AIR CONDITIONING

REVO® Global

Mounting instructions

Rev. 02/2025
Id.No. DOK52502-001

SPHEROS

Highlighted words like Warning, Caution, ATTENTION and NOTE in these Installation instructions signify the following precautions:

Warning!	This caption is used to indicate possible severe injuries or fatal accidents if instructions or procedures are carried out incorrectly or entirely disregarded.
Caution!	This caption is used to indicate possible minor injuries if instructions or procedures are carried out incorrectly or entirely disregarded.
ATTENTION:	This caption points to actions which may cause material damage.
NOTE:	This caption is used to draw attention to an important feature.

NOTE: Subject to modification. In multilingual versions the German language is binding. The latest version of this document is provided for download on **www.spheros.com**.

Table of contents

1 General

1.1. Contents and deployment

These mounting instructions contain important information with regard to fixing the REVO Global air-conditioning unit correctly. Users must adhere to these instructions and directions during the installation procedure for safe and fault-free operation of the equipment. Therefore, please read through these instructions carefully before starting with the installation.

The REVO Global air-conditioning unit is designed for vehicles having a roof radius of 5.5-18 m in 3 different versions:

Version 1: 5.5 - 7m
Version 2: 7.5 - 11m
Version 3: 12 - 18m

Please ensure that you use the right version oft the unit which fits with your roof radius.

For some applications spacers must be used at the inner or outer fixing points. See enclosed the list with spacers (these can be ordered from Spheros).

Force fitting the equipment by means of fastening screws is not permissible since such a step can cause damage to other components.

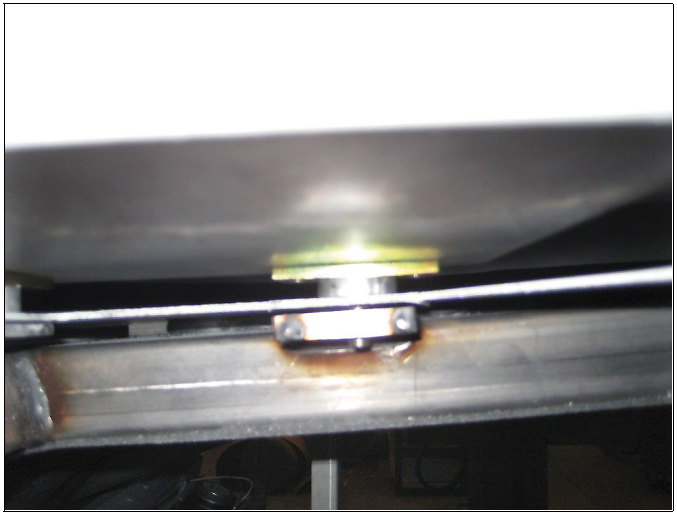


Fig. 1 Spacer (sample view)

1.2. Documents for additional reference

REVO Evacuation and charging instructions

2 Safety regulations

The rooftop air-conditioning unit has been designed and manufactured in accordance with the EC guidelines. If mounted and used **in compliance with the assembling, operation and service instructions** the equipment is safe for operation.

If the height specified in the vehicle's documentation exceeds as a result of mounting the rooftop air-conditioning unit an approval by the authorities must be obtained for acceptance following the provision under clause No. 19 of StVZO (the German Road Traffic Licensing Regulations).

As a consequence, the vehicle load capacity is reduced by the weight of the extra fixtures.

In principle, the general regulations for prevention of accidents must be followed. Other safety precautions beyond the scope of the "General Safety Regulations" are listed in the following. The specific safety regulations are defined in the individual sections or procedures of these instructions by highlighting the same.

General safety regulations

Non-compliance with the assembling instructions and the directions specified therein shall result in cancellation of liability on the part of Spheros. The same applies to repairs carried out by unqualified personnel or without the use of original spare parts.

Assembling, maintenance and repair work must be performed by knowledgeable and qualified personnel only. Such work must only be performed when the engine is at standstill and power supply is cut off.

Electrical cables and operating elements of the air-conditioning unit must be arranged in the vehicle in such a way that their functioning is faultless under normal operating conditions and cannot be hampered.

Before any work on the electrical lines the battery terminals must be disconnected.

	**Warning!**	**Hazardous to human life and health!**

When working on the bus roof or on any hoisting equipment, scaffolding etc. suitable safety precautions must be taken to prevent falls.

For lifting the air-conditioning unit suitable and safe devices must be used.

Do not stand under suspended heavy loads! However, if the working procedure compels it adequate measures must be taken to additionally secure the load. Before starting the work make sure that adequate precautions are duly taken. Do not stand under heavy loads beyond the necessary period of time. Wear a protective helmet in any case!

3 Preparation of the bus roof

	Warning!	**Danger of severe injuries or fatal fall!**

When working on the bus roof or on any hoisting equipment, scaffolding etc. suitable safety precautions must be taken to prevent falls.

	Caution!	**Danger of cut injuries due to sharp metal edges!**

Wear protective gloves!

3.1. Roof cut-outs

The required roof cut-outs (openings for water connection, connection for refrigerant, connection for the condensate, electrical interfacing, ambient air intake, blow-out opening) must be clearly indicated on the roof.

The dimensions for the cutouts for each version of the unit are available at the customer drawing.

The below shown sketch is only an example.

Fig. 2

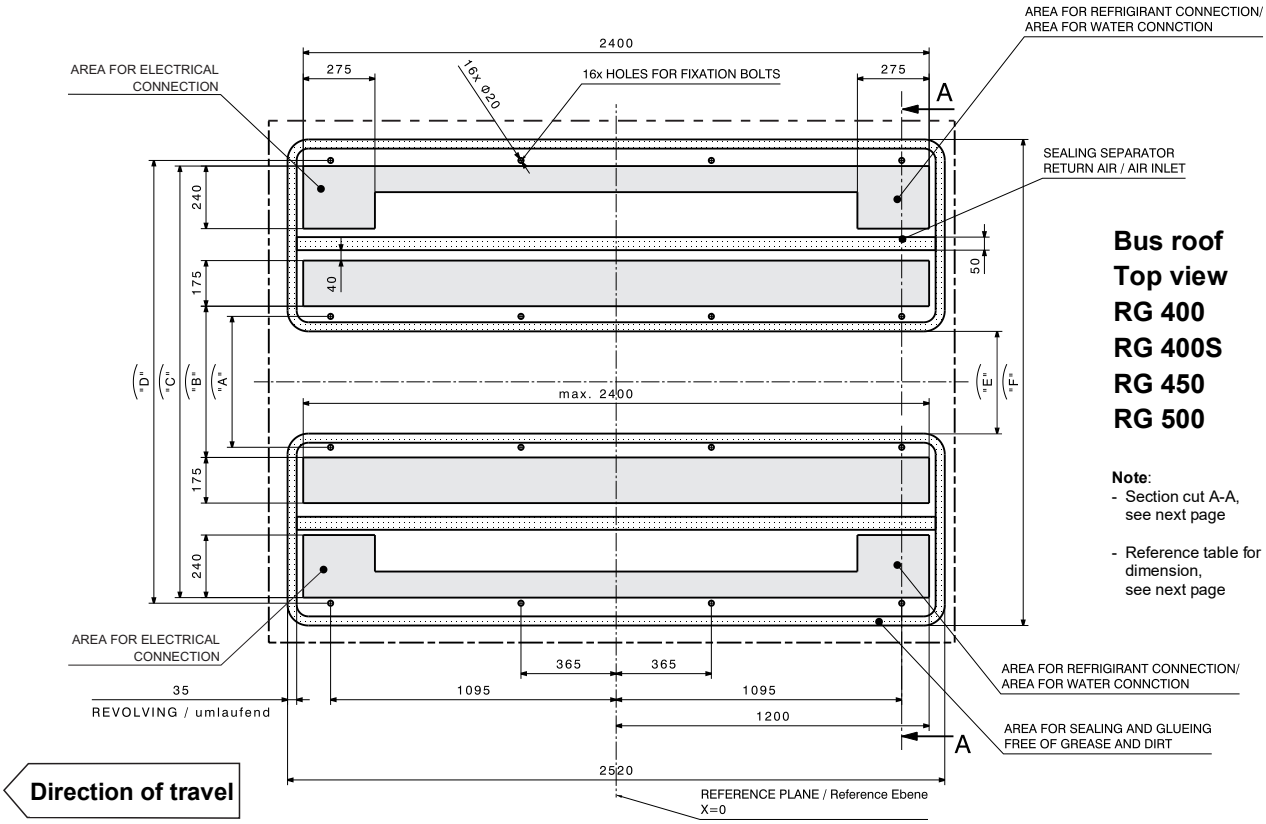
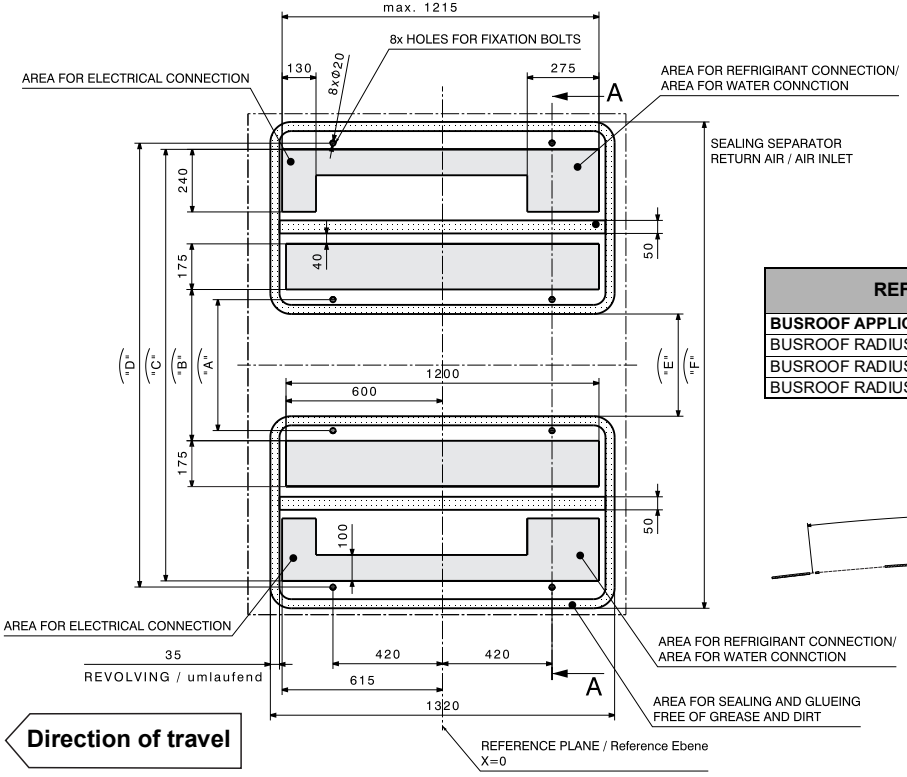

AREA FOR REFRIGIRANT CONNECTION/
AREA FOR WATER CONNCTION
2400
AREA FOR ELECTRICAL
CONNECTION
275
16x Ø20
16x HOLES FOR FIXATION BOLTS
275
A
SEALING SEPARATOR
RETURN AIR / AIR INLET
240
175
40
50
"D"
"C"
"B"
"A"
max. 2400
"E"
"F"
175
240
AREA FOR ELECTRICAL
CONNECTION
365
365
35
1095
1095
REVOLVING / umlaufend
1200
AREA FOR REFRIGIRANT CONNECTION/
AREA FOR WATER CONNCTION
AREA FOR SEALING AND GLUEING
FREE OF GREASE AND DIRT
A
2520
Direction of travel
REFERENCE PLANE / Reference Ebene
X=0
Bus roof
Top view
RG 400
RG 400S
RG 450
RG 500
Note:
- Section cut A-A,
see next page
- Reference table for
dimension,
see next page

Fig. 3



Bus roof top view
RG 200 / 250

REFERENCE TABLE FOR DIMENSION						
BUSROOF APPLICATION	"A"	"B"	"C"	"D"	"E"	"F"
BUSROOF RADIUS R5-R7	498	569	1653	1698	384	1857
BUSROOF RADIUS R8-R9	502	572	1655	1701	386	1860
BUSROOF RADIUS R10-R20	508	580	1660	1706	392	1865

SECTION CUT / Schnitt A-A

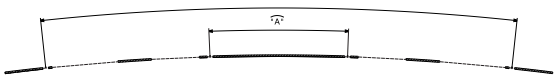


Fig. 4

3.2. Fastening drill holes

The air-conditioning unit is fastened to the vehicle's shell with screwed bolts (M8, mounted on the unit) **and matching nuts and washers.** For this purpose, corresponding stable retaining plates/bows must be provided on the shell. We suggest making the drill holes sufficiently large (at least 15 - 20mm) or long to compensate for the frame tolerances.

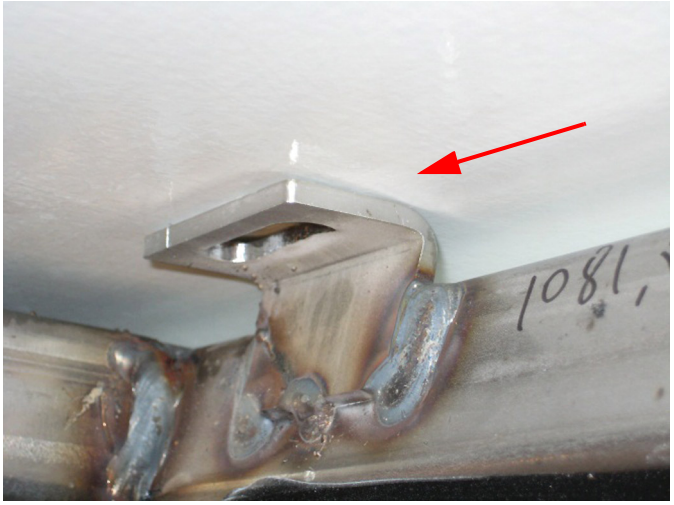


Fig. 5

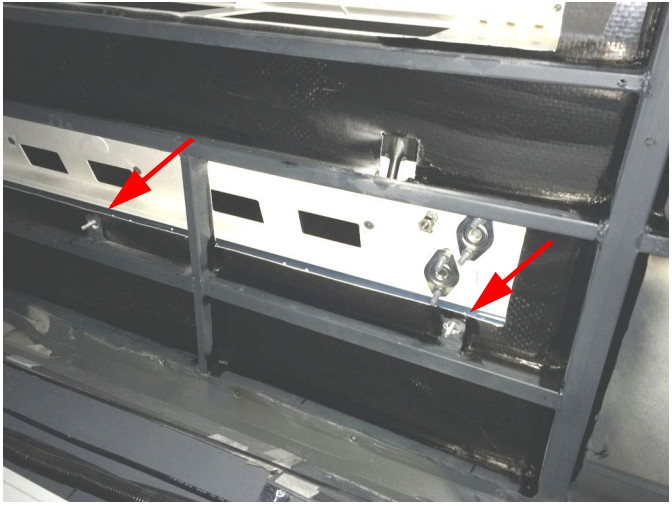


Fig. 6

The fastening points must always be positioned in alignment with the roof membrane.

3.3. Cleaning the vehicle's roof

Once all cut-outs are made on the vehicle's roof the areas must be cleaned with compressed air.

Fig. 7

3.4. Sealing of the unit

When fixing / sealing the air-conditioning unit the areas on the vehicle's roof, where adhesive material is to be used for the sealing profile, must be pre-treated with a cleansing agent / primer for bonding as specified by the manufacturer of the adhesive material. Follow the processing instructions provided by the manufacturer of the adhesive material.

NOTE:
The customer is responsible for the selection and verification of the adhesive material's bonding with the vehicle's roof / sealing profile (e.g. Sika Activator or cleaner and primer).

Fig. 8

Recommendation by Spheros:

- Sikaflex 521 UV or Sikaflex 558
- When using Sikaflex products, the pretreatment of the EPDM rubber profile must be carried out with Sikaflex Activator. No primer may be applied to this profile.

4 Mounting the air-conditioning unit

4.1. Lifting the air-conditioning unit

	Warning!	Danger of injuries due to air-conditioning unit crashing down

Use a suitable device to lift the onit on the eye screws as prescribed for lifting!

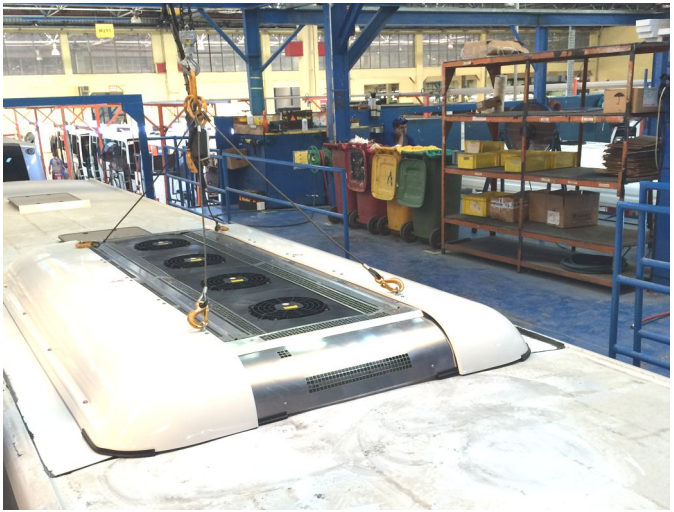


Fig. 9

ATTENTION:
When lifting the air conditioning unit use belts / chains with a length of at least 1.5 m. Otherwise, it may lead to mechanical damage to the air conditioning unit.

4.2. Applying the adhesive

	Warning!	**Danger of injuries due to air-conditioning unit or its components crashing down accidentally!**

The equipment must be secured firmly against crashing during work under suspended loads.

The best method of applying the adhesive material for preparing sealing between the air-conditioning unit and the vehicle's roof is onto the sealing profile while the air-conditioning unit is suspended. Prior to this all dusty surfaces must be cleaned using compressed air, a cleaner and a suitable primer acc. to the suppliers spec. Then, apply uniformly a bead of adhesive in the center onto the sealing profile.

Fig. 10

Fig. 11

4.3. Mounting the air-conditioning unit

Before mounting the unit onto the roof, at least 2 centering bolts with a diameter of 10mm and a length of 100mm have to be mounted diagonal at the M8 bolts of the unit.

Fig. 12 11121834A

Fig. 13

Lift the air-conditioning unit over the vehicle's roof, mount it centrally and insert the fastening bolts through the drill holes on the roof (Follow processing time prescribed by the manufacturer of the adhesive material!).

ATTENTION: Make sure to prevent the condensate drain pipes from hitting the frame as it may cause damage.

Fig. 14

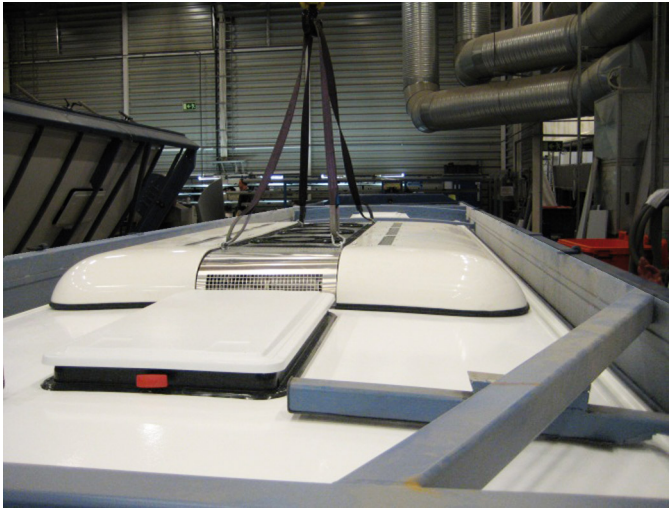


Fig. 15

NOTE:
After positioning the unit, smooth the adhesive with a suitable tool (spatula), if necessary, additional adhesive must be applied.

4.4. Fastening the equipment

From inside the vehicle remove the centering bolts and fix all fastening bolts using adequately large washers and nuts and tighten them uniformly (torque: 14 ±1 Nm).

Fig. 16

Ensure that the glue tightens the gap between vehicle and A/C unit properly. Add some additional glue were necessary.

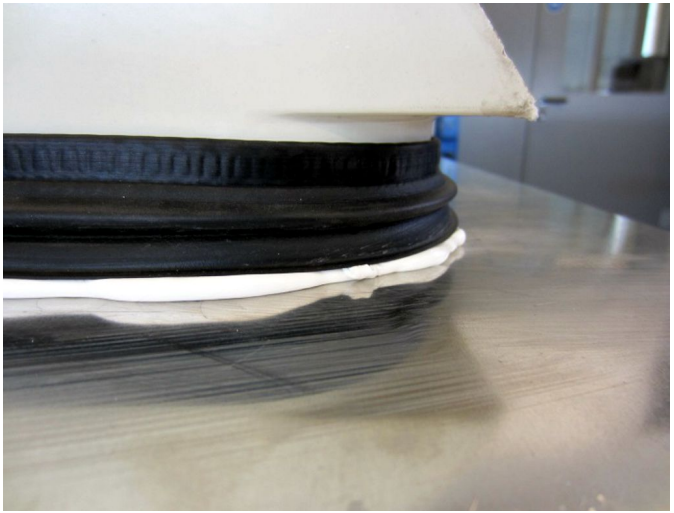


Fig. 17

5 Connecting the air-conditioning unit

5.1. Connecting the refrigerant / water piping

In delivery condition, the connecting points on the air-conditioning unit for the refrigerant are closed with sealing caps, and the unit is pre-filled with Nitrogen. The unit is under a pressure of 2 bar. Prior to mounting the refrigerant piping the sealing caps must be removed

For reasons of thermal effects and to prevent condensation, the refrigerant piping in the vehicle must be insulated (recommended: suction / pressure lines).

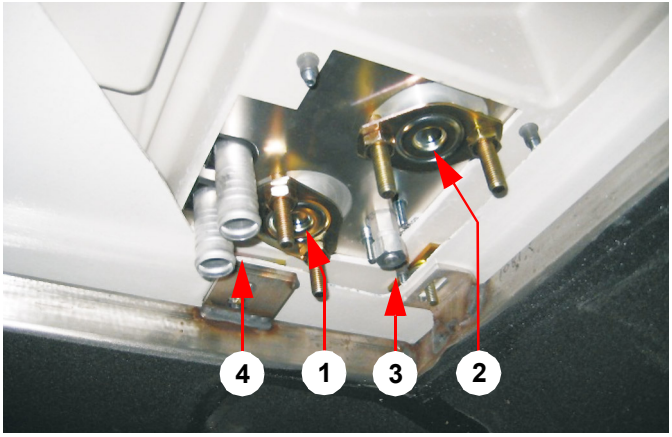


Fig. 18

Fig. 19

Maintain the following connections / torques:

1. Suction line: Flange connection with paper sealing; torque 60Nm ±5 Nm
2. Pressure line: Flange connection with paper sealing; torque 60Nm ±5 Nm
3. Front box connection: Automotive O-ring connection 5/8“; torque 17Nm ±1 Nm
4. Water connection: Hose pipe Id=22 mm; tightening torque as specified by the manufacturer of the hose pipe clamp.

5.2. Fixing the condensate hose pipe

A hose pipe with Id=15 mm is used as condensate hose pipe. The hose pipe is fixed to the 4 condensate drains with hose clamps. The tightening torque should be maximum 4 Nm.

From each drainage point a hose pipe with a loop downwards must be placed: Joining two hose pipes on each side is advisable since the condensate passage cannot be guaranteed in every state of driving.

The condensate pipes must be fastened at every 30 - 40 cm. Adding more weight (e.g. cable harnesses) is not permissible since the drainage pipe may break.

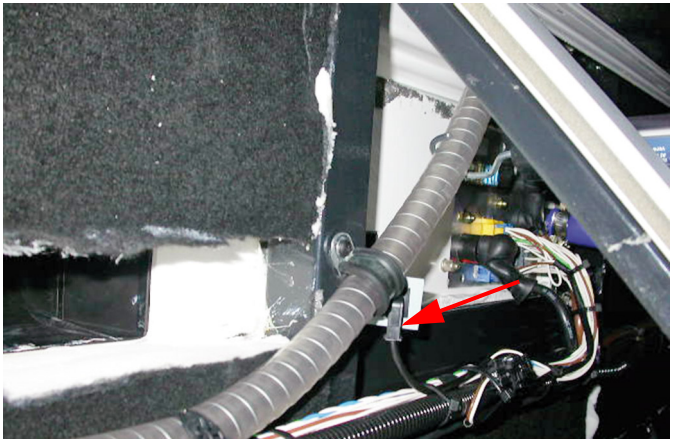


Fig. 20

To ensure better water flow, Spheros recommends usage of lip valves.

5.3. Electrical connections

(see also customer-specific circuit diagram)

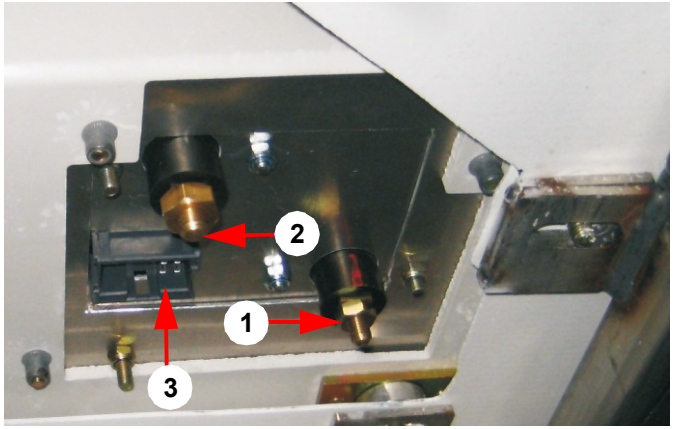


Bild 21:

Bild 22:

The electrical interfacing is located in the rear portion of the equipment on right or left against the refrigerant interfacing. For power supply terminals bolts M8 (+24V) and M10 (ground) are provided. The connection is made with a cable lug as per DIN 46234. The following torques must be maintained:

1. Bolt M8: 7 +1 Nm
2. Bolt M10: 17 +2 Nm
   The plus terminal must be covered with a cap after the assembly to prevent anyone touching it.
3. For control signals use Tyco/AMP MCP 2.8 socket housing: Socket housing 6 pins:

Socket housing 6 pole:	Tyco No.:	8-968970-1
Socket housing 9 pole:	Tyco No.:	8-968971-1
Socket housing 12 pole:	Tyco No.:	8-968972-1
Socket housing 15 pole:	Tyco No.:	8-968973-1
Socket housing 18 pole:	Tyco No.:	8-968974-1
Socket contact 0.5-1.0 mm²:	Tyco No.:	2-968849-1
Socket contact 1.5-2.5 mm²:	Tyco No.:	2-968851-1

The plug type being used may vary (number of contacts) and depends on the customer-specific version / equipment model. The plug contacts must adhere to manufacturer's specifications.

The following table lists the cable cross-section specifications:

Vehicle mounted A/C-units Wires according ISO 6722 class B (-40°C … 100°C)

Max. ambient temperature [°C]	Normal cross section [mm²]	Max. current carrying capacity calculated according DIN VDE 0298-4 [A]	Max. allowed fuse rating according DIN 72581*
70	0.75	13	10
	1.0	16	15
	1.5	20	20
	2.5	27	25
	4	36	30
	6	46	40
	10	62	60
	16	84	70
	25	110	100
	35	135	130
	50	169	150

* The fuse has also to be rated for the equipment to be connected.

Voltage drop has to be calculated: Max. allowed voltage drop ΔU on the cable within the A/C unit is 1V.

$\Delta U = \frac{L*I*2}{\kappa*A}$ L- length, I- nominal current, A- cross section, κ- electrical conductivity = 56 $\frac{m}{\Omega*mm^2}$

If calculated voltage drop is higher then next higher cable diameter has to be used.

Maximum power consumption of various equipment models:

	REVO Global						
	200	250	350	400	400S	450	500
Max. current consumption at 24V (A)	54	61	81	88	108	115	123
Number of fans	4x RAD 2x AX	4x RAD 3x AX	6x RAD 3x AX	6x RAD 4x AX	8x RAD 4x AX	8x RAD 5x AX	8x RAD 6x AX

A ground connection to the bus body is not permissible.

5.4. Screw the unit hoods

In order to vent the water cycle or to replace the fresh air filter, you need to open the hoods of the rooftop air-conditioning unit.
To do this, first remove the outer 3 or 4 screws from the hoods and then support the hoods using the aluminum rods which are inside the hoods.
Before closing the hood, clip the hood supports back into the designated bracket on the underside of the hood.
After you have closed the hoods, secure them using the Torx screws and washers.
The tightening torque of the hood screws is 6 Nm.
If the hoods must be removed for painting, during reassembly the hood hinge screws must be tightened with 6 Nm.

5.5. Charging hot water circulation

For charging the hot water circulation a mixture of water and glycol with Aluminum compatible phosphate and sulphate-free glycol should be used. During the charging procedure the exhaust valves at both water heat exchangers in the evaporator unit must be opened until water emerges from it. The exhaust procedure must be repeated often until water emerges from both water heat exchangers without bubbles.

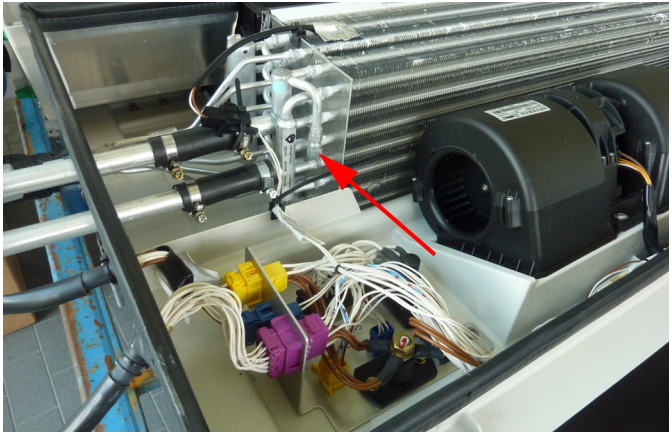


Fig. 23 Open here for bleeding.

5.6. Charging the refrigerant cycle

	**Caution!**	**Hazardous to health!**

	**Warning!**	**Danger to human life and health!**

Safety regulations prescribed in the REVO Global Evacuation and Charging Instructions must be followed.

Before commencing with charging the refrigerant cycle read through the REVO Global Evacuation and Charging Instructions.

For charging the refrigerant cycle use only R134a as refrigerant which has the SAE J2776 grade of purity standard. The charging volume is determined according to the REVO Global Evacuation and Charging Instructions.

memos

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Spheros Germany GmbH
Friedrichshafener Str. 7 | 82205 Gilching | Germany | www.spheros.com