AIR CONDITIONER COACHBUS / CITY BUS

REVO®400

Owner's Manual
Warranty Certificate

Rev.01/August 2025
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SPHEROS

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SPHEROS DO BRASIL - S/A develops its products, oncerned with offering passengers a comfortable environment, always seeking the best HVAC conditions.

The equipment has a design that allows perfect integration with vehicles, facilitating operation and maintenance.
With optimized sizing, they ensure a high cooling capacity and low noise level.

This manual was developed with the purpose of presenting important aspects of functioning, operation and maintenance, in order to obtain the best performance of the air conditioning equipment.

In order to ensure that the equipment has a long and trouble-free service life, it is essential that the operating and maintenance instructions described in this manual are followed and executed periodically.

The controls installed by SPHEROS DO BRASIL - S/A that are used by the user are properly illustrated and explained in this manual.
It is important that the user carefully read the instructions in this manual before operating the air conditioning equipment.

SPHEROS DO BRASIL - S/A maintains an authorized service network with tools, equipment and a team trained to perform any type of maintenance within quality standards.

Thank you for choosing SPHEROS DO BRASIL - S/A products. In case of doubts, contact the SPHEROS DO BRASIL - S/A authorized service network or contact the technical assistance department.

During operation these equipments have energized parts, so any irregularity in the system, please contact a Spheros authorized dealer.

OBSERVATION: to get the best air conditioner performance we recommend that you read this manual carefully before starting operation. Keep this manual with your vehicle for reference.

Warrant Terms

SPHEROS DO BRASIL - S/A warrants its products for two-years period in accordance with the terms listed below:

1 - The warranty will be valid for the period above specified, counting from the
date when the equipment is installed in keeping with the warrant certificate, even after the property there of has ben transfered.

2 – Should the equipment be installed by a third part, SPHEROS DO BRASIL - S/A warrant only the product and not its instalations.

3 - During the stipulated period, the warranty completely covers the workmanship and spare parts used to repair defects duly identified as being:
premature failure of material and components defects used on its manufacture.

4 - Only a techinician from the SPHEROS DO BRASIL - S/A authorized network of services is qualified to repair the defects coverd under the warranty.

5 - The warranty approval is subject to the technical analysis of the defects shown in the components and operational conditions to which the equipment has been subjected.

6 - No claims will be accepted if the vehicle is still in use after the defect is found, even if there is lack of pieces, delay in transportation or any other such incident.

7 - The Warrant Loses its Validity

a) If the installation or use of the product is not in accordance with the SPHEROS DO BRASIL - S/A technical recommendations.

b) If the product suffers any damage caused by improper use, neglect, accident, failures caused by external agents and even lack of maintenance (see owner's manual) or services performed by unqualified person.

c) If the warranty certificate and/or the serial number of the product are adulterated, overwritten or damaged.

d) If defects or unsatisfactory performance are caused by the use of non original
spare parts and in disagreement with the technical specifications from SPHEROS DO BRASIL - S/A.

8 - The Warranty Does Not Cover

a) Displacement of the bus for repairing of the equipment. In case the customer
requests to be attended in the same place where products is operating, the collection or not of the visitation charge will be the criterion of the authorized service provider.

b) The attending to the consumer, free or paid, in cities that do not have authorized services providers. So the expenses with displacement are the sole responsibility of the owner.

c) Lack of proper preventive maintenance, as described in the preventive maintenance item in this manual.

d) Loss or loss of profits caused by the stoppage of the vehicle due to non-operation of the equipment.

Preventive Maintenance

Preventive Maintenance Frequency Check List

WEEKLY	1 - Clean or change the return air filter.
MONTHLY	1 - Accomplish the weekly check list.
	2 - Clean the condenser capillary tube coil (Apply only water and neutral non-aggressive soup to cooper and aluminum). See note (*)
	3 - Check if the evaporator hatches are closed to avoid air intake into the equipment.
	4 - Test the equipment operation functions: cool / fan (high and low speed) / heat / dry (air renewing) modes.
QUARTERLY	1 -Accomplish the monthly check list.
	2 - Activate the heating system, if any.
	3 - Measure the exhaust suction pressure, temperature and suction line condition.
	4 -Measure the condenser and evaporator fan flow consumption (check their air outflow).
SEMESTER	1 - Accomplish the quaterly check list.
	2 - Clean the evaporator capillary tube coil (Apply only water and neutral non-aggressive soup to cooper and aluminum). See note (*)
	3 - Clean heating system heaters, if any. (Apply only water and neutral non-aggressive soup to cooper and aluminum). See note (*)
	4 - Clean the evaporator drain.
	5 - Look carefully, if there is any leakage at coupling spots: oil leakage, refrigerant leakage.
	6 - Check if there are any loose, free, damaged, broken, worn parts, rusty, melting, cracked or bad fractioning to the bus body.
YEARLY	1 - Accomplish the semester check list.
	2 - Check the opening and closing pressures of high and low pressure switches.
	3 - Clean the air conditioning body getting rid of any dust/scrap at components. See note (*)

IMPORTANT: you do not accomplish the preventive maintenance check list as above, it implies to total or partial loss of warranty coverage.
The actions of preventive maintenance written in this manual have been based on normal conditions. Just in case of environment contaminated and bad weather conditions, then you must do the maintenance more frequent.
NOTE (*): when cleaning using water, protect electrical and electronic components to prevent damage.

Dry Filter

We recommend that you shall preventively change the drier filter every 3 years. Just in case, you need to refill in the equipment with gas, we recommend you replace to a new filter to extinguish any dirt out of the system.

Ducts

The cleaning of the air ducts must be done every tree months, it can be earlier, depending on: the frequency of operation of the air conditioning system, quantity of passengers and resistivity of the environment where it is driven. This
cleaning is the responsibility of the vehicle owner´s only, he is in charge of this cleaning in order to offer good air quality to his passengers.

NOTE: ducts are components of the bus body.

IMPORTANT: the vehicle owner must do preventive maintenance actions. If you do not do the preventive maintenance as described in this chapter, it implies you lose partially or full warranty coverage.

ATTENTION: Just in case a problem happens in the refrigeration system, then it must be repaired in an authorized shop or qualified professional.
If a third party installs the equipment, SPHEROS DO BRASIL - S/A, guarantees only the product, not the installation of it.

Items of Responsibility of the Bus Bodybuilder

• **Driver´s evaporator:**
Problems with any driver´s air conditioning component, leakage, bad working or operation.
IMPORTANT: lclean the return filter of the driver´s air conditioning, at least, once a week.

• **Tubes, hoses, drains and wiring harness:**
Bad attachment. Leakage at connections and welding points. Damages due to frictioning / chassis and components frictioning or bad installed.

• **Gas Charge Process:**
Leakage test procedure. Vacuum process and refrigerant gas charge.

• **Operation module:**
Control and commissioning of the air conditioning are also of responsibility of the bus bodybuilder.

• **Hermetic compressor:**
Mounted close to the ceiling unit.

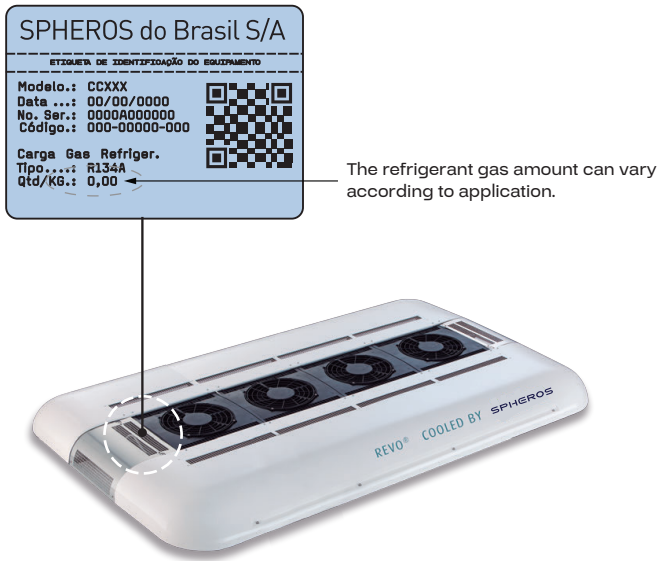
SAY NO TO RECONDITIONED PARTS
The application of reconditioned parts will diminish the air conditioning efficiency, will overcharge the electric system causing early brake of the compressor and set a fire!

Identification Tag

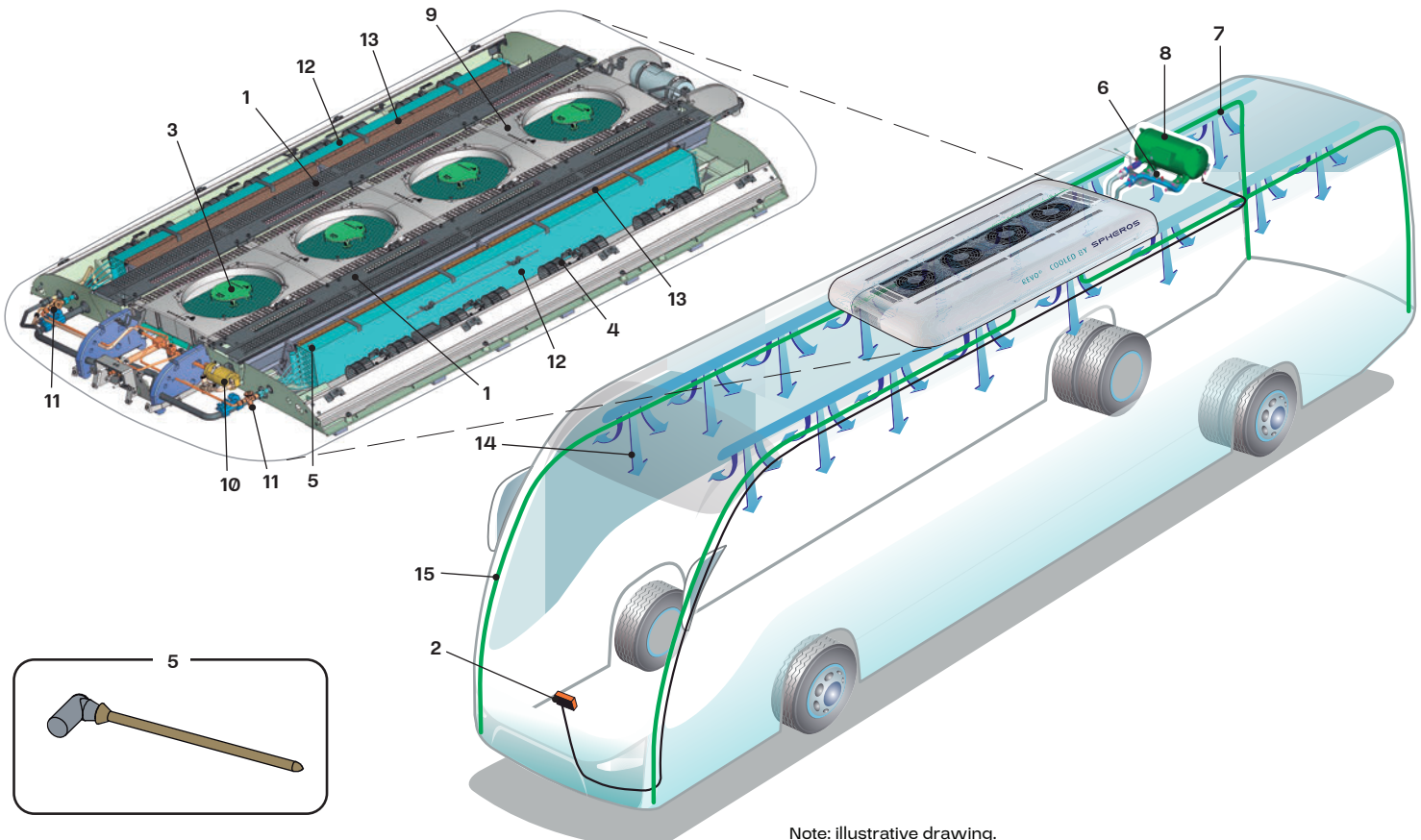
It is very important, when you need to ask for spare parts or after sales parts, and similar ones, customer must identify the model of the air conditioning, telling the series number, model and manufacturing date.

This information can be found in the Air Conditioning Warranty Certificate and ID tag. The ID tag also contains the type of refrigerant gas used and the amount required for the model.

Application information regarding to: series and bus body model, series and chassis model are very important to identify which parts the equipment carries.
In order to identify the bus body and chassis, you need to check the bus body builder manual.



1- Main Components Air Conditioner Module



Note: illustrative drawing.

ELECTRIC SYSTEM

1 Air renewall

This permits the entry of the exernal in order to expel unwanted odors and impurities from the vehicle.

2 Controller

It is installed in the instrument panel, it offers to the driver to set-point of temperature, to see by display the interior temperature, offering full climatic control inside de bus.
Set-point: it is the temperature the driver wishes to set inside the vehicle for passengers.

3 Condenser Fan

Condenser fan and the compressor will only work at "Cool Mode".

4 Evaporator Fan

Evaporator fans are working at cool and fan modes, fans can be set in two speeds.
Sped control can be manual or automatic.

5 Ice Sensor

The interior temperature is measured by the temperature sensor placed at the air return spot.

6 Pressure Sensor

Pressure sensors are devices that read pressure and convert it into electrical signals.

MECHANIC SYSTEM

7 Refrigerant Fluid

It is inside the air conditioning equipment, inside the system. It works absorbing the heat from the interior / room of the vehicle, at the evaporator, and then it goes to the condenser where the heat is thrown to the outside. SPHEROS DO BRASIL - S/A, products apply refrigerant R134a, according to the Protection Environmental Law.

8 Compressor

When it is working, the compressor sucks the refrigerant fluid from evaporator at gaseous state and under low pressure, compressing it, so temperature and pressure

9 Condenser

Its main goal is dissipate the heat out, which was absorbed by the refrigerant fluid along the refrigeration system.
At the condenser, the overheat refrigerant fluid is sent to outside losing its force, changing from gaseous state to liquid state.

10 Drier filter

Tiene la finalidad de retener impurezas y/o humedad que pueda haber en el sistema impidiendo que lleguen en la válvula de expansión.

MECHANIC SYSTEM

11 Expansion Thermostatic Valve

Valve hinders the refrigerant inlet that comes from de condenser at high pressure and its goal is adjust the refrigerant gas flow that passed by the evaporator looking for making the pressure steady and temperature at the capillary tubes output.

12 Evaporators

Now at evaporators, the refrigerant fluid, at low pressure, turns from liquid to gaseous state, absorbing the interior heat of the vehicle in this process.

13 Air filter

Air return filter retains impurities from air avoiding any block of dirt at evaporator capillary tubes and coil.

14 Air circulation

Air being cooled by the evaporator, then it follows to the bus interior through fans.

15 Drain

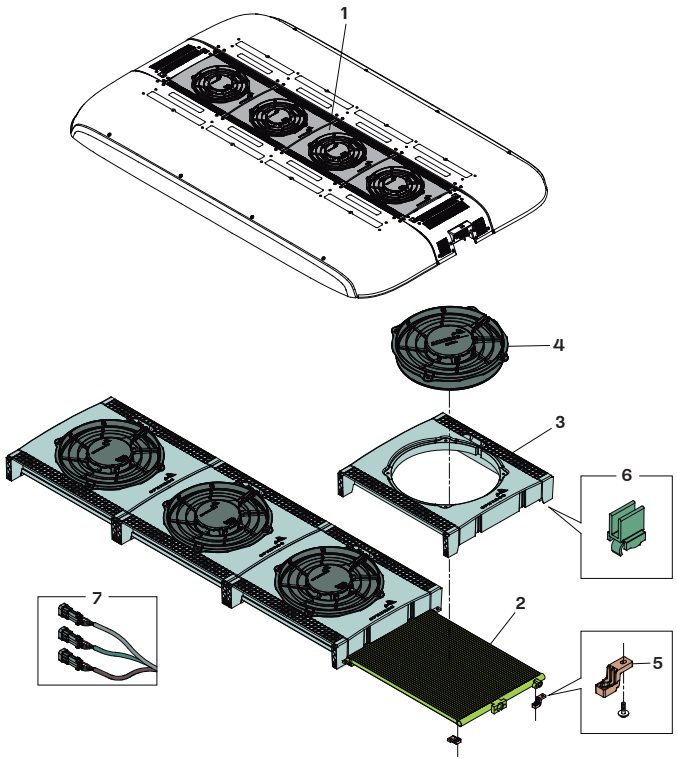
It is a way to get the condensed moisture from evaporator tubes from the condensed tray to putting out.

2- Technical Specifications of the Device

Component	Characteristics	REVO®400
AIR CONDITIONING	Maximum Cooling Capacity	136.500 BTU/h (40kW)
	Maximum Heating Capacity	130.000 BTU/h (38kW)
	Air Renewal (1)	25%
	Evaporator Air flow (free blowing)	9.280 m^3/h
	Radial Blowers	8
	Condenser Air flow (free blowing)	11.600 m^3/h
	Axial Fans	4
DIMENSIONS	L x W x H (mm)	3227 x 2076 x 215
	Unit Weight (2)	162 Kg
	Raio de Teto (mm)	8.000
ELECTRIC	Tension / Current	24V - 116 A
COMPRESSOR	Refrigerant Gas (3)	R134a

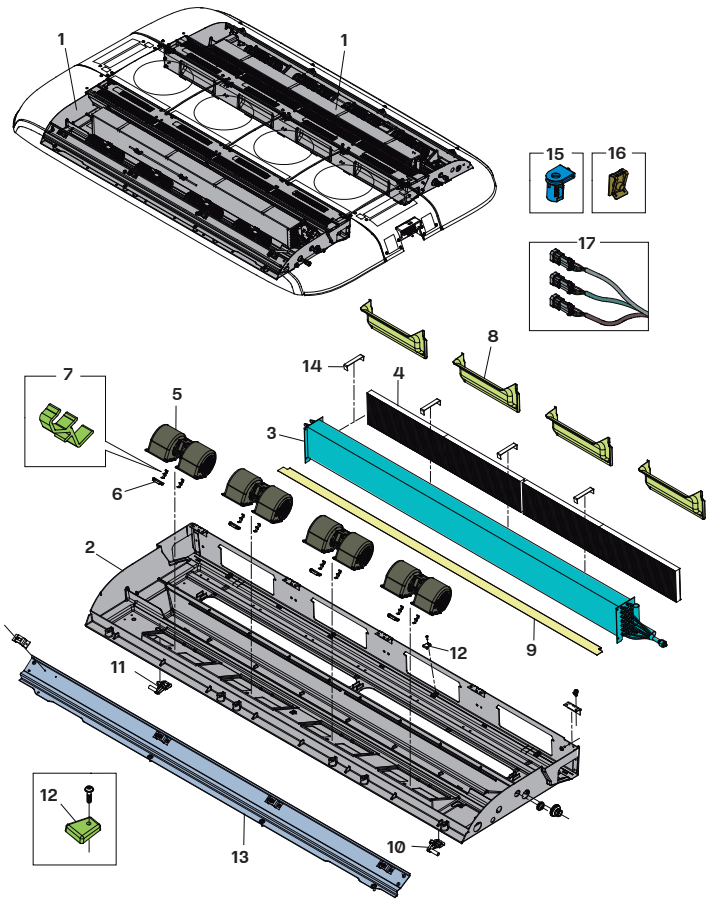
(1) Refers to the total flow of the free evaporator.
(2) Unit without integrated heating system.
(3) Gas charge values vary by application.

3.1- Central Condenser Module



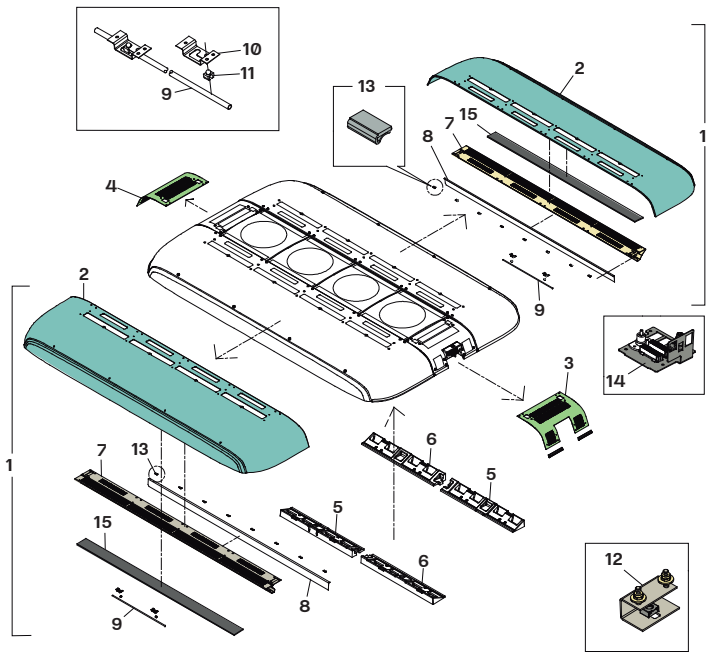
ITEM	DESCRIPTION	QTY.
1	REVO®400 Condenser Unit	1
2	MPE REVO®400 Condenser Coil	1
3	REVO®400 axial Fan Module	4
4	Axial SPAL Fan 24V	4
5	REVO®400 Condenser Support	16
6	Plastic Strap with Clip	8
7	REVO®400 (11117934) Condenser Electric Harness	1

3.2- Evaporators Modules



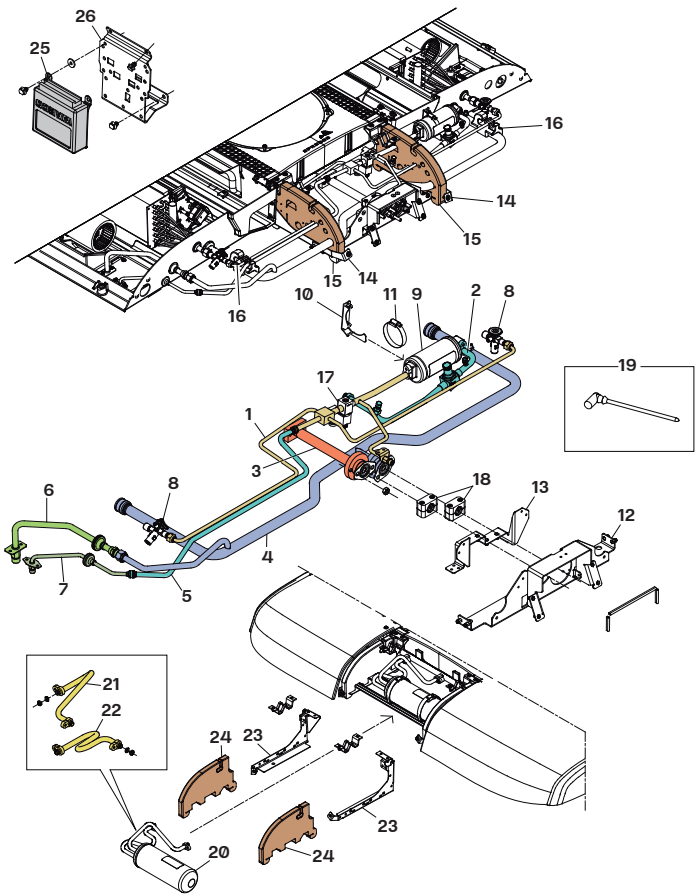
ITEM	DESCRIPTION	QTY.
1	REVO®400 Right and Left Side Evaporators Unit	1
2	REVO®400 Right and Left Side Evaporators base	1
3	REVO®400 Right and Left Side Evaporator Coil - Aluminum	1
4	Viral Filter REVO®	8
5	Electronic Radial Blower - 1150 024 BLDC 0 - REVO®400	8
6	REVO®400 Blower Clamp Body	8
7	Clamp for Blower	8
8	Air Directing Guide 360 REVO®400	8
9	Cover 400/450	2
10	REVO®400 Right Side Water Drain Connection	2
11	REVO®400 eft Side Water Drain Connection	2
12	REVO®400 Deflector Long Plate Renewal Support	8
13	Side Plate REVO®400 - 450	2
14	REVO®400 Evaporator Air Filter Support	8
15	Plastic Quick Nut EJOT EASY BOSS 60 X 2 X 11	20
16	Quick Nut M6 5246C SJ	4
17	REVO®400 (11115964) Evaporator Electric Harness	1

3.3- Covering and Fixation Components



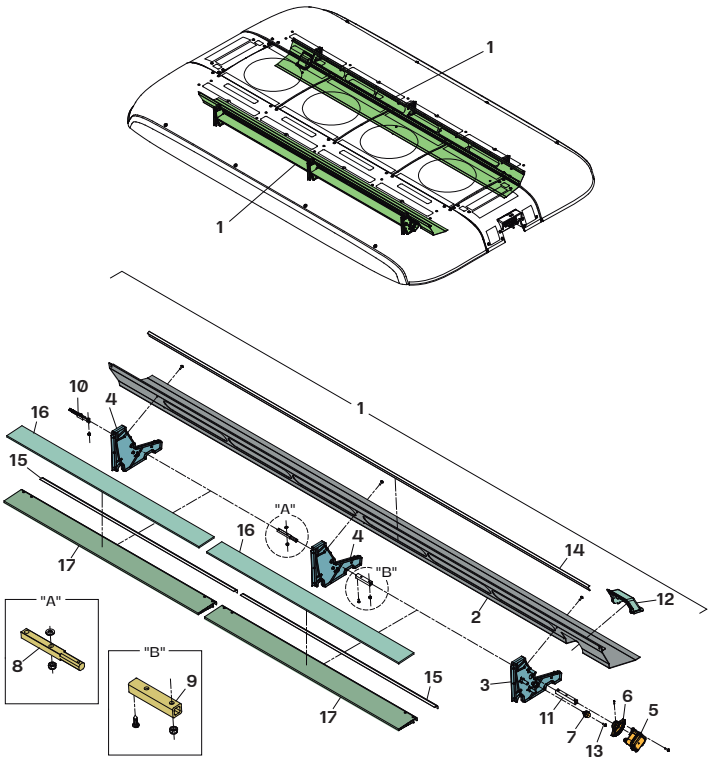
ITEM	DESCRIPTION	QTY.
1	REVO®400 Right or Left Side Cover Set	1
2	Urban Bus Coverage REVO®400 E (11116078)	2
3	Connection Coverage eCBC	1
4	REVO®400 Central Covering Plate	1
5	Air Duct Adapter I (Evaporator Insufflation) REVO®400	2
6	Air Duct Adapter II (Evaporator Insufflation) REVO®400	2
7	REVO®400 Water Deflector Plate	2
8	Expanded Metal Mesh Grid REVO®400 - 450 Left or Right Side	1
9	REVO®400 Coverage Stick	2
10	REVO®400 Hood Jamb Support	4
11	Cable Clamp DM8 Form 1 - 11787	4
12	REVO®400 Front/Side/Rear Base Fixation Support	36
13	Cable Clamp CFCC-3-05A3-RT	16
14	REVO®400 Electrical Interface Plate	1
15	Sealing Foam REVO®400 - 2050 X 116 X 10	2

3.4- Air Conditioning Tubing Components



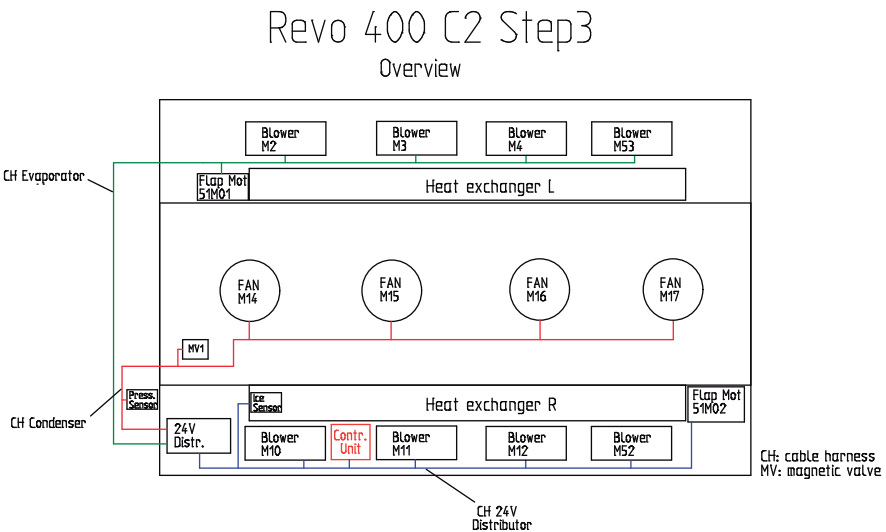
ITEM	DESCRIPTION	QTY.
1	Liquid Line Tube with SMA Connection (REVO®)	1
2	Condenser Tube - Dryer Filter 2 SMA eCBC Connection (REVO®)	1
3	eCBC Connection Pressure Tube	1
4	Suction Tube with eCBC Connection	1
5	Tube 2 Defroster Left Side Connection	1
6	eCBC Defroster Return Tube	1
7	Left Side Defroster Tube	1
8	Expansion Valve Tgen 3,5TR – Danfoss (Static Overheat 5k)	2
9	Drying Filter R134a - Connection SMA - REVO®400	1
10	REVO®400 Filter Dryer Support	1
11	Endless Cable Tie 14mm 70 - 89 Stainless Steel AISI 304 - Super	1
12	Support Adapter Rf Central REVO®400	1
13	eCBC Suction and Pressure Tube Support	1
14	eCBC Left or Right Side Cover Support	1
15	REVO®400 Tube Support	2
16	Support for Tube and Electrical Whip Harness REVO®400	2
17	Solenoid + Plug Ref SG 1102620A	1
18	Clamp Body Diameter 28mm – PP	4
19	ICE Temperature Sensor	1
20	REVO®400 Liquid Tank 3 Liters Aluminum	1
21	Liquid Tank X Condenser Tube Set - REVO®400	1
22	Liquid Tank Tube Set - Sub Cooling - REVO®400	1
23	Right or Left Side Closure Support REVO®400	1
24	REVO®400 Cover Support Foam Shield	2
25	WABCO REVO®400 Electronic Module	1
26	REVO®400 Control Unit Support	1

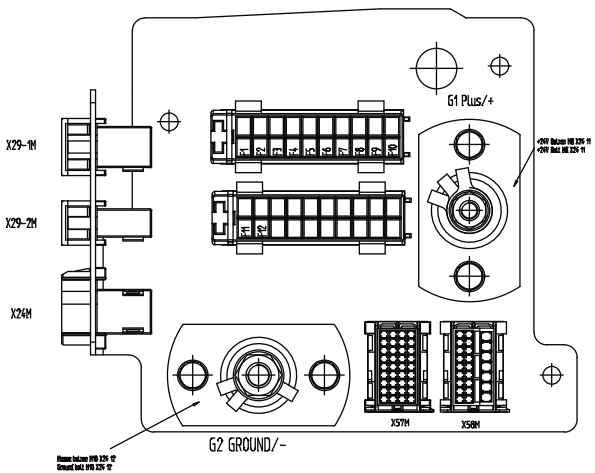
3.5- Air Renewall Set



ITEM	DESCRIPTION	QTY.
1	REVO®400 Air Renewall Set	2
2	REVO®400 Deflector Long Plate Renewal	2
3	REVO®400 Engine Damper Base Support	2
4	DAMPER II REVO®400 Base Support	4
5	BUSCHJOST 24V Electric Engine Air Renewall	2
6	REVO 400® Gear for Engine Side Air Flap	2
7	REVO 400® Gear for Engine Side Air Flap	2
8	REVO 400® Axis for Flap Partition	2
9	REVO 400® Axis for Flap Partition	2
10	REVO 400® Axle Pin	2
11	Axis for Position FLAP REVO®400	2
12	Axis for Position FLAP REVO®400	2
14	Extruded Profile of the REVO®400 Deflector	2
15	Felt Tape with Adhesive	4
16	Sealing Foam REVO®400	4
17	Renewall Trim REVO®400 - 450	4

4- REVO® 400 C2 Step 3 - Overview





4.1- Terminal Plate Connections

TERMINAL PLATE CONNECTIONS

B02

36 PIN MCP CONNECTOR AMP N°1-1718492-1 (X57M)			
Pin	Description	Imput	Output
1	N/C	-	-
2	Blower floor stage 1	-	x
3	Cylinder compressor cutoff	-	x
4	Relais mixed circulation pump	-	x
5	water valve floor (rear section)	-	x
6	N/C	-	-
7	Reserve Output 300mA	-	-
8	Air outlet temperatur sensor Tair roof rear	x	-
9	Reference temp. Sensors	x	-
10	N/C	-	-
11	N/C	-	-
12	N/C	-	-
13	Water valve floor	x	-
14	Return pot. water valve roof heating	x	-
15	water valve floor (rear section)	-	x
16	N/C	-	-
17	Stadtbus: outlet floor Reisebus: room roof front	-	x
18	Low pressure switch	x	-
19	N/C	-	-
20	N/C	-	-
21	N/C	-	-
22	Water valve floor (rear section)	-	x
23	Water valve roof heating (+)	-	x
24	PWM sensor blower diag. temp. sens. roof rear	x	-
25	N/C	-	-
26	Room temp. sensor roof rear	x	-
27	High pressure switch	x	-
28	N/C	-	-
29	N/C	-	-
30	N/C	-	-
31	Water valve floor (rear section)	-	x
32	Water valve roof heating (-)	-	x
33	N/C	-	-
34	N/C	-	-
35	N/C	-	-
36	N/C	-	-

25 PIN MCP CONNECTOR AMP N°1-171849-1 (X58M)			
Pin	Description	Imput	Output
1	N/C	-	-
2	N/C	-	-
3	N/C	-	-
4	Code 2	x	-
5	N/C	-	-
6	Blower floor stage 2	-	x
7	CAN L	x	x
8	CAN GND	x	x
9	LIN	x	x
10	N/C	-	-
11	N/C	-	-
12	N/C	-	-
13	Code 1	x	-
14	N/C	-	-
15	CL15	x	-
16	CAN H	x	x
17	HVAC LIN/CAN (GND)	x	x
18	LIN 12V	x	x
19	N/C	-	-
20	compressor	-	x
21	CL 31	x	-
22	CL 30	x	-
23	N/C	-	-
24	N/C	-	-
25	Terminating resistor 120 ohm	x	x

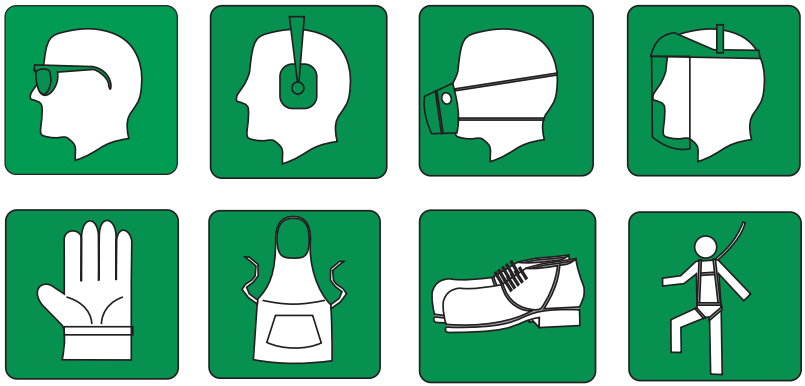
5- Personal Protection

Air conditioning systems offers chemic, mechanic and electric risks.

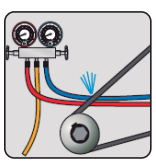
It is mandatory to wear IPE (Individual Protection Equipment), picture 1 to protect yourself from refrigerant gas, refrigerant oil, battery acid, waste launched, engine high temperature and noise.

Other Care:

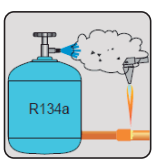
- Ladders and platforms: they can slip or break;
- Whenever working at a height greater than 1.5m use proper PPE for working at height (belt, helmet, etc.;
- Cooling oil can cause skin and eye irritation, use the appropriate PPE (gloves and goggles);
- Check that all screws are adequate and torqued correct.



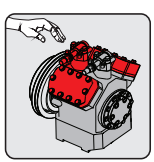
High Pressure:
The refrigerant in liquid state and high pressure causes a potential risk. When the refrigerant is sprayed to natural air, it can cause serious injuries to eyes and skin.



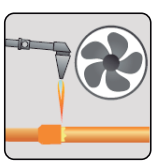
Hoses:
Check if manometer hoses are in good conditions, when holding them; stay far from belts, pulleys and hot surfaces.



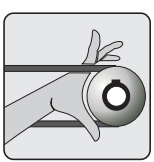
Toxic Gases:
The refrigerant gas along with flame becomes into toxic gases and can cause very serious breathing illness. Take special care in closed places, if gases scape somehow (leakage) and then it can cause no toxygen in the air.



Hot Surface:
The compressor discharges, exhaust pipes and other engine components can be extremely hot.



Welding:
Welding must be done carefully; it causes burns and spray toxic gases out. Provide ventilated places to do it.



Rotation Components:
The fans, pulleys and belts are not visible under certain conditions. Special care must be taken when putting your hands near them.

6- Product Discard

Concerned about sustainability at SPHEROS DO BRASIL - S/A guides its customers and its authorized service network to discard products in an environmentally sound and safe manner.

Proper disposal of the product or components at the end of their useful life will contribute with the preservation and pollutinon reduction of the environment, creating economic growth through the Reverse Logistics Program.

According to Law 12,305 / 2010, the environmentally adequate destination of components (parts, oil, refrigerant) is required.

It is the responsibility of all to ensure that products and components are sent to appropriate treatment to companies approved by the environmental agencies.

For more information about our Reverse Logistics Program, please see our website: **www.spheros.com/br**

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