

**A'GRAMKOW A/S**

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## **INSTRUCTIONS**

## **RHS 700**

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### **Recovery, Recycling, Evacuation and Charging Station**

### **RHS 700**

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## **Contents RHS 700**

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## Application

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Your new RHS 700 station represents the latest in equipment for servicing air-conditioning units (A/C units). The station is designed for refrigerants R12 and R134a. It can, and must, only be used for one of these refrigerants.

RHS 700 is a test, recovery/recycling-(draining/cleaning), evacuation, oil/refrigerant charging station and is thus able to perform a total process cycle in servicing A/C units for the automobile industry.

The recycling process is designed to follow SAE-standards J1989 and J2099 on recycled refrigerant for A/C units.

Process operations - from test to charging - are performed by operating four different process switches and two shut-off valves. This reduces the risk of error operation to a minimum.

Constant monitoring ensures that the automatic process sequence does occur correctly. Safety devices are built into the station to stop operation and indicate faults in processes, e.g. excessively high pressure, overcharging of charging cylinder.

During the recycling process a small quantity of oil is drained from the A/C unit. On completion of the recovery process this quantity can be drained into a measuring beaker. The same quantity of new oil must be filled into the A/C unit. Refer to the A/C unit instructions and use only the type of oil specified.

The filter driers have a very high capacity (200 kg) and are easy to replace during servicing.

A system built into the station ensures that non-condensable gases are automatically blown off and that the discharge of refrigerant to the atmosphere is kept to a minimum.

Before using RHS 700, read these instructions carefully to ensure that the processes are performed correctly.

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## **Application**

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We reserve the right to make constructional and design changes and accept no responsibility for printing errors.

RHS 700 complies with European standards on "Safety and health" and is GS-tested.

See appendixes, "Declaration of Conformity" and TÜV test report.

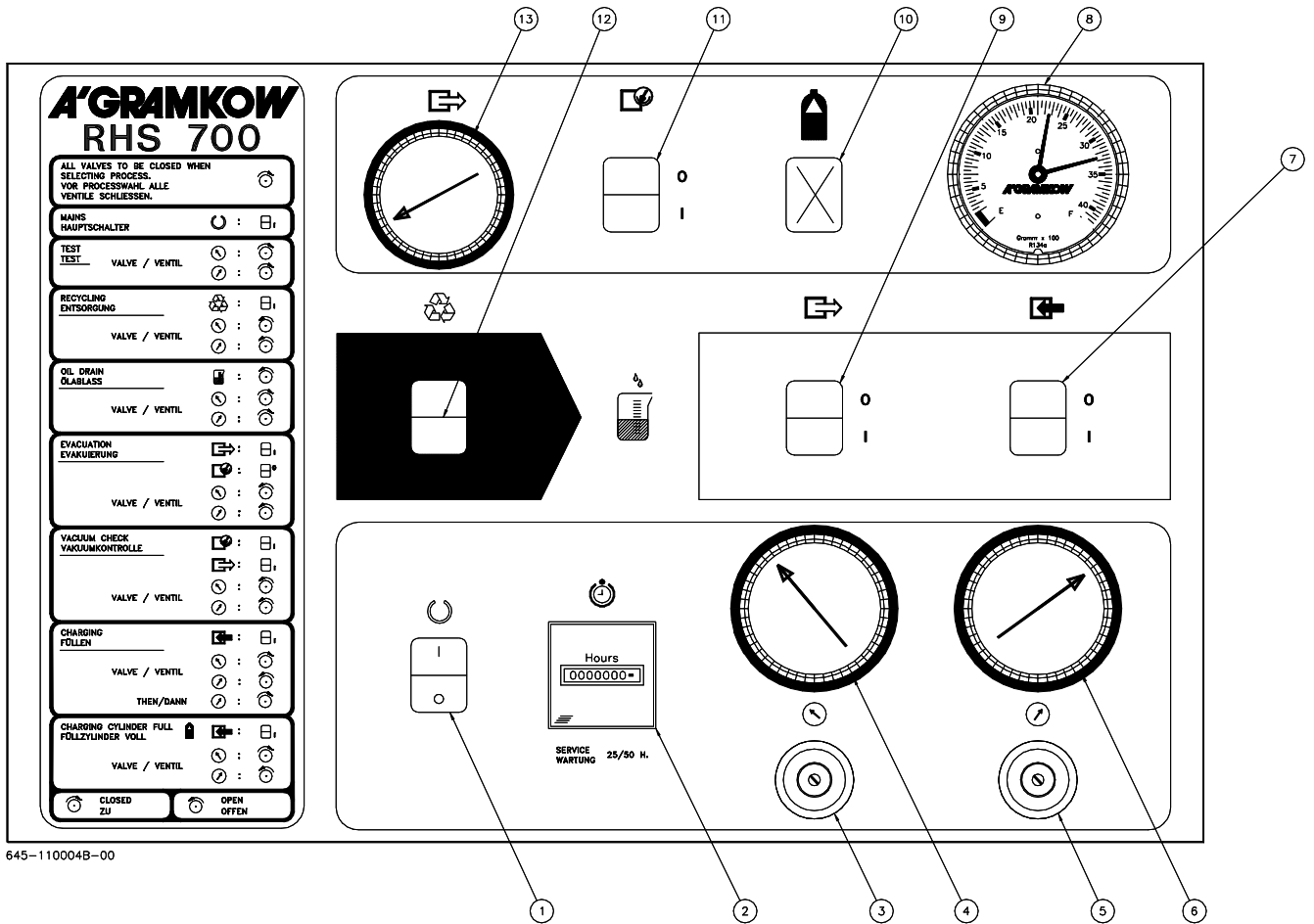
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## Safety precautions

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1. Always wear protective goggles and gloves when working with refrigerant.
2. Do not allow refrigerant to come into contact with the skin or eyes.
3. Before disconnecting RHS 700 from the A/C unit, make sure that the process is completed so that refrigerant does not escape to the atmosphere.
4. RHS 700 is for use only in dry indoor surroundings.
5. Disconnect the electrical supply before performing maintenance on RHS 700.
6. To reduce the risk of fire, avoid using an extension cord. If, however, an extension cord is necessary, it must have a minimum cross-sectional area of 2.5 mm<sup>2</sup>.
7. In the event of fire, remove any external refrigerant cylinders.
8. When oil which accompanies the refrigerant drained from the A/C unit is tapped from the suction accumulator into the measuring beaker supplied, ensure that it is handled according to existing national legislation. A suitable container can be obtained from the refrigerant supplier.
9. Always brake the two front wheels of the station when parking.
10. Most national legislation forbids the station being used for the charging of cylinders which are intended for transference to a third party.

## Components



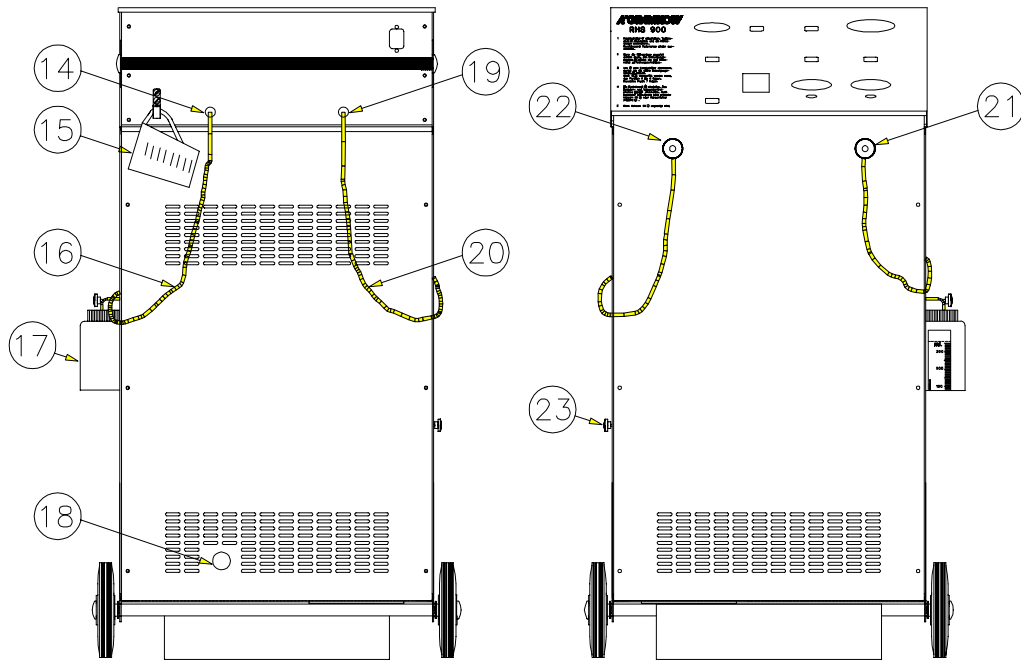
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1. Main switch
2. Operation time indicator
3. Low-pressure valve
4. Pressure gauge - low pressure
5. High-pressure valve
6. Pressure gauge - high pressure
7. Charging switch
8. Charging quantity indicator
9. Evacuation switch
10. Cylinder full - lamp
11. Vacuum check
12. Recovery/recycling switch
13. Vacuum gauge

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## Components

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645-13000A-00

14. High-pressure side
15. Oil beaker - 250 ml
16. High-pressure hose - red
17. Oil charging
18. Sightglass
19. Low-pressure side
20. Low-pressure hose - blue
21. Service coupling - high pressure
22. Service coupling - low pressure
23. Oil drain valve

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## Before use

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### Check the following:

- whether the station has been damaged in transit - if so, contact supplier immediately;
- oil level in vacuum pump: it must not be below the centre of the sight glass. If the level is too low, see section MAINTENANCE for vacuum oil replenishment instructions;
- whether the mains supply is as stated on the station nameplate;
- whether the refrigerant in the A/C unit is as stated on the station nameplate.

### Preparation:

- Connect mains plug to mains supply.
- Connect the red and blue hoses to their stubs on the rear of the station. Blue hose to low-pressure side, red hose to high-pressure side. (See the next two pages.)
- Make sure that the shut-off valves on hoses and pos. 5 are closed.
- Connect high and low-pressure hoses to their respective sides (using the service couplings) on the A/C unit. (See the next two pages.)
- RHS 700 is now ready for operation.



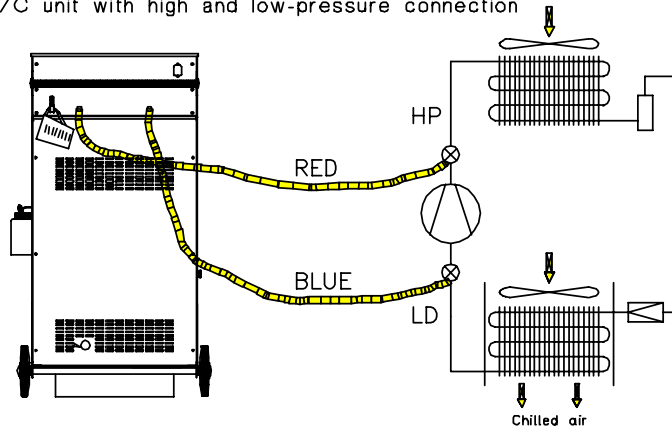
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## Before use

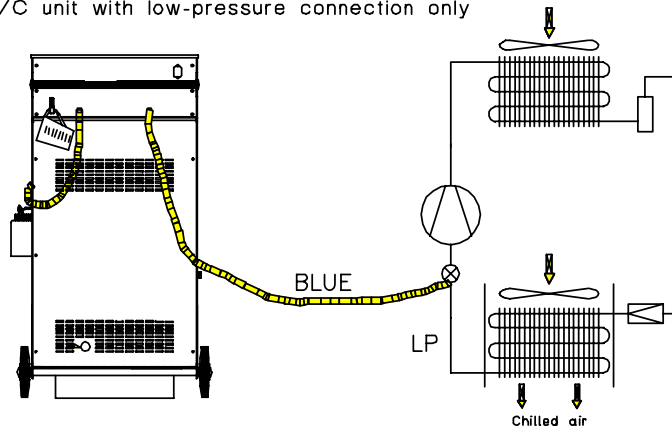
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### Connection of service couplings

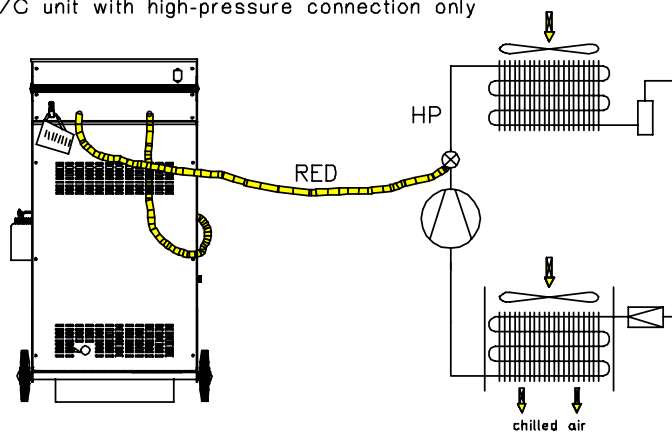
A/C unit with high and low-pressure connection



A/C unit with low-pressure connection only



A/C unit with high-pressure connection only



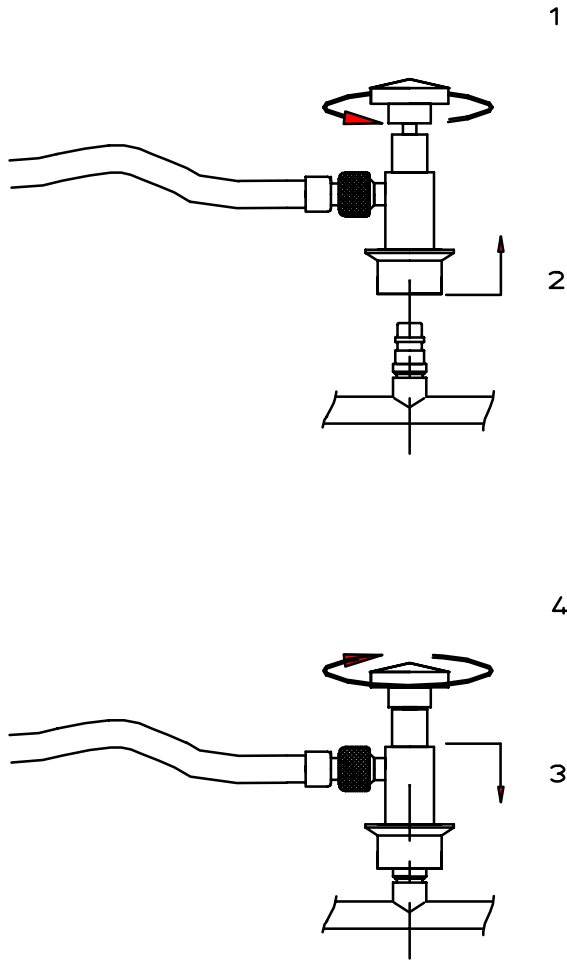
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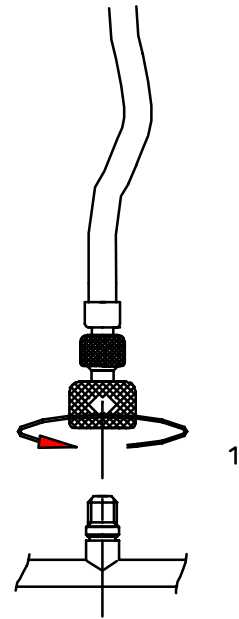
**Before use**

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R134a

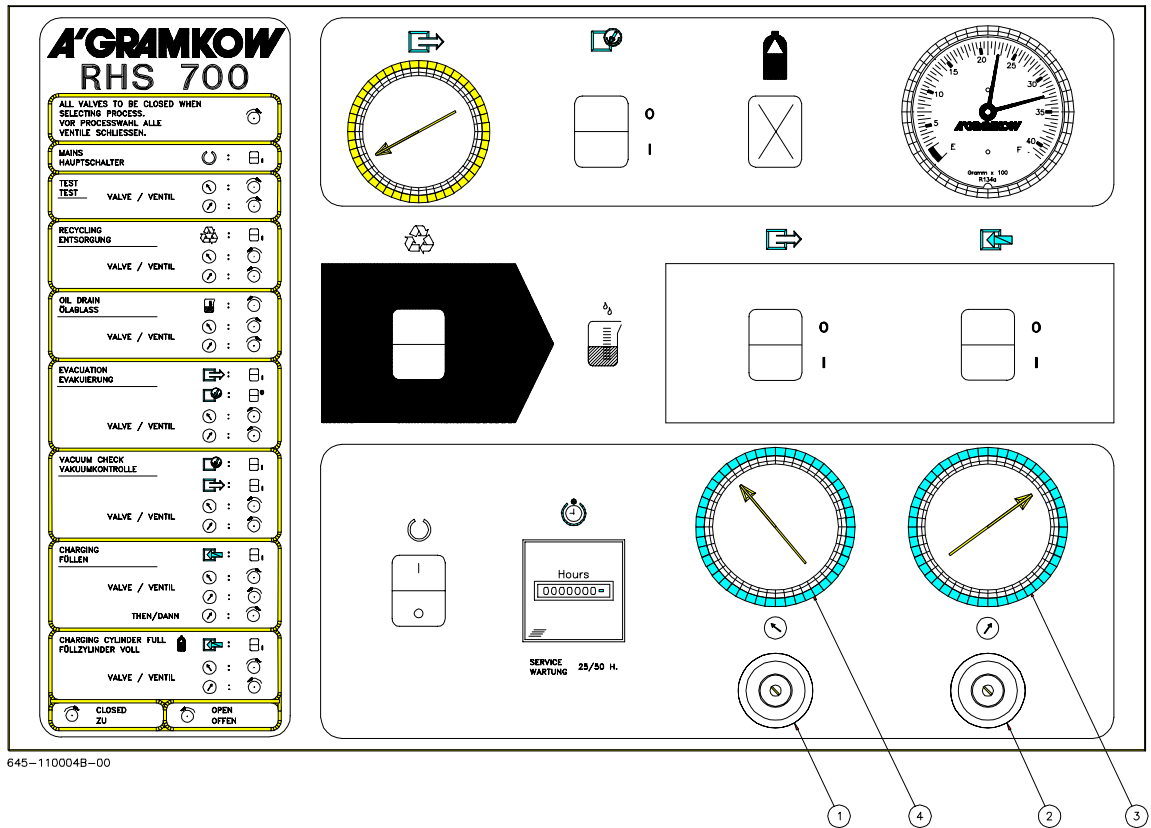


R12



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## Test



The test function must be performed to check the station.

1. Close both valves on the control panel (pos. 1-2).
2. Connect the high and low-pressure hoses to the A/C unit and open the service couplings.
3. Switch on the A/C unit and read the pressures on the high and low-pressure gauges (pos. 3/4). The correct pressures are given in the A/C unit manual.
4. Perform a condition diagnosis in accordance with the supplier's instructions. See appendix "Example of trouble shooting in an A/C unit".



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## Recovery/recycling

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When an A/C unit is to be repaired or serviced, the RECOVERY/RECYCLING process must be used in order to drain refrigerant from the A/C unit.

1. Make sure that all valves are closed, then connect high and low-pressure hoses to the A/C unit and open the service couplings.


1. Switch on the main switch  and the **RECOVERY/RECYCLING** process switch 

2. Open valves 1 and 2. Provided there is pressure/refrigerant in the A/C unit, it will be automatically emptied by RHS 700. The green lamp in the **RECOVERY/RECYCLING** process switch  remains on until the process is complete.

3. When the green lamp goes out for the first time, wait 5 minutes to ensure that the A/C unit is completely empty.

1. As soon as the charging cylinder becomes full during the **RECOVERY/RECYCLING** process, RHS 700 stops and the yellow **CYLINDER FULL** lamp  lights up. The charging cylinder must then be emptied into an A/C unit or a refrigerant cylinder before the process can be continued. See description in the section **CHARGING**.

2. During the **RECOVERY/RECYCLING** process, oil might be drained from the A/C unit. This oil can be tapped from oil drain valve (23) into the accompanying measuring beaker. The A/C unit must be replenished with a corresponding amount of oil. Follow the supplier's instructions and use only the specified oil type.

3. The internal cylinder is charged by connecting the service hose between refrigerant cylinder and low-pressure stub (blue). Open the gas valve on the refrigerant cylinder (charge only on the gas phase). Follow the instructions, points 1, 2 and 3, until the required amount of refrigerant in the internal cylinder has been reached. Close the gas valve on the cylinder again. When the green **RECOVERY/RECYCLING** lamp  goes out the process has been completed. Close valves 1 and 2 and disconnect service hose.

*Note:*


Sometimes it can be an advantage to recover from the low-pressure side only, for then no oil is drained from the A/C unit. However, if this method is used make sure that valve 2 is kept closed.

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## Evacuation

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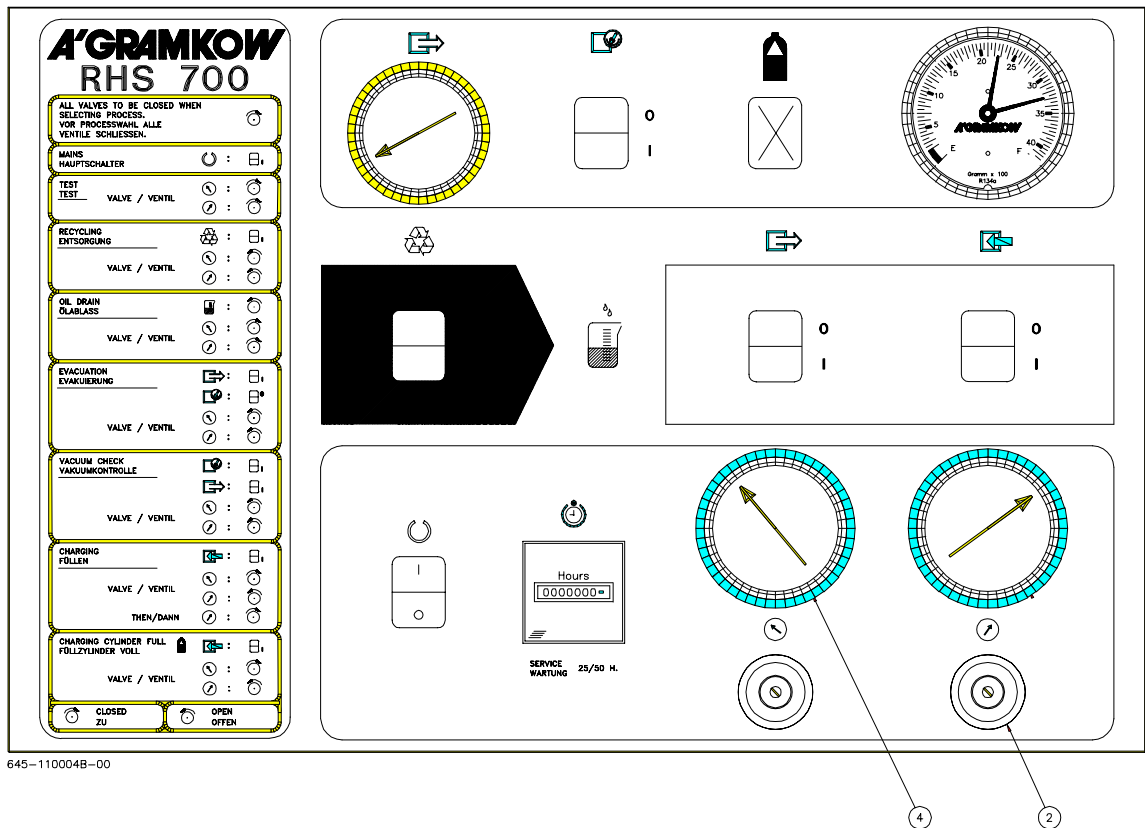
After servicing the A/C unit, air and/or moisture must be evacuated. Air and/or moisture in the A/C unit will impair system operation.

1. Set the main switch on I and switch on the **EVACUATION** process switch  (if the pressure exceeds 0.2 barg, the evacuation process cannot be started). If the pressure does exceed 0.2 barg, a short recovery process should be performed.
2. Before connecting the service couplings to the A/C unit, read the vacuum gauge. This reading is the max. level attainable.
3. Now open the service couplings on the hoses. An evacuation can be performed if thought necessary.
4. A vacuum check must now be made. Switch on the **VACUUM CHECK** process switch and at the same time watch the vacuum gauge! If the pressure rises continuously the system either leaks or contains moisture.
5. When the evacuation process is complete, the A/C unit can be replenished with the amount of oil which might have been taken out during the recovery process. Open the valve, pos. 17, on the oil container on the right-hand side and read off the required amount of oil on the scale.

*Note:*


If the pressure rises slightly and then restabilises, it means that the A/C unit is adjusting itself to the ambient temperature.

## Charging



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The required quantity of refrigerant can be seen in the vehicle manual or on the nameplate under the vehicle bonnet.







1. Close valve 1 ☹ and open valve 2 ☺ Then connect high and low-pressure hoses, keeping both hose valves closed. (When charging R12 systems, do not connect the high-pressure hose at this point).
2. Set the main switch on I and switch on the CHARGE process switch  The high-pressure hose will now contain refrigerant.
3. To ensure that the correct quantity of refrigerant is used, the red pointer on the charging quantity indicator must now be set to determine the level at which the black pointer indicates that the required quantity of refrigerant has been charged (i.e. the level to which the charging cylinder is to be emptied).

*Note:* The charging quantity indicator will first indicate the level 2 minutes after starting the station.


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## Charging

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4. Open the high-pressure valve on the red hose (on R12 systems simply close the hose) and observe the charging quantity on the charging quantity indicator. When the black pointer has reached the red pointer, the charging process must be stopped with the process switch.
5. It is now possible to check the function of the A/C unit by closing valves 1 and 2 and opening both hose valves.
6. After completion of the A/C unit test process, close the red high-pressure hose valve and open valve  and  while the A/C unit is in operation. This empties refrigerant from the high-pressure hose and ensures the accuracy of the refrigerant quantity charged. Now close the service valve on the blue hose. (On R12 systems simply remove the hose.)
7. After charging, hoses will contain a small quantity of refrigerant. To recover this refrigerant, first close hose valves and then switch over to **RECOVERY** for a short time.
8. Connect the service hose between refrigerant cylinder and high-pressure stub (red) to empty/recharge the internal cylinder. Emptying must be as described in point 4 and recharging as described in the RECOVERY process. Open valve  and the valve on the refrigerant cylinder. The refrigerant cylinder must only be filled to not more than 80% of its maximum volume. After emptying/recharging of the required refrigerant quantity, close the valves again. Open  valve  and  (low-pressure stub closed) and switch on the process switch for **RECOVERY/RECYCLING** to empty the hose.

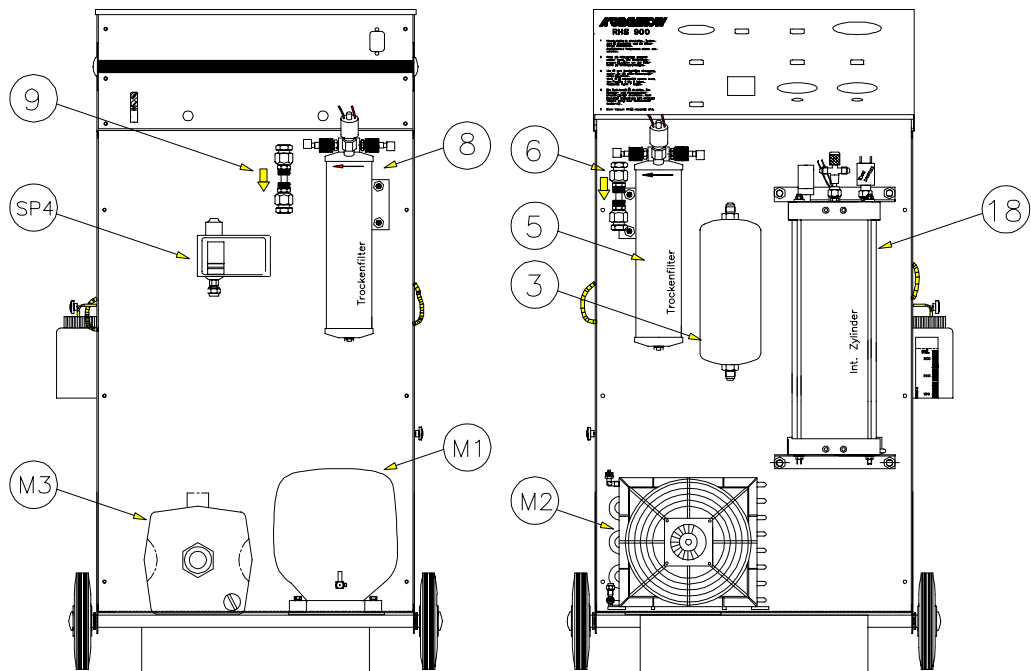
*Note:*

It is often a problem to charge the whole charging quantity from the high-pressure side only. If this is the case, a two-sided charge is possible by opening valve  .

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## Maintenance

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- 3) Suction accumulator
- 5) Acid filter / filter drier
- 6) Check valve
- 9) Check valve
- 8) Filter drier
- 18) Charging cylinder
- M1) Compressor
- M2) Condenser
- M3) Vacuum pump
- SP4) Pressure control



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## Maintenance

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To observe the warranty on RHS 700, all components used for maintenance must be identical to those in the service set, see Section 9.

To ensure problem-free operation of RHS 700, the station must be maintained in accordance with the following:

**The power supply to the station must be switched off.**

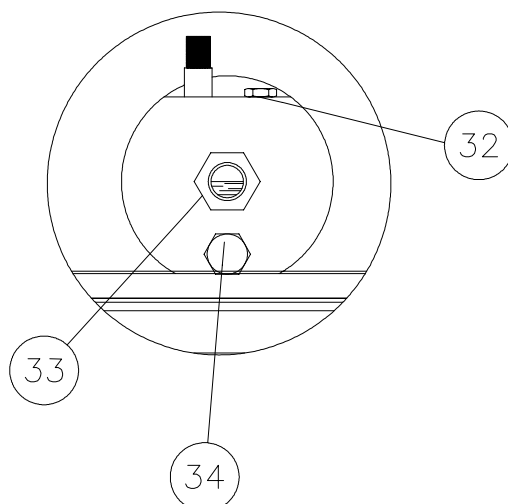
**For each 25 operating hours:**

A large amount of the moisture evacuated from the A/C unit accumulates in the vacuum oil and therefore it can be advantageous to change the oil from time to time. The reason moisture accumulates in the vacuum oil is that the vacuum pump does not create the required vacuum!

**Changing vacuum pump oil:**

- Hold an oil beaker under the oil drain screw (pos. 34) and loosen the screw. Allow the old oil to drain into the beaker.
- Remove the oil filling cap (pos. 32).

Retighten the oil drain screw and fill with new oil through the oil filling stub (pos. 32) until the level reaches the centre of the sight glass (pos. 33).



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## Maintenance

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**The condenser cooling surface must be kept clean:**

- Remove the rear panel of the station (4 screws).
- Clean the cooling surface with compressed air and perhaps a soft brush. Be careful not to bend the fins since this would reduce the air flow and impair condenser capacity.
- Replace rear panel.

**Check the oil level in the vacuum pump:**

- If the oil level is below the centre of the sight glass, replenish as follows:
- Remove cap (pos. 32) to replenish vacuum pump.
- Replenish (slowly) with vacuum oil to the correct level.
- Replace cap.

**For each 75 operating hours:**

**Replacement of filter drier (pos. 5)**

- Remove front panel (6 screws).
- Remove filter by loosening the pressure control (two 3/8" flare nuts), and then fit the replacement filter. Always use a new filter fitted with protective caps on the connectors.

**Replacement of filter drier (pos. 8)**

- Remove rear panel (6 screws).
- Remove filter by loosening the union nuts and the solenoid valve (pos. 36) at the filter end. Loosen the nuts slowly and take out the filter.
- Fit a new filter in the station, making sure to retighten the union nuts.
- Refit pressure control and solenoid valve.

**On replacing filter driers a small quantity of refrigerant escapes - therefore follow the appropriate safety precautions.**

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## Trouble shooting

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### Test process

Problem	Fault	Remedy
Pressure gauge shows no pressure	1. + 2. Valve not opened  3. No refrigerant in A/C unit	1. Open high and low-pressure valves on service couplings  2. Open valves on service couplings  3. Repair A/C unit
Pressure gauge shows the same reading all the time	1. A/C unit defective  2. A/C unit not cut in	1. Empty A/C unit and repair  2. Cut in A/C unit

### Recovery process:

Problem	Fault	Remedy
Recovery process does not start - green recovery lamp does not light up	1. RHS 700 not cut in  2. Valves not opened  3. No refrigerant in A/C unit  4. System pressure is 16 bar  5. Internal cylinder full  6. Internal component fault	1. Cut in RHS 700  2. Open high and low-pressure valves on service couplings  3. Repair A/C unit  4. Contact RHS 700 supplier  5. Empty cylinder  6. Contact RHS 700 supplier
Recovery process does not stop	1. Oil drain valve not closed  2. A/C unit leakage  3. Internal component fault	1. Close valve  2. Contact RHS 700 supplier  3. Contact RHS 700 supplier
Recovery process runs only for a short period	1. Valves on service couplings not opened  2. System pressure is 16 bar  3. Internal cylinder full  4. Internal component fault	1. Open valves  2. Blow off non-condensable gases  3. Empty cylinder  4. Contact RHS 700 supplier

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## Trouble shooting

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### Evacuation process:

<b>Problem</b>	<b>Fault</b>	<b>Remedy</b>
Vacuum pump does not run	1. RHS 700 not cut in 2. Overpressure in A/C unit 3. Internal component fault	1. Cut in RHS 700 2. Cut in recovery process 3. Contact RHS 700 supplier
Vacuum pump runs but does not build up enough vacuum	1. Service couplings not fitted correctly 2. A/C unit defective/leaking 3. Internal component fault	1. Fit service couplings correctly 2. Repair A/C unit 3. Contact RHS 700 supplier

### Charging process:

<b>Problem</b>	<b>Fault</b>	<b>Remedy</b>
No refrigerant flow	1. High-pressure valve on service coupling not opened 2. Internal component fault 3. Charging cylinder empty 4. A/C unit not evacuated 5. Heating element defective 6. Thermal protector defective	1. Open valve 2. Contact RHS 700 supplier! 3. Connect a refrigerant cylinder and use the recovery process 4. Recover the A/C unit again and then evacuate it 5. Contact the RHS 700 supplier 6. Contact the RHS 700 supplier

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**Service set no. 645-010003A (RHS 700 unit)**

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<b>Quantity</b>	<b>Description</b>	<b>Code no.</b>
1	Filter drier - short	069-7480069
1	Filter drier - long	069-7480077
0.25 l	Compressor oil - mineral	290-0001250
0.25 l	Oil for vacuum pump	290-0001272

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## Accessories / Spare parts

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Qty	Description	Code no.
<b>Spare parts:</b>		
1	Operating instructions	645-400008A
1	Service coupling, high pressure (R134a)	290-7480095
1	Service coupling, low pressure (R134a)	290-7480096
1	Service coupling (R12)	290-4669016
1	Service coupling (R12)	066-7390234
1	Service hose, blue (R134a) = 72"	634-140002A
1	Service hose, red (R134a) = 72"	634-140001A
1	Service hose, yellow (R134a) = 36"	634-140004A
1	Service hose, blue (R12) = 180 cm	080-4665015
1	Service hose, red (R12) = 180 cm	080-4665017
1	Service hose, yellow (R12) = 90 cm	080-4665002
1	Gasket for R134a hose - white	087-7481010
1	O-ring for R134a hose, Ø 14.5 mm	087-7481341
1	Gasket for R12 hose	066-7750950
1	Oil beaker	146-7489012
<b>Accessories:</b>		
1	Oil charging (R134a)	642-040003A
1	Tracer kit R12	634-040007A
1	Tracer kit R134a	643-040002A

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## Specifications

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### General:

Supply voltage:	See nameplate
Amperage:	See nameplate
Power consumption:	See nameplate
Starting current:	See nameplate
Weight:	95 kg
Dimensions:	1030 x 670 x 800 mm

### Test function:

High-pressure gauge:	0 to 34 bar
Low-pressure gauge:	-1 to 8 bar

### Recovery/recycling process:

Refrigerant:	See nameplate
Oil level measurement:	Drain at side of station, measuring beaker supplied
Recycling capacity:	4 kg/h (3-5 vehicles/h)
Non-condensable gases:	Automatic blow-off, temperature-compensated
Suction accumulator:	2.4 litres (approx. 2 kg)
Refrigerant charge:	4.0/4.2 kg R134a/R12
Filter drier:	Replaceable (every 75 hours)
Charging pressure gauge:	0-4000 g

### Evacuation process:

Suction capacity:	Approx. 3 m <sup>3</sup> /h
Vacuum level:	< 0.5 mbar absolute

### Option:

Oil charging:	Oil container = 250 ml
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## Specifications

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### Operating panel:

Mains switch - white:	Power supply cut in
Recovery switch - green:	Recovery process in function
Evacuation switch - green:	Evacuation process in function
Refrigerant charging switch - green:	Refrigerant charging in process
Vacuum check lamp - green:	Vacuum OK
Charging cylinder lamp - yellow:	Cylinder full

### Service and maintenance

Filter drier 1:	Replaceable, 3/8" SAE
Filter drier 2:	Replaceable, 3/8" SAE (capacity 50 hours or 200 kg refrigerant)
Vacuum pump oil level:	Sight glass + charging stub
Safety equipment:	Mechanical safety valve on charging cylinder Overfilling protection on charging cylinder Suction pressure regulator on compressor High-pressure control on compressor
Code number of RHS 700:	See nameplate

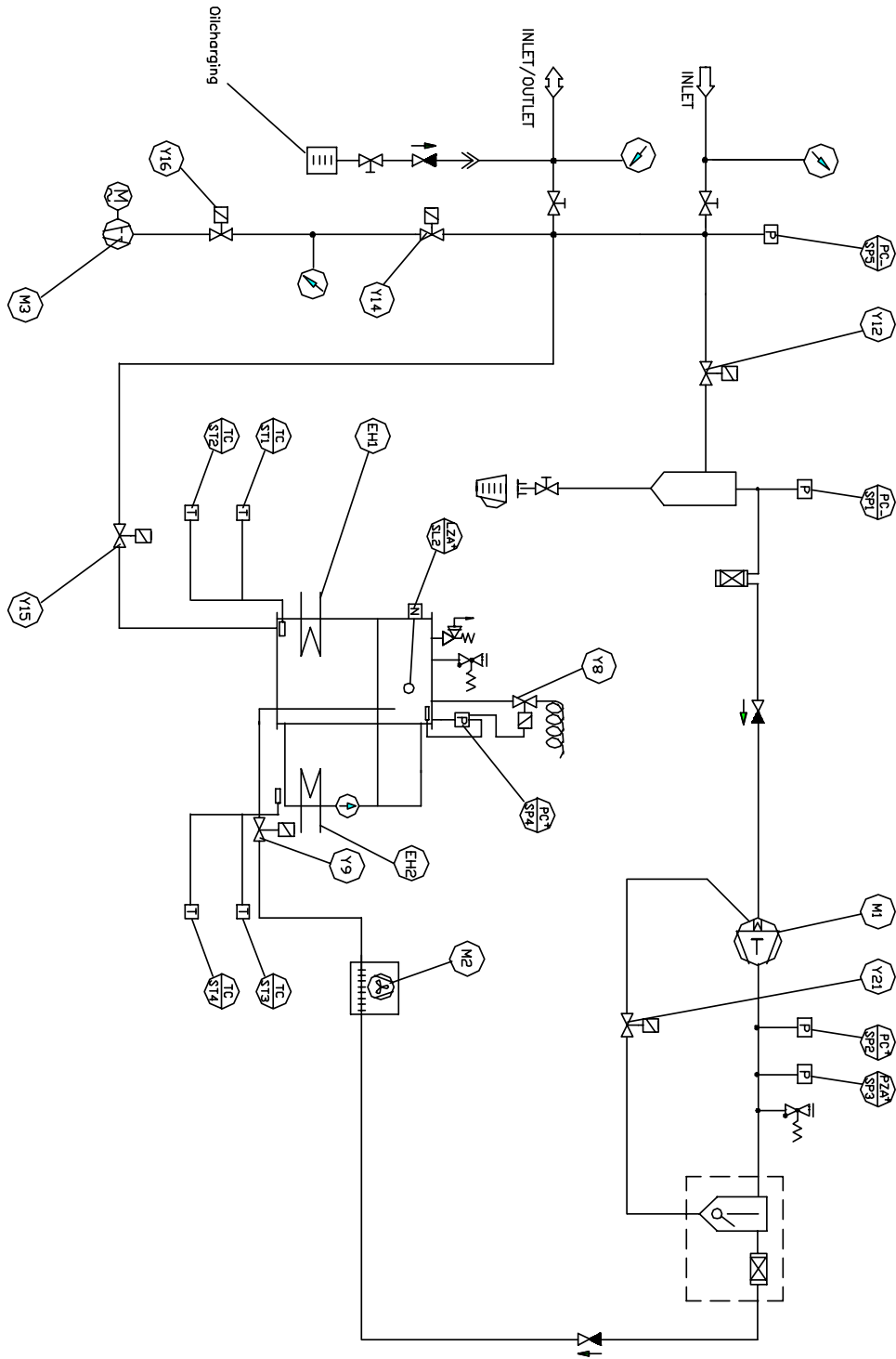


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**Pos. no. location**

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**Wiring diagram:**



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**Pos. no. location**

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**Wiring diagram**

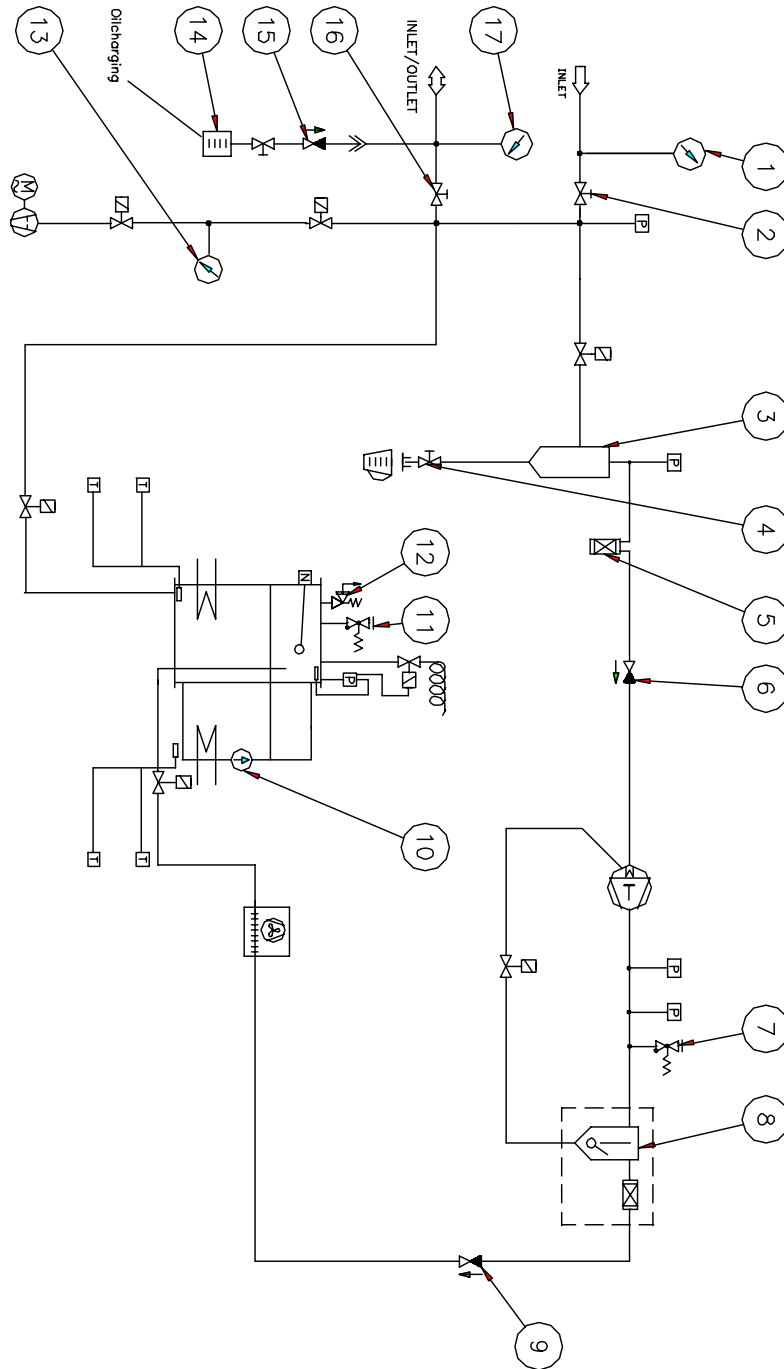
<b>M3:</b>	Vacuum pump
<b>Y14:</b>	Solenoid valve
<b>Y15:</b>	Solenoid valve
<b>Y16:</b>	Solenoid valve
<b>EH1:</b>	Heating element
<b>EH2:</b>	Heating element
<b>ST1:</b>	Thermostat
<b>ST2:</b>	Thermal protector (manual reset)
<b>ST3:</b>	Thermostat
<b>ST4:</b>	Thermal protector (manual reset)
<b>M1:</b>	Compressor
<b>M2:</b>	Fan
<b>Y9:</b>	Solenoid valve
<b>Y21:</b>	Solenoid valve
<b>SL2:</b>	Level switch
<b>Y8:</b>	Solenoid valve
<b>SP1:</b>	Pressure control
<b>SP2:</b>	Pressure control
<b>SP3:</b>	Pressure control
<b>SP4:</b>	Pressure control
<b>SP5:</b>	Pressure control

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**Pos. no. location**

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**Mechanical diagram**

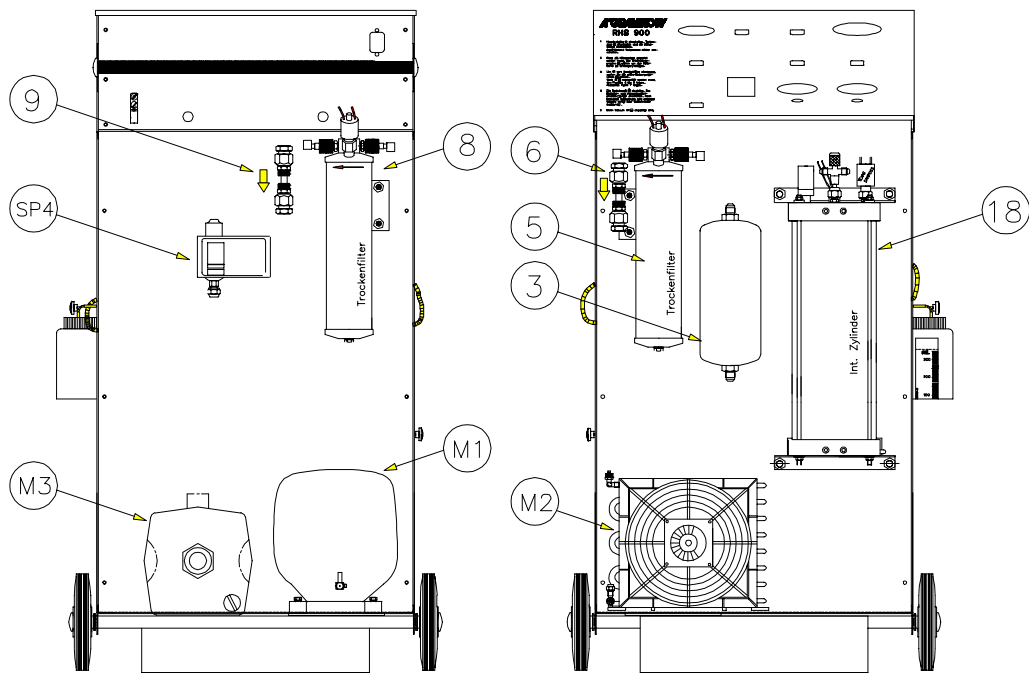


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**Pos. no. location**

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- 3) Suction accumulator
- 5) Acid filter / filter drier
- 6) Check valve
- 9) Check valve
- 8) Filter drier
- 18) Charging cylinder
- M1) Compressor
- M2) Condenser
- M3) Vacuum pump
- SP4) Pressure control

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## Appendixes

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### **Example of trouble shooting on an A/C unit:**

#### **Conditions:**

- |                                 |                   |
|---------------------------------|-------------------|
| 1. Ambient temperature          | 30-35°C (86-95°F) |
| 2. Motor speed                  | 2,000 rpm         |
| 3. A/C unit temperature setting | Maximum           |

#### **Under the above conditions an intact A/C unit will show the following pressures in the TEST process:**

High pressure	15 bar
Low pressure	2 bar

#### **Follow the TEST process as shown in section 5:**

- Connect service couplings to the A/C unit.
- Close the high and low-pressure valves on RHS 700
- Open the valves on the service couplings.
- Cut in the A/C unit.
- The station will now perform a test function.  
Perform a condition diagnosis in accordance with the supplier's instructions.
- When the test is completed, cut the A/C unit off again.

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## Appendixes

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### Test 1:

High pressure	8 - 9 bar
Low pressure	Approx. 0.8 bar

<b>Fault/problem</b>	<b>Symptom</b>	<b>Possible cause</b>	<b>Remedy</b>
Unsatisfactory refrigeration output	Virgin ventilation air	Leak in A/C unit	Locate leak and repair
	Air bubbles in sight glass	Insufficient refrigerant in A/C unit	Replenish refrigerant

### Test 2:

High pressure	Approx. 20 bar
Low pressure	Approx. 2.5 bar

<b>Fault/problem</b>	<b>Symptom</b>	<b>Possible cause</b>	<b>Remedy</b>
Unsatisfactory refrigeration output		Refrigerant over-charged	
		Insufficient condenser cooling	Clean the condenser
		Fan not running	Repair fan
		Reduced condenser output because of oil or dirt deposits	Clean the condenser
		Insufficient oil in A/C unit (compressor friction)	Replenish oil
			If none of the above steps remedy the fault, check refrigerant quantity in A/C unit, empty, evacuate and recharge unit

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## Appendixes

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### Test 3:

High pressure	Approx. 7 - 15 bar
Low pressure	Approx. 1.5 bar

<b>Fault/problem</b>	<b>Symptom</b>	<b>Possible cause</b>	<b>Remedy</b>
A/C unit runs irregularly	Varying pressures on high and low-pressure sides	Moisture in A/C unit causes ice on expansion valve and reduces output.  Filter drier saturated	Empty, evacuate and recharge A/C unit. After recovery process replace filter drier. If necessary, remove and clean expansion valve. Replace valve or fit new valve.

### Test 4:

High pressure	Approx. 6 bar
Low pressure	Approx. -0.3 bar

<b>Fault/problem</b>	<b>Symptom</b>	<b>Possible cause</b>	<b>Remedy</b>
A/C unit does not cool - or cools only slightly	Hoses ahead of or after expansion valve or filter drier covered with moisture or ice	Because of moisture in A/C unit, expansion valve or filter drier blocked by ice	Cut out A/C unit, wait a few minutes and empty it. Then evacuate and recharge A/C unit.

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## Appendixes

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### Test 5:

High pressure	Approx. 19 - 20 bar
Low pressure	Approx. 2.5 bar

<b>Fault/problem</b>	<b>Symptom</b>	<b>Possible cause</b>	<b>Remedy</b>
Unacceptable cooling	Ice or moisture on hoses on high and low-pressure sides of A/C unit	Expansion valve defective or sensor placed incorrectly	Check position of expansion valve sensor.
		Expansion valve opens too much	Replace expansion valve.

### Test 6:

High pressure	Approx. 7 - 10 bar
Low pressure	Approx. 4 - 6 bar

<b>Fault/problem</b>	<b>Symptom</b>	<b>Possible cause</b>	<b>Remedy</b>
A/C unit does not cool	Pressure on low-pressure side too high or pressure on high-pressure side too low	Internal compressor leakage	Repair or replace compressor



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## Appendixes

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### Pressure vessel declaration

We confirm herewith that the condition of the pressure vessel in this unit conforms to regulations laid down by the appropriate authorities:

#### Suction accumulator, pos. 4:

Manufacturer:	Denaline S.R.L. Via Segaluzza 11/B Italy
Type:	GRA.120.240.0
Permissible working pressure:	PS = 23 bar
Permissible working temperature:	-40/70°C
Volume:	V = 2.4 litres

#### Filter drier, pos. 5:

Manufacturer:	RTI Technologies Inc. (A'G subsidiary) York, PA USA
Type:	026-80069-00
Permissible working pressure:	PS = 31.05 bar
Permissible working temperature:	10/120°C
Volume:	V = 0.83 litres

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## Appendixes

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### **Filter drier, pos. 8:**

Manufacturer:	RTI Technologies Inc. (A'G subsidiary) York, PA USA
Type:	026-80077-00
Permissible working pressure:	PS = 31.05 bar
Permissible working temperature:	10/120°C
Volume:	V = 0.83 litres

### **Charging cylinder, pos. 10**

Manufacturer:	A'GRAMKOW A/S Augustenborg Landevej 19 DK-6400 Sønderborg Denmark
Type:	645-010038A
Permissible working pressure:	PS = 25 bar
Permissible working temperature:	10/70°C
Volume:	V = 4.26 litres