Installation
Operation
Maintenance

WALL MOUNTED 2-5 Tons
Central Air Conditioners
“Self Contained” type

Models
SWMB 020
SWMB 030
SWMB 040
SWMB 050

SAFETY WARNING

Only qualified personnel should install and service the equipment. The installation, starting up, and servicing of heating, ventilating, and air-conditioning equipment can be hazardous and requires specific knowledge and training. Improperly installed, adjusted or altered equipment by an unqualified person could result in death or serious injury. When working on the equipment, observe all precautions in the literature and on the tags, stickers, and labels that are attached to the equipment.

November 2015

PKG-SVX002B-EN

Important

IMPORTANT:

Dimensional measuring units on this catalog are on milimitres (mm). (Exept for those locally referencied).

Refrigerant Emission Control

The conservation and deduction of gas emission must be achieved by following the operation and servicing procedures recommended by Trane, with specific attention to the following:

The refrigerant utilized in any type of air conditioning equipment must be recovered and/or recycled for reutilization, reprocessing or completely destroyed, whenever it is removed from the equipment. It must never be released into the atmosphere.

Always consider the possibility of recycling or reprocessing the transferred refrigerant before initiating the recovery by any sort of method. (Issues regarding recovered refrigerants and acceptable standards are described in the ARI standard 700 norm.

Use approved and safe standard cylinders. Follow all applicable safety and transport regulations whenever transporting refrigerant containers.

In order to minimize emissions while transferring the refrigerant gas, use recycling equipment. Always utilize methods that make the vacuum as low as possible while recovering and condensing the refrigerant inside the cylinder.

Since the manufacturer has a policy of continuous product improvement, it reserves the right to change specifications and design without notice. The installation and servicing of the equipment referred to in this booklet should be done by qualified, experienced technicians.

Contents

I-Model Number

BASE UNIT															GENERAL ACCESS.								PIPE ACESSORIES						ELECTRICAL ACCESS.						SPE
S	W	M	B	0	2	0	3	D	2	L	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	S
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36

Digits 1, 2 e 3 - Product Line
SWM = self-contained

Dígit 4 - Project series
B

Digits 5,6,7 - Nominal Capacity (Ton)
02 = 02 Ton
03 = 03 Ton
04 = 04 Ton
05 = 05 Ton

Digit 8 - Power Voltage
1 = 220V/60Hz/1f (only 2 and 3 ton)
3 = 220V/60Hz/3f
K = 380V/60Hz/3f
H=380V/50Hz/3f

Digit 9 - Compressor - Assembly Side (Note for Return Supply)
D = Right
E = Left

Digit 10 - Filtering + Dirty Filter Sensor
1 = G0 (Without Dirty filter Sensor)
2 = G4 (Without Dirty filter Sensor)
3 = G0 + G4 (Without Dirty filter Sensor)

Digit 11 - Market Region
L = Local Market (Brazil)
E = Export (LAR)
R = Export (Ohters)

Digit 12,13 - Service Digit
A0 = Digit A0

Digit 14,15 - Reserved Digit
00 = Reserved (Not Aplicable)

Digit 16 - Wood Package
0 = No
1 = Yes

Digit 17 - Yellow Fin - Coil
0 = No
1 = Yes

Digit 18 - Emergency Ventilation + Economizer Cycle
0 =Without
1 = With Emergency Ventilation
2 = With Emergency Ventilation + Economizer Cycle (temperature Control)
3 = With Emergency Ventilation + Economizer Cycle (latent Heat Control)

Digit 19 - Return Grill / Air Supply (Aluminium)
0 = No
1 = Yes

Digit 20 - Condenser Protection Grid
0 = No
1 = Yes

Digit 21 - Controls - Pressostat
Fundamental for 1 or 3 if digit 30 = 1 or 2)
0 = w/o Pressostat or Not Aplicable
1 = Air Flow Switch
2 = Clogged Filter Switch
3 = A + B

Digit 22, 23 - Reserved Digit
00 = Reserved (Not Aplicable)

Digit 24 - High Pressure Switch (Manual Reset)
0 = No
1 = Yes

Digit 25 - Service Valve
0 = No
1 = Yes

Digit 26 - Sightglass
0 = No
1 = Yes

Digit 27 - Refrigerant
1 = R407c

Digit 28, 29 - Reserved Digit
00 = Reserved (Not Aplicable)

Digit 30 - Electrical Heating
Options 1 and 2 only available if Digit 21 equals to 1 or 3
0 = No
1 = Heating 3,0kW - 1 Stage
2 = Heating 4,5kW - 1 Stage

Digit 31 - Control
0 = Without
A = With Bulb Thermostat
B = With Conventional Thermostat
C = With Programble Thermostat
D = With Lead-Lag

Digit 32 - Power Factor Correction Capacitor
0 = No
1 = Yes

Digit 33 - Local Switch / Remote
0 = No
1 = Yes

Digit 34, 35 - Reserved Digit
00 = Reserved (Not Aplicable)

Digit 36 - Special Produc Control Digit (SPE)
S = Standard Product (wo/ SPE)
Z = Special Product (w/ SPE)

II-General Information

Presentation

This manual describes the adequate installation, start, operation and servicing, and diagnostics for the "Self Contained" type Wall Mounted Air Conditioners of 2 to 5 TRs.

Units Features

Trane's "Self Contained" Wall Mounted Air Conditioners were designed to meet the strictest demands by the Telecommunications market. They are autonomous equipments used for venting, filtering, cooling, dehumidifying, and heating the air.

They are entirely factory-mounted, duly tested, with the correct load of lube oil and refrigerant for its adequate operation, being shipped ready to be installed by the client.

They operate at the most extreme conditions by the tests from the ARI (American Refrigeration Institute) norms (Standard 210/240)

The project allows for the incorporation of many optional items in order to adequately meet each installation's needs.

Specially treated to meet the most rigid climatic conditions, a Scroll compressor, an evaporator, an air cooled compressor, motor-ventilator assemblies, air filters, protection and control components, and electrical panel box for the start, condensation pressure control, and able of being supplied with a high efficiency economizer cycle.

Check Lists

A Check List for the use by the installer is supplied at the end of the installation section in this booklet, in order to ensure that all installation procedures were carried out correctly. The instruction for the correct checks needed for the "Start" are given in the Start section of this booklet.

The Start Sheet is also given for the registration of all initial operation data.

In the Periodic Preventative Servicing section we also supply a Check List so that the operator or the Service Engineer can establish a routine service schedule.

The Servicing procedures are also specified in detail.

Table II-1 - Nominal Capacities.

Nominal Capacity	Models
2 Ton	SWMB 020
3 Ton	SWMB 030
4 Ton	SWMB 040
5 Ton	SWMB 050

ID TAG

The unit's ID tag is glued on the electrical panel lid, and includes the model code, serial number, and electrical features, weight and refrigerant load, as well as other data related to the unit.

Figure II - 1 - ID TAG

TRANE Av. dos Pinheirais, 565 - Estação - Araucária/PR - Brasil – Phone: (55) 41 641 4444

Modelo		Nº Série			Capacidade	
	Potência	Corrente Nominal	Fases	Rotação	Data Fab.	
EVAPORADOR	CV / CV	A / A		Rpm	Vazão de Ar: m³ / min.	Pressão Estática Externa: mmca
CONDENSADOR	CV / CV	A / A		Rpm	Vazão de Ar: m³ / min.	Carga de Refrigerante: kg
COMPRESSOR	kW / kW	A / A		Rpm	Tensão de Alimentação: V Tensão de Comando: V	
AQUECIMENTO	Estágios / Potência: kW	A		Nº de Estágios	Frequência Nominal: Hz Corrente Total: A	
UMIDIFICAÇÃO	Estágios / Potência: kW	A		Nº de Estágios	Potência Total: kW Peso do Equipamento: kg	

General Information

General Security

TRANE Wall Mounted Central Air Conditioners are designed to work in a safe and trusty manner, when operated according to the safety regulations.

The system works with electrical, mechanical, gas pressures, components, etc., which could cause damage to individuals and the equipment.

Therefore, only installers with trained and qualified personnel should perform the installation and maintenance of these equipments.

Follow all the safety regulations related to this job and safety warning labels placed on the units, as well as the use of appropriate tools and equipment.

Danger Identification

WARNING

Warning signs appear in adequate intervals and in the appropriate locations throughout this booklet in order to alert the contractors and service personnel regarding potentially risky situations that, if not avoided, COULD result in death or severe personal injury.

CAUTION

Caution signs appear in adequate intervals and in the appropriate locations throughout this booklet in order to alert the contractors and service personnel regarding potentially risky situations that, if not avoided, COULD result in death or severe personal injury.

III - General Data

Table - III - 01 - General Data Wall Mounted.

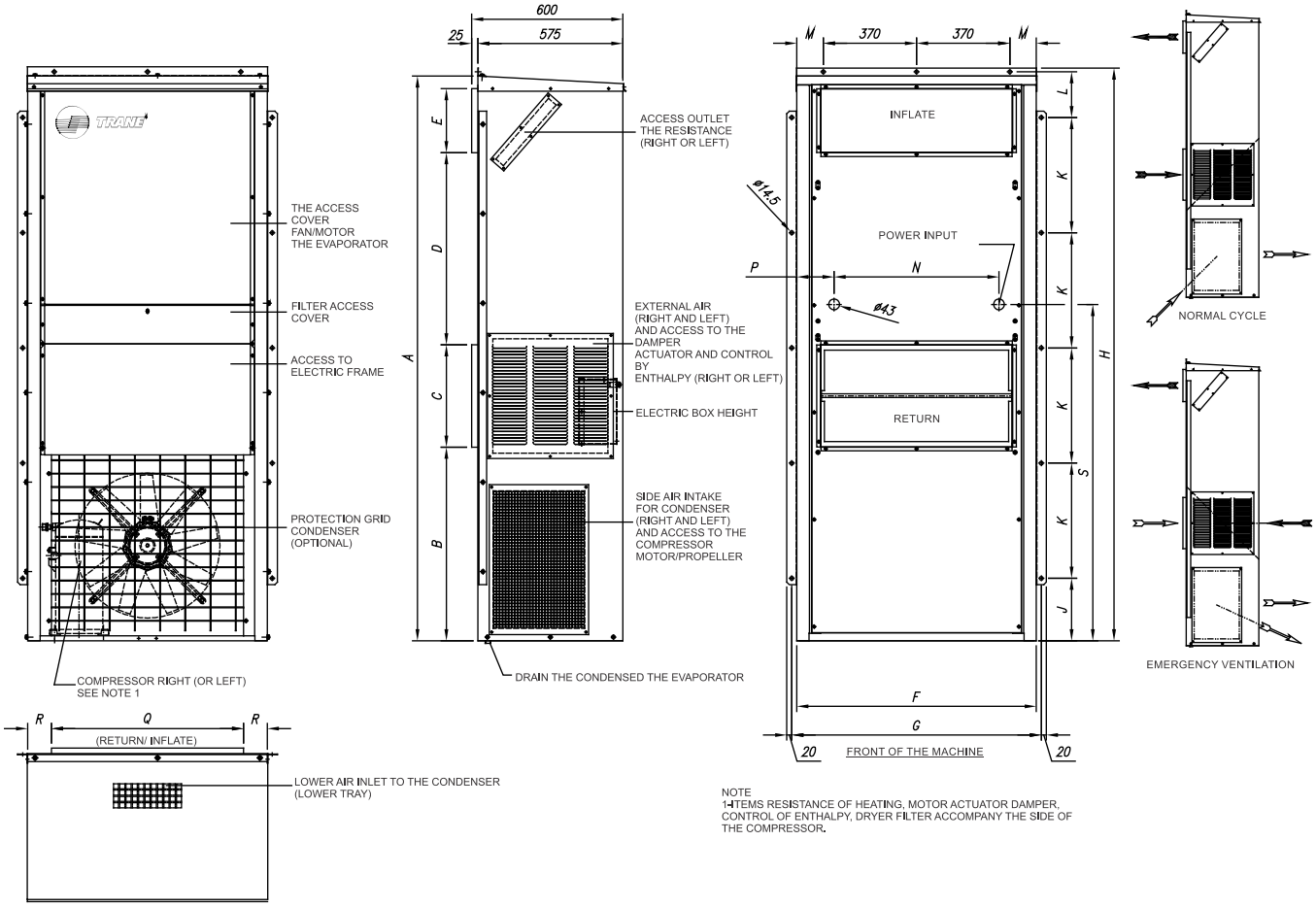
Models	SWMB 020		SWMB 030		SWMB 040		SWMB 050	
Nominal TR	2		3		4		5	
	Kcal	MBH	Kcal	MBH	Kcal	MBH	Kcal	MBH
Model 60 Hz								
Total Effective Capacity(1)	6.930	27,50	9.248	36,70	12.071	47,90	14.314	56,60
Sensible Effective Capacity(1)	5.922	23,50	6.829	27,10	9.677	38,40	10.559	41,90
Total Effective Capacity (2)	6.678	26,50	8.870	35,20	11.592	46,00	13.910	55,20
Sensible Effective Capacity (2)	5.821	23,10	6.678	26,50	9.475	37,60	10.382	41,20
Total Effective Capacity (3)	6.350	25,20	8.417	33,40	11.012	43,70	13.381	53,10
Sensible Effective Capacity (3)	5.670	22,50	6.502	25,80	9.246	36,70	10.181	40,40
Model 50 Hz								
Total Effective Capacity(1)	6.174	24,50	8.366	33,20	10.786	42,80	12.852	51,00
Sensible Effective Capacity(1)	5.594	22,20	6.476	25,70	9.148	36,30	9.979	39,60
Total Effective Capacity (2)	5.922	23,50	8.039	31,90	10.357	41,10	12.499	49,60
Sensible Effective Capacity (2)	5.494	21,80	6.350	25,20	8.996	35,70	9.828	39,00
Total Effective Capacity (3)	5.645	22,40	7.610	30,20	9.853	39,10	12.020	47,70
Sensible Effective Capacity (3)	5.342	21,20	6.174	24,50	8.770	34,80	9.652	38,30
Operational Nominal Value								
Total Nominal Consumption (kW)	3,49		4,59		5,59		6,59	
Total Nominal Current (A)	12,80		16,20		19,89		22,63	
Phisical Dymensions								
Width (mm)	930		930		1030		1030	
Depth (mm)	600		600		600		600	
Height (mm)	1.872		1.872		2.272		2.272	
Weight (kg)	231		231		277		277	
Filter Dimension and Quantity								
Length x Height	540 x 540 mm (21.3 x 21.3 in)		540 x 540 mm (21.3 x 21.3 in)		760 x 540 mm (29.9 x 21.3 in)		760 x 540 mm (29.9 x 21.3 in)	
Quantity	1		1		1		1	
Compressor Data								
Type	Scroll		Scroll		Scroll		Scroll	
Quantity	1		1		1		1	
Evaporator Coil								
Rows	3		3		3		3	
FPF (finns per feet)	132		132		132		132	
Finned type	Corrugated aluminum fins							
Evaporator Fan								
Type	Centrifugal		Centrifugal		Centrifugal		Centrifugal	
Quantity	2		2		2		2	
Motor 220V/50-60Hz/1f (CV - poles)	3/4-6		3/4-6		3/4-6		3/4-6	
Air Flow (m^3/h) / CFM - 60 Hz	2264 / 1332		2264 / 1332		3491 / 2054		3491 / 2054	
Air Flow (m^3/h) / CFM - 50 Hz	1971 / 1160		1971 / 1160		3041 / 1790		3041 / 1790	
Condenser Coil								
Rows	4		4		4		4	
FPF (finns per feet)	144		144		144		144	
Finned type	Corrugated aluminum fins							
Condenser Fan								
Type	Axial		Axial		Axial		Axial	
Quantity	1		1		1		1	
Motor 220V/50-60Hz/1f (CV - poles)	1/2-6		1/2-6		1/2-6		1/2-6	

NOTES:

1. Capacity data based on the following conditions:
Temperature of evaporator coil input: BS=26.7ºC/BU=19.4ºC.
Temperature of condenser coil input: BS=35ºC
2. Electrical data are for 220V/60Hz/3 phases (the evaporator fan and the condenser fan motors are always single phase.
3. The voltage consumption data do not consider the electrical reheating.

IV-Dimensional Data

Figure IV - 01 - SWMB - 020/030/040/050 - Phisical Dimensions.



MODEL	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S
SWMB 020/030	1840	670	353	460	200	850	890	1872	115	410	102	55	600	125	708	71	1109
SWMB 040/050	2240	768.5	406	762	254	950	990	2272	248	457	181.5	105	654	148	762	94	1334

V-Installation

Receiving and Moving
The SWMB "Self Contained" type Air Conditioners is shipped completely assembled on top of wooden pallets.
The thermostat to be installed on field is shipped inside the control panel.

Inspecting the Unit
When receiving the unit in the installation site:
☐ Verify that the data contained in the ID tag is the same as the data contained in the sales order and in the shipping receipt.
(including the electrical features)
☐ Verify that the local power supply meets the specifications on the ID tag.
☐ Cautiously inspect the unit, searching for signs of shipping damage.
If the inspection carried out in the unit reveals signs of damage or missing parts, immediately register a complaint with the shipping company. Specify the nature and magnitude of the damage regarding the acknowledgment of the shipment before signing.
☐ Inform Trane of the damage and the course of action to be taken for the repairs to be carried out. Do not repair the unit until all the damages are inspected.
☐ The equipment can be optionally supplied with four eyelets for hoisting, that facilitate the installation service.

Storage
In case the unit cannot be placed on final installation site, store it in a safe place away from bad weather.

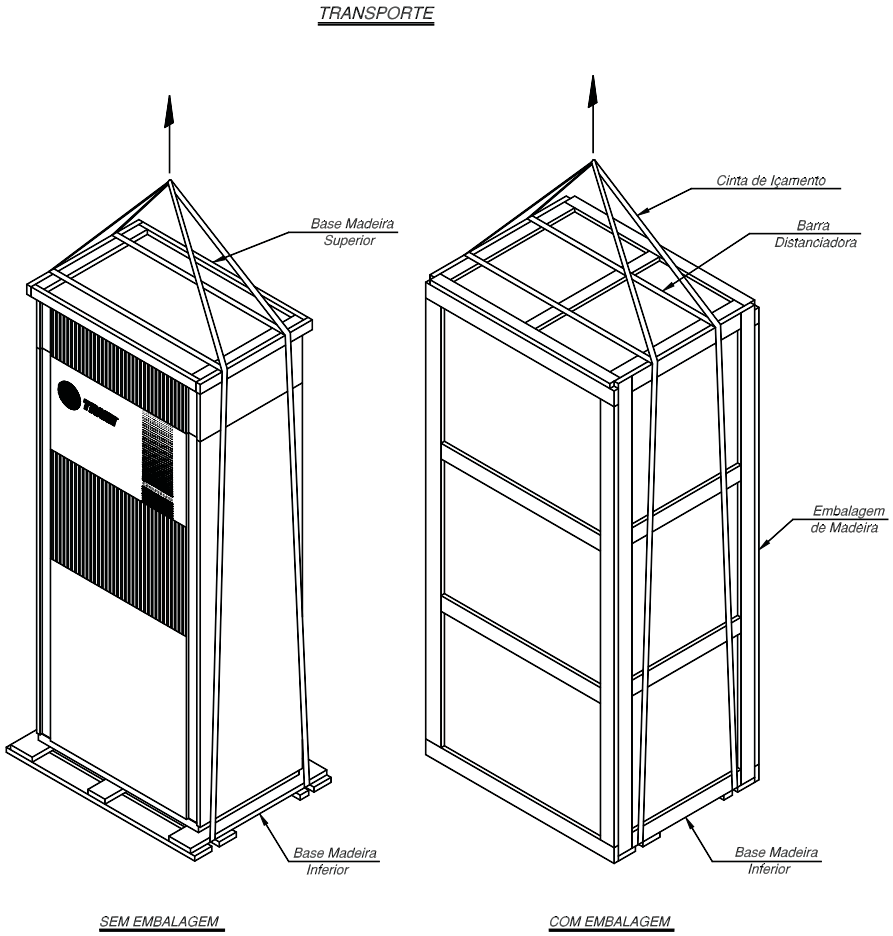
Instructions for Handling and moving hte unit
Follow the instructions bellow for transporting and moving the unit:
1 - Check the weight of the unit on the booklet or on the label.
2 - Place the lift cables or chains bellow the wooden pallet according to figure related to moving. Other means of lifting could cause damage to the equipment and serious personal injury.
3 - Avoid that the chains, ropes, or steel cables touch the air conditioner. Use adequate distancing bars as shown in the drawing.
4 - Do not unwrap the air conditioner until it is on final installation site. Move it carefully.
5 - During transport, do not tilt the equipment more than 15º relating to vertical.
6 - Always perform the lift test in order to determine the exact balance and stability before lifting the unit to the place of installation.
7 - When moving the unit horizontally, use rollers of equal diameter bellow the wooden base.
8 - Always use a wooden pallet when using a forklift.

Instalation
It is not necessary to remove any covers when fixing the cabinet on the container wall. There are lateral flanges and an inferior angle plate for fixing the machine. There are collars that facilitate the fitting of the machine on the wall on the air supply and return points.
There are 46 mm and 27 mm diameter holes for the power input on both lateral sides, and on the opposite side of the electrical box just bellow the unit's air return.

Spaces and Servicing and Technical Assistance
Foresee enough free spaces for the servicing and technical assistance.
It is recommended a distance of 2.5 m at the condenser's discharge in order to

Installation

Figure V - 01 - Instructions for moving.



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Installation

ATTENTION!

Turn off the power in order to avoid injury or even death due to electrical shock.

Electrial Diagrams

The electrical diagrams specified in the unit are glued on the internal cover of the electrical box. Use these diagrams when making the connections or to analyze problems. On the Electrical Diagrams section we supply a complete set of electrical diagrams.

1. The complete electrical installation must meet the ABNT norms, the local and/or the National Electric Code (NEC).
2. Install a non-fused power disconnected switch with fuses or thermomagnetic circuit breakers.
3. The installer must perform an electrical installation with correctively dimensioned cables, electrical ducts, fuses, non-fused power disconnected switches or circuit breakers.
4. The power cables must be dimensioned by the circuit's minimum amperage, which is calculated by the sum of 125% of the maximum operating current (MOC) of the biggest compressor or motor, plus 100% of the sum of the other compressors and motors currents.
5. Electrical Characteristics

In order to obtain input in kWs, nominal operating current (NOC), maximum operating current (MOC), locked rotor current (LRC) and nominal tension, refer to the electrical features charts on the Wall Mounted Product Catalog (PKG-PRC004-PO).

6. Supply Voltage

The unit's supply power must be rigorously appropriate in order for the unit to operate properly. The voltage supplied and the unbalance between phases should be within the tolerances indicated bellow. The power supply and the unit's consumption checks are important for the equipment and motor safety.

7. The power input can be done through the right or left side of the Unit.
8. The Voltage supply is: 220V/380V/440V, 3 F, 60 Hz.

Measure the supply voltage in all phases of the non-fused power disconnected switches. The readings should be within the utilization Voltage range shown in the units tag, meaning the nominal Voltage + / - 10%. If the Voltage in any of the phases does not fall under the tolerance, contact the electrical company to fix the problem before breaking the equipment.

The maximum allowed Voltage unbalance is 2%.

Inadequate voltage in the unit will cause malfunctioning of the controls and a shortening of the working life of the counter's connections and electrical motors.

9. Grounding the Equipments

Provide for an appropriate Grounding at the connection points foreseen on the control and power panels.

Controls

There are four control options
- Standard Thermostat
- Programmable Thermostat
- Lead-Lag Controller
- Logical Programmable Controller - PLC

Standard Thermostat

Basic thermostat with on/off power switch and set-point adjustment button. It is installed in the conditioned environment and interconnected to the equipment electrical panel through electrical cable harnesses.

Programmable Thermostat

It has a liquid crystal display for viewing the time, day of the week, selected program and ambient temperature. Four different set-points can be programmed for each day of the week. The user can keep the equipment functioning through the timed-override key as well as the programmed times as desired.

Lead-Lag Controller

It was developed for the control of the operation in telecommunications installations. The Lead-Lag controls the temperature inside the container, using two air conditioning machines (Main and Back-up), controlling the operation and alternation of the equipments by time of operation.

The temperature control is achieved by the non-simultaneous functioning of the compressor and the heating resistance. From the value of the temperature obtained by the sensor, the maximum, medium, and minimum temperatures are used as parameters.

The Unit Control System (UCS) allows for the existence of three alarms for the Central Control Center (CCC). These alarms can be for high temperature, main machine fault, and back-up machine types.

Logical Programmable Controller - PLC

The Microprocessed Control panel is external and can be installed in the environment to be conditioned or in any other place according to the installation requirements.

There are two preset configurations: one with 15 points, and another with 20 points. Others can be defined. The PCL also controls the alternation of both equipments, considering that in this case both equipments are capable of operating depending on the worked hours. Some of the main features are:

- Alternation per hours worked by the equipments, adjusted through the controller’s display.

Installation

- Enabling of the back-up equipment in case of faults on the main equipment or considering the high temperature of the environment - It is possible to configure the PLC in a way to allow for both equipments to come into operation.
- Proportional/Full Control of the compressors.
- Protection of the fans and compressors in case of faults.
- Totalization of the number of hours of equipments' functioning.
- Totalization of the number of starts in the compressors.
- Possibility of access through a Communications System (RS-232).
- Escalated operation to turn on the equipments in any functioning situation.
- Internal clock - real time.
- The display's keyboard has access passwords and allows for the viewing of all information to control the unit.
- Optionally, the unit can be accessed remotely through a phone line. This is possible through a modem connected to the controller and communications software.

Servicing Switch (Local/Remote Type)
A device that improves usefulness and speeds up servicing, testing or start-up. It is accessed directly from the conditioner electrical panel box, activating the compressor or heating resistance regardless of the central control.

Activating the Outdoor Air Damper
This could be activated by the Economizer cycle or by the emergency ventilation.

Installation Checklist
Fill this Checklist as soon as the unit is installed to check that all recommended installation procedures have been performed prior to starting the unit.
This checklist does not replace detailed instructions provided in the section of this booklet.
Always read the entire section to become familiar with the procedures.

Receiving
☐ Unit and components have been inspected to check for damages in shipping.
☐ Unit has been checked for lack of materials and controls.
☐ Plate data checked, being the same as the order.

Unit Location
☐ The unit packing has been removed and taken away from the unit. Do not remove the skid until the unit is in its final position.
☐ Unit location is adequate for its dimensions and electric tubing.
☐ Access and maintenance spaces around the unit are adequate.

Unit Movement
Refer to item “Unit Movement” in the Installation section.

Unit Assembly
☐ The unit is located in the final installation site.
☐ The unit is duly installed.
☐ Compressor pad screws haven been retightened.
☐ Wrapping has been removed.

Component Review
☐ Motors rotate freely.

Controls
Control thermostat is correctly installed in an area not subject to light bulb heat, inside doors, away from hot or cold air streams and sunlight.

Electrical Schemes
☐ Check the electrical scheme of the unit starter.
☐ Power supply is made through a non-fused molded case Switch or Circuit Breaker to the Air Conditioning unit.
☐ Check retightening of all electric terminals.
☐ Check the Unit phase sequence and connection.

VI-Unit Start

Checklist for Starting
Once unit is installed, fill every item on this list. When all is completed the unit will be ready for starting.
Check that installation voltage is in accordance with conditioner.
Check the phase sequence. It should be done clockwise.

WARNING
Change the phase sequence and the position of both cables in the equipment input if required.

CAUTION
The Scroll Compressor should only rotate clockwise. Check the phase sequence prior to starting it.

☐ Inspect all electric connections. They should be cleaned and tightened.

WARNING
In order to prevent accidents or death caused by electric shock openand and lock all circuit breakers and non-fused molded case switches.

☐ Retighten the screw head or nut against metal sleeve of the rubber pads. Operation and shipping position for this kind of pad is the same.
☐ Open (Port) suction line, liquid valves and discharge service valves.
☐ Confirm there is no refrigerant leaking.
☐ Meter the compressor motor with a 500 volt megohmeter. The minimum recommended amount is 5 megaohms.
☐ Check that the fan(s) rotation direction is correct.

CAUTION
In order to avoid compressor damage, do not allow refrigerant liquid to enter the suction line.

WARNING
In order to avoid damages to the compressor do not run the unit with the service, suction, discharge or liquid valve closed.

☐ Check the correct thermostat installation.
☐ Check air flows in the Evaporator and condenser.

Start-up Procedures
Do not start the unit until all its preparation procedures have been completed.
☐ Check whether all items of “Start-Up Preparation” described in the previous item have been completed.
☐ Turn the unit non-fused molded case switch and command circuit breakers on. The Self On-Off switch, installed on the thermostat should be in the OFF position.

WARNING
Do not change cables for the compressor only, doing it will affect the unit diagram.

☐Check that fans are not locked and rotate freely.
☐Check working of heating interlocks (if any).
☐ Check suction line, liquid and discharge service valves. These valves should be open (in port) prior to starting compressors.

WARNING
In order to avoid damages to the compressor, make sure that all valves are open prior to starting the unit.

☐ TURN the ON-OFF Self-Switch installed on the thermostat ON.

Unit Start

Checking Operational Conditions
Once the unit has been operating for about 30 minutes and system is stabilized, check operational conditions and complete the checking procedures as follows:

☐ Check suction and discharge pressures in the manifold gauge who hoses have been previously connected.

Discharge Pressure:
Measure the discharge pressure in the Schrader valve foreseen in the liquid line. Normal pressure values are:
200 to 340 psig.

Suction Pressure:
Measure the suction pressure in the Schrader valve foreseen in the suction line. Normal suction values are:
54 - 80 psig.

☐ Check and record amperage consumed by the compressor. Compare readings against the compressor electrical data provided in the equipment plate.
☐ Check the liquid sightglass. The refrigerant flow should be clean. Bubbles in the liquid indicate either low refrigerant load or excessive pressure loss in the liquid line. A restriction may be often identified by a remarkable temperature difference from one side to the other in the restricted area. Ice is often formed in the leaving liquid line also.

⚠ CAUTION
The system may not have an adequate refrigerant load though the liquid sightglass is clean. We should also consider superheat, subcooling and operating conditions.

☐ Once amperage and operating pressure is stabilized, measure superheating.
☐ Measure subcooling.

☐ If operating pressure, liquid sightglass, superheating and subcooling indicate no refrigerant gas, load gas into each circuit. No refrigerant is indicated if working pressures are low and subcooling is low too.

⚠ CAUTION
If suction and discharge pressures are low but subcooling is normal, there is no refrigerant absence. Adding refrigerant will result in overload.

☐ Add refrigerant gas (in gaseous shape only) with the unit running by loading gas through the Schrader valve located in the suction line, until operating conditions are normal.
☐ If operating conditions indicate gas overload, proceed about slowly removing refrigerant through the service valve in the liquid line. Do not unload the refrigerant into the atmosphere.
☐ Fill in the “Start Sheet” located at the end of this chapter.

⚠ CAUTION
In order to avoid losses due to freezing, avoid skin contact with refrigerant.

Once the unit is running normally, keep the location clean and tools in their places. Make sure control panel doors are in their places.

System Overheating
Normal overheating for each circuit is from 8 to 12 ºC at full load. If superheat is not within this range, adjust the expansion valve overheat matching. Allow 5 to 10 minutes between adjustments so the expansion valve stabilizes to each new adjustment.

System Subcooling
Normal subcooling for each circuit is from 5 to 10ºC at full load. If subcooling is not within this range, check the circuit subcooling and adjust it if required.

Unit Start

TRANE	SELF CONTAINED START SHEET
MODEL:	SERIAL #
CUSTOMER	CONTACT
ADDRESS	
CITY	STATE

CHECKLIST

CIRCUIT 1			CIRCUIT 2		
	YES	NO		YES	NO
01 LEAK	☐	☐	01 LEAK	☐	☐
02 VIBRATION	☐	☐	02 VIBRATION	☐	☐
03 SIGHTGLASS BUBBLING	☐	☐	03 SIGHTGLASS BUBBLING	☐	☐
04 NORMAL OIL LEVEL	☐	☐	04 NORMAL OIL LEVEL	☐	☐
05 NORMAL VOLTAGE	☐	☐	05 NORMAL VOLTAGE	☐	☐
08 HIGH PRESSURE CONTROL: ON/OFF	_____		08 HIGH PRESSURE CONTROL: ON/OFF	_____	
09 LOW PRESSURE CONTROL: ON/OFF	_____		09 LOW PRESSURE CONTROL: ON/OFF	_____	
11 CONTROL THERMOSTAT SERIAL #	_____		11 CONTROL THERMOSTAT SERIAL #	_____	

IMPORTANT

1. THE SCROLL COMPRESSOR SHOULD ROTATE CLOCKWISE ONLY. BEFORE STARTUP, CHECK PHASE SEQUENCE, THEN FOLLOW THE BOOKLET INSTRUCTIONS.
2. THE SCROLL COMPRESSOR CANNOT RUN IN VACUUM. IT WILL SUFFER DAMAGE
3. IN CASE YOU FIND ANY FAILURE DURING STARTUP MARK IT IN THE SCHEMATIC CIRCUIT (BACK PAGE) OR IN THE REMARKS ITEM.
4. OPERATING VALUE NOTES WILL BE MADE AFTER RUNNING IS STABILIZED.

TECHNICAL DATA

PLATE	MODEL	SERIAL #	CURRENT (AMP)	OIL LEVEL
COMPRESSOR CIRC. 1				
COMPRESSOR CIRC. 2				

RUNNING READING

CIRCUIT	HIGH PRESSURE PSIG	LOW PRESSURE PSIG	LIQUID PIPING ºC	SUCTION PIPING ºC	UNDER-COOLING ºC	SUPERHEAT ºC
COMPRESSOR CIRC. 1						
COMPRESSOR CIRC. 2						

AIR EVAPORATOR							AIR CONDENSER		
AIR FLOW M^3/H	RETURN ºCº		SUPPLY ºC		OUTDOOR ºC		AIR FLOW $M^{3/H}$	TBS INLET ºC	TBS OUTLET º C
	TBS	TBU	TBS	TBU	TBS	TBU			

WATER CONDENSER			
WATER TEMP. º C		WATER PRESSURE ( )	
INLET	OUTLET	INLET	OUTLET

CURRENT (AMPERES)							
	R	S	T	R	S	T	
COMPR.1		EVAPORATOR					
COMPR.2		CONDENS.1					
	CONDENS. 2						
VOLTAGE		VOLTAGE					

Unit Start

NORMAL OPERATING CONDITIONS

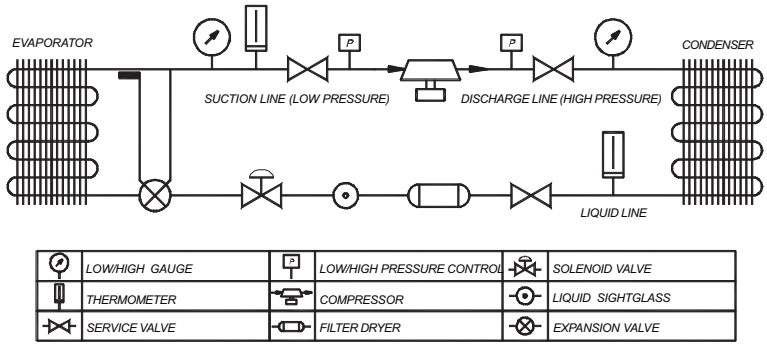
1. OIL LEVEL IN SIGHTGLASS – NOT LOWER AT HALF SIGHTGLASS
2. LIQUID SIGHTGLASS – CLEAN
3. PLATE RATED VOLTAGE ±10% FLUCTUATION
4. CURRENTS – SEE EQUIPMENT TECHNICAL CATALOG
5. TABLE WITH TYPICAL VALUES

UNIT MODELS	HIGH PRESSURE		LOW PRESSURE		SUPER ºC	UNDER ºC
	BAR	PSIG	BAR	PSIG		
RVE/SIVE	14 TO 23.5	200 TO 340	3.8 TO 5.5	54 TO 80	8 TO 12	5 TO 10
SAVE	12.5 TO 16.5	180 TO 240	3.8 TO 5.5	54 TO 80	8 TO 12	5 TO 10

6. PRESSURE CONTROL PERFORMANCE

LOW PRESSURE CONTROL – DISARMING 25±8 PSIG / REARMING 80±12
HIGH PRESSURE CONTROL – (AIR CONDENSATION) DISARMING 395±15 PSIG/REARMING 280±20
HIGH PRESSURE CONTROL – (WATER CONDENSATION) DISARMING 2755 ±15 PSIG/REARMING 195±15

COOLING CYCLE SCHEMATIC CIRCUIT



NOTICE: IN REGIONS WHERE VERY LOW CONDENSER AIR OR WATER INLET TEMPERATURES OCCUR, IT IS RECOMMENDED TO PLACE FLOW ADJUSTMENT DEVICES TO ASSURE A SAFE EQUIPMENT OPERATION.

INSTALLER *START DATE*
EMPLOYEE *TRANE #* *SIGNATURE*
EQUIPMENT APPLICATION
☐ *COMFORT* ☐ *TELECOIL* ☐ *CPD* *OTHER* _____
VALVES OR DAMPERS
REMARKS:

VII-Operation

Manual Stop
It occurs when you want the conditioner for any other reason or at the end of the work period.
1.1. Place the ON/OFF starting CONTROL located in front of the thermostat in the OFF position. This interrupts electric power flow to the ventilation contactor that turns off the compressor contactors when it shuts down.
1.2. Keep the circuit breaker or the non-fused molded switch case closed.

CAUTION
Do not use this procedure to stop the unit when performing services or repairs. In order to prevent accidents or death due to electric shock, perform the service only with the unit circuit breaker off.

Operation Control Stop
As return temperature decreases, the control thermostat turns the equipment compressor off. If it rises, the control thermostat activates the compressor again.

Safety Control Stop
Any safety control listed later may cause the conditioner stop.
Before rearming them, eliminate irregularities by analyzing the installation in detail and using the Troubleshooting Section as a guide.
Never change safety control adjustment portions nor jump them in order to run the conditioner. Serious damage may occur and cause system shutdown for a long time.

Temporary Stop
Sometimes it is necessary to stop the conditioner for a few days for installation remodeling or building maintenance. In this event, proceed as in manual stop.

Protection and Safety Devices
The pressure controls are cartridge-like. They have automatic rearming and fixed adjustments.

3.1 Low pressure control
The low control is at a Schrader valve in the suction piping, feeling the pressure that is established there and it turns off the equipment when there is evaporation of refrigerant liquid in the evaporator, with consequent fall of pressure. The disarming value is 25 +/- 8 psig and the rearming is 80 +/- 12 psig. It is automatically rearmed.
The Scroll compressor cannot operate in vacuum. Its operation for more than one minute at negative pressures will cause high discharges temperatures, which will warp the aluminum rotors, damaging the compressor irreversibly. This pressure control can never be taken out of action because of a jumper.
Two warnings that are posted inside the electrical board ("NEVER CONNECT" and "WARNING: AVOID DAMAGE TO THE SCROLL COMPRESSOR") teach the correct procedures for a safe compressor operation.

3.2 High pressure control
The high-pressure control is connected to the discharge piping, feeling the pressure that is established there and it turns off the equipment in case the pressure overtakes the adjusted limit. The disarming value is 395 +/- 15 psig for air-cooled machines and 275 +/- psig for water-cooled machines. The rearming value will occur at 280 +/- 20 psig pressures for air-cooled machines and 195 +/- 15 psig for water-cooled machines. Rearming is automatic.

3.3 Control pressure control of condensing pressure
This pressure control turns off the condenser fan motor, allowing the operation of the equipment with a low outdoor temperature.

3.4. Compressor Internal Thermostat
It is a device located next to the motor winding and designed to protect the compressor motor against excessive temperature caused by a low refrigerant flow (motor deficient cooling) or excessive electric current (due to external demand conditions). Rearming is automatic.

3.5 Discharge Thermostat
It is a bimetal thermostat located inside the Copeland compressor in the discharge chamber, which will turn off the compressor when discharge temperature reaches 145 ºC, turning the compressor on again when temperature falls to 60 ºC.

3.6 Current Overload Relay
Current overload relays are installed in order to protect the evaporator and condenser motors.

3.7 Non-fused Molded Case Switch with electromagnetic fuses or circuit breaker
It should be installed in place to protect the Conditioner.

3.8 Water Flow in the Condenser
The "flow-switch" must be calibrated to open the contacts when water flow falls below 90% of the condenser rated flow.

3.9 Copeland Compressor Internal Relief Valve
When pressure differential between suction and discharge reaches amounts from 375 to 450 psig this valve will open, communicating suction and discharge, relieving discharge pressure.

Operation

Refrigerant issued is R-407C
Indication normal conditions are those indicated below:

Table VII-01 - Normal Operating Conditions.

1, HIGH PRESSURE	200 to 340 PSIG
3, LOW PRESSURE	54 to 80 PSIG
4. SUPERHEATING	FROM 8 to 12 ºC
5. SUBCOOLING	FROM 5 to 10 ºC
6. LIQUID SIGHTGLASS	REFRIGERANT FLOW WITH NO GAS TRACES
7. VOLTAGE	SHOULD NOT EXCEED +/- 10% OF PLATE VOLTAGE
8. CURRENT	SHOULD NOT EXCEED PLATE CURRENT

Table VII-02 - Control Adjustment.

Control	Disarming	Rearming	Remarks
High Pressure Control	395 +/- 15 psig	280 +/- 20 psig	Air Condensation
Low Pressure Control	25 +/- 8 psig	80 +/- 12 psig	Wall Mounted
Pressure Control Switch	195 + / - 15 psig	275 + / - 275 psig	Wall Mounted
Motor Winding Thermostat	105 ºC	82 ºC	Wall Mounted
Compressor Discharge Thermostat	145 ºC	60 ºC	Wall Mounted

VIII-Maintenance (Periodical Preventive)

Perform all inspections and maintenance services during recommended intervals. This will extend the equipment working life and will decrease failure possibilities. Use the "Operation Data Reading Sheet" to record monthly operating conditions for this unit. The operation data sheet may be a valuable diagnostics tool for the technical assistance staff. By recording trends in operating conditions the operator may often predict and avoid situations and problems prior to their becoming serious.
If unit is not running properly see the Diagnostics Section.

Monthly-Maintenance
Run the equipment for about 15 minutes and with the system stabilized, check operating conditions by means of the following procedures:

☐ Clean the permanent air filters whenever needed once they are saturated. Disposable filters must be replaced.
☐ Clean the fan blade.
☐ Retighten all terminal screws.
☐ Clean the evaporator tray, the condensed water hose and drain.
☐ Check suction and discharge pressure with the manifold. See item "Checking Operating Conditions."
☐ Check the liquid line sightglass. Test for leaks and correct them if required. See item "Checking Operating Conditions".
☐ If operating conditions and the liquid sightglass indicate no gas, measure the system superheating and subcooling. See items "System Superheating" and "System Subcooling".
☐ If running conditions indicate an overload, slowly (in order to minimize oil losses) remove refrigerant through the liquid line Shrader service valve.

⚠ WARNING
In order to avoid accidents by freezing, avoid skin contact with refrigerant.

☐ Inspect the system for abnormal conditions. Use the reading sheet to record the unit conditions. A completed reading sheet is a valuable tool for technical assistance staff.

Quarterly-Maintenance
☐ Perform all monthly maintenance services.
☐ Check bearing fixing screws, adjust them if required.
☐ Clean the condenser whenever required.
☐ Clean the evaporator whenever required.
☐ Check and record fan and compressor motor service voltages and currents.
☐ Test safety controls.
☐ Check and record dry bulb and wet bulb temperature at evaporator inlet and outlet.
☐ Measure and record the system overheating.
☐ Measure and record the system subcooling.

Yearly-Maintenance
☐ Perform all recommended monthly and quarterly maintenance services.
☐ Have a qualified technician check each control adjustment and working and inspect and replace, if required, contactors or controls.
☐ Remove the cabinet panels and eliminate rust points.
☐ Change thermal insulation and gaskets that present failures.
☐ Retouch outdoor and indoor painting, if required.
☐ Eliminate rust.
☐ Inspect the expansion valve bulb for cleaning. Clean it if required. The bulb must have an excellent contact with the suction line and be properly insulated.
☐ Measure the compressor motor electric insulation.

Maintenance Procedures

Preventive Maintenance
This section describes maintenance procedures that should be performed as part of a unit normal maintenance schedule.

Air Filters
Permanent and washable filters, supplied with conditioners, should be cleaned in a water and neutral detergent solution.
Filters should be brushed inside the solution, rinsed in cold water and blown by a compressed air jet.
Disposable filters should be replaced.
Do not run the unit without the filters.

Liquid Sightglass
When it is bubbling it may indicate one of the following problems:
a. No refrigerant;
b. Filter drier clogged;
c. Expansion valve very open;
d. Low subcooling;
e. Presence of incondensable.
When it presents a yellow color, it indicates the presence of residual moisture in the refrigerant circuit.
Under normal operation, the sightglass should present no bubbling and a green coloring which indicates that the cooling system has the correct refrigerant load and is dehydrated.

Air Condenser
It should be cleaned with a smooth brush and a compressed air jet or water at low pressure in the normal air movement counter flow.
Move the hose downward and adjust its pressure so as not to deform the fins.

CAUTION
Do not crush the fins when cleaning them.

Corrective Maintenance
It will become easier to find the cause of the system malfunctioning by identifying which control opened the system.
Confirm it by checking lack of continuity through the indicated control.
Make sure the subject control is adjusted correctly and running adequately.

CAUTION
Never turn the equipment on prior to eliminating the cause of the presented defect.

Leakage Tests With Nitrogen
Leakage test should be performed after making the installation of split unit interconnection tubing, whenever the liquid sightglass presents bubbling or after the device undergoes repairs in the cooling circuit.
Use refrigerant as a testing element for detecting leaks and dry nitrogen to reach the testing pressure.

CAUTION
Always use the pressure regulating valve between the nitrogen cylinder and the pressure gauge set, never and under any circumstance, fail to use it.

Procedures
- Install the pressure-regulating valve in the nitrogen cylinder.
- Gradually inject this gas into the system until reaching a maximum pressure of 200 psig.
- Check for leaks in all welding points circuit flanges with soap foam that forms bubbles in the defective spots.
- The R-407C test is performed by injecting a 14 psig pressure with R-407C prior to placing the nitrogen pressure. Check for leaks with an electronic detector or halogen lamp.
- In case a leak is detected release the pressure, make the repair and perform a new test to make sure the leak has been eliminated.

CAUTION
Under no circumstance use oxygen or acetylene instead of dry nitrogen to test for leaks, a violent explosion may occur.

Evacuation
- Evacuation is required to remove water steam and non-condensable gases from the system.
- Use a rotary-type high vacuum pump.
- Install a pressure gauge-manifold set as indicated in refrigeration cicle figure .
- A minimum one-hour vacuum time is recommended to make the first reading. Evacuation will only be completed once final vacuum is between 250 and 500 microns. As a release test, the pump valve should be closed for 5 minutes and vacuum should not increase more than 100 microns.
- Open valves A-B-D-E;
- Close valve C.

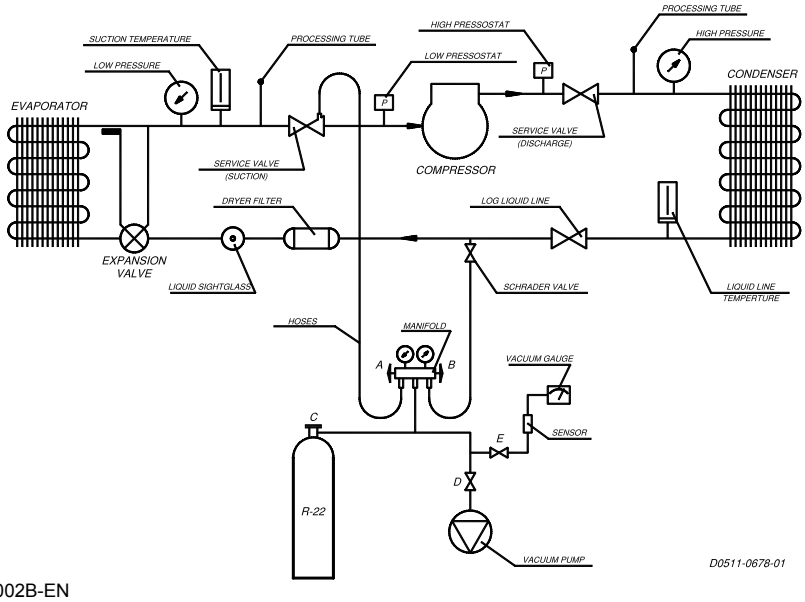
Refrigerant Load
To perform the refrigerant load accurately, use a balance to weight the refrigerant in a cylinder or in a graded bottle.
The quantity will depend on the unit's model and dimensions of the piping. Before filling it with refrigerant, be sure that the equipment is in vacuum and free of leaks.

Liquid Refrigerant Load
The load of liquid refrigerant is made with the compressor stopped, by means of the liquid line Schrader valve. Control its inlet with the register of pressure gauges set. The initial load of the system must be performed with liquid refrigerant.
Start the unit and watch its pressures and temperatures to be sure that it is operating normally.
Open the registers C-B and lock A-D-E registers - figure 5.

Stream Refrigerant Load
The load of steam refrigerant is made with the suction standard isolation valve and with the compressor on. Usually, this system is used for partial refrigerant loads.

WARNING
Weight the refrigerant cylinder before and after loading it.

Figure VIII-01 - Refrigeration Cicle.



Open the registers C-A. Lock A-D-E.
The refrigerant load will only be correct when the high, low, overheat and subcooling pressures are inside the normal operation range.

Subcooling Calculation
Subcooling is the difference between the saturated condensing temperature (TSC) and the liquid line temperature (TLL).

- Take the saturated condensation temperature that corresponds to the pressure indicated by the high pressure gauge.
- Take the liquid line temperature indicated in the thermocouple, before the filter drier.
- Calculate the difference.
SUB = TSC - TLL
- The result must be between 5 and 10ºC

Overheating Calculation
Overheat is the difference between the suction line temperature (TSL) and the saturated evaporation temperature (TSET).

- Take the suction temperature indicated by the thermocouple about 10 cm away from the compressor.
- Take the saturated evaporation temperature that corresponds to the pressure indicated by the low pressure gauge.
- Calculate the difference.
SUP = TSL - TSET

The result must be between 8 and 12ºC.

If the subcooling and overheating found values do not match the range established, proceed to correct it.

CAUTION
Do not run the compressor without any refrigerant inside the circuit. Damage may occur in the compressors.

WARNING
Never apply flames to the refrigerant cylinder to raise its pressure. Heating without control may cause an excessive pressure and explosion, resulting in hurts, death and damage to the equipment.

WARNING
Do not allow any contact of the liquid refrigerant with skin. If it happens, take care of the wound as if it were an open sore produced by freezing or chilling. Slowly heat the affected area with warm water.

CAUTION
Do not allow liquid refrigerant to get into the suction line. Too much liquid may damage the compressor.

Tabla VIII - 01 - Superheating and subcooling settings.

Activity	Overheating		Sub cooling	
	Increases	Reduces	Increases	Reduces
Open expansion valve		X		X
Lock expansion valve	X		X	
Put R-407c refrigerant		X	X	
Remove R-407c refrigerant	X			X

Tabla VIII - 02 - From Pressure (PSGI) x Temperature (ºF) To R-407C.

PSIG	Sat. Liq. (°C)	Sat Ste. (°C)	PSIG	Sat. Liq. (°C)	Sat Ste. (°C)
30	-17,2	-10,6	165	27,2	32,2
32	-16,1	-9,4	170	27,8	33,3
34	-15,0	-8,3	175	28,9	34,4
36	-13,9	-7,2	180	30,0	35,6
38	-12,8	-6,1	185	31,1	36,1
40	-11,7	-5,0	190	32,2	37,2
42	-10,6	-3,9	195	32,8	38,3
44	-9,4	-3,3	200	33,9	38,9
46	-8,9	-2,2	205	35,0	40,0
48	-7,8	-1,1	210	35,6	40,6
50	-6,7	-0,6	215	36,7	41,7
52	-6,1	0,6	220	37,2	42,2
54	-5,0	1,7	225	38,3	43,3
56	-4,4	2,2	230	38,9	43,9
58	-3,3	2,8	235	40,0	45,0
60	-2,8	3,9	240	40,6	45,6
62	-1,7	4,4	245	41,7	46,7
64	-1,1	5,6	250	42,2	47,2
66	0,0	6,1	255	43,3	47,8
68	0,6	6,7	260	43,9	48,9
70	1,1	7,8	265	44,4	49,4
75	3,3	9,4	270	45,6	50,0
80	5,0	11,1	275	46,1	50,6
85	6,7	12,8	280	46,7	51,7
90	7,8	13,9	285	47,8	52,2
95	9,4	15,6	290	48,3	52,8
100	11,1	17,2	295	48,9	53,3
105	12,8	18,3	300	49,4	53,9
110	13,9	20,0	310	51,1	55,6
115	15,0	21,1	320	52,2	56,7
120	16,7	22,2	330	53,9	57,8
125	17,8	23,9	340	55,0	58,9
130	18,9	25,0	350	56,1	60,6
135	20,6	26,1	360	57,2	61,7
140	21,7	27,2	370	58,9	62,8
145	22,8	28,3	380	60,0	63,9
150	23,9	29,4	390	61,1	65,0
155	25,0	30,6	400	62,2	66,1
160	26,1	31,7	425	65,0	68,3

Maintenance Procedures

New Compressor Instalation
The compressor may present basically two kinds of problems: mechanical or electrical.
Both will require the replacement of the compressor. However, keep in mind that it is not enough to replace it; you have always to try to find and eliminate the origin(s) of the fault.

Mechanical Failure
If the compressor does not have standard isolation valves, transfer the refrigerant to an adequate cylinder and perform a pressurization test (maximum of 200 psig to protect the low pressure control). Make a new vacuum, refrigerant load and a second start with all readings.
Correct the region of the installation that may have damaged the equipment, letting it free for operation and keep an accredited company to follow the procedures.
In case the compressor has standard isolation valves, the refrigerant can be maintained in the circuit.

1.1 Turn off the compressor's electrical circuit and take out the electrical cables (mark them);
1.2 Lock the compressor's suction and discharge valves;
1.3 Disconnect the compressor's standard isolation valves with the suction and discharge piping.
1.4 Remove the compressor;
1.5 Install the new compressor
1.6 Install the electrical circuit and the pressure control cruppers;
1.7 Evacuate the compressor
1.8 Open the compressor's valves.

Motor Combustion
The combustion of the motor involves the forming of acids and the settling of oxides and sediments in some places in the circuit. That is the reason why it is necessary to replace the refrigerant and the oil, to clean all the circuit and to put filter driers anti HH acid in the suction and in the liquid line.

In this case, the cleaning must be performed as follows:
2.1. Get all the refrigerant and put it in a cylinder and send to the manufacturer to be recycled, or make your own recycling with your equipment.
2.2. Withdraw the compressor;
2.3. Withdraw the filter drier;
2.4. Install the proper filter in the suction line of the compressor and replace the one of the liquid line.
2.5. Install the new or reconditioned compressor, evacuate and load the system;
2.6. Check the contactor. The contacts must be cleaned or replaced;
2.7. Put the equipment in operation and watch it;
2.8. Check the loss of pressure by means of the suction filter. If the loss of pressure exceeds the manufacturer recommendations, the filter must be replaced.
2.9. After 8 hours of operation, the oil must be analyzed. After 30 minutes, we recommend that you gauge the electrical isolation of the compressor motor.
2.10. Replace the oil and the filters each 48 hours until the oil is totally acid-free ;
2.11. Withdraw the suction filter.

CAUTION
NEVER FREE THE GAS IN THE ATMOSPHERE.

IX-Tools and Equipment

Necessary Tools

- Set of pipe wrench 7/16 to 1 1/14";
- Torque meter with scale up to 180 ft/bf;
- Adjustable screw wrench 6" and 12";
- Cock spanner 14";
- Complete set of hollow setscrew key;
- Set of screwdrivers;
- Set of pliers, universal, cutting, pressure, and wire pealer;
- Tube flange set;
- Ratchet-spanner for refrigeration;
- Set of fixed wrenches from 1/4 to 1 1/4";
- Set of star wrenches from 1/4 to 9/16".

Necessary Equipment

- Pressure regulator for nitrogen
- 5 cfm vacuum pump
- Electronic vacuum gauge;
- Megohmmeter 500 volts with scale from 0 to 1000 megohms;
- Electronic leak detector;
- Ammeter pliers;
- Complete manifold;
- Electronic thermometer;
- R-407C refrigerant and Trane 48 oil;
- Oxyacetylene welder equipment;
- Table of pressure and temperature of R-407C freon;
- Refrigerant gas transferer or recuperator;
- Anemometer;
- Psychrometer;
- Sheave remover;
- Manual oil pump.

X-Diagnostics

WARNING

Turn off the electrical power and wait until all the equipment in operation stops before servicing, checking or testing the unit.

Problems Analysis/System Checks

Before using the equipment irregularities analysis tables, which are described below, make the following analysis.

1.Measure the voltage of the compressor's terminals and of the fan with the unit in operation. The voltage must be inside the motor range showed in the board.
Its unbalance must be less than 2%'.

2. Check if all wiring and connections are in good conditions of use and well tightened. The electrical scheme is posted on the back cover of the board.

3. Check if all the fuses are correctly installed and sized.

4. Check if all air filters and coils are clean and assure that the air flux is not blocked up.

5. If the unit is not operating, put the command switch in the OFF position. Wait a little so the internal sensors of the compressor get cold.

6. Check the thermostat adjustments.

7. Check if fans are rotating in the correct direction.

8. Inspect the controls of the air outlets (if any).

9. Measure the return air.

Operation Procedures

Install the high and low pressure gauges in the Schrader valves of the liquid and suction lines. When the unit is stable (after 15 minutes of operation at full load), write down the suction and discharge pressures. System failures like lack of air, restriction in the filter drier and malfunctioning of the expansion valve make the pressures get out of the appropriate range.

Unballanced Voltage

Excessive unbalancing between the phases of a three-phase system will cause an overheating in the motors and the possibility of failure. The maximum unbalancing allowed is 2%. Unbalancing of voltage can be defined as 100 times the maximum deviation of the three voltages (three phases) in relation to the arithmetic mean of them (without considering the signal) divided by the arithmetical mean.

Example

If the three voltages measured in a line are 221 volts, 230 volts and 227 volts, the arithmetical mean should be:

(221 + 230 + 227) / 3 = 226 volts

The unbalance percentage is 100 x (226 - 221) = 2,2 %.
The result shows that there is an unbalancing 0,2 % higher than the maximum allowed (2 %). This unbalancing between phases may result in a current unbalancing of 20 %, which causes an increase of the motor winding temperature and a reduction of its working life.

XI-Troubleshooting

A. Condenser Fan Does Not Start

Symptoms	Possible Cause	Procedure
1. The voltmeter does not read voltage supply	1. No power.	1. Check the power supply.
2. The voltmeter does not read voltage supply to the contactors	2. Non-fused molded case switch is OFF	2. Turn non-fused molded case switch ON.
3. The voltmeter reads voltage before the fuses, but not after them.	3. Burnt out fuse.	3. Replace fuses. Check motor load.
4. The voltmeter reads low voltage.	4. Low voltage.	4. Contact the Power Company.
5. There is voltage in the motor terminals, but it does not start.	5. Burnt out motor.	5. Replace it.
6. Start contactor does not close.	6. Check the commands and if the contactor coil is burnt out.	6. Repair or replace it.
7. Contactor does not energize.	7. Overload relay's contact is open.	7. Reset the overload relay.

B. Compressos Does Not Start

Symptoms	Possible Cause	Procedure
1. Electrical circuit test reveals there is no voltage on the motor start switch's line side.	1. No power.	1. Check the power supply.
2. Electrical circuit test reveals there is no voltage on the motor start switch line side.	2. Non-fused molded case switch is OFF.	2. Find out why the non-fused molded case switch was opened.
3. Electrical circuit test reveals there is voltage on line side, but not on the fuse load side.	3. Burnt out fuse.	3. Replace fuses. Check motor load.
4. The voltmeter reads low voltage.	4. Low voltage.	4. Call the Power Company.
5. There is voltage in the motor terminals, but it does not start	5. Burnt out motor.	5. Repair or replace it.
6.. Start switch inoperative.	6. Test to check there are no burnt out coils or broken contacts.	6. Repair or replace it.
7. The start switch coil does not receive power.	7. Control circuit is open.	7. Find out what control turned it off and the cause.
	7.1. High pressure control.	
	7.2. Low pressure control.	
	7.3. Limit pressure control.	
	7.4. Motor protections.	
	7.5. Interlocking circuit open.	
8. Compressor does not run.	8. The compressor is jammed or damaged.	8. Repair or replace the compressor.
9. Low pressure control contacts open.	9. Suction pressure is below the control point of the pressure control.	9. Check for loss of refrigerant, repair the leak and reload.
10. High pressure control contacts open. High pressure above normal.	10. Head pressure above the high pressure control point.	10. See problem G.
11. Start switch circuit does arm.	11. Overload relays contacts are open.	11. Rearm the relay, the RCM and check for the cause.
12. The system does not start.	12. Contacts of the flow switch are open.	12. Restore the water flow and check the flow switch operation. Check the switches.

Troubleshooting

C. Compressor Runs Intermittently

Symptoms	Possible Cause	Procedure
1. Normal operation, except for frequent stops and starts.	1. Intermittent contact in the control circuit (bad electrical contact).	1. Repair or replace the defective control.
2. Idem.	2. Low pressotat diferencial too tight.	2. Set diferencial to the same condition as normal.
3. The solenoid valve hisses when closed. There is also change in the refrigerant line temperature through the valve.	3. Leaking in the liquid line solenoid valve.	3. Repair or replace it.
4. Normal operation except for too frequent stops and starts by low pressure. Bubbles in the sightglass.	4. It lacks refrigerant.	4. Repair the refrigerant leak and reload.
5. Suction pressure too low and ice forming in the drier.	5. Dryer in the liquid line is clogged.	5. Replace the drier core.

D. Compressor Runs Continuously

Symptoms	Possible Cause	Procedure
1. High temperature in the conditioned area.	1. Excessive load.	1. Check for outdoor air infiltration. Check the area thermal insulation for inadequacy.
2. Low temperature in the conditioned area.	2. Thermostat is set to an excessive low temperature.	2. Repair or replace it.
3. Low temperature in the conditioned space.	3. Start switch contacts jammed.	3. Repair or replace the contactor.
4. Conditioned site is too cold.	4. Solenoid valve in the liquid line is open and stuck.	4. Repair or replace the valve.

E. Compressor With Too Low Oil Level

Symptoms	Possible Cause	Procedure
1. Oil level is too low.	1. Insufficient oil load.	1. Add a sufficient amount of the compressor appropriate oil.
2. Oil level drops gradually.	2. Filter drier clogged.	2. Replace the filter drier.
3. Suction excessively cold.	3. Expansion valve bulb is loose (bad thermal contact).	3. Produce a good contact between the remote bulb and the suction line.
4. Same as previous item and noisy operation of the compressor.	4. Return of liquid to the compressor.	4. Reset the superheat, subcooling, or check the remote bulb contact of the expansion valve.
5. Starts and stops excessively frequent.	5. The compressor starts and stops frequently.	5. See related problems in problem “C”.

Troubleshooting

F. Compressor Is Noisy

Symptoms	Possible Cause	Procedure
1. Rattling noises.	1. It lacks oil.	1. Add oil.
2. Excessive noise.	2. Compressor internal parts broken.	2. Replace the compressor.
3. Excessively cold suction line.	3. Liquid is returning to the compressor.	3. Check and adjust the superheating. The valve may be too big or the remote bulb may be loose in the suction line.
4. Excessively cold suction line. The compressor vibrates.	4. Expansion valve stuck in the open position.	4. Repair or replace it.

G. System Has Deficient Throughput

Symptoms	Possible Cause	Procedure
1. Expansion valve hisses.	1. Bubbles in the liquid.	1. Add refrigerant.
2. Change of temperature in the refrigerant line through the filter drier or the solenoid blocking valve.	2. Filter drier or the solenoid blocking valve is clogged.	2. Clean or replace it.
3. Short cycling.	3. Expansion valve is stuck or clogged.	3. Repair or replace the expansion valve.
4. Superheating is too high.	4. Excessive pressure drop in the evaporator.	4. Check superheating and readjust the expansion valve.
5. Supply air temperature too high or too low .	5. Inadequate superheating.	5. Check the superheating. Adjust the expansion valve.
6. Reduced air flow . Evaporation temperature below zero.	6. Clogged air filters.	6. Clean or replace them.

H. Discharge Pressure Too High

Symptoms	Possible Cause	Procedure
1. High air temperature through the condenser.	1. Small airflow through the condenser.	1. Readjust the flow . Check for obstructions.
2. Air coming out of the condenser excessively cold. Small rise in temperature through the condenser.	2. Dirty condenser fins.	2. Clean the fins.
3. Air coming out of the condenser in high temperature.	3. Malfunction in the condenser fans.	3. Check the motors of the condenser fans.
4. Condenser exceptionally hot and excessive discharge pressure.	4. Air or non-condensable gases in the system.	4. Transfer refrigerant for recycling. Produce new vacuum and load the system.
5. Same as above.	5. Excessive refrigerant load.	5. Gradually remove the excess refrigerant. Normal subcooling is from 6 to 10 oC.
6. Dirty tubes in the “Shell and Tube” condenser.	6. Water is coming out too cold from condenser. Small rise in temperature through the condenser.	6. Clean condenser tubes.
7. Cooling tow er malfunction.	7. Water enters the condenser at high temperature.	7. Check the tow er fan motor, the starting device and the thermostat.

Troubleshooting

I. Discharge Pressure Too Low

Symptoms	Possible Cause	Procedure
1. Small rise in water temperature through the condenser.	1. Excessive water flow through the condenser	1. Readjust the flow and the project's pressure drop.
2. Small rise in air temperature through the condenser.	2. Excessive airflow through the condenser.	2. Readjust the flow and the project's pressure drop.
3. Bubbles in the sightglass.	3. Lacking refrigerant.	3. Repair leak and reload.
4. Temperature of air entering the condenser is too low.	4. Outdoor air temperature is too high.	4. Install an automatic pressure regulator.
5. Compressor discharge or suction valves broken or leaking.	5. Suction pressure rises more rapidly than 5 psig per minute after a stop.	5. Remove head, check the valves and replace the ones that are not operating properly.

J. Suction Pressure Too High

Symptoms	Possible Cause	Procedure
1. Abnormally Cold suction line. Liquid returns to compressor.	1. Excessive flow in the expansion valve.	1. Regulate and adjust the expansion valve superheating and check if the bulb is properly attached to the suction line.
2. Same as above.	2. Expansion valve is stuck in the open position.	2. Repair or replace the expansion valve.
3. Suction line abnormally cold. Liquid is returning to the compressor.	3. Expansion valve is stuck.	3. Repair or replace the valve.
4. Compressor is noisy.	4. Suction valves broken in the compressor.	4. Remove head, check the valves and replace the ones that are inoperative.
5. Suction line abnormally cold. Liquid is returning to the compressor.	5. Excessive flow in the expansion valve.	5. Regulate the superheating setting of the expansion valve and check if the bulb is properly attached to the suction line.

K. Suction Pressure Too Low

Symptoms	Possible Cause	Procedure
1. Bubbles in the sightglass.	1. Lacking refrigerant.	1. Repair the leak and reload.
2. Compressor enters short cycling.	2. Poor thermal load in the chiller.	2. See item B.
3. Change in temperature in the liquid line through the drier or the solenoid blocking valve.	3. Liquid line drier clogged or restriction in the solenoid valve.	3. Replace the filter drier or the solenoid valve.
4. There is no refrigerant flow through the valve.	4. The expansion valve remote bulb has lost its load.	4. Replace the expansion valve.
5. Capacity loss.	5. Expansion valve is obstructed.	5. Clean the valve and replace it if required.
6. Conditioned ambient is too cold.	6. RCM's potentiometer is set too low.	6. Adjust or replace it if required.
7. Superheating too high.	7. Excessive drop in pressure through the chiller.	7. Readjust the superheating.
8. Low airflow.	8. Filter is clogged.	8. Clean or replace the filter.

Troubleshooting

L. Scroll Compressor Excessive Consumption

Symptoms	Possible Cause	Procedure
1. High temperature in the conditioned area.	1. It is operating with excessive thermal load.	1. Check for air infiltrations and thermal insulation in the area.
2. Excessive consumption.	2. It is operating with low voltage.	2. Ensure the voltage is within the utilization range. In case it is not, call the Power Company.
3. Excessive consumption.	3. Overload relay disarms.	3. Check operation. Replace relay if required.

M. Scroll Compressor's Low Consumption

Symptoms	Possible Cause	Procedure
1. Little change in the high and low pressures.	1. The compressor is turning counterclockwise.	1. Swap two phases.
2. Suction pressure is extremely low.	2. Check for restrictions and lack of refrigerant.	2. Eliminate leaks and complete the load. Eliminate restrictions.
3. Compressor does not pump and the suction and discharge pressures are low. The compressor is correctly phased.	3. Compressor is damaged.	3. Check oil condition and replace compressor.

N. Thermostat Winding Opens With Scroll Compressor

Symptoms	Possible Cause	Procedure
1. Compressor vibrates and makes noise.	1. The compressor is phased counterclockwise.	1. Swap two phases.
2. Suction pressure is low.	2. Lack of gas and motor overheat.	2. Eliminate leaks and load gas.
3. Suction pressure is low.	3. Compressor starts repeatedly, opening the motor internal thermostat.	3. Same as above.

O. Scroll Compressor With Incorrect Phasing

Symptoms	Possible Cause	Procedure
1. Low ampere rating. High and low pressures change little. Rattling sounds. Compressor vibrates excessively.	1. The compressor is turning counterclockwise.	1. Swap two phases.

Tab. XII-01 - Electric Characteristic - 50 Hz.

	Model		SWMB 020		SWMB 030		SWMB 040	SWMB 050	SWMB 020	SWMB 030	SWMB 040	SWMB 050	SWMB 020	SWMB 030	SWMB 040	SWMB 050
	Voltage	V	220						380				440			
	Phases	Unid.	1	3	1	3	3	3	3				3			
Nominal values Operation	Compressor	KW	2,16	2,08	3,07	2,99	3,52	4,32	2,08	2,99	3,52	4,32	2,08	2,99	3,52	4,32
		RLA	9,08	6,25	14,11	9,15	11,05	14,20	3,60	5,29	6,38	8,21	3,13	4,58	5,52	7,10
	Evaporator's Motor Fan(1)	KW	0,30	0,40	0,30	0,40	0,58	0,57	0,40	0,40	0,58	0,57	0,40	0,40	0,58	0,57
		FLA	2,23	2,23	2,22	2,22	3,12	3,09	2,23	2,22	3,12	3,09	2,23	2,22	3,12	3,09
	Condenser's Motor Fan(1)	KW	0,42	0,42	0,42	0,42	0,59	0,58	0,42	0,42	0,59	0,58	0,42	0,42	0,59	0,58
		FLA	2,49	2,49	2,48	2,48	2,95	2,97	2,49	2,48	2,95	2,97	2,49	2,48	2,95	2,97
	Total	KW	2,88	2,90	3,79	3,81	4,69	5,47	2,90	3,81	4,69	5,47	2,90	3,81	4,69	5,47
		FLA	13,80	10,97	18,81	13,85	17,12	20,26	8,32	9,99	12,45	14,27	7,85	9,28	11,59	13,16
Values of Startup	Compressor	LRA	76,00	62,00	104,00	88,00	115,00	128,00	35,90	50,95	66,58	74,11	31,00	44,00	57,50	64,00
	Evaporator's Motor Fan(1)	LRA	10,50	10,50	10,50	10,50	10,50	10,50	10,50	10,50	10,50	10,50	10,50	10,50	10,50	10,50
	Condenser's Motor Fan(1)	LRA	10,50	10,50	10,50	10,50	10,50	10,50	10,50	10,50	10,50	10,50	10,50	10,50	10,50	10,50
	Total	LRA	97,00	83,00	125,00	109,00	136,00	149,00	56,89	71,95	87,58	95,11	65,00	10,50	78,50	85,00
Maximum values Operation (Critical temperature)	Compressor	KW	2,65	2,55	4,40	4,32	5,05	6,21	2,55	4,32	5,05	6,21	2,55	4,32	5,05	6,21
		RLA	10,80	7,45	18,99	12,32	14,68	18,48	4,30	7,11	8,46	10,67	3,73	6,16	7,34	9,24
	Evaporator's Motor Fan(1)	KW	0,40	0,40	0,40	0,40	0,58	0,57	0,40	0,40	0,58	0,57	0,40	0,40	0,58	0,57
		FLA	2,23	2,23	2,22	2,22	3,12	3,09	2,23	2,22	3,12	3,09	2,23	2,22	3,12	3,09
	Condenser's Motor Fan(1)	KW	0,42	0,42	0,42	0,42	0,59	0,58	0,42	0,42	0,59	0,58	0,42	0,42	0,59	0,58
		FLA	2,49	2,49	2,48	2,48	2,95	2,97	2,49	2,48	2,95	2,97	2,49	2,48	2,95	2,97
	Total	KW	3,47	3,47	5,22	5,14	6,22	7,36	3,37	5,14	6,22	7,36	3,37	5,14	6,22	7,36
		FLA	15,52	12,17	23,69	17,02	20,75	24,54	9,02	11,81	14,53	16,73	8,45	10,86	13,41	15,30
Resistance the Heating Reheating	3,0 KW	KW	3,00	3,00	3,00	3,00	3,00	3,00	3,00	3,00	3,00	3,00	3,00	3,00	3,00	3,00
		FLA	13,64	7,87	13,64	7,87	7,87	7,87	4,55	4,55	4,55	4,55	3,94	3,94	3,94	3,94
	4,5 KW	KW	4,50	4,50	4,50	4,50	4,50	4,50	4,50	4,50	4,50	4,50	4,50	4,50	4,50	4,50
		FLA	20,45	11,81	20,45	11,81	11,81	11,81	6,82	6,82	6,82	6,82	5,91	5,91	5,91	5,91
Total (Equip.) Res. of (Calef.)	3,0 KW	KW	5,88	5,90	6,79	6,81	7,69	8,47	5,90	6,81	7,69	8,47	5,90	6,81	7,69	8,47
		FLA	27,44	18,84	32,45	21,72	24,99	28,13	12,87	14,54	17,00	18,82	11,79	13,22	15,53	17,10
	4,5 KW	KW	7,38	7,40	8,29	8,31	9,19	9,97	7,40	8,31	9,19	9,97	7,40	8,31	9,19	9,97
		FLA	34,25	22,78	39,26	25,66	28,93	32,07	15,14	16,81	19,27	21,09	13,76	15,19	17,50	19,07

Notes:
(1)Both evaporator's fan and condenser's fan motor are always 220V one-phase, for all equipments supply
RLA- Rated Load Amps(A).
LRA - Locked Rated Amps (Start) (A).
FLA - Full Load Amps (Exterior Air Temperature 43°C) (A).

Electric Characteristic

60 Hz

Tab. XII-02 - Electric Characteristic - 60 Hz.

	Model		SWMB 020		SWMB 030		SWMB 040	SWMB 050	SWMB 020	SWMB 030	SWMB 040	SWMB 050	SWMB 020	SWMB 030	SWMB 040	SWMB 050
	Voltage	V	220						380				440			
	Phases	Unid.	1	3	1	3	3	3	3				3			
Nominal values Operation	Compressor	KW	2,60	2,50	3,70	3,60	4,20	5,20	2,50	3,60	4,20	5,20	2,50	3,60	4,20	5,20
		RLA	10,60	7,30	16,50	10,70	12,80	16,60	4,20	6,18	7,39	9,60	3,65	5,35	6,40	8,30
	Evaporator's Motor Fan(1)	KW	0,48	0,48	0,48	0,48	0,69	0,69	0,48	0,48	0,69	0,69	0,48	0,48	0,69	0,69
		FLA	2,60	2,60	2,60	2,60	3,61	3,61	2,60	2,60	3,61	3,61	2,60	2,60	3,61	3,61
	Condenser's Motor Fan(1)	KW	0,51	0,51	0,51	0,51	0,70	0,70	0,51	0,51	0,70	0,70	0,51	0,51	0,70	0,70
		FLA	2,90	2,90	2,90	2,90	3,42	3,42	2,90	2,90	3,42	3,42	2,90	2,90	3,42	3,42
	Total	KW	3,59	3,49	4,69	4,59	5,59	6,59	3,49	4,59	5,59	6,59	3,49	4,59	5,59	6,59
		FLA	16,10	12,80	22,00	16,20	19,83	23,63	9,70	11,68	14,42	16,63	9,15	10,85	13,43	15,33
Values of Startup	Compressor	LRA	76,00	62,00	104,00	88,00	115,00	128,00	35,90	50,95	66,58	74,11	31,00	44,00	57,50	64,00
	Evaporator's Motor Fan(1)	LRA	10,50	10,50	10,50	10,50	10,50	10,50	10,50	10,50	10,50	10,50	10,50	10,50	10,50	10,50
	Condenser's Motor Fan(1)	LRA	10,50	10,50	10,50	10,50	10,50	10,50	10,50	10,50	10,50	10,50	10,50	10,50	10,50	10,50
	Total	LRA	97,00	83,00	125,00	109,00	136,00	149,00	56,90	71,95	87,58	95,11	52,00	65,00	78,50	85,00
Maximum values Operation (Critical temperature)	Compressor	KW	3,18	3,06	5,30	5,20	6,02	7,47	3,06	5,20	6,02	7,47	3,06	5,20	6,02	7,47
		RLA	12,60	8,70	22,20	14,40	17,00	21,60	5,02	8,31	9,80	12,47	4,35	7,20	8,50	10,80
	Evaporator's Motor Fan(1)	KW	0,48	0,48	0,48	0,48	0,69	0,69	0,48	0,48	0,69	0,69	0,48	0,48	0,69	0,69
		FLA	2,60	2,60	2,60	2,60	3,61	3,61	2,60	2,60	3,61	3,61	2,60	2,60	3,61	3,61
	Condenser's Motor Fan(1)	KW	0,51	0,51	0,51	0,51	0,70	0,70	0,51	0,51	0,70	0,70	0,51	0,51	0,70	0,70
		FLA	2,90	2,90	2,90	2,90	3,42	3,47	2,90	2,90	3,42	3,47	2,90	2,90	3,42	3,47
	Total	KW	4,17	4,05	6,29	6,19	7,41	8,86	4,05	6,19	7,41	8,86	4,05	6,19	7,41	8,86
		FLA	18,10	14,20	27,70	19,90	24,03	28,68	10,52	13,81	16,83	19,55	9,85	12,70	15,53	17,88
Resistance the Heating Reheating	3,0 KW	KW	3,00	3,00	3,00	3,00	3,00	3,00	3,00	3,00	3,00	3,00	3,00	3,00	3,00	3,00
		FLA	13,64	7,87	13,64	7,87	7,87	7,87	4,55	4,55	4,55	4,55	3,94	3,94	3,94	3,94
	4,5 KW	KW	4,50	4,50	4,50	4,50	4,50	4,50	4,50	4,50	4,50	4,50	4,50	4,50	4,50	4,50
		FLA	20,45	11,81	20,45	11,81	11,81	11,81	6,82	6,82	6,82	6,82	5,91	5,91	5,91	5,91
Total (Equip.) Res. of (Calef.)	3,0 KW	KW	6,59	6,59	7,69	7,59	8,59	9,59	6,49	7,59	8,59	9,59	6,49	7,59	8,59	9,59
		FLA	29,74	20,67	35,64	24,07	27,70	31,50	14,25	16,23	18,97	21,18	13,09	14,79	17,37	19,27
	4,5 KW	KW	8,09	7,99	9,19	9,09	10,09	11,09	7,99	9,09	10,09	11,09	7,99	9,09	10,09	11,09
		FLA	36,55	24,61	42,45	28,01	31,64	35,44	16,52	18,50	21,24	23,45	15,06	16,76	19,34	21,24

Notes:
(1)Both evaporator's fan and condenser's fan motor are always 220V one-phase, for all equipments supply
RLA- Rated Load Amps(A).
LRA - Locked Rated Amps (Start) (A).
FLA - Full Load Amps (Exterior Air Temperature 43°C) (A).

XIII-Electrical Diagrams

SWMB Electrical Diagrams

We explain the control sequence of the SWMB

The conditioner is turned on when the System Control sends a signal to the borne 2 on the panel. The C1 contactor that supplies the evaporator fan will be energized by the d5 21-24 or d1 11-14 (parallel) contacts that are serial with the RS1 overload relay.

The d5 auxiliary contactor parallel with C3 closes the NA 11-14 serial contacts with NF 61-62 contacts of the CE that maintains the unit damper in the recirculating air position.

If the system control thermostat requires cooling, it will supply the 3 terminal that energizes the C3 condenser compressor/ fan contactor, by means of the CS safety contactor NA 53-54 contact and the d2 auxiliary contactor d2 11-14 contact (which, in turn, is serial with the PA (high pressure),PB.RS3 (low pressure) safety contactors) and by the C1 fan contactor NA 63-64 contact.

The CS safety contactor is energized only when there is three-phase voltage, by means of the SST, NA 11-14 contacts being timed by the RT 2 time relay.

If the Power Company lacks three-phase power, the unit panel will be supplied by means of the customer's emergency single-phase voltage and the STT closes the NF 11-12 contacts and through C1 NA 13-14 contacts turns on the emergency contactor that starts the evaporator fan.

The CE contactor closes the NA contact that opens the damper, allowing the inlet of outdoor air.

If the temperature in the room is met, the thermostat turns the 3 terminal power off, which causes the condenser compressor and fan to shut down, only the evaporator fan remaining running as it waits for a new cooling cycle.

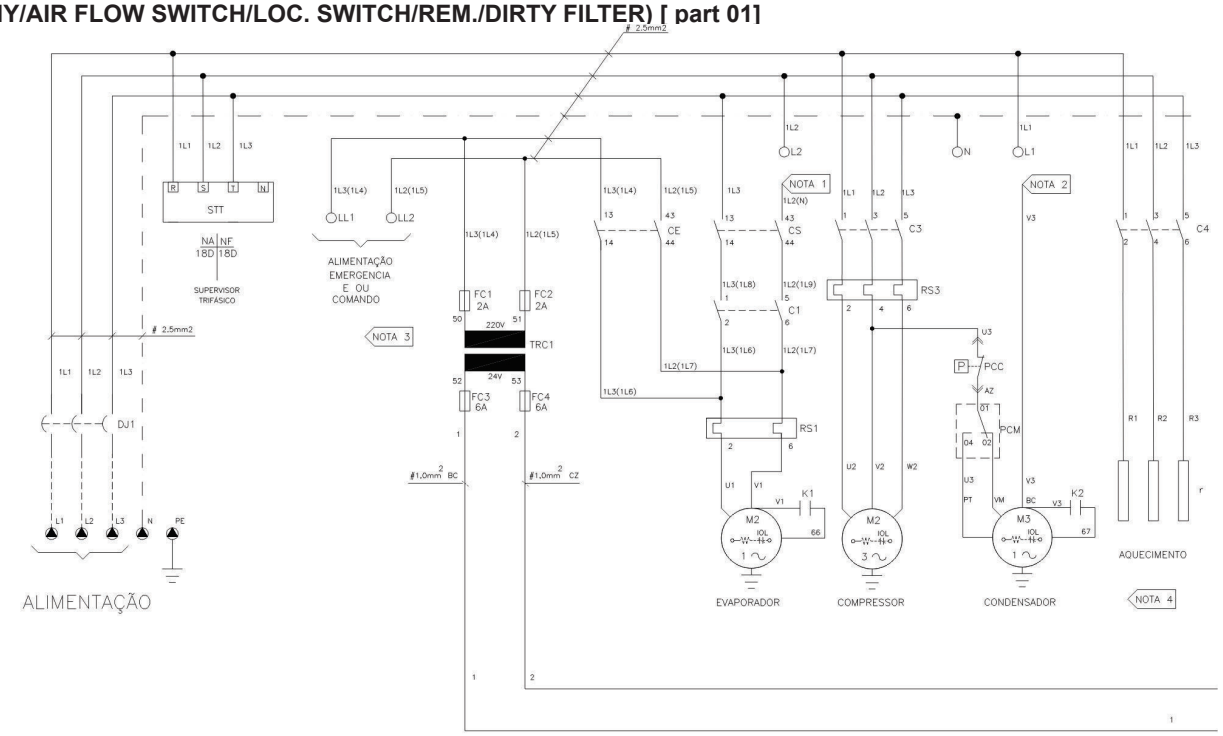
The Wall Mounted turns off when the system control stops sending the signal to the panel 2 borne.

The C4 heating contactor turns on when the 16 terminal is supplied with power and by means of d4 auxiliary contactor d4 11-14 contact that is serial with the heating safety contactors (TS, MFA).

In cases in which the customer's electronic system does not operate, the Wall Mounted has a local/remote control system installed. Press the button to place it in the local position and turn on the cool and/or heat switch, if necessary.

Electrical Diagrams

Fig. XIII-01 - Three-Phase Electrical DiagramEsquema Elétrico, Power/Command (STD/HEAT/EMERGENCY FAN./ ENTALPHY/AIR FLOW SWITCH/LOC. SWITCH/REM./DIRTY FILTER) [part 01]



ANOTAÇÕES GERAIS

NOTA 1

- QUANDO A ALIMENTAÇÃO FOR 220V LIGAR ESTE FIO (1L2) NO BORNE (L2).
- QUANDO A ALIMENTAÇÃO FOR 380/440V LIGAR ESTE FIO (N) NO BORNE (NEUTRO) NEUTRO AZUL.

NOTA 2

- QUANDO A ALIMENTAÇÃO FOR 220V LIGAR ESTE FIO (V3) NO BORNE (L1).
- QUANDO A ALIMENTAÇÃO FOR 380/440V LIGAR ESTE FIO (V3) NO BORNE (N) NEUTRO AZUL.

NOTA 3

- QUANDO HOUVER ALIMENTAÇÃO EMERGÊNCIA 220VAC LIGAR OS 02 FIOS NOS BÓRNES LL1 e LL2.
- SOMENTE QUANDO NÃO HOUVER ALIMENTAÇÃO DE EMERGÊNCIA E A TENSÃO DA REDE PRINCIPAL FOR 220VAC: JUMPEAR O BÓRNE LL1 com L1 e LL2 com L2.
- SOMENTE QUANDO NÃO HOUVER ALIMENTAÇÃO DE EMERGÊNCIA E A TENSÃO DA REDE PRINCIPAL FOR 380VAC: JUMPEAR O BÓRNE LL1 com L1 e LL2 com N.

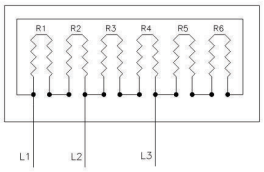
NOTA 4

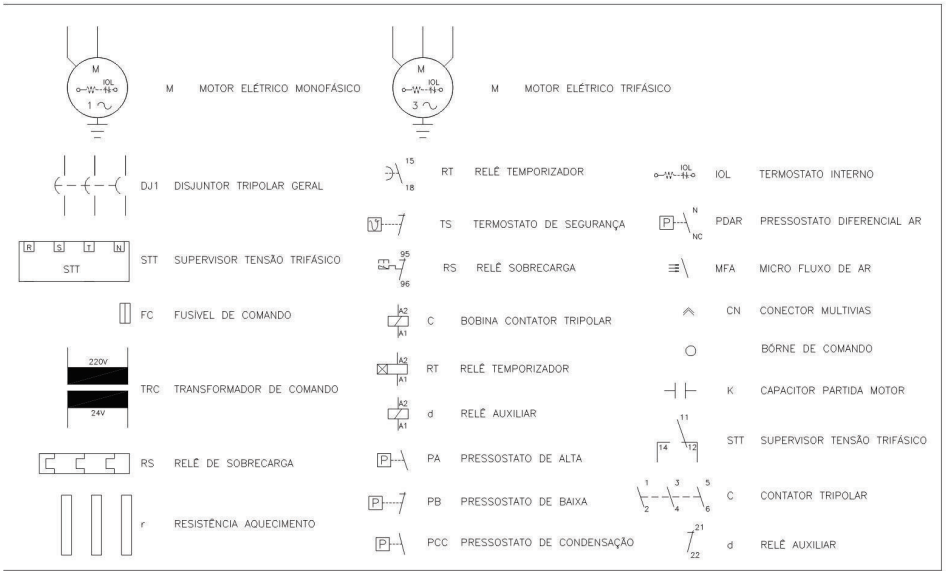
- QUANDO A ALIMENTAÇÃO FOR 220VAC A LIGAÇÃO É SÉRIE TRIÂNGULO E CADA ELEMENTO É DE 110VAC.
- QUANDO A ALIMENTAÇÃO FOR 380VAC A LIGAÇÃO É SÉRIE TRIÂNGULO E CADA ELEMENTO É DE 190VAC.
- QUANDO A ALIMENTAÇÃO FOR 440VAC A LIGAÇÃO É SÉRIE TRIÂNGULO E CADA ELEMENTO É DE 220VAC.

NOTA 7

- LIGAR FIOS A1–C1 E A2–C1 PARA ALIMENTAÇÃO DO SENSOR DE FLUXO LOCALIZADO NO EVAPORADOR.

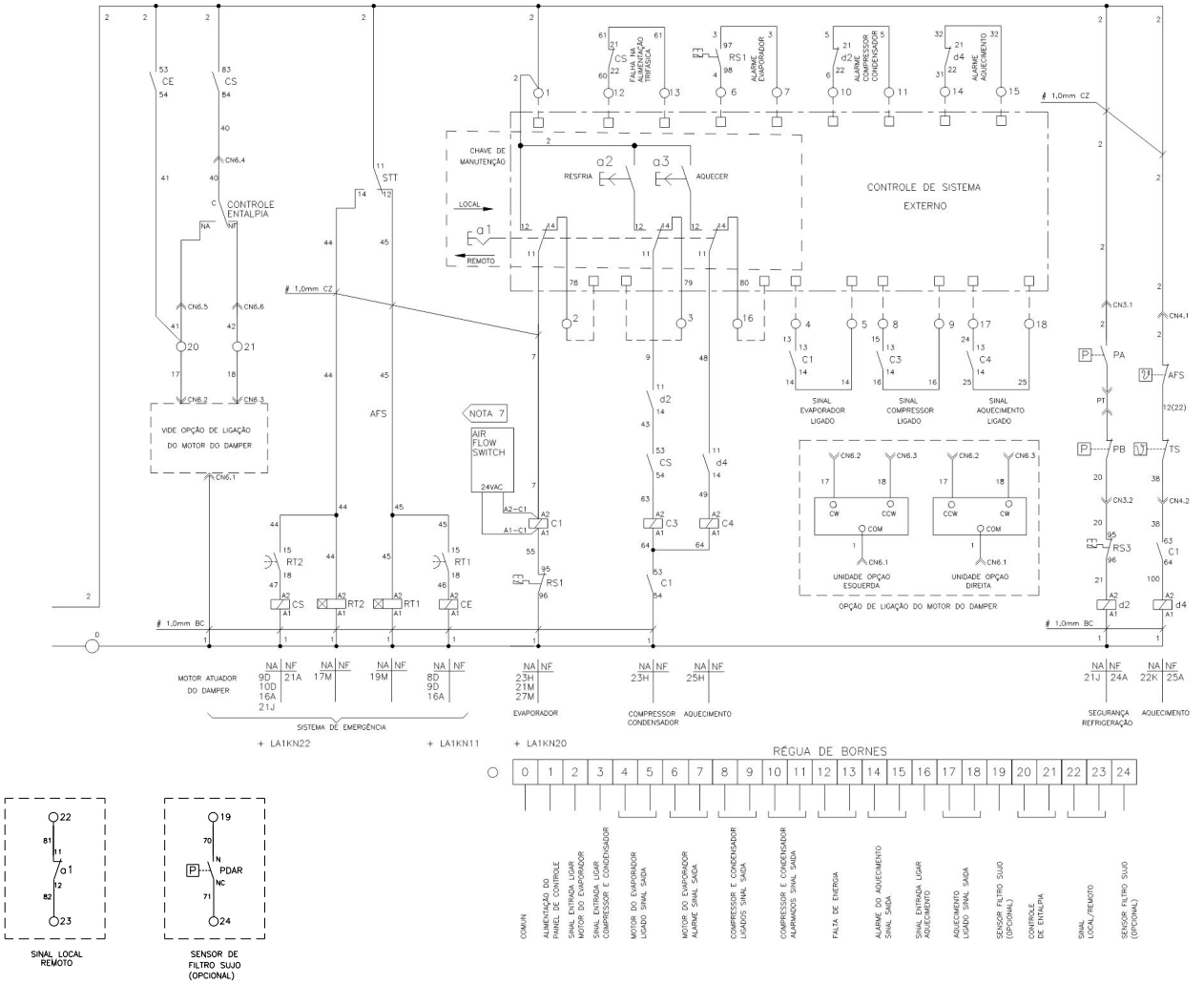
AIR FLOW SWITCH





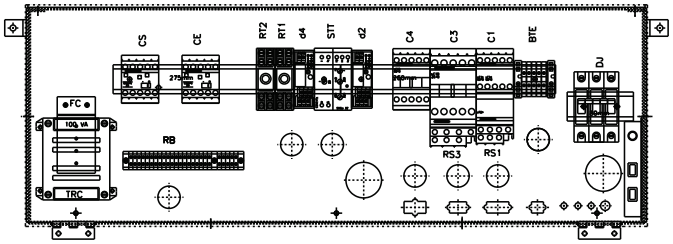
Electrical Diagrams

Fig. XIII-02- Three-Phase Electrical DiagramEsquema Elétrico, Power/Command (STD/HEAT/EMERGENCY FAN./ ENTALPHY/AIR FLOW SWITCH/LOC. SWITCH/REM./DIRTY FILTER) [part 02].



LAY–OUT CAIXA ELÉTRICA

SWMB–040 SWMB–050



LAY–OUT CAIXA ELÉTRICA

SWMB–020 SWMB–030

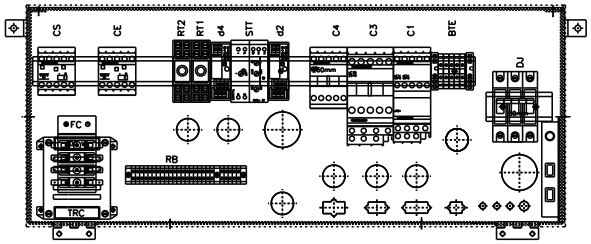
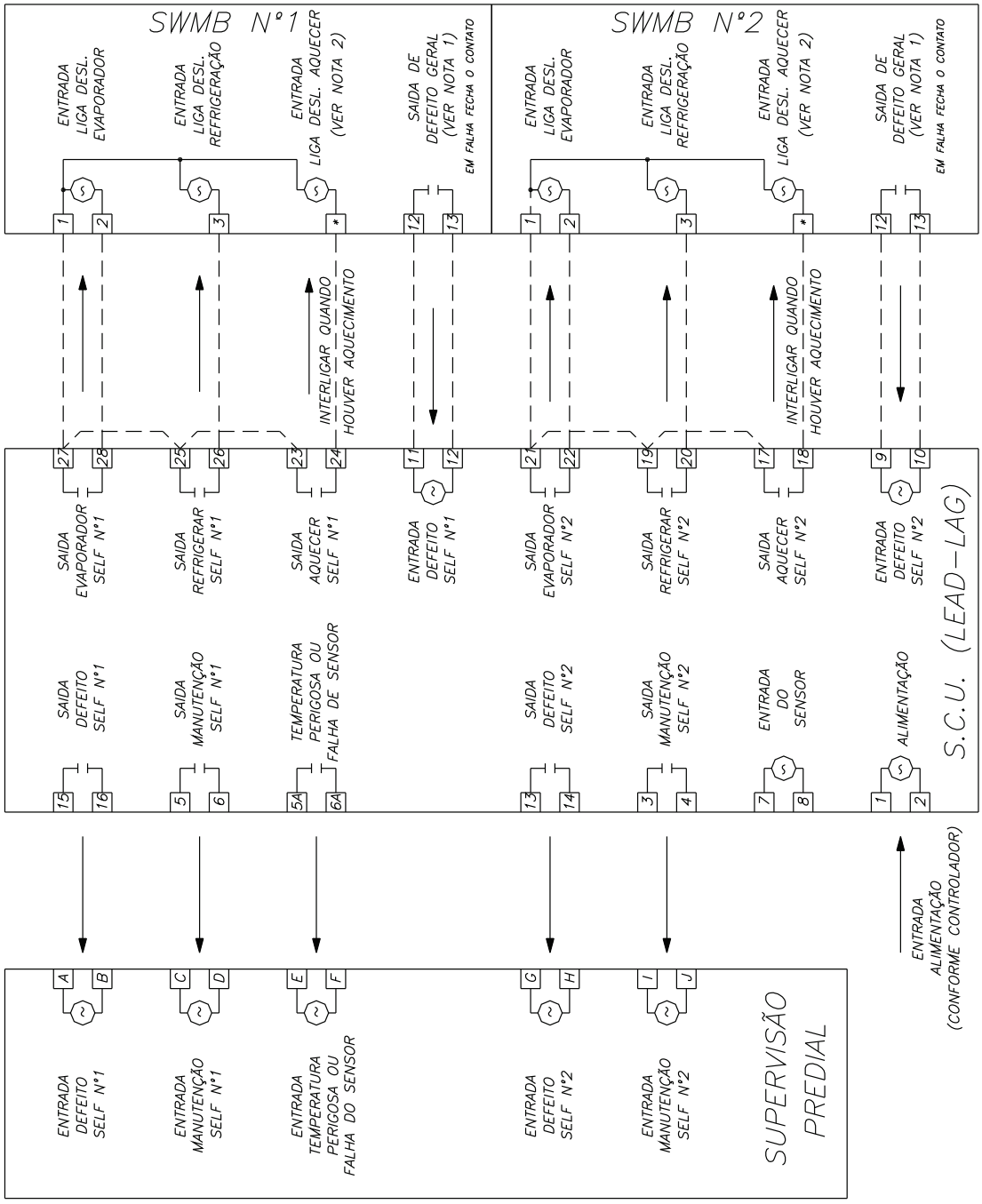


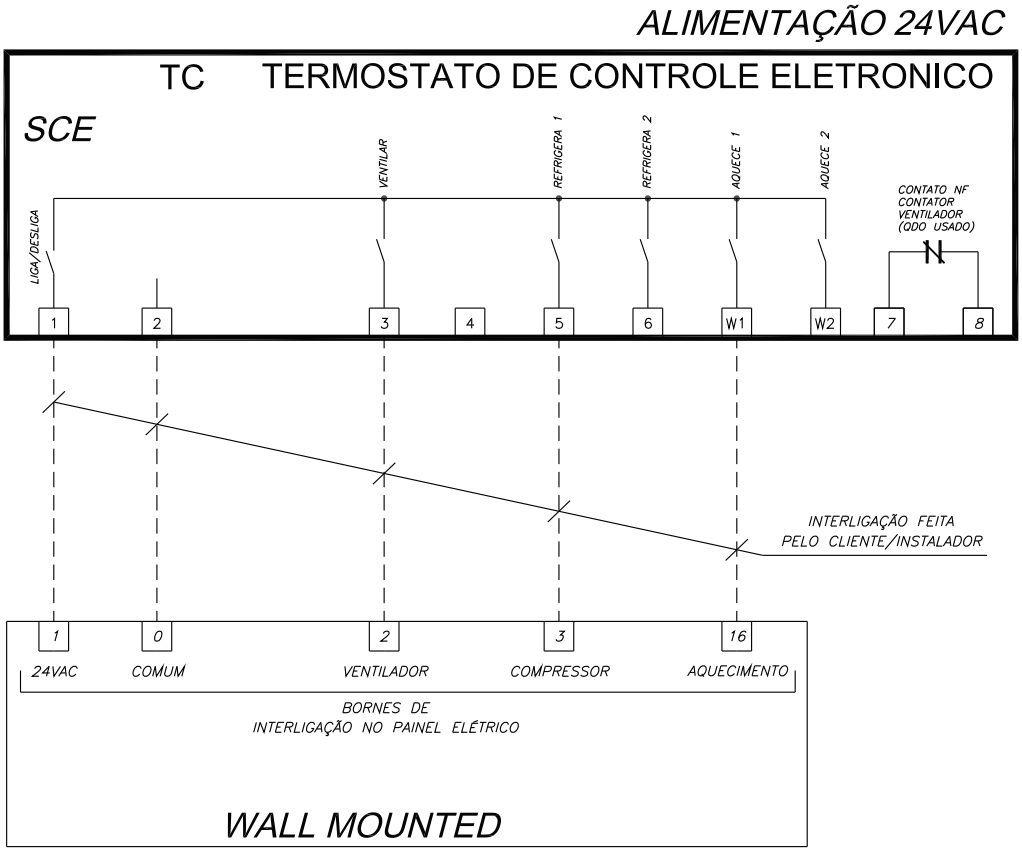
Fig. XIII-03 - Controler Interligation LEAD-LAG.



* NOTAS:
(1) CASO HAVER OUTROS ALARMES INTERLIGÁ-LOS EM PARALELO.
(2) NUMERAÇÃO DO BORNE CONFORME ESQUEMA ELÉTRICO

LEAD-LAG (S.C.U.)

Fig. XIII-04 - Refrigeration/Heating/ Control, Termostat interligation.



BORNES
WALL MOUNTED

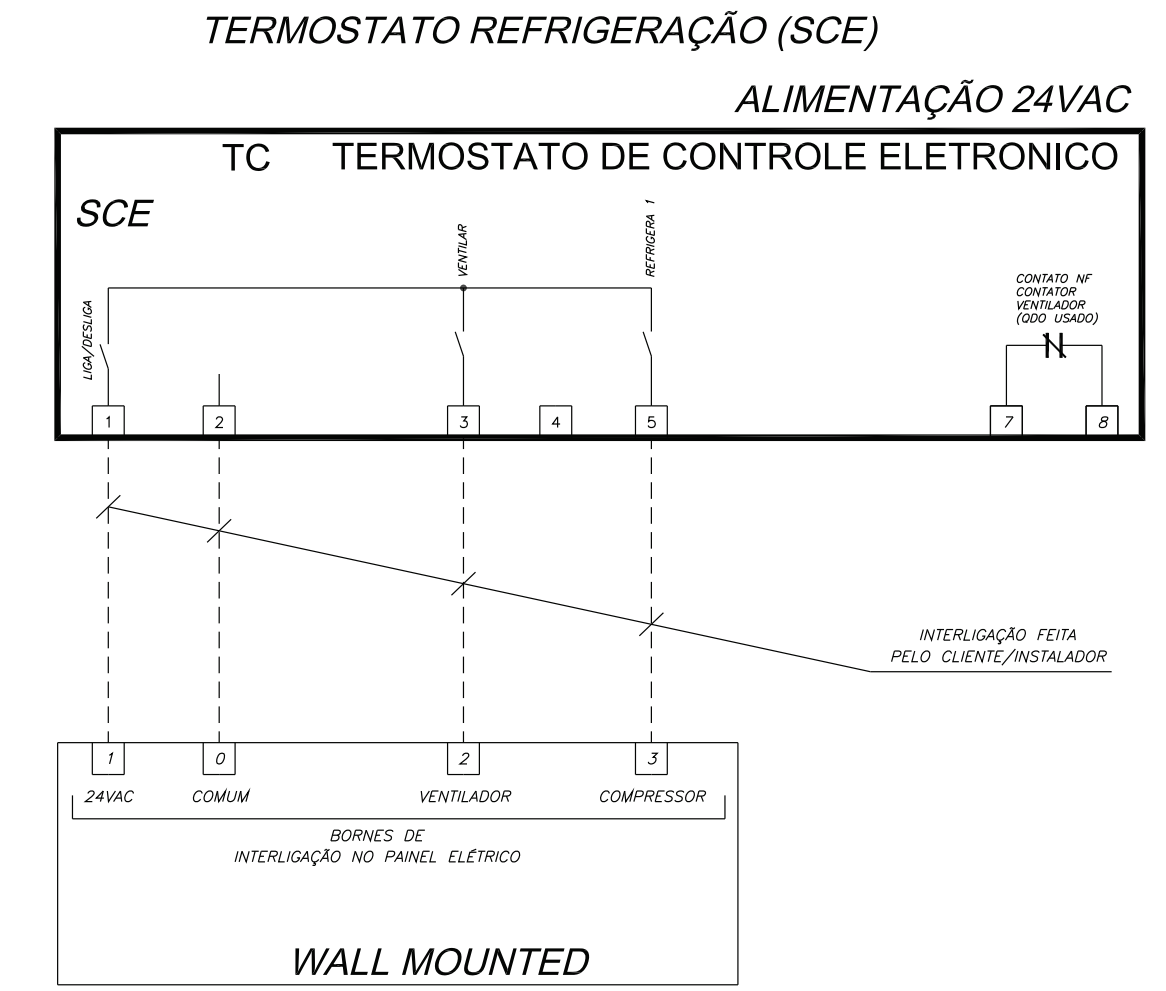
0 e 1 = ALIMENTAÇÃO 24VAC
2 = LIGA VENTILADOR EVAPORADOR
3 = LIGA COMPRESSOR
16 = LIGA RESISTÊNCIA AQUECIMENTO

BORNES
TC (TERMOSTATO CONTROLE)

1 e 2 = ALIMENTAÇÃO
3 = VENTILADOR DO EVAPORADOR
4 = VAGO (NÃO UTILIZAR)
5 = REFRIGERAR 1° ESTÁGIO
6 = REFRIGERAR 2° ESTÁGIO
7 e 8 = VIDE NOTA N°1
W1 = AQUECER 1° ESTÁGIO
W2 = AQUECER 2° ESTÁGIO

NOTA N°1 = QUANDO SE FECHA O BORNE 7 e 8 O TERMOSTATO INIBE O CONDICIONAMENTO PERMANECENDO APENAS VENTILAÇÃO ATÉ QUE O FECHAMENTO DESTES 02 BORNES SEJA DESFEITO. ESTE FECHAMENTO SÓ DEVE SER FEITO ATRAVÉS DE 01 CONTATO SECO (SEM TENSÃO) NÃO SENDO NECESSÁRIO CASO HAJA INTERTRAVAMENTO NO PAINEL.

Fig. XIII-05 - Refrigeration Control, Termostat interligation.



BORNES
WALL MOUNTED

0 e 1 = ALIMENTAÇÃO 24VAC
2 = LIGA VENTILADOR EVAPORADOR
3 = LIGA COMPRESSOR

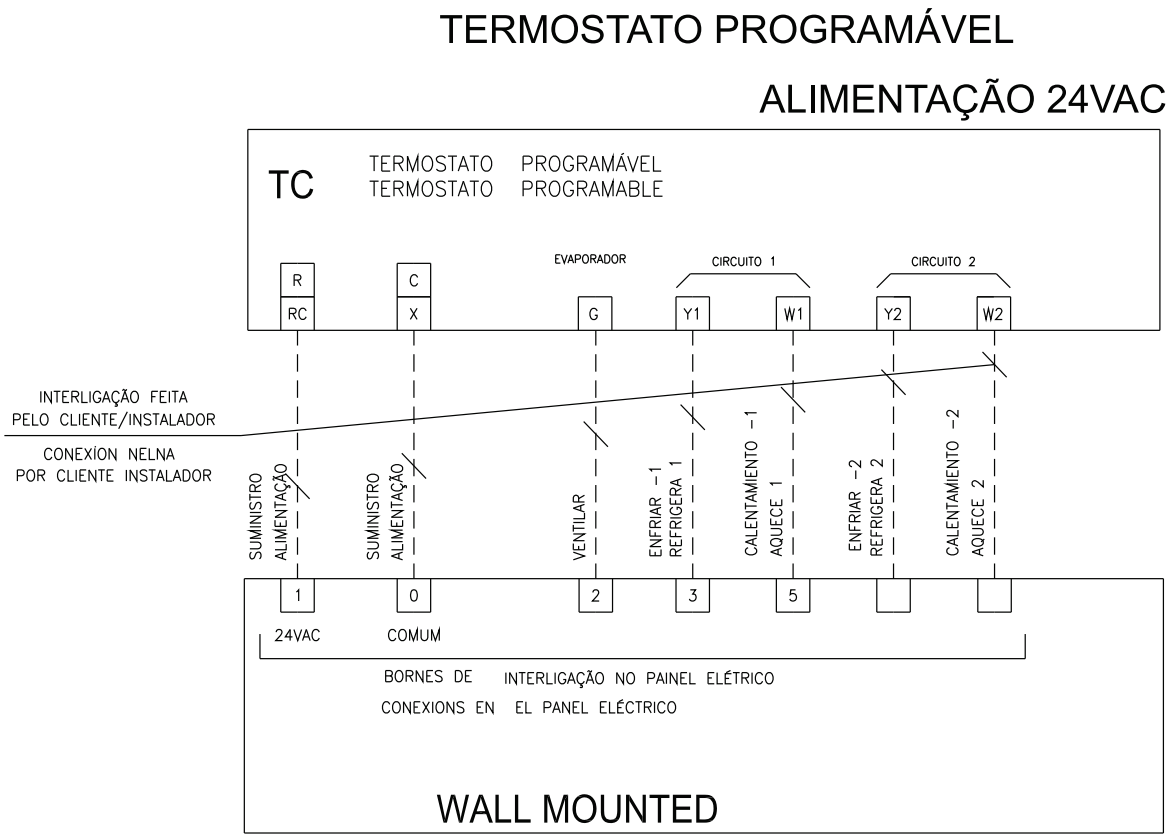
BORNES
TC (TERMOSTATO CONTROLE)

1 e 2 = ALIMENTAÇÃO
3 = VENTILADOR DO EVAPORADOR
4 = VAGO (NÃO UTILIZAR)
5 = REFRIGERAR 1° ESTÁGIO

7 e 8 = VIDE NOTA N°1

NOTA N°1 = QUANDO SE FECHA O BORNE 7 e 8 O TERMOSTATO INIBE O CONDICIONAMENTO PERMANECENDO APENAS VENTILAÇÃO ATÉ QUE O FECHAMENTO DESTES 02 BORNES SEJA DESFEITO. ESTE FECHAMENTO SÓ DEVE SER FEITO ATRAVÉS DE 01 CONTATO SECO (SEM TENSÃO) NÃO SENDO NECESSÁRIO CASO HAJA INTERTRAVAMENTO NO PAINEL.

Fig. XIII-06 - Programable control termostat interligation.



BORNES
TC (TERMOSTATO CONTROLE)

C = COMUM 24VAC
R = ALIMENTAÇÃO 24VAC
G = VENTILADOR DO EVAPORADOR
Y1 = REFRIGERAR 1° ESTÁGIO
Y2 = REFRIGERAR 2° ESTÁGIO NOTA N°1
W1 = AQUECER 1° ESTÁGIO
W2 = AQUECER 2° ESTÁGIO NOTA N°2

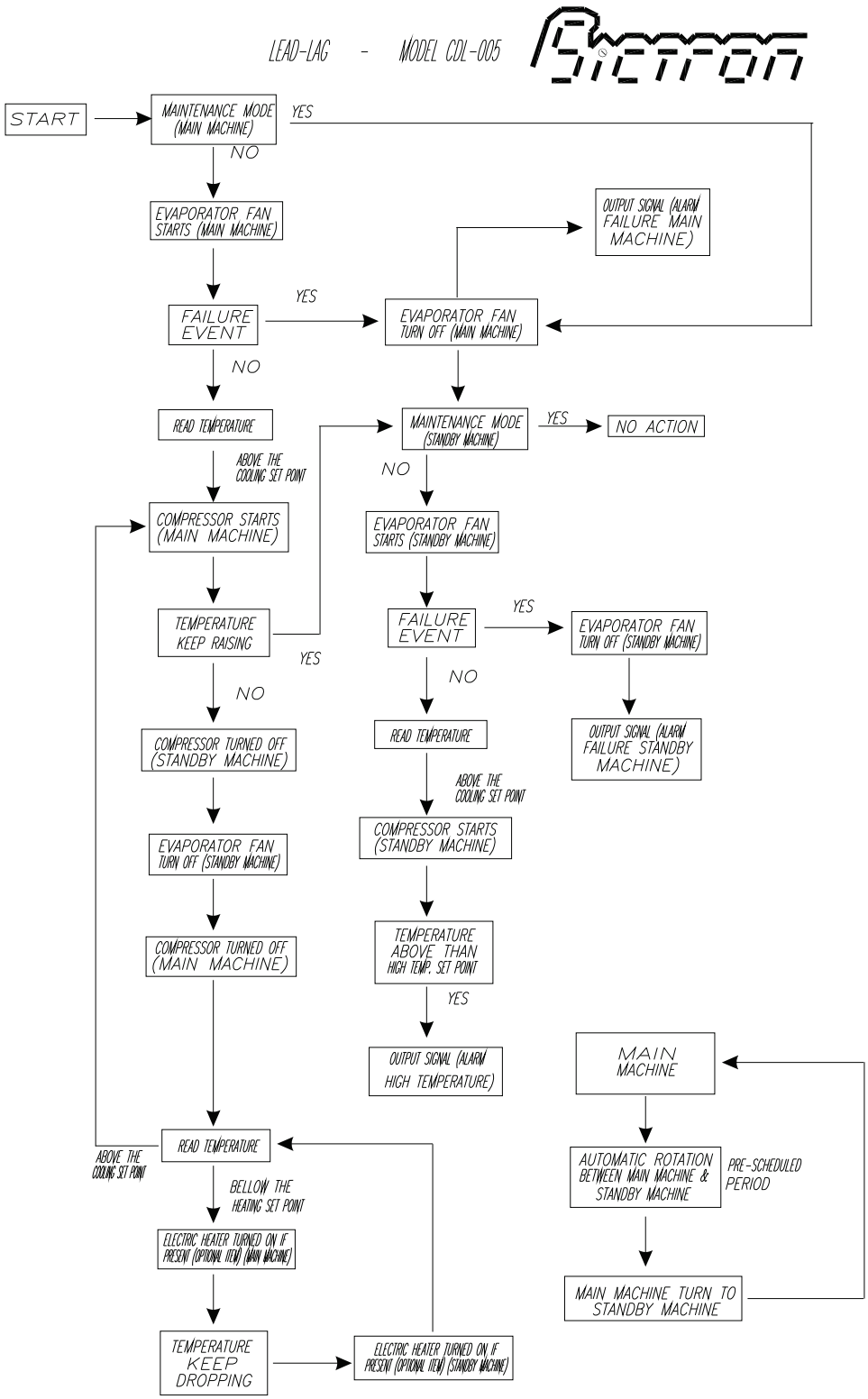
BORNES
WALL MOUNTED

0 = COMUM 24VAC
1 = ALIMENTAÇÃO 24VAC
2 = LIGA VENTILADOR EVAPORADOR
3 = LIGA COMPRESSOR
16 = LIGA RESISTÊNCIA AQUECIMENTO

NOTA N°1 = NESTE EQUIPAMENTO NÃO POSSUI O 2° ESTÁGIO DE REFRIGERAÇÃO

NOTA N°2 = NESTE EQUIPAMENTO NÃO POSSUI O 2° ESTÁGIO DE AQUECIMENTO

Fig. XIII-07 - Logical and operational flowchart LEAD-LAG.



XIV-Conversion Table

To convert from:	*To:*	*Multiply By:*
Length		
Feet (ft)	meters (m)	0,30481
Inche (in)	milimeters (mm)	25,4
Area		
Square feet (ft^2)	square meters(m^2)	0,93
Square inche(in^2)	square milimeters(mm^2)	645,2
Volume		
Cubic feet (ft^3)	cubic meters(m^3)	0,0283
Cubic Inches (in^3)	cubic milimeters (mm^3)	16387
Gallons (gal)	litres (L)	3,785
Gallons (gal)	cubic meters (m^3)	0,003785
Flow		
Cubic feet / min (cfm)	cubic meters / second (m^3/s)	0,000472
Cubic feet / min (cfm)	cubic meters / hour (m^3/h)	1,69884
Gallons / min (GPM)	cubic meters / hour (m^3/h)	0,2271
Gallons / min (GPM)	litres / second (L/s)	0,06308

To convert from:	*To:*	*Multiply By:*
Velocity		
Feet per minute (ft/min)	meters per second (m/s)	0,00508
Feet per second (ft/s)	meters per second (m/s)	0,3048
Energy, Power and Capacity		
British Termal Units (BTU)	Kilowatt (kW)	0,000293
British Termal Units (BTU)	Kilocalorie (kcal)	0,252
Tons (refrig. Effect)	Kilowatt (kW)	3,516
Tons (refrig. Effect)	Kilocalorie per hour (kcal/h	3024
Horsepower (HP)	Kilowatt (kW)	0,7457
Pressão		
Feet of water (ft.H_2O)	Pascal (Pa)	2990
Inches os water (in.H_2O)	Pascal (Pa)	249
Pounds per square inch (PSI)	Pascal (Pa)	6895
Pounds per square inch (PSI)	Bar ou kg/cm^2	6,895 x 10^{-2}
Peso		
Ounces (oz)	Kilograms (kg)	0,02835
Pounds (lbs)	Kilograms (kg)	0,4536

Temperature		
°C	C ou F	°F
-40,0	-40	-40
-39,4	-39	-38,2
-38,9	-38	-36,4
-38,3	-37	-34,6
-37,8	-36	-32,8
-37,2	-35	-31
-36,7	-34	-29,2
-36,1	-33	-27,4
-35,6	-32	-25,6
-35,0	-31	-23,8
-34,4	-30	-22
-33,9	-29	-20,2
-33,3	-28	-18,4
-32,8	-27	-16,6
-32,2	-26	-14,8
-31,7	-25	-13
-31,1	-24	-11,2
-30,6	-23	-9,4
-30,0	-22	-7,6
-29,4	-21	-5,8
-28,9	-20	-4
-28,3	-19	-2,2
-27,8	-18	-0,4
-27,2	-17	1,4
-26,7	-16	3,2
-26,1	-15	5
-25,6	-14	6,8
-25,0	-13	8,6
-24,4	-12	10,4
-23,9	-11	12,2
-23,3	-10	14
-22,8	-9	15,8
-22,2	-8	17,6
-21,7	-7	19,4
-21,1	-6	21,2
-20,6	-5	23
-20,0	-4	24,8
-19,4	-3	26,6
-18,9	-2	28,4
-18,3	-1	30,2
-17,8	0	32
-17,2	1	33,8
-16,7	2	35,6
-16,1	3	37,4
-15,6	4	39,2

Temperature		
°C	C ou F	°F
-15,0	5	41
-14,4	6	42,8
-13,9	7	44,6
-13,3	8	46,4
-12,8	9	48,2
-12,2	10	50
-11,7	11	51,8
-11,1	12	53,6
-10,6	13	55,4
-10,0	14	57,2
-9,4	15	59
-8,9	16	60,8
-8,3	17	62,6
-7,8	18	64,4
-7,2	19	66,2
-6,7	20	68
-6,1	21	69,8
-5,6	22	71,6
-5,0	23	73,4
-4,4	24	75,2
-3,9	25	77
-3,3	26	78,8
-2,8	27	80,6
-2,2	28	82,4
-1,7	29	84,2
-1,1	30	86
-0,6	31	87,8
0,0	32	89,6
0,6	33	91,4
1,1	34	93,2
1,7	35	95
2,2	36	96,8
2,8	37	98,6
3,3	38	100,4
3,9	39	102,2
4,4	40	104
5,0	41	105,8
5,6	42	107,6
6,1	43	109,4
6,7	44	111,2
7,2	45	113
7,8	46	114,8
8,3	47	116,6
8,9	48	118,4
9,4	49	120,2

Temperature		
°C	C ou F	°F
10,0	50	122
10,6	51	123,8
11,1	52	125,6
11,7	53	127,4
12,2	54	129,2
12,8	55	131
13,3	56	132,8
13,9	57	134,6
14,4	58	136,4
15,0	59	138,2
15,6	60	140
16,1	61	141,8
16,7	62	143,6
17,2	63	145,4
17,8	64	147,2
18,3	65	149
18,9	66	150,8
19,4	67	152,6
20,0	68	154,4
20,6	69	156,2
21,1	70	158
21,7	71	159,8
22,2	72	161,6
22,8	73	163,4
23,3	74	165,2
23,9	75	167
24,4	76	168,8
25,0	77	170,6
25,6	78	172,4
26,1	79	174,2
26,7	80	176
27,2	81	177,8
27,8	82	179,6
28,3	83	181,4
28,9	84	183,2
29,4	85	185
30,0	86	186,8
30,6	87	188,6
31,1	88	190,4
31,7	89	192,2
32,2	90	194
32,8	91	195,8
33,3	92	197,6
33,9	93	199,4
34,4	94	201,2

Temperature		
°C	C ou F	°F
35,0	95	203
35,6	96	204,8
36,1	97	206,6
36,7	98	208,4
37,2	99	210,2
37,8	100	212
38,3	101	213,8
38,9	102	215,6
39,4	103	217,4
40,0	104	219,2
40,6	105	221
41,1	106	222,8
41,7	107	224,6
42,2	108	226,4
42,8	109	228,2
43,3	110	230
43,9	111	231,8
44,4	112	233,6
45,0	113	235,4
45,6	114	237,2
46,1	115	239
46,7	116	240,8
47,2	117	242,6
47,8	118	244,4
48,3	119	246,2
48,9	120	248
49,4	121	249,8
50,0	122	251,6
50,6	123	253,4
51,1	124	255,2
51,7	125	257
52,2	126	258,8
52,8	127	260,6
53,3	128	262,4
53,9	129	264,2
54,4	130	266
55,0	131	267,8
55,6	132	269,6
56,1	133	271,4
56,7	134	273,2
57,2	135	275
57,8	136	276,8
58,3	137	278,6
58,9	138	280,4
59,4	139	282,2

Temperature		
°C	C ou F	°F
60,0	140	284
60,6	141	285,8
61,1	142	287,6
61,7	143	289,4
62,2	144	291,2
62,8	145	293
63,3	146	294,8
63,9	147	296,6
64,4	148	298,4
65,0	149	300,2
65,6	150	302
66,1	151	303,8
66,7	152	305,6
67,2	153	307,4
67,8	154	309,2
68,3	155	311
68,9	156	312,8
69,4	157	314,6
70,0	158	316,4
70,6	159	318,2
71,1	160	320
71,7	161	321,8
72,2	162	323,6
72,8	163	325,4
73,3	164	327,2
73,9	165	329
74,4	166	330,8
75,0	167	332,6
75,6	168	334,4
76,1	169	336,2
76,7	170	338
77,2	171	339,8
77,8	172	341,6
78,3	173	343,4
78,9	174	345,2
79,4	175	347
80,0	176	348,8
80,6	177	350,6
81,1	178	352,4
81,7	179	354,2
82,2	180	356
82,8	181	357,8
83,3	182	359,6
83,9	183	361,4
84,4	184	363,2

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