard air conditioning applications we can say that a one degree Celsius pressure drop on the suction side decreases the cooling capacity by 4% and increases the compressor power input by 2%. Increasing the pipe diameter permits limiting the pressure drops.

The pressure drop in the liquid line (linking the condenser outlet to the expansion device) must not result in a change in phase. The estimate of these pressure drops must include those for the possible accessories, such as solenoid valves, filters, dehumidifier etc.

10.2 - Use of pipe sizing diagrams

The appendix of this document includes two pipe sizing diagrams. They allow an estimate of the cooling capacity, corresponding to 1.5 K pressure drop for different pipe diameters, based on the pipe length.

The following procedure can be used for pipe sizing:

1. Measure the length (in metres) of the piping under consideration.
2. Add 40 to 50% to take account of special characteristics.
3. Multiply this length by the appropriate correction factor from Table 1 (this correction factor depends on the saturated suction and condensing temperatures).
4. Read the pipe size from Figs. 5 or 6 in the appendix.
5. Calculate the equivalent lengths for parts included in the piping under consideration (such as valves, filters, connections).
   The equivalent lengths are normally available from the component supplier. Add these lengths to the length calculated in step 3.
6. Repeat steps 4 and 5 is necessary.

   The diagrams in the appendix can obviously be used to calculate the actual pressure drops for the piping under consideration:
7. Based on the pipe diameter and the cooling capacity find the equivalent length, producing 1.5 K pressure drop in Figs. 5 or 6.
8. Calculate the equivalent pipe length as described in steps 1, 2, 3 and 5.
9. Calculate the length ratio from steps 8 and 7 (equivalent length from step 8 DIVIDED by the equivalent length from step 7).
10. Multiply this ratio by 1.5 to find the equivalent pressure drops in K.

10.3 - Suction pipe sizing

This sizing is the most critical. A distillation process takes place in the evaporator, during which the refrigerant evaporates until it reaches a balance point. It exists in two phases: the vapour phase that only contains refrigerant, and the liquid phase, which is a mix of liquid refrigerant and oil.

The content of refrigerant in this mixture depends on the pressure. The liquid mixture can only be returned to the compressor by entrainment, initiated by the vapour velocity.

10.3.1 - Vertical suction pipe risers

This has more restraints, as the vapour velocity must be sufficient to entrain the liquid refrigerant/oil mixture against the gravity.

Table 2 shows the minimum required cooling capacities for different pipe diameters and different saturated suction temperatures. This table is based on a 8 K superheat and a refrigerant temperature of 32°C upstream of the expansion device. Table 3 shows the correction factors to be applied to the cooling capacity for other refrigerant temperatures than 32°C upstream of the expansion device.

The vertical suction pipe risers must be sized for the MINIMUM unit cooling capacity: as a first estimate this minimum capacity can be determined for a suction temperature that is 10°C below the nominal value.

For units with several capacity stages this constraint can lead to excessive pressure drops, if the unit operates at its maximum capacity. A dual vertical suction pipe riser is required.

10.3.2 - Dual vertical suction pipe risers

Fig. 4 shows the principle of the dual vertical suction pipe riser.

1. Suction pipe A is sized to permit the return of the refrigerant/oil mixture for minimum cooling capacities.
2. Pipe B normally has a larger diameter and is sized so that the pressure drops generated by the two pipes at MAXIMUM cooling capacity remain acceptable, while ensuring the return of the refrigerant/oil mixture.
3. An oil trap is installed in the two pipes. During operation at part load, when the refrigerant vapour velocity is not sufficient to entrain the liquid refrigerant/oil mixture, this trap progressively fills with the mixture, until the refrigerant vapour can no longer circulate across pipe B. All the refrigerant vapour now circulates in pipe A which is correctly sized to entrain the liquid oil/refrigerant mixture.

The trap must be correctly sized to ensure that not too much of the liquid refrigerant/oil mixture is trapped. On the other hand, as shown in Fig. 4, pipe B must arrive FROM ABOVE on the common suction pipe.

This position ensures that the liquid refrigerant/oil mixture from pipe A does not accumulate in pipe B during operation at low cooling capacity (pipe B ist inactive due to the trap).

10.3.3 - Liquid line sizing

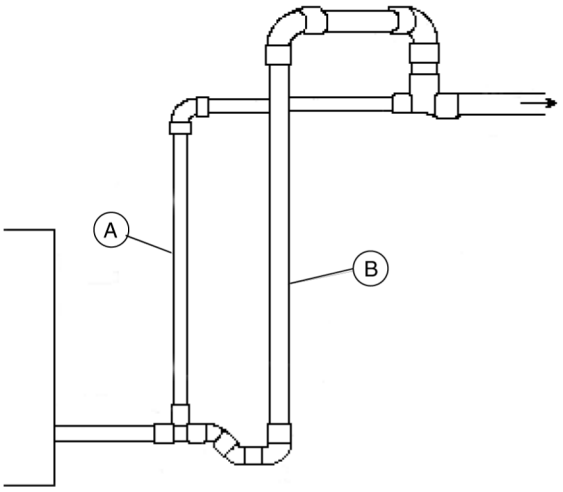
The 38RA compressors are supplied with an oil that is fully miscible with refrigerant R407C in the liquid phase. Consequently low refrigerant velocities in the liquid lines are not a problem.

The admissible pressure drops in the liquid lines depend mainly on the subcooling level of the liquid refrigerant at the condenser outlet. Pressure drops corresponding to 1.5 K saturated temperature must not be exceeded (see appendix: Fig. 6).

Special attention must be paid to the liquid line sizing when the expansion device ist positioned higher than the condenser. It may now be necessary to increase the pipe diameter to compensate for the additional pressure of the liquid refrigerant column. If the liquid refrigerant head is very high, it may even be necessary to increase the subcooling to prevent an phase change in the liquid line. This can be done e.g. by a liquid-vapour heat exchanger or an additional coil.

At 45°C the volume mass of refrigerant R407C in the liquid phase is approximately 1050 kg/m^3. A pressure of 1 bar corresponds to a liquid head of: 100 000/(1050 x 9.81) = 9.7 m.

Fig. 4 - Vertical suction pipe risers



Legend
A + B Suction pipes

Table 1 - R-407C - correction factors for copper tube

38RA	Saturated suction temperature, °C											
Cond. temp.	-18		-12		-7		-1		4		10	
°C	S	F	S	F	S	F	S	F	S	F	S	F
27	2.01	1.09	1.61	1.07	1.31	1.06	1.07	1.04	0.89	1.03	0.74	1.01
32	2.11	1.08	1.69	1.06	1.37	1.04	1.12	1.03	0.93	1.01	0.77	1.00
38	2.22	1.08	1.78	1.06	1.44	1.04	1.18	1.02	0.97	1.01	0.81	0.99
43	2.34	1.08	1.88	1.06	1.52	1.04	1.24	1.02	1.03	1.00	0.85	0.99
49	2.49	1.09	1.99	1.07	1.61	1.05	1.32	1.03	1.09	1.01	0.90	0.99
54	2.66	1.12	2.13	1.10	1.72	1.07	1.40	1.05	1.16	1.03	0.96	1.01
60	2.87	1.16	2.29	1.13	1.85	1.11	1.50	1.08	1.24	1.06	1.03	1.04
66	3.13	1.21	2.49	1.18	2.01	1.15	1.63	1.12	1.34	1.10	1.11	1.08
71	3.46	1.29	2.74	1.26	2.21	1.22	1.79	1.19	1.47	1.16	1.21	1.13

Legend
S Suction pipe
F Liquid pipe

Table 2 - Minimum capacity for oil entrainment in the suction piping (kW)

R-407C - copper tube	Outside pipe diameter, inch											
Saturated suction temperature, °C	1/2	5/8	3/4	7/8	1-1/8	1-3/8	1-5/8	2-1/8	2-5/8	3-1/8	3-5/8	4-1/8
-40	0.21	0.38	0.60	0.95	1.83	3.09	4.78	9.53	16.35	25.53	37.25	51.70
-29	0.28	0.50	0.81	1.27	2.46	4.15	6.40	12.77	21.95	34.29	50.01	69.36
-18	0.37	0.66	1.09	1.65	3.20	5.42	8.37	16.67	28.66	44.74	65.24	90.53
-7	0.47	0.84	1.37	2.08	4.08	6.89	10.66	21.28	36.54	57.01	83.18	115.39
4	0.58	1.05	1.72	2.60	5.10	8.62	13.29	26.59	45.65	71.25	103.93	144.20

Table 3 - R-407C - correction factors for the oil entrainment in the suction piping

Liquid temperature, °C										
10.00	16.00	21.00	27.00	32.00	38.00	43.00	49.00	54.00	60.00	66.00
1.21	1.16	1.11	1.05	1.00	0.94	0.89	0.83	0.77	0.70	0.64

See chapter 10.3.1 - "Vertical suction pipe risers"

11 - START-UP

11.1 - Preliminary checks

- Never be tempted to start the unit without reading fully, and understanding, the operating instructions and without having carried out the following pre-start checks:
- Refer to the wiring diagram supplied with the unit.
- Ensure that there are no refrigerant leaks.
- Confirm that all pipe securing bands are tight.
- Confirm the the electrical connections are secure.
- Ensure that the compressor crankcase heaters have been operating correctly for 24 hours before start-up.
- Confirm that the power supply corresponds to the data on the unit nameplate.

11.2 - Actual start-up

IMPORTANT

- ***Commissioning and start-up of the unit must be supervised by a qualified refrigeration engineer.***
- ***All set-point adjustments and control tests must be carried out before the unit is started up.***
- ***Please refer to the 38RA series Pro-Dialog Plus Control manual.***

Ensure that all safety devices are satisfied, especially the high pressure switches with manual reset.

Set the room thermostat to a temperature value that is lower than the room temperature in order to do a start-up test. If the compressor does not start, set the thermostat to a lower value.

11.3 - Refrigerant charge adjustment

IMPORTANT: It is imperative to empty the nitrogen holding charge from the system and evacuate the system before beginning to charge refrigerant into the unit. Never charge refrigerant into the low-pressure side of the system. During charging of refrigerant ensure that the indoor fan is operating.

With all fans operating, adjust the refrigerant charge. Measure the pressure at the liquid line service valve. If possible, measure the liquid line temperature as close as possible to the service valve. Add charge until the refrigerant passing through the sight glass is 'clear': the refrigerant is now only liquid. When the liquid line temperature is measured, it should now be possible to calculate an actual subcooling value between 4 and 8 K (refer to the section 12.1.3 for the conversion from saturated pressure to saturated temperature). The actual subcooling is equal to the saturated temperature at the bubble point, minus the liquid line temperature measured. If the actual subcooling value is higher than 8 K, an excess charge is possible. This excess charge translates to an excessive condensing pressure and increases the compressor power input.

If adding charge does not result in a clear sight glass and the condensing pressure rises above the acceptable values, ensure that the filter drier is not blocked and that one of the solenoid valves is not partially closed.

12 - MAINTENANCE

Any technician attending the machine for any purpose must be fully qualified to work on refrigerant and electrical circuits.

All refrigerant charging, removal and draining operations must be carried out by a qualified technician and with the correct material for the unit. Any inappropriate handling can lead to uncontrolled fluid or pressure leaks.

WARNING: Before doing any work on the machine ensure that the power is switched off. If a refrigerant circuit is opened, it must be evacuated, recharged and tested for leaks. Before any operation on a refrigerant circuit, it is necessary to remove the complete refrigerant charge from the unit with a refrigerant charge recovery group.

12.1 - Maintenance of the refrigerant circuit

12.1.1 - General maintenance

- Keep the unit itself and the space around it clean and free of obstructions. Remove all rubbish such as packing materials, as soon as the installation is completed.
- Regularly clean the exposed pipework to remove all dust and dirt. This makes detection of leaks easier, and they can be repaired before more serious faults develop.
- Confirm that all screwed and bolted connections and joints are secure. Secure connections prevent leaks and vibration from developing.
- Check that all insulation joints are securely closed and that all insulation is firmly in place. Check all heat exchangers and all pipework.

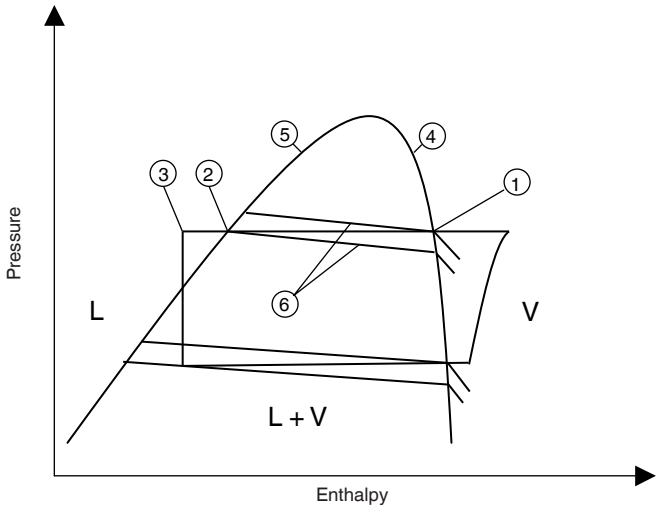
The 38RA units use refrigerant. For your information, we are reproducing here some extracts from the official publication dealing with the design, installation, operation and maintenance of air conditioning and refrigeration systems and the training of people involved in these activities, agreed by the air conditioning and refrigeration industry.

12.1.2 - Refrigerant guidelines

Refrigeration installations must be inspected and maintained regularly and rigorously by specialists. Their activities must be overseen and checked by properly trained people. To minimise discharge to the atmosphere, refrigerants and lubricating oil must be transferred using methods which reduce leaks and losses to a minimum.

- Leaks must be repaired immediately
- All units are equipped with connections on the suction and liquid line, which permit the connection of refrigerant recovery valves.
- If the residual pressure is too low to make the transfer alone, a purpose-built refrigerant recovery unit must be used.
- Compressor lubricating oil contains refrigerant. Any oil drained from a system during maintenance must therefore be handled and stored accordingly.
- Refrigerant under pressure must never be discharged to the atmosphere.

12.1.3 - Apparent and actual subcooling



Legend

1	Saturated condensing temperature at the dew point
2	Saturated liquid temperature at the bubble point
3	Liquid refrigerant temperature
4	Saturation curve at the dew point
5	Saturation curbe at the bubble point
6	Isotherms
L	Liquid
L + V	Liquid + vapour
V	Vapour

Note:
Calculation for subcooling:
Apparent (1 - 3)
Actual (2 - 3)

12.1.4 - Recharging liquid refrigerant

CAUTION: 38RA units are charged with liquid HFC-407C refrigerant.

This non-azeotropic refrigerant blend consists of 23% R-32, 25% of R-125 and 52% R-134a, and is characterised by the fact that at the time of the change in state the temperature of the liquid/vapour mixture is not constant, as with azeotropic refrigerants. All checks must be pressure tests, and the appropriate pressure/temperature ratio table must be used to determine the corresponding saturated temperatures (saturated bubble point curve or saturated dew point curve).

Leak detection is especially important for units charged with refrigerant R-407C. Depending on whether the leak occurs in the liquid or in the vapour phase, the proportion of the different components in the remaining liquid is not the same.

NOTE: Regularly carry out leak checks and immediately repair any leak found.

12.1.5 - Undercharge

If there is not enough refrigerant in the system, this is indicated by gas bubbles in the moisture sight glass in the cooling mode.

If the undercharge is significant, large bubbles appear in the moisture sight glass, and the suction pressure drops. The compressor suction superheat is also high. The machine must be recharged after the leak has been repaired.

Find the leak and completely drain the system with a refrigerant recovery unit. Carry out the repair, leak test and then recharge the system.

IMPORTANT: After the leak has been repaired, the circuit must be tested, without exceeding the maximum low-side operating pressure shown on the unit name plate.

The refrigerant must always be recharged in the liquid phase into the liquid line. The refrigerant cylinder must always contain at least 10% of its initial charge.

12.1.6 - Characteristics of R407C

See the table on the next page.
Saturated bubble point temperatures (bubble point curve)
Saturated dew point temperatures (dew point curve)

12.2 - Electrical maintenance

When working on the unit comply with all safety precautions decribed in section 1.3.

- It is strongly recommended to change the fuses in the units every 15000 operating hours or every 3 years.
- It is recommended to verify that all electrical connections are tight:
  - after the unit has been received at the moment of installation and before the first start-up,
  - one month after the first start-up,when the electrical components have reached their nominal operating temperatures,
  - then regularly once a year.

Data for refrigerant R-407C

Bar (relative)	Saturated bubble point temp. ,°C	Saturated dew point temp.,°C	Bar (relative)	Saturated bubble point temp. ,°C	Saturated dew point temp.,°C	Bar (relative)	Saturated bubble point temp. ,°C	Saturated dew point temp.,°C
1	-28.55	-21.72	10.5	23.74	29.35	20	47.81	52.55
1.25	-25.66	-18.88	10.75	24.54	30.12	20.25	48.32	53.04
1.5	-23.01	-16.29	11	25.32	30.87	20.5	48.83	53.53
1.75	-20.57	-13.88	11.25	26.09	31.62	20.75	49.34	54.01
2	-18.28	-11.65	11.5	26.85	32.35	21	49.84	54.49
2.25	-16.14	-9.55	11.75	27.6	33.08	21.25	50.34	54.96
2.5	-14.12	-7.57	12	28.34	33.79	21.5	50.83	55.43
2.75	-12.21	-5.7	12.25	29.06	34.5	21.75	51.32	55.9
3	-10.4	-3.93	12.5	29.78	35.19	22	51.8	56.36
3.25	-8.67	-2.23	12.75	30.49	35.87	22.25	52.28	56.82
3.5	-7.01	-0.61	13	31.18	36.55	22.5	52.76	57.28
3.75	-5.43	0.93	13.25	31.87	37.21	22.75	53.24	57.73
4	-3.9	2.42	13.5	32.55	37.87	23	53.71	58.18
4.25	-2.44	3.85	13.75	33.22	38.51	23.25	54.17	58.62
4.5	-1.02	5.23	14	33.89	39.16	23.5	54.64	59.07
4.75	0.34	6.57	14.25	34.54	39.79	23.75	55.1	59.5
5	1.66	7.86	14.5	35.19	40.41	24	55.55	59.94
5.25	2.94	9.11	14.75	35.83	41.03	24.25	56.01	60.37
5.5	4.19	10.33	15	36.46	41.64	24.5	56.46	60.8
5.75	5.4	11.5	15.25	37.08	42.24	24.75	56.9	61.22
6	6.57	12.65	15.5	37.7	42.84	25	57.35	61.65
6.25	7.71	13.76	15.75	38.31	43.42	25.25	57.79	62.07
6.5	8.83	14.85	16	38.92	44.01	25.5	58.23	62.48
6.75	9.92	15.91	16.25	39.52	44.58	25.75	58.66	62.9
7	10.98	16.94	16.5	40.11	45.15	26	59.09	63.31
7.25	12.02	17.95	16.75	40.69	45.71	26.25	59.52	63.71
7.5	13.03	18.94	17	41.27	46.27	26.5	59.95	64.12
7.75	14.02	19.9	17.25	41.85	46.82	26.75	60.37	64.52
8	14.99	20.85	17.5	42.41	47.37	27	60.79	64.92
8.25	15.94	21.77	17.75	42.98	47.91	27.25	61.21	65.31
8.5	16.88	22.68	18	43.53	48.44	27.5	61.63	65.71
8.75	17.79	23.57	18.25	44.09	48.97	27.75	62.04	66.1
9	18.69	24.44	18.5	44.63	49.5	28	62.45	66.49
9.25	19.57	25.29	18.75	45.17	50.02	28.25	62.86	66.87
9.5	20.43	26.13	19	45.71	50.53	28.5	63.27	67.26
9.75	21.28	26.96	19.25	46.24	51.04	28.75	63.67	67.64
10	22.12	27.77	19.5	46.77	51.55	29	64.07	68.02
10.25	22.94	28.56	19.75	47.29	52.05	29.25	64.47	68.39

12.3 - Condenser coil

We recommend, that finned coils are inspected regularly to check the degree of fouling. This depends on the environment where the unit is installed, and will be worse in urban and industrial installations and near trees that shed their leaves.

For coil cleaning proceed as follows:

- Remove fibres and dust collected on the condenser face with a soft brush (or vacuum cleaner).
- Clean the coil with the appropriate cleaning agents.

We recommend TOTALINE products for coil cleaning:
Part No. P902 DT 05EE: traditional cleaning method
Part No. P902 CL 05EE: cleaning and degreasing.

These products have a neutral pH value, do not contain phosphates, are not harmful to the human body, and can be disposed of through the public drainage system.

Depending on the degree of fouling both products can be used diluted or undiluted.

For normal maintenance routines we recommend using 1 kg of the concentrated product, diluted to 10%, to treat a coil surface of 2 m^2. This process can either be carried out with a TOTALINE applicator gun (part No. TE01 WA 4000EE) or using a high-pressure spray gun in the low-pressure position. With pressurised cleaning methods care should be taken not to damage the coil fins. The spraying of the coil must be done:

- in the direction of the fins
- in the opposite direction of the air flow direction
- with a large diffuser (25-30°)
- at a minimum distance of 300 mm from the coil

The two cleaning products can be used for any of the following coil finishes: Cu/Al with Polual or Blygold protection.

It is not necessary to rinse the coil, as the products used are pH neutral. To ensure that the coil is perfectly clean, we recommend rinsing with a low water flow rate. The pH value of the water used should be between 7 and 8.

WARNING: Never use pressurized water without a large diffusor. Concentrated and/or rotating water jets are strictly forbidden.

Correct and frequent cleaning (approximately every three months) will prevent 2/3 of the corrosion problems.

Never use a fluid with a temperature above 45°C to clean the air heat exchangers.

13 - AQUASNAP MAINTENANCE PROGRAMME

All maintenance operations must be carried out by technicians who have been trained on Carrier products, observing all Carrier quality and safety standards.

Maintenance instructions
During the unit operating life the service checks and tests must be carried out in accordance with applicable national regulations.

If there are no similar criteria in local regulations, the information on checks during operation in annex C of standard EN 378-2 can be used.

External visual checks: annex A and B of standard EN 378-2
Corrosion checks: annex D of standard EN 378-2. These controls must be carried out:

- After an intervention that is likely to affect the resistance or a change in use or change of high-pressure refrigerant, or after a shut down of more than two years. Components that do not comply, must be changed. Test pressures above the respective component design pressure must not be applied (annex B and D).
- After repair or significant modifications or significant system or component extension (annex B)
- After re-installation at another site (annexes A, B and D)
- After repair following a refrigerant leak (annex D). The frequency of refrigerant leak detection can vary from once per year for systems with less than 1% leak rate per year to once a day for systems with a leak rate of 35% per year or more. The frequency is in proportion with the leak rate.

NOTE 1: High leak rates are not acceptable. The necessary steps must be taken to eliminate any leak detected.

NOTE 2: Fixed refrigerant detectors are not leak detectors, as they cannot locate the leak.

14 - APPENDIX

The piping length will result in a refrigerant pressure drop equivalent to 1.5 K

Fig. 5 - Suction line

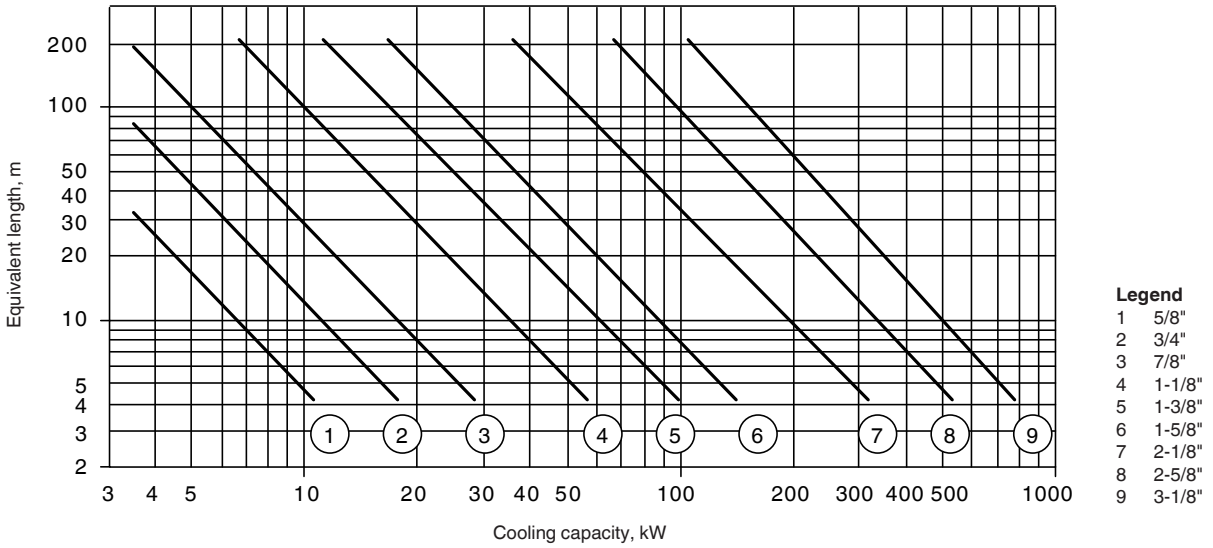
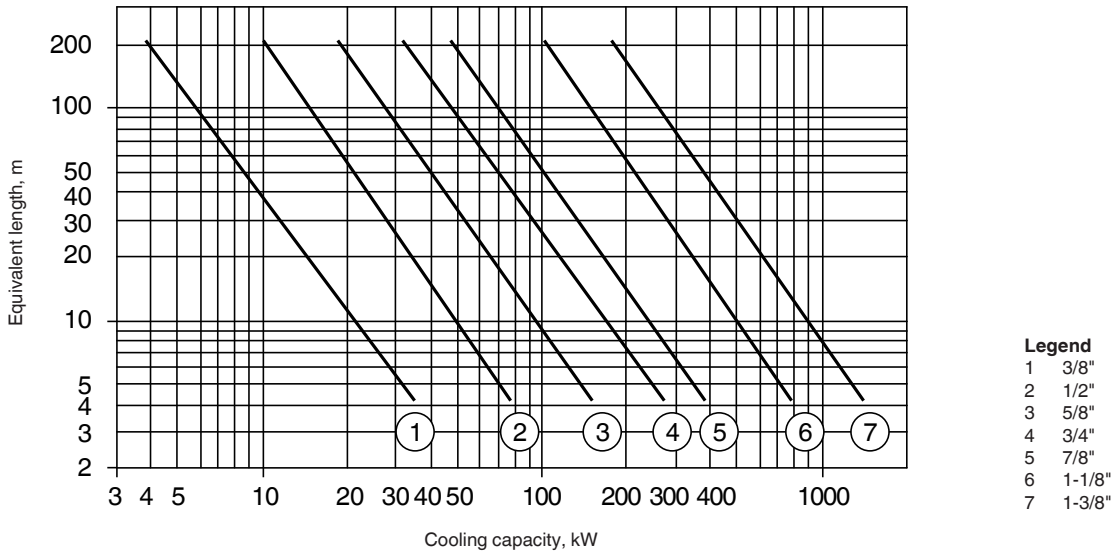


Fig. 6 - Liquid line



15 - START-UP CHECKLIST FOR 38RA CONDENSING UNITS (USE FOR JOB FILE)

Preliminary information
Job name: .....
Location: .....
Installing contractor: .....
Distributor: .....
Start-up performed by: ..... Date: .....

Equipment
Model No. 38RA: ..... Serial No.: .....

Compressors

Circuit A	**Circuit B**
Model No.:	Model No.: .....
Serial No.:	Serial No.: .....
Motor No.:	Motor No.: .....
Model No.:	Model No.: .....
Serial No.:	Serial No.: .....
Motor No.:	Motor No.: .....

Air handling equipment
Manufacturer: .....
Motor No.: ..... Motor No.: .....

Additional air handling units and accessories .....
.....

Preliminary equipment check
Is there any shipping damage? ..... If so, where? .....
.....
Will this damage prevent unit start-up? .....

☐ Unit is level in its installation
☐ Power supply agrees with unit name plate
☐ Electrical circuit wiring has been sized and installed properly
☐ Unit ground wire has been connected
☐ Electrical circuit protection has been sized and installed properly
☐ All terminals are tight
☐ All cables and thermistors have been inspected for crossed wires
☐ All plug assemblies are tight

Check air handling equipment
☐ All air handlers are operating

Unit start-up
☐ Oil level is correct
☐ Unit has been leak checked (including fittings)
☐ Locate, repair and report any refrigerant checks
.....
.....
.....

Check voltage imbalance: AB ..... AC ..... BC .....
Average voltage = ... (see installation instructions)
Maximum deviation = ... (see installation instructions)
Voltage imbalance = ... (see installation instructions)

☐ Voltage is less than 2%

WARNING: Do not start the unit if voltage imbalance is greater than 2%. Contact local power company for assistance.

☐ All incoming power voltage is within rated voltage range

Set the room thermostat to a temperature value that is lower than the room temperature.

WARNING: Be sure that all service valves are open, and that user safety loop is closed, before attempting to start this machine.

Unit starts and operates properly

Temperatures and pressures

WARNINGS:

1. ***The pouch supplied with the unit contains the label indicating the refrigerant used and describing the procedure required under the Kyoto Protocol F-Gas Regulation:***
   - ***Attach this label to the machine.***
   - ***Follow and observe the procedure described.***
2. ***Once the machine operation has stabilised, record the following parameters:***

Ambient temperature .....
Air entering temperature, evaporator .....
Air leaving temperature, evaporator .....
Suction pressure, circuit A .....
Suction pressure, circuit B .....
Discharge pressure, circuit A .....
Discharge pressure, circuit B .....
Suction temperature, circuit A .....
Suction temperature, circuit B .....
Discharge temperature, circuit A .....
Discharge temperature, circuit B .....
Liquid line temperature, circuit A .....
Liquid line temperature, circuit B .....

NOTES:

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Environmental Management System Approval

Carrier

Order No. 13058-76, 07.2008. Supersedes order No.: 13058-76, 04.2002.
Manufacturer reserves the right to change any product specification without notice.

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