

Note

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Safety precautions

- a) This equipment is designed for skilled personnel only, in accordance with DIN EN13313, who must be familiar with the basics of refrigerating technology, refrigerants and possible damage that pressurized equipment may cause.
- b) Carefully read the instructions contained in this manual; strict observance of the procedures described is of fundamental importance to the operator's safety, the proper functioning of the unit and its consistent performance.
- c) Do not operate the unit with a different refrigerant than the one for which it has been designed (R134a).
- d) Before commissioning, make sure that the hoses used for connections have been evacuated first and do not contain non-condensable gases.
- e) Avoid skin contact; the low boiling temperature of the refrigerant (approx. -30°C) can cause freezing.
- f) Avoid breathing in refrigerant vapors.
- g) It is recommended to wear suitable protective equipment such as safety glasses and gloves; contact with refrigerant may cause blindness and other personal injuries.
- h) Do not operate near open flames and hot surfaces, the high temperatures decompose the refrigerant, releasing toxic and caustic substances which are hazardous for the operator and the environment.
- i) Always make sure that the unit is connected to a suitably protected mains supply with an efficient ground connection.
- j) Before performing maintenance operations or if the unit is not to be used for a longer period, turn the unit off by setting the main switch to 0 and disconnecting the power supply cord; always follow the sequence of operating steps.
- k) Operate the unit only in locations with suitable ventilation and a high air exchange rate.
- l) Before disconnecting the unit, make sure that the respective working step has been completed and that all valves are closed in order to avoid release of refrigerant to the atmosphere.
- m) Never fill any refrigerant tank with refrigerant to more than 75% (approx. 15 kg) of its maximum capacity.
- n) During operation avoid release of the refrigerant to the environment, this precaution is required by international environment standards and is essential to avoid difficult leak detection in a refrigerant-polluted environment.
- o) Operation of the equipment must always be supervised by an operator.
- p) The equipment must be protected from external humidity penetration.
- q) Do not modify the calibration of safety valves and control systems.
- r) The refrigerant scale must be fixed in place during transport.
- s) The equipment must not be transported in a horizontal position.

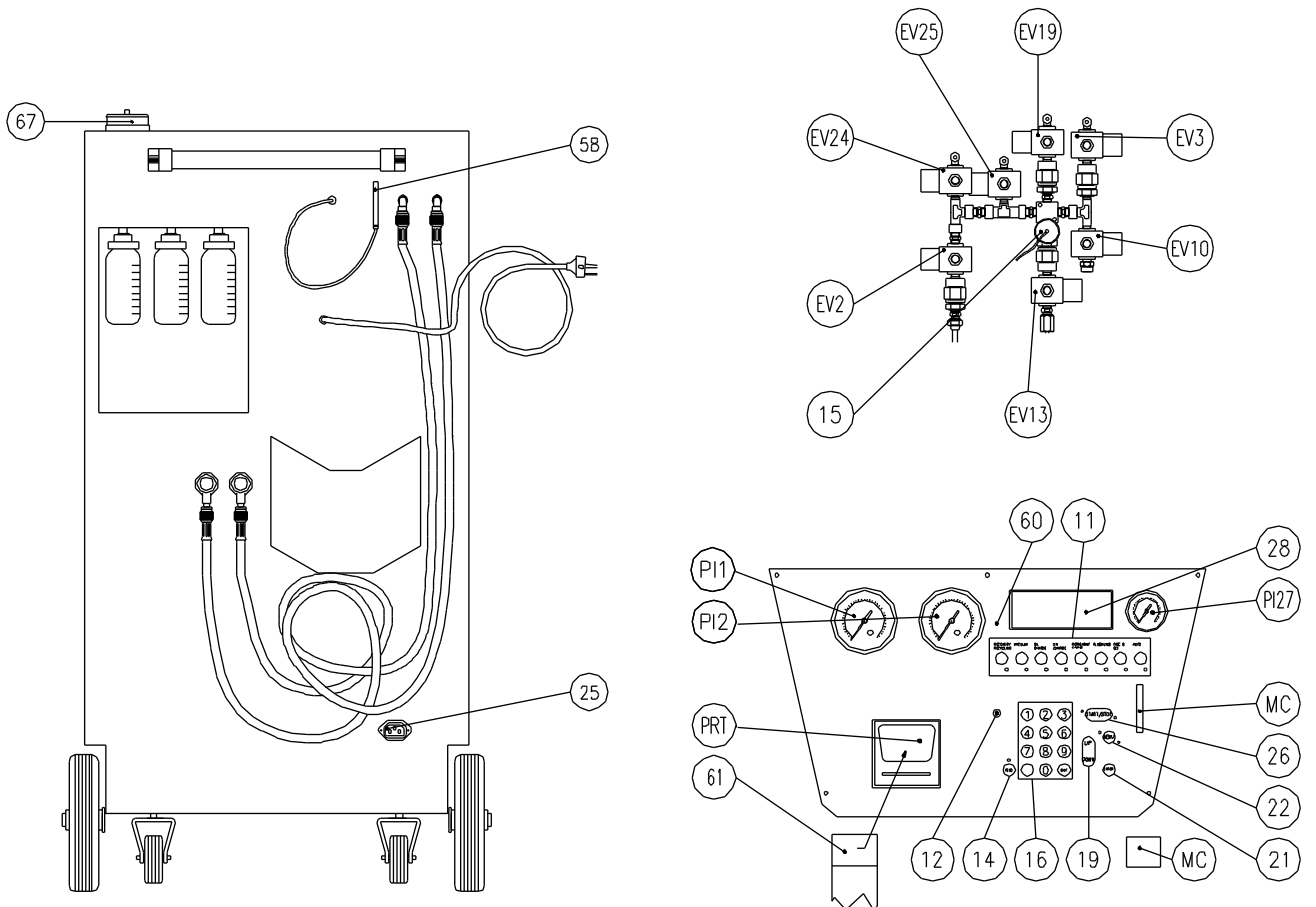
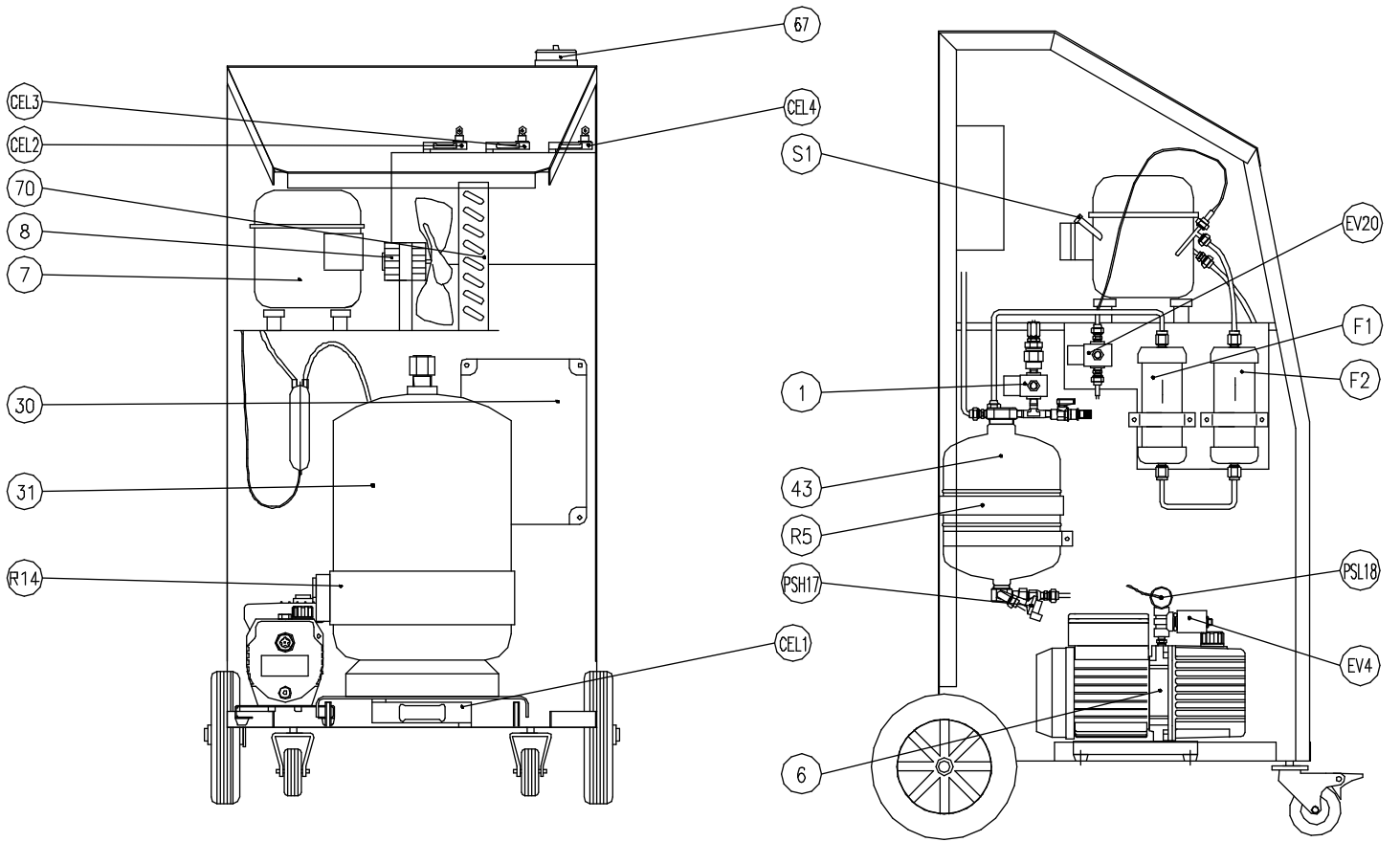
Improper Operation

Improper operation can cause personal injury! The SECU smart unit is designed for commercial service of vehicle air conditioning systems that are exclusively filled with R134a refrigerant.

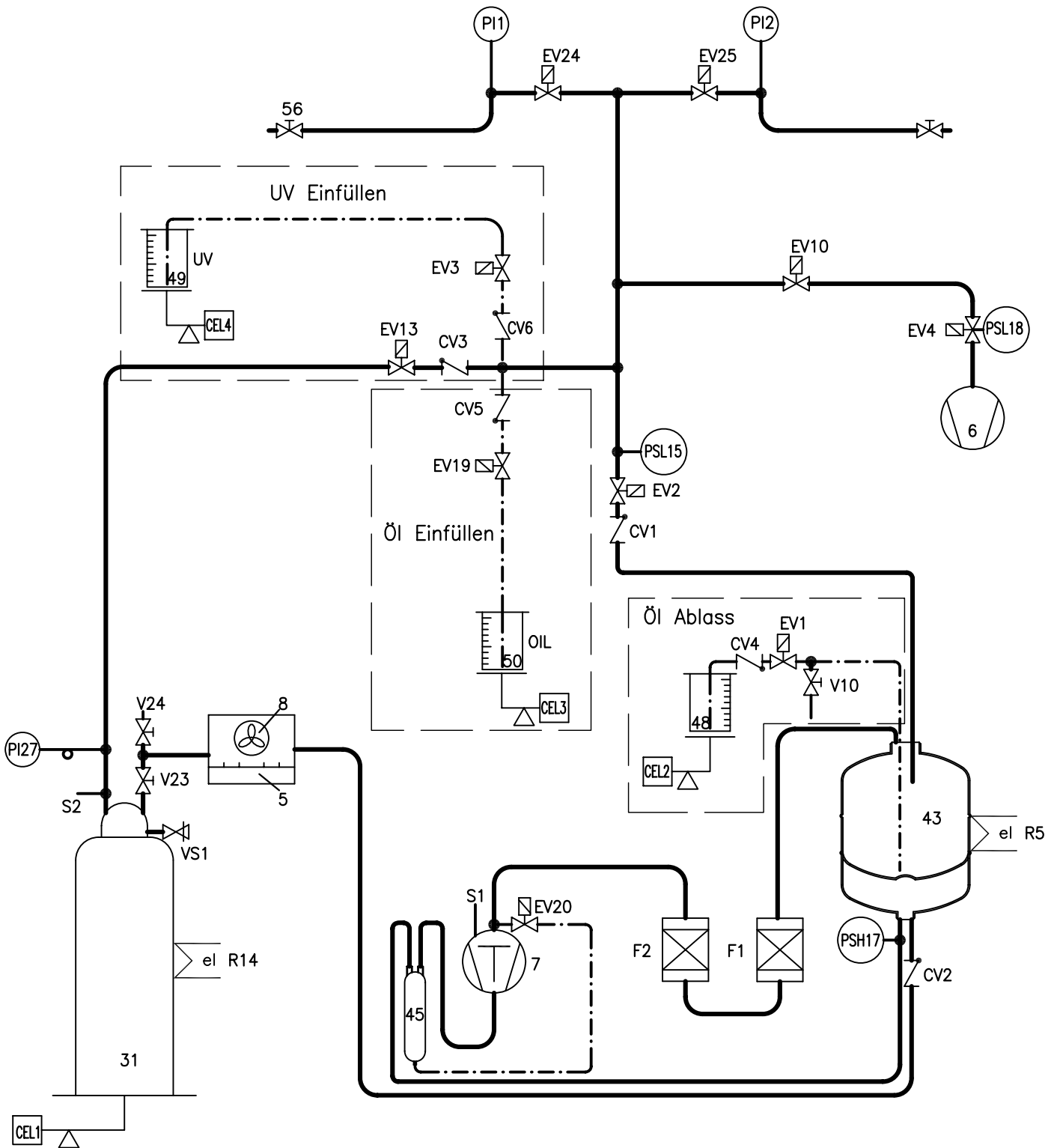
Behr Service accepts no liability for damages resulting from the following:

- Use for purposes other than those described in the user's manual.
- Changes to the unit made without express approval from Behr Service.
- Damages to the unit caused by external influences.
- Incorrect operation

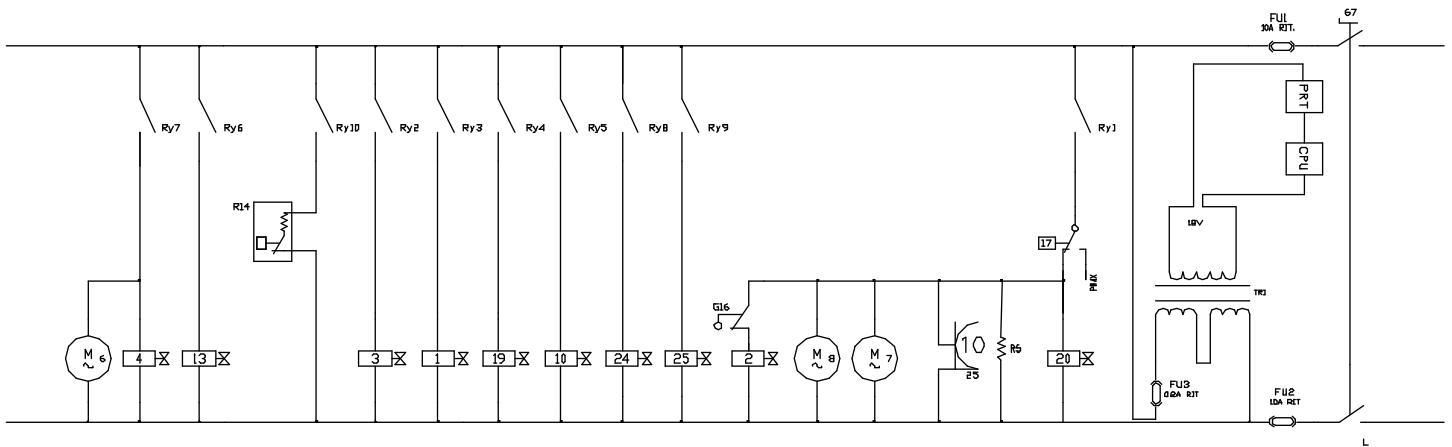
Design drawing



Hydraulic diagram



Circuit diagram



Key

Design drawing (page 5)

11	Control function key
12	Warning light
14	Start key, printer
16	Numeric keys
19	Up / down key
21	Enter key
22	Menu key
25	Socket for flushing unit
26	START/STOP
30	Electrical distributor box
31	Refrigerant bottle
43	Distiller – separator
44	F1/F2 hose lines
45	Compressor oil distiller
48	Oil drain unit (recovered oil)
49	UV contrasting agent dosing unit
50	Oil dosing unit
55	High-pressure connection valve
56	Low-pressure connection valve
58	Temperature sensor
60	Controller
61	Printer paper
62	Black plastic pan
67	Main power switch
70	Condenser
MC	Memory card
R14	Heater on the refrigerant bottle
R5	Heater on the distiller

Hydraulic diagram (page 6)

5	Condenser
6	Vacuum pump
7	Compressor
8	Fan
CEL1	Refrigerant load cell – 100 kg
CEL2	Oil drain load cell – 5 kg
CEL3	Oil injection load cell – 5 kg
CEL4	UV contrasting agent load cell – 5 kg
CV1	Check valve on suction line
CV2	Check valve on distiller
CV3	Check valve in the refrigerant charging line
CV4	Check valve in the oil draining line
CV5	Check valve in the oil charging line
CV6	Check valve in the UV charging line

EV1	Solenoid valve in the oil draining line
EV2	Solenoid valve in the recovery line
EV3	Solenoid valve in the UV charging line
EV4	Solenoid valve on the vacuum pump
EV10	Solenoid valve in the vacuum test line
EV13	Solenoid valve in the refrigerant charging line
EV19	Solenoid valve in the oil charging line
EV20	Solenoid valve in the oil return line to the compressor
EV24	Solenoid valve in the low-pressure line
EV25	Solenoid valve in the high-pressure line
F1	Filter dryer
F2	Filter dryer
PI1	Low pressure gauge
PI2	High pressure gauge
PI27	Bottle pressure gauge
PRT	Printer
PSL15	Pressure/vacuum switch
PSL18	Vacuum switch
PSH17	Safety switch
S1	Compressor service connection
S2	Refrigerant bottle tank
V10	Discharge valve on the distiller
V23	Valve on the refrigerant bottle
V24	Bottle service valve
VS1	Safety valve

Circuit diagram (page 7)

FU1	10 A fuse
FU2	10 A fuse
FU3	0.2 A fuse
G16	Float switch
RY1	Relay for recovery
RY2	Relay for contrasting agent charging
RY3	Relay for vacuum test
RY4	Relay for refrigerant charging
RY6	Relay for oil draining
RY7	Relay for contrasting agent charging
RY8	Input relay for low-pressure side
RY9	Input relay for high-pressure side
RY10	Relay for refrigerant bottle heater
TR1	Electronic exchanger 220/18 A

1. Introduction to the SECU smart air conditioning service unit

SECU smart permits quick and efficient recovery of refrigerant from the A/C system, refrigerant recycling, evacuation of the system, check for air-tightness, additive or lubricant injection, charging with refrigerant and measurement of the operating pressures. SECU smart permits the control of all functions with the aid of 4 electronic load cells which carry out the following measurements: the quantity of oil discharged from the A/C system, the quantity of refrigerant discharged and refilled, quantity of oil charge and UV contrasting agent (leak detection additive).

1.1 Technical data

SECU smart

Refrigerant used	R134a
Max. storage capacity	20 kg
Max. permissible capacity of refrigerant in the supply bottle	15 kg
Refrigerant reserve	2 kg (included in the maximum storage capacity)
Max. recovery rate	0.4 kg/min
Vacuum pump capacity	180 l/min, 2-stage
Final vacuum	0.01 mbar (at 20°C at the pump)
Max. oil storage capacity	200 ml
Oil reserve	30 ml
Max. additive storage capacity	200 ml
Additive reserve	30 ml
Power supply	230V/50Hz
Power consumption	700 W
Refrigerant bottle heater	400 W
Storage temperature	-10 ÷ +50 °C
Operating temperature	0 ÷ 40 °C
Protective rating	IP24
Noise level	< 70dB (A)
Dimensions (LxWxH)	□ → p. 22
Weight	110 kg

Max. refrigerant charge

The maximum refrigerant quantity available for charging is calculated by subtracting 2 kg from the weight of the refrigerant contained in the bottle and indicated on the display.

Max. kg for charging = kg in bottle - 2 kg

Model	Connections
SECU Smart	3/8" (SAE standard) with quick-action coupler valves

2. Description of components and standard equipment

2.1 Vacuum pump

This pump is an essential component for extracting external gases and ambient air and humidity out of the A/C system. The vacuum pump the unit is fitted with is a 2-stage rotary vane type, lubricated by oil injection

2.2 Refrigerant bottle

Max. capacity 20 kg

Weight of empty bottle 12 kg

Since refrigerant can expand with an increase in temperature, the permissible capacity of the bottle may only be 75% of the total capacity (approx. 15 kg). The bottle has two service connections – one for liquid refrigerants and one for gaseous refrigerants, a safety valve for non-condensable gases (external gases) and a heater belt with thermostat.

2.3 Distiller – separator

Single body design featuring:

- distillation chamber with automatic flow control
- separating chamber for the oil removed from the compressor. The chamber is fitted with a device for automatic return at the end of the cycle.
- heat exchanger chamber for recovered refrigerant

2.5 Compressor

The compressor is of the hermetic type.

2.6 Filters

Each of the 2 filter dryers has a water absorption capacity of 40 g. The filter dryers must be replaced after 100 hours of operation. The unit automatically indicates the necessary filter replacement after the operating period has expired. The filter dryers must be replaced once annually, even if they have not been in operation for 100 hours within the one-year period.

2.7 Hoses

Their flexibility ensures easy connection in any situation. The hoses withstand the operating pressure of the A/C system and maintain their passage section even when operating in a vacuum. The **SECU smart** unit features hoses with special quick-action coupler valves.

2.8 Quick-action coupler valves

Mounted on the hose ends and color coded (blue = low pressure; red = high pressure). They simply have to be inserted onto the vehicle's service connection. The service valve at the vehicle is opened by turning the knurled nut.

2.9 Printer

Printing is on thermal paper with a standard width of 57 mm. Reports with the values programmed by the operator and carried out by the unit can be printed; the reports can be printed repeatedly.

Procedure for changing the header and footer on the print-out:

- Press the **MENU** key in standby mode (without any service function running).
- Select no. 7 (Service).
- Enter the code **2006**.
- Change the header and footer according to your requirements using the keypad. Letters are entered as with a standard cellular phone keypad.
- Press the **ENTER** key after every line to confirm the entry.
- Press **STOP** to store your entry and exit the menu.

2.10 Control module

When the unit is turned on (**PWR** switch to position **I**), the display shows the following:

- The refrigerant quantity in kg in the internal supply bottle (see 1.1. "Technical data")
- The quantity (ml) of oil in the oil supply tank of the dosing unit
- The quantity (ml) of contrasting agent in the tank of the contrasting agent dosing unit
- The measured temperature of the integrated temperature sensor on the unit

Thanks to the micro-processor and the 4 electronic scales, the **SECU smart** unit is completely computerized and is operated by means of the keyboard located on the upper panel.

SECU smart has a large display which makes perfect value read-off possible even in poor light; the 4-line display (with 20 characters each) allows the reading of the parameters connected to the selected functions and indicates operating or functioning alarms if necessary.

2.11 Function programming

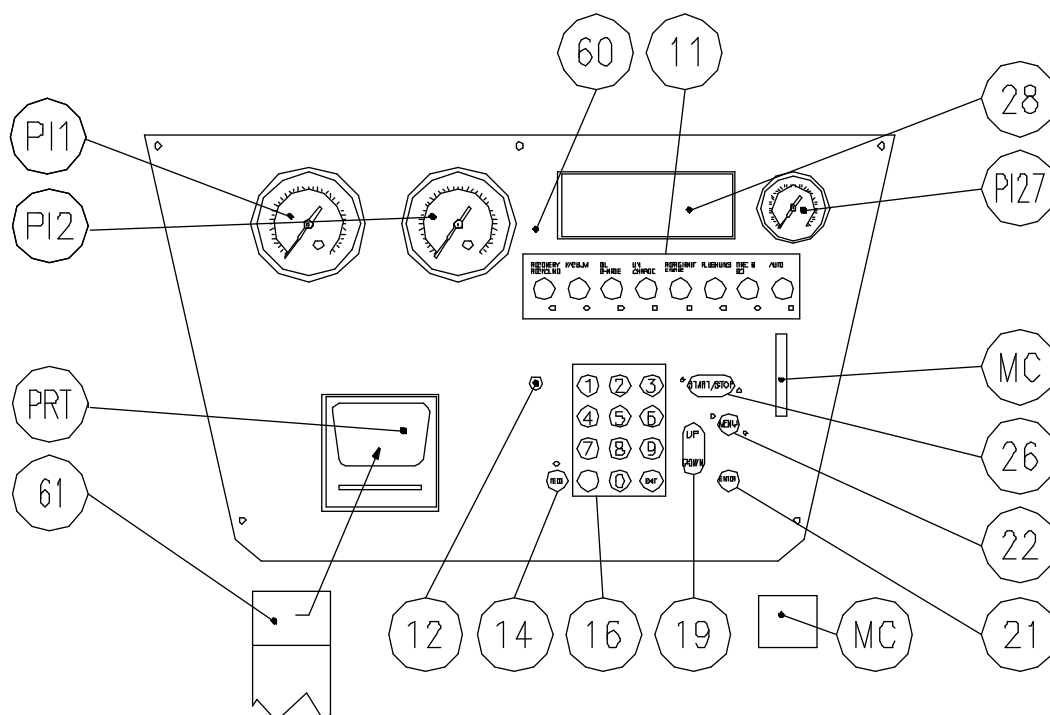
The individual functions shown on the screen can be modified by pressing the function keys. The display shows all the necessary explanations to be able to perform this operation. The values can be modified by means of the numerical keyboard or the UP/DOWN keys. In both cases the display will indicate which key to press in order to start the function after modification. It is possible to modify the filling quantities by means of the keyboard or the refrigerant charge using the DATABASE of the unit.

2.12 Possible functions

- a) SECU smart allows the functions to be carried out individually or one after the other, whereby the relevant values can be modified.
- b) SECU smart makes an operator-controlled, fully automatic program possible, described as "AUTO I" and having the following functions:
 - RECOVER refrigerant
 - RECOVERY TEST
 - SEPARATION of OIL (from the recovered refrigerant)
 - VACUUM and VACUUM TEST
 - OIL CHARGE
 - UV CONTRASTING AGENT CHARGE
 - REFRIGERANT CHARGE
- c) If the operator does not want to perform a function, he must set a value of 0.0 during programming.
- d) SECU smart has a fully automatic program called "AUTO II". In this case, the unit automatically performs the same functions as with the "AUTO I" program, with the difference that only the refrigerant charge quantity can be modified. The UV contrasting agent charge is programmed as a fixed amount of 7 ml.
- e) SECU smart allows flushing of the air-conditioning system using R134a. For this, an additional external flushing unit and adapter set must be used, which are available separately. When the FLUSHING key is pressed, the unit automatically performs the following functions:
VACUUM and VACUUM TEST (this function is only performed at the first cycle)
 - SYSTEM FLOODING
 - REFRIGERANT RECOVERY
 - OIL DISCHARGE (this function is performed at the first and last cycle)
- f) Should there be an alarm signal during any automatic or individual function, the function will stop and the alarm message will be stored on the display.

3. Control panel

The unit's upper panel contains all control elements required for operation, checking air tightness, and measuring operating pressures on the A/C system.



3.1 Description of the control keys and the menu functions

- Pos. **11**: These keys are used for the functions perform or modify. From left to right you will find the following functions: RECOVERY/RECYCLING, VACUUM, OIL CHARGE, UV CONTRASTING AGENT CHARGE, REFRIGERANT CHARGE, FLUSHING, AUTO I, AUTO II.
- The numeric keys Pos. **16** enable the modification of the values of the functions to be performed.
- The UP/DOWN key Pos. **19** enables the modification of the values of the functions to be performed.
- The ENTER key Pos. **21** is used to confirm the modified values.
- The MENU key (**22**) is used to see the pages of the unit's inside values on the display (28).
 - REGISTRATION NUMBER: By pressing **1**, the vehicle's registration number can be entered with the aid of the numeric keys (**16**). The respective numeric keys must be kept pressed until the required letter appears. This also applies for special characters, which are selected via **1**, and spaces, which are selected via **0**. The registration number is printed out on the report when the functions are completed.
 - LANGUAGE: The unit's language display can be modified by pressing **2**.
 - MEASURED VALUES: The measuring units can be converted from international to imperial by pressing **3**.
 - DATABASE UPDATE: By pressing **4**, the user reaches his/her personal database, e.g. in order to file specific charge quantities.
 - DATE and TIME: By entering **5**, users can update the date and time.
 - CALIBRATE SCALES: By pressing **6**, the **4** scales can be re-calibrated. This can be necessary after repairs, for example, and should only be carried out by Customer Services.
 - SERVICE: By entering **7**, users reach the password-protected menu items (refer below).
- The **DATABASE** key is used to access the charge quantity database stored in the unit and the database, which can be stored by the user personally.
- **START/STOP** key (**26**): used to start or stop the unit's functions
- Pos. **MC**: space reserved for insertion of the MEMORY CARD
- Pos. **PI1**: Low pressure gauge
- Pos. **PI2**: High pressure gauge
- Pos. **PI27**: Pressure gauge for indicating pressure inside the refrigerant supply bottle
- **FEED (14)**: Used for printing the report
- Pos. **12**: Alarm LED, lights up whenever a function or value is irregular
- **PRT**: Thermal printer
- **C/EXIT (16)**: Used to exit programming and for deletion

PASSWORD-PROTECTED AREA:

In the password-protected area, various settings can be made using the following passwords:

Password: 5011 = Viewing and resetting the operating hours counter of the unit, the compressor and the vacuum pump (e.g. after filter or vacuum pump oil replacement)

Password: 1937 = Importing updated software (from the Compact Flash Card to the unit memory)

Password: 2006 = Changing the header and footer for the report print-out (Password: 7564 = Importing the last 32 service incidents (from the unit memory to the Compact Flash Card)

Password: 8733 = Downloading a new language file from the Compact Flash Card to the unit memory

Password: 9376 = Reset all scales to 0

4. Preparing the SECU smart for operation

4.1 Checking the vacuum pump oil level

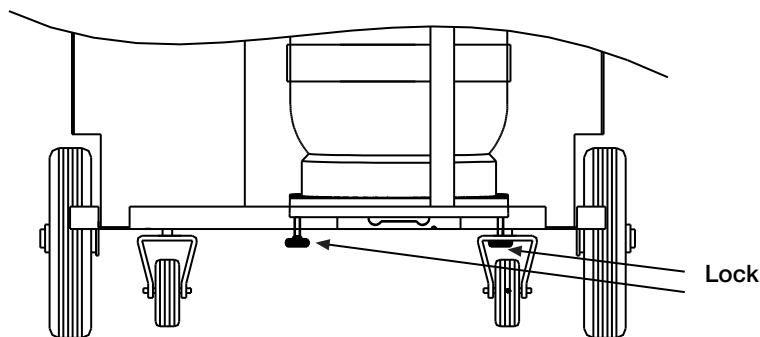
Before the oil level is checked, the unit must be placed on a level surface and its power supply must be turned off. Make sure that the vacuum pump oil level covers half of the sight glass (see drawing on page 25). The oil level can be checked through the hole on the front of the unit cover.

4.2 Unlocking / Locking the scales

Warning

If the following procedure is not performed, correct operation of the unit will not be guaranteed. Always empty the refrigerant supply bottle (see 4.5.2) before reset or calibration.

Loosen the 4 plastic knobs situated underneath the unit anti-clockwise until **standstill**. The 4 plastic knobs must be tightened clockwise until **standstill** before any major movements can be made which can lead to considerable fluctuations/vibration of the unit.



4.4 RESETTING THE SCALES / CONVERTING THE LANGUAGE

Having unlocked the refrigerant scales, all the scales must be set to 0 as follows the first time the unit is put into operation:

- a) Connect the unit to the power supply.
- b) Turn the **PWR** switch to the respective position – position **I**.
- c) The message on the display will now appear in English. This can be changed as follows: Press the **MENU** key. A selection of various menu items now appears in the display. Press the number 2 (Language) on the keypad. Use the **UP/DOWN** key to select the required language by entering the appropriate number.
- d) Read off the pressure gauge of the refrigerant bottle and carry out a visual inspection of the oil/contrasting agent container to make sure that all the containers are empty.
- e) Press the **MENU** key: The following will then appear in the display with the different possible functions.
- f) Press **7** (Service) on the control module and enter the 4-digit numerical code (9376).
- g) Follow the instructions on the display.
- h) At the end of the reset, press the **C/EXIT** key.

4.5 Filling REFRIGERANT into the internal refrigerant tank

Once all the above-mentioned preparatory activities have been performed, a sufficient quantity of refrigerant must be filled into the unit. This quantity should be sufficient to enable recharging.

4.5.1 Filling REFRIGERANT into the unit

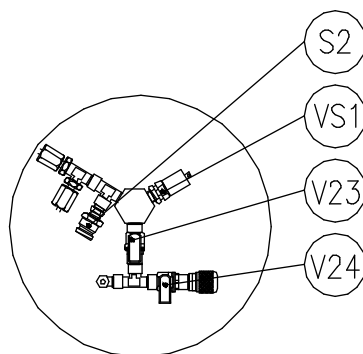
- a) Connect the unit to the power supply.
- b) Make sure that the **PWR** switch is in the **0** position.
- c) Position the external bottle in such a way that liquid refrigerant will come out (bottle with rising tube upright, bottle without rising tube upside down).
- d) Connect the red high-pressure hose with the connection of the external refrigerant bottle. If appropriate, unscrew the red quick-action coupler valve from the high-pressure hose and use a suitable adapter. Open the service valves.
- e) Connect the high-pressure hose to the service bottle.
- f) Set the **PWR** switch to position **I**.
- g) Press the **VACUUM** key. The LED will start to flash and the **set** vacuum time will appear on the display.
- h) Press the **START** key to start the vacuum cycle. The display will show:
 - VACUUM TIME
 - REMAINING TIME
- i) Leave the vacuum pump running for about 5 minutes.
- j) After 5 minutes, press the **STOP** key to stop the pump; press the **STOP** key again to exit from the vacuum test function.
- k) Press any key to return to the initial screen or the **FEED** key to print out the report of the function.
- l) Press the **RECOVERY** key, the LED will begin to flash and the following message will appear on the display:
 - RECOVER ALL
 - MAX. RECOVERY 12,000 kg – hypothetical value
- m) Use the **UP key or the numerical keys** to set the reference value, i.e. the refrigerant charge in kg which is to be transferred to the refrigerant tank. Slowly open the valve of the external bottle.
- n) Press the **START** key to start recovery, the unit will stop automatically as soon as the previously set quantity has been transferred to the internal refrigerant tank.
- o) Close the valve of the service bottle.
- p) Press the **RECOVERY** key, the LED will begin to flash and the following message will appear on the display:
 - RECOVER ALL
 - MAX. RECOVERY 12,000 kg – hypothetical value
- q) Press the **START** key to start recovery of the refrigerant from the hose and wait until the unit stops automatically.
- r) Press the **STOP** key twice to quit the **RECOVERY** function.

- s) Press any key to return to the initial screen or the **FEED** key to print out the report of the function.
- t) Disconnect the high-pressure hose from the external bottle.
- u) If appropriate, connect the original quick-action coupler valve (red) to the high-pressure hose again.

4.5.2 Emptying the internal REFRIGERANT TANK

The internal refrigerant tank can be emptied with the aid of an empty external bottle as long as it is not secured against "external filling" by a protective device by the bottle manufacturer. To do this proceed as follows:

- a) Evacuate the external refrigerant bottle.
- b) Remove the unit's plastic cover.
- c) Connect the quick-action coupler valve of the high-pressure hose to the **S2** service connection of the internal bottle and open the valve.
- d) By means of the service hose supplied with the unit, connect the valve of the (previously evacuated) external bottle to valve **V24** of the internal refrigerant tank and close valve **V23** using the stop valve.
- e) Open valve **V24** and the valve of the external bottle.
- f) Connect the high-pressure hose to the **S2** valve on the bottle.
- g) Connect the hose supplied with the service kit to valve **V24** on the internal refrigerant tank.
- h) Connect the other end of the hose to the external bottle.
- i) Close valve **V23** and open valve **V24**.
- j) Initiate a recovery cycle from the high-pressure side.
- k) After recovery, return valves **V23** and **V24** to their starting position (**V23** = open, **V24** = closed).
- l) Close valve **V24** and the valve on the external refrigerant bottle and disconnect the service hose.
- m) Connect the low-pressure hose at the service connection (**S1**) of the compressor.
- n) Start the vacuum function (30 minutes) and the vacuum test function.
- o) When the vacuum and the vacuum test function have been completed, disconnect the high-pressure hose from the **S2** service connection and proceed with calibration of the scales (see 4.4).
- q) Then open valve **V23** again and remount the cover. The internal refrigerant tank can also be emptied using an additional air-conditioning service unit. To do this, connect the high-pressure hose of the additional service unit to the **S2** service connection. The refrigerant can now be suctioned out of the internal tank using the additional service unit.



5. Recovery

Warning

Some vehicles only have one service connection. In this case the refrigerant can be recovered via this single connection. In special cases there is a service connection on the low-pressure side with the dimensions of a high-pressure connection.

When the recovery function has been started, it will only last max. 60 minutes. If the pre-set refrigerant quantity has not been recovered within 60 minutes, the unit will stop automatically and an alarm message will appear on the display.

5.1 Preparing the vehicle for REFRIGERANT RECOVERY from the A/C system

The preliminary preparation of the vehicle facilitates the separation of refrigerant and lubricant and prevents the latter from being dragged.

- a) Start up the vehicle with the hood closed.
- b) Switch on the A/C system and set it to maximum cooling.
- c) Allow the vehicle to run at increased idling speed (1500 – 2000 rpm) for a few minutes.
- d) Turn off the engine.

5.2 REFRIGERANT RECOVERY, RECOVER = ALL

This function allows the total recovery of the refrigerant via the high-pressure or low-pressure side or via both connections. The unit stops automatically when the A/C system has reached an internal residual pressure of under 0 bar. The value after MAX. RECOVERY shows the maximum refrigerant quantity that can be recovered.

- a) Connect the quick-action coupler valve of the low-pressure hose to the low-pressure service connection of the A/C system.
- b) Connect the quick-action coupler valve of the high-pressure hose to the high-pressure service connection of the A/C system.
- c) Open the service connection.
- d) Switch on the unit by setting the **PWR** main switch to position **I**.
- e) Press the **RECOVERY** key (flashing LED). The following will appear in the display:
 - RECOVER ALL
 - MAX. RECOVERY 12,000 kg – hypothetical value
- f) Press the **START** key. The unit begins to recover refrigerant; the LED on the **RECOVERY** key lights up and the following appears on the display:
 - The refrigerant quantity that is being recovered
 - The refrigerant contained in the internal tank
 - The number of recovery cycles performedIf there is no refrigerant in the vehicle or too much refrigerant in the refrigerant tank, the function will not be activated and an alarm message will appear on the display.
- g) At the end of recovery the unit stops automatically and waits for 2 minutes.
- h) If during these 2 minutes the pressure in the A/C system rises beyond 0.8 bar, the unit will automatically start a further recovery cycle.
- i) The unit carries out a maximum of 3 recovery cycles. If the pressure in the A/C system still rises beyond 0.8 bar after the third recovery cycle, the unit will automatically stop and an alarm message will be displayed.
- j) If after 2 minutes the pressure does not rise beyond 0.8 bar, the unit will automatically stop and will automatically start oil discharge, and the function will appear on the display accordingly.
- k) At the end of the function, the following will appear on the display:
 - RECOVERED REFRIGERANT
 - RECOVERED OIL
- l) At the end of the function, the unit will print a report (the print can be repeated).

Warning

The internal supply tank of the service unit has a maximum capacity of 20 kg refrigerant. If the maximum capacity is reached during recovery (the alarm message 20.00 appears on the display), the unit will stop automatically. In this case, the refrigerant must be transferred from the refrigerant tank into a bottle suitable for recycling (see procedure in 4.5.2).

Note

*When the functions have been completed, the unit returns to the summarizing display. Press any key to exit and return to the initial display or press the **FEED** key to print out the function report.*

5.3 REFRIGERANT RECOVERY, RECOVERY = XXX KG

This function can be used to recover a pre-defined refrigerant quantity; the unit automatically stops when the pre-set quantity has been reached.

- a) Make sure that the **PWR** main switch is in the 0 position.
- b) Connect the quick-action coupler valve of the low-pressure hose to the low-pressure service connection of the A/C system.
- c) Connect the quick-action coupler valve of the high-pressure hose to the high-pressure service connection of the A/C system.
- d) Open the service connections.
- e) Switch on the unit by setting the **PWR** main switch to position **I**.
- f) Press the **RECOVERY** key (flashing LED). The following will appear in the display:
 - RECOVER ALL
 - MAX. RECOVERY 12,000 kg – hypothetical value

- g) Use the numerical keys or the UP/DOWN keys to select the refrigerant quantity to be recovered. The value after MAX. RECOVERY shows the maximum refrigerant quantity that can be recovered.
- h) Press the **ENTER** key to store the value entered with the numerical keys.
- i) Press the **START** key to start the recovery procedure; if there is no refrigerant present the function is not activated and an alarm message will appear on the display.
- j) Once the pre-set refrigerant quantity has been recovered, the unit will stop automatically and the amount of refrigerant recovered will be displayed. Press any key to exit the function and return to the initial display.

Note: If the unit stops during operation before the refrigerant quantity selected has been recovered, an alarm message will appear.

- k) Disconnect the low and high-pressure hoses from the A/C system.
- l) Press the **RECOVERY** key (flashing LED). The following will appear on the display:
 - RECOVER ALL
 - MAX. RECOVERY 12,000 kg – hypothetical value
- m) Press the **START** key, the unit will start recovery, the LED on the **R**-key will light up and the following message will appear on the display:
 - RECOVERY
 - Recovered refrigerant quantity
 - Amount of refrigerant in the refrigerant tank
 - Number of recovery cycles performed
- n) At the end of recovery the unit stops automatically and waits for 2 minutes.
- o) At the end of the function, the unit will print a report (the print can be repeated).

Warning

The supply bottle of the unit has a maximum capacity of 20 kg refrigerant. If the maximum capacity is reached during recovery (the alarm message 20.00 appears on the display), the unit will stop automatically. In this case, the refrigerant must be transferred from the bottle into a suitable external recycling bottle (see procedure in 4.5.2).

Note

*When the functions have been completed, the unit returns to the summarizing display. Press any key to exit and return to the initial display or press the **FEED** key to print out the function report.*

6. Draining of the oil recovered from the A/C system

At the end of RECOVERY, the oil recovered from the A/C system is automatically filled into the oil container (48).

Warning

Do not pollute the environment with oil; used oil is special waste and must not be mixed with other liquids. Used oil must be stored in an appropriate container separate from other substances and disposed of by a professional company. Regulations vary in different countries. In Germany the Waste Management Law with respective waste codes is in effect. Regularly produced waste must be accounted for in a log and a company official responsible for waste must be appointed. Records from the professional disposal companies on the disposed quantities must be issued and maintained. .

7. Vacuum phase and checking the A/C system for air tightness

This operation serves to remove any trace of ambient air, water vapor and other non-condensable gases possibly contained from the A/C system so that it is possible to fill it with refrigerant. A possible deterioration of the vacuum level after this operation indicates that there is air penetration which could turn into a refrigerant leak after the air conditioning has been charged. Make sure that the following steps are taken:

- a) Connect the quick-action coupler valve of the low-pressure hose to the low-pressure service connection of the A/C system.
- b) Connect the quick-action coupler valve of the high-pressure hose to the high-pressure service connection of the A/C system.
- c) Open the service connections.
- d) Set the **PWR** main switch to position **I**.
Then proceed as follows:

- e) Press the **VACUUM** key, the **pre-set vacuum time** will appear on the display (see chapter 2.10 "Control module" on how to change pre-set values).
- f) Press the **START** key to start the vacuum cycle. The display will show:
 - VACUUM TIME
 - REMAINING TIME
- g) Check on the display that the value for remaining time is not flashing and that the countdown begins within 5-10 minutes; if this is not the case, stop the vacuum phase and look for the leak in the circuit.
- h) When the pre-set time has been reached, the function stops automatically and the **vacuum test** is carried out for 3 minutes.
- i) If the **vacuum test** is completed without a message appearing, this means that the system has been successfully evacuated and is now ready for charging; if, however, an alarm message appears on the display during the 3-minute **vacuum test**, this means that there are leaks in the circuit which have to be detected and repaired.

Note

*When the functions have been completed, the unit returns to the summarizing display. Press any key to exit and return to the initial display or press the **FEED** key to print out the function report.*

8. Refilling oil into the A/C system

After A/C system recovery/evacuation and before refrigerant charging, the unit will automatically perform the pre-set oil charge (see 8.3).

8.1 ATTENTION

Most lubricants are highly hygroscopic. To avoid contamination, always make sure the bottles are well closed and open them only just before use. Oil injection may only be performed when the A/C system has been properly recovered/evacuated.

8.2 ATTENTION

Before performing an oil charge make sure that there is a greater quantity of oil in the oil dosing unit (50) than the quantity required for the charge. (Note: The oil quantity required for charging the system is equal to the contents of the graduated bottle minus 30 ml as a buffer. The quantity used as a buffer for safety acts to prevent air from being suctioned into the system.

8.3 Oil filling procedure in the A/C system

- a) Make sure that the **PWR** switch is set to **I**.
- b) Press the **OIL CHARGE** key. The following will appear on the display:
 - OIL CHARGE 30 ml – hypothetical value
 - MAX. CHARGE 120 ml - hypothetical value
 - DRAINED OIL 0 ml
- c) If the operator does not want to refill oil into the system, the value 0 must be set on the display.
- d) Press the **START** key. The unit begins with oil charging; the LED on the **OIL CHARGE** key lights up and the following appears on the display:
 - OIL CHARGE
 - OIL
 - OIL AVAILABLE
- e) After having charged the pre-set oil quantity, the function automatically stops and the following will appear on the display:
 - OIL CHARGE
 - OIL

Note

*When the functions have been completed, the unit returns to the summarizing display. Press any key to exit and return to the initial display or press the **FEED** key to print out the function report.*

Warning

Do not pollute the environment with oil; used oil is special waste and must not be mixed with other liquids. Used oil must be stored in an appropriate container separate from other substances and disposed of by a professional company. Regulations vary in different countries. In Germany the Waste Management Law with respective waste codes is in effect. Regularly produced waste must be accounted for in a log and a company official responsible for waste must be appointed. Records from the professional disposal companies on the disposed quantities must be issued and maintained.

8.4 Recommended oil quantities

Depending on the type of A/C system component that has been replaced, the oil quantities shown below need to be refilled (% of the system oil quantity), even if no oil has been extracted during recovery.

Evaporator:	20%
Condenser:	10%
Dryer/accumulator:	10%
Pipelines:	10%

The operator must always follow the instructions of the vehicle or A/C system manufacturer.

8.5 ATTENTION

Before performing an UV contrasting agent charge, make sure that there is a greater quantity of contrasting agent in the supply bottle of the dosing unit (49) than the quantity required for the charge. (Note: The contrasting agent quantity required for charging the system is equal to the contents of the graduated bottle minus 30 ml as a buffer. The quantity used as a buffer for safety acts to prevent air from being suctioned into the system.)

8.6 UV contrasting agent refilling procedure in the A/C system

Warning

- a) Make sure that the **PWR** switch is set to **I**.
- b) Press the **UV CHARGE** key. The following will appear in the display:
 - **UV CHARGE** 30 ml – hypothetical value
 - **MAX. CHARGE** 120 ml – hypothetical value
- c) If the operator does not want to refill contrasting agent in the system, set the value 0.00 on the display (see 2.10 "Control module" on how to modify the set values).
- d) Press the **START** key. The unit begins with contrasting agent charging; the LED on the **UV CHARGE** key lights up and the following appears on the display:
 - **UV CHARGE**
 - **UV**
 - **UV AVAILABLE**
- e) After having charged the pre-set UV quantity, the function automatically stops and the following will appear on the display:
 - **UV CHARGE**
 - **UV**

Note

*When the functions have been completed, the unit returns to the summarizing display. Press any key to exit and return to the initial display or press the **FEED** key to print out the function report.*

9. Filling refrigerant into the A/C system

Warning

Before performing a charging operation, check the quantity of refrigerant available in the refrigerant tank. It must contain more refrigerant than necessary for charging. If this is not the case, begin by charging the internal refrigerant tank first. Some vehicles only have one service connection. In this case the refrigerant must be charged via this single connection. In special cases, there is a service connection on the low-pressure side with the dimensions of a high-pressure connection.

Note: **The quantity of refrigerant available for charging is equal to the refrigerant in the bottle minus 2 kg**
Possible quantity charge = quantity in bottle - 2 kg

9.2 A/C system REFRIGERANT CHARGING PROCEDURE

- a) Make sure that the **PWR** switch is set to **I**.
- b) Press the **REFRIGERANT CHARGE** key. The following will appear on the display:
 - R134 CHARGE 1,550 - hypothetical value
 - MAX. CHARGE 15,500 - hypothetical valueTo modify the refrigerant quantity, press the numerical keys on the keypad directly or press the **DATABASE** key and then select the vehicle-specific filling quantity from the database stored in the unit or the user-specific database.
- c) Press the **START** key. The current function is displayed.
- d) After the function has been completed, the unit begins with refrigerant charging; the LED on the **REFRIGERANT CHARGE** key lights up and the following appears on the display:
 - R134a CHARGE
 - R134a
 - R134a AVAILABLE
- e) After having charged the pre-set refrigerant quantity, the function automatically stops and the following will appear on the display:
 - R134a CHARGE
 - R134a 00.800 kg (hypothetical value)

Note

When the functions have been completed, the unit returns to the summarizing display. Press any key to exit and return to the initial display or press the **FEED** key to print out the function report.

10. Checking the A/C system operating pressures and the air flow temperature

- a) Start the engine and switch on the A/C system.
- b) Wait a few minutes to enable the pressure to stabilize.
- c) Make sure that the pressure values correspond to those supplied by the vehicle or A/C system manufacturer.
- d) Measure the air flow temperature inside the vehicle with the aid of the temperature sensor attached to the unit and compare the value with that prescribed by the vehicle manufacturer.

- 14. The following operations should be performed before disconnecting the unit after charging the A/C system:**
- Disconnect the quick-action coupler valve of the high-pressure hose with the A/C system switched off.
 - Start the engine. Switch on the A/C system.
 - As soon as the pressure on the high and low pressure gauges are almost the same and do not exceed 2-3 bar, disconnect the quick-action coupler valve of the low-pressure hose with the engine switched off.
 - Perform a recovery cycle to extract residual refrigerant from the hoses so that the unit is immediately ready for the next operation.
 - Set the quick-action coupler valves of the low-pressure and high-pressure hoses on their holders on the unit.
 - Switch off the unit (**PWR** switch to 0).

Note: An electronic leak detector should be used to check the A/C system for leaks after every service operation. The addition of a UV leak detection agent and subsequent use of a UV lamp will make it easier to locate the position of the possible leak in future.

15. Routine maintenance

15.1 Materials for routine maintenance

- 2 filter dryers
- 1 liter bottle of oil for the vacuum pump

15.2 Regular check-ups

- Check all screw, line and point connections regularly and tighten if necessary. Leaks must be eliminated immediately.
- Check the oil level in the vacuum pump regularly. The pump must be switched off when the oil level is being checked and the pump refilled. Also note the instructions under 15.3.

15.3 Maintenance must be performed at least once annually.

The following operations can be performed by the operator.

- Replacement of both filter dryers
- Vacuum pump oil change

The following operations must be completed by professional service personnel in accordance with DIN EN 13313:

- Check service unit for air tightness (according to Regulation (EC) 842/2006 – fluorinated greenhouse gases, F-Gas Regulation)
- Calibration of all scales

15.4 Inspection intervals for refrigerant tank and safety valve

- The refrigerant tank must be inspected after 10 years.
- The safety valve must be inspected after 5 years.

15.5 Changing the vacuum pump oil

Warning

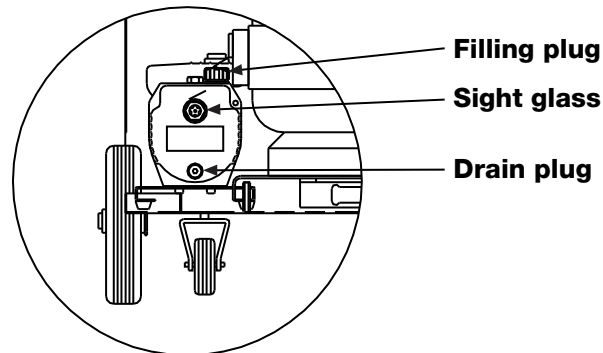
Since the vacuum pump is hermetically sealed to a large extent, the oil only needs to be changed every 100 operating hours. The service unit counts down the operating hours to the next oil change. Independently of this, the filter dryers must be replaced once a year even if they have not been in operation for 100 hours within this one-year period.

To avoid a reduction of pump efficiency and maintain its performance, the oil has to be changed after the end of the service life. The oil also needs to be changed whenever it becomes cloudy. Contaminated oil reduces vacuum pump performances and leads to irreversible damage to the mechanical components. Draining and refilling operations must be performed when the pump is turned off.

- Before draining the oil, have the pump run for at least 10 minutes (see 7. "Evacuating and checking the A/C system for tightness", item g).
- Turn the service unit off by setting the **PWR** switch to the 0 position and disconnecting the power cable; the sequence must be strictly observed.
- Remove the unit cover.
- Remove the drain plug located at the bottom of the pump.
- Drain the oil completely and collect it in a suitable container.
- Screw the drain plug in again.
- Remove the filling plug located at the top of the pump.
- Slowly refill the pump with oil until the level covers half of the sight glass located on the side of the pump.
- Screw the filling plug back in again and replace the unit cover.

Warning

Do not pollute the environment with oil; used oil is special waste and must not be mixed with other liquids. Used oil must be stored in an appropriate container separate from other substances and disposed of by a professional company. Regulations vary in different countries. In Germany the Waste Management Law with respective waste codes is in effect. Regularly produced waste must be accounted for in a log and a company official responsible for waste must be appointed. Records from the professional disposal companies on the disposed quantities must be issued and maintained.



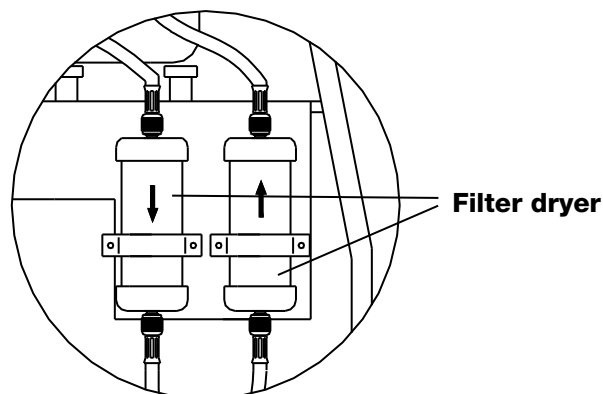
Warning

Wear protective clothing (gloves, safety glasses). Do not pollute the environment with used filters; used filters are special waste and must be disposed of according to the regulations in force.

15.6 Replacing the filter dryers

Before replacing the filters, the hoses must be evacuated by a recovery cycle.

- a) Turn the service unit off by setting the **PWR** switch to the **0** position and disconnecting the power cable; this sequence must be strictly observed.
- b) Remove the unit cover.
- c) First remove the copper line and then proceed to remove the filter dryers **F1** and **F2**.
- d) Install two new filter dryers.
- e) Connect the quick-action coupler valve (**56**) of the low-pressure hose (**53**) to the compressor service connection **S1**. First remove the protective cap from the **S1** connection.
- f) Connect the unit to the mains and set the **PWR** switch to position **I**.
- g) Press the **VACUUM** key to start the vacuum pump. Allow the pump to run for approx. 30 minutes.
- h) Disconnect the quick-action coupler valve of the low-pressure hose.
- i) Remount the protective cap to the **S1** connection.
- j) Replace the plastic cover.



16. Accessories and spare parts

You can obtain accessories and spare parts through your unit retailer.

17. Dimensions

