# SERVICE-MANUAL

REFRIGERATORS _____

FREEZERS _____



Vestfrost

Nr. 95.54.600 / Version G / November 2000.

Vestfrost

## TABLE OF CONTENTS




A/S Vestfrost
Spangsbjerg Møllevej
DK-6705 Esbjerg Ø . Denmark
Phone: +45 79 14 22 22*



**Nr.: 95.54.600**
Version G
November 2000

Vestfrost

# 1. The Refrigerating Cycle



A/S Vestfrost
Spangsbjerg Møllevej
DK-6705 Esbjerg Ø . Denmark
Phone: +45 79 14 22 22*

**Nr.: 95.54.600**
Version G
November 2000

## 1. THE REFRIGERATING CYCLE

The compressor draws the refrigerant in vapour form from the evaporator through the suction pipe, compressor housing, suction mufflers and suction valve into the cylinder, where compression takes place.
The evaporator and compressor housing are thus located on the low-pressure side of the system.

After compression, the gas is led through the pressure valve, pulsation damper and discharge pipe to the condenser.

In the condenser, heat is given off and the gas is condensed. The now liquid refrigerant is passed through a calibrated capillary tube, where a pressure drop (expansion) takes place.

When the refrigerant enters the evaporator, it is subjected to the lower pressure produced by the compressor.
The refrigerant evaporates, thus extracting heat from the surroundings and lowering the temperature of the evaporator.

A filter drier is also built into the refrigerating system for the primary purpose of collecting any residual moisture present in the system and preventing dirt from clogging up the capillary tube.

### Note: Oil-cooled Compressor

The oil in the sump is cooled by leading the condenser pipe through the sump, where the condensed refrigerant absorbs heat from the oil. Some of the condensate is evaporated again, giving a high heat absorption, and is condensed once again in the remaining part of the condenser.

A/S Vestfrost
Spangsbjerg Møllevej
DK-6705 Esbjerg Ø . Denmark
Phone: +45 79 14 22 22*

**Nr.: 95.54.600**
Version G
November 2000

## 1.2. Function of the No-Frost System

A No-Frost system works as follows: A finned evaporator and a fan are placed in a closed shaft. The fan circulates the air in the unit in such a way that the fan sucks in from the "hottest" part and pushes the air through the evaporator, where it is then further cooled down again. This causes the frost to settle on the evaporator and only on the evaporator. In order to avoid the evaporator being blocked by frost and ice, the evaporator is defrosted every time the compressor has run for about 12 hours. This can take place in 2 different ways depending on which timer is used.

When using a traditional timer (black) the compressor is stopped for 30 minutes, and the heating element is switched on until the evaporator has reached a temperature of +13°C, which is measured by a bimetallic thermostat placed at the injection or until the 30 minutes have elapsed.

When using a Vestfrost timer (white) the compressor is also stopped after a running period of about 12 hours and at the same time a relay stops the motor in the timer as long as the heating element is switched on. When the evaporator has reached the temperature of +13°C and the bimetallic thermostat has cut out, the motor in the timer is switched on again, and 3 minutes will pass in order to give the water the time to drain off before the compressor is switched on again.

**Traditional timer (black)**

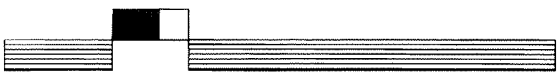
Standstill: 30 min.
Heat with much frost
Waiting time: none
Running time: 11 hours 30 min.

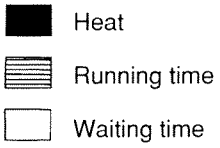
Heat with little frost
Waiting time
Running time: 11 hours 30 min.

**Vestfrost timer (white)**

Variable standstill
Heat with much frost
Waiting time: 3 min.
Running time: 11 hours 57 min.

Heat with little frost
Waiting time: 3 min.
Running time: 11 hours 57 min.






A/S Vestfrost
Spangsbjerg Møllevej
DK-6705 Esbjerg Ø . Denmark
Phone: +45 79 14 22 22*

**Nr.: 95.54.600**
Version G
November 2000

Vestfrost

# 2. Compressors, Electrical Equipment and Thermostats




A/S Vestfrost
Spangsbjerg Møllevej
DK-6705 Esbjerg Ø . Denmark
Phone: +45 79 14 22 22*



**Nr.: 95.54.600**
Version G
November 2000

# 2. COMPRESSORS, ELECTRICAL EQUIPMENT AND THERMOSTATS

## 2.1. Compressors and Electrical Equipment

### The Danfoss Starting and Thermal Overload Protection System

Most Danfoss compressors feature a sophisticated starting and thermal overload protection system which consists of an electronic starting device (PTC) and a winding protector.

### Winding Protector

The winding protector, which is built into the motor windings, detects temperature increases in the windings and disconnects the compressor if the temperature exceeds a pre-set limit.
The winding protector prevents re-start of the compressor until the temperature has fallen to an acceptable value.
If the compressor is disconnected when cold, an interval of approx. 5 minutes can be expected before the winding protector will permit re-start of the compressor. If disconnection occurs when the temperature of the compressor housing exceeds 80°C, the time interval which elapses is increased. If the compressor housing has a temperature exceeding 120° - 130°C, re-start can be delayed up to 45 min.

### The PTC Starting Device

The PTC starting device has no movable parts. When "cold", the starting device allows current to flow to the start winding, and the compressor can start. The PTC disconnects the start winding after 1 - 2 seconds, as the flow of current heats up the PTC unit. This increases the resistance considerably, and the current is reduced to a few milliamperes. This level is sufficient to keep the PTC warm and the start winding disconnected.

The PTC starting device requires a minimum standstill time of 5 minutes prior to re-start. This interval is necessary to allow cooling of the PTC unit before a new start-up. Most refrigerating systems with capillary tube control have thermostats which ensure a standstill time of at least 5 minutes.

### Avoid immediate Re-start of the Compressor

If the compressor is re-started immediately after stopping, the system will not be pressure equalized, and the winding protector will therefore be activated. This means that, depending on the circumstances, up to 30 minutes will elapse before the compressor can be re-started. After any unintentional disconnection of the compressor, a period of at least 5 minutes should therefore be allowed before re-start is effected.

#### H.S.T. Starting Device

H.S.T. starting device consists of an electromechanical starting relay and if necessary a starting condenser.
The starting relay coil is connected in series to the motor run winding where the current in the run winding will determine when the start winding will be cut in or out. This takes place when the motor has reached an adequate speed (and the current through the run winding is reduced).
A starting condenser is used, and it is connected in series to the start winding and will be cut in and out together with this.
The H.S.T. starting device is used, when it cannot be ensured that the system is completely pressure equalized before each start.

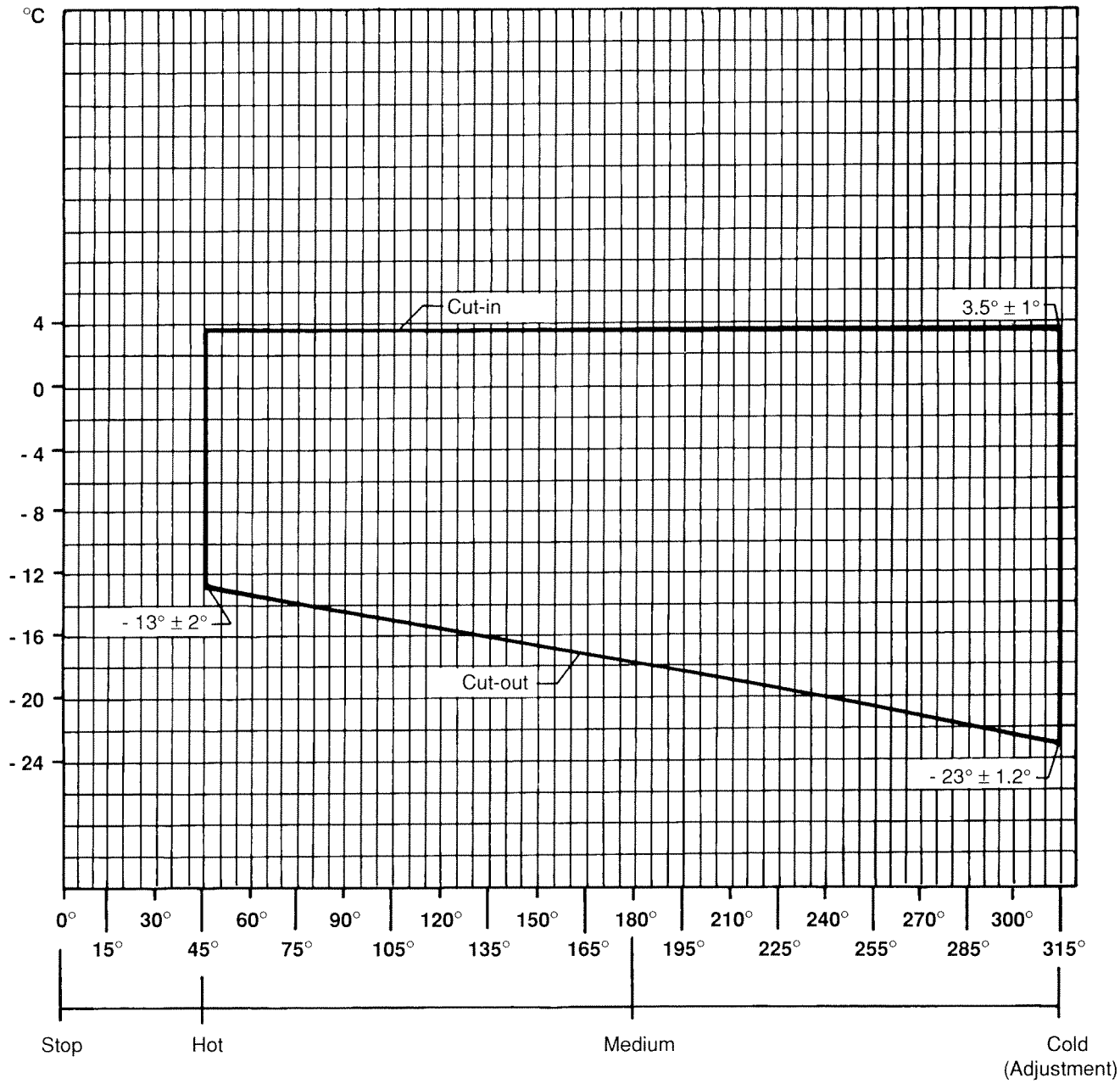
### Starting the Compressor

Never start the compressor without the use of a starting device. If no PTC starting device (or starting condenser) is connected, the resistance of the starting circuit will be reduced, causing an increase in current. The temperature in the start winding will thus increase more rapidly than the winding protector can react to, and a burnt-out compressor can be the result.

Vestfrost

Example: Working diagram for thermostat type 077B6236, used in some Vestfrost refrigerating units.

The working temperatures are based on a barometric pressure = 760 mm HG.




**A/S Vestfrost**
Spangsbjerg Møllevej
DK-6705 Esbjerg Ø . Denmark
Phone: +45 79 14 22 22*

**Nr.: 95.54.600**
Version G
November 2000

Vestfrost

# 3. Trouble-Shooting




A/S Vestfrost
Spangsbjerg Møllevej
DK-6705 Esbjerg Ø . Denmark
Phone: +45 79 14 22 22*



**Nr.: 95.54.600**
Version G
November 2000

# 3. TROUBLE-SHOOTING

## 3.1. Trouble-Shooting Chart



| Disturbance | Cause | Equipment Required | Trouble-Shooting | Remedy |
|---|---|---|---|---|
| Unit does not refrigerate or freeze, compressor does not operate. | Wall socket is dead. | Voltmeter or test lamp. | Check installation. | Install new fuse if necessary. Inform user. |
| | Mains cable is defective. | Voltmeter or test lamp. | See Section 3.2.: Trouble-Shooting in the Electric Circuit. | Repair or replace socket or mains cable. |
| | Thermostat is defective. | | | Replace thermostat |
| | Defective winding in compressor. | Ohmmeter. | See Section 3.5.: Trouble-Shooting for Electrical Faults in the Compressor. | Replace compressor. |
| | Starting device is defective. | New starting device. | See Section 3.2.: Trouble-Shooting in the Electric Circuit. | Replace starting device |
| | Wiring for starting device is incorrectly installed. | Wiring diagram. | | Correct in accordance with wiring diagram in the spare parts list. |
| No-Frost. | Timer is set in defrosting position. | | | Turn timer knob past defrosting. |
| Unit does not refrigerate or freeze, compressor tries to start but fails to operate. | Insufficient mains voltage. | Voltmeter. | Check mains voltage. | Inform user that installation should be repaired by an electrician. |
| | Wrong or defective starting device. | New starting device. | See Section 3.2.: Trouble-Shooting in the Electric Circuit. | Install new starting device. |
| | Wiring for starting device is incorrectly installed. | Wiring diagram. | | Correct according to wiring diagram in the spare parts list. |
| | Winding fault in compressor. | Ohmmeter. | See Section 3.5.: Trouble-Shooting for Electrical Faults in the Compressor. | Replace compressor. |
| | Condensing pressure too high (obstructioin capillary tube). | Manometer, service valve and dry nitro-gen ($N_2$). | Open system and localize obstruction by blowing $N_2$ through system. See Section 4.1.: Opening the Refrigerating System with R600a for Repairs and Section 4.1.1.: Opening the Refrigerating System for Repairs with Recovery of Refrigerant. | Remove the filter drier and cut 5 cm of the capillary tube. Blow through the system thoroughly before installing new filter. |

To be continued on the next page.

| Disturbance | Cause | Equipment Required | Trouble-Shooting | Remedy |
|---|---|---|---|---|
| | Defective thermostat. | Electronic thermo-meter. | 1. Turn thermostat knobto zero.<br>2. Compressor conti nues to run.<br>3. Dismount brown wire.<br>4. Compressor continues to run.<br>5. Compressor stops. | 4. Check interna wiring for short circuit (fast-freeze switch).<br>5. Replace thermostat. |
| Compressor starts nor-mally but stops again. | Extremely high voltage. | Voltmeter. | Measure voltage. | Inform user. |
| | High ambient tempera-ture. Poor ventilation. | Electronic thermo-meter. | Measure temperature and check ventilation around compressor. | Improve ventilation. |
| | Can be normal. | None. | Check temperature in unit. | Inform user. |
| Refrigerates/freezes too much, normally, too little or not at all. Compressor may run continuously. | Leakage in system with resulting loss of refrigerant. | Electronic leak detec-tor, liquid leak detector (Leak-Tec) or liquid soap, dry nitrogen ($N_2$) for increasing pressure in system.<br>Dentist's mirror. | Symptom:<br>Evaporator not wholly utilized.<br>Localize leakage with electronic leak detec-tor - first at soldering joints, pipes and com-pressor in motor com-partment, next in the evaporator and conden-ser.<br>When leakage has been localized, cover area with a layer of Leak-Tec or liquid soap. Bubbles will appear at the exact site of leak-age.<br>Check pressure side with compressor run-ning and suction side when pressure isequal-ized. If refrigerant pres-sure is insufficient for leak detection, install a service valve on charging pipe and add refrigerant and $N_2$ (ap-prox. 10 kg/cm$^2$).<br>Repeat leak detection. | After repairing leakage, repair system as in the case of ice blockage in capillary tube.<br>See relevant section in chart. |
| No-Frost.<br><br>To be continued on the next page. | Fan is not operating. | | Electric connections.<br>Check if blade is fixed properly on shaft. | Blade is fixed or replaced. |

A/S Vestfrost
Spangsbjerg Møllevej
DK-6705 Esbjerg Ø . Denmark
Phone: +45 79 14 22 22*

Nr.: 95.54.600
Version G
November 2000

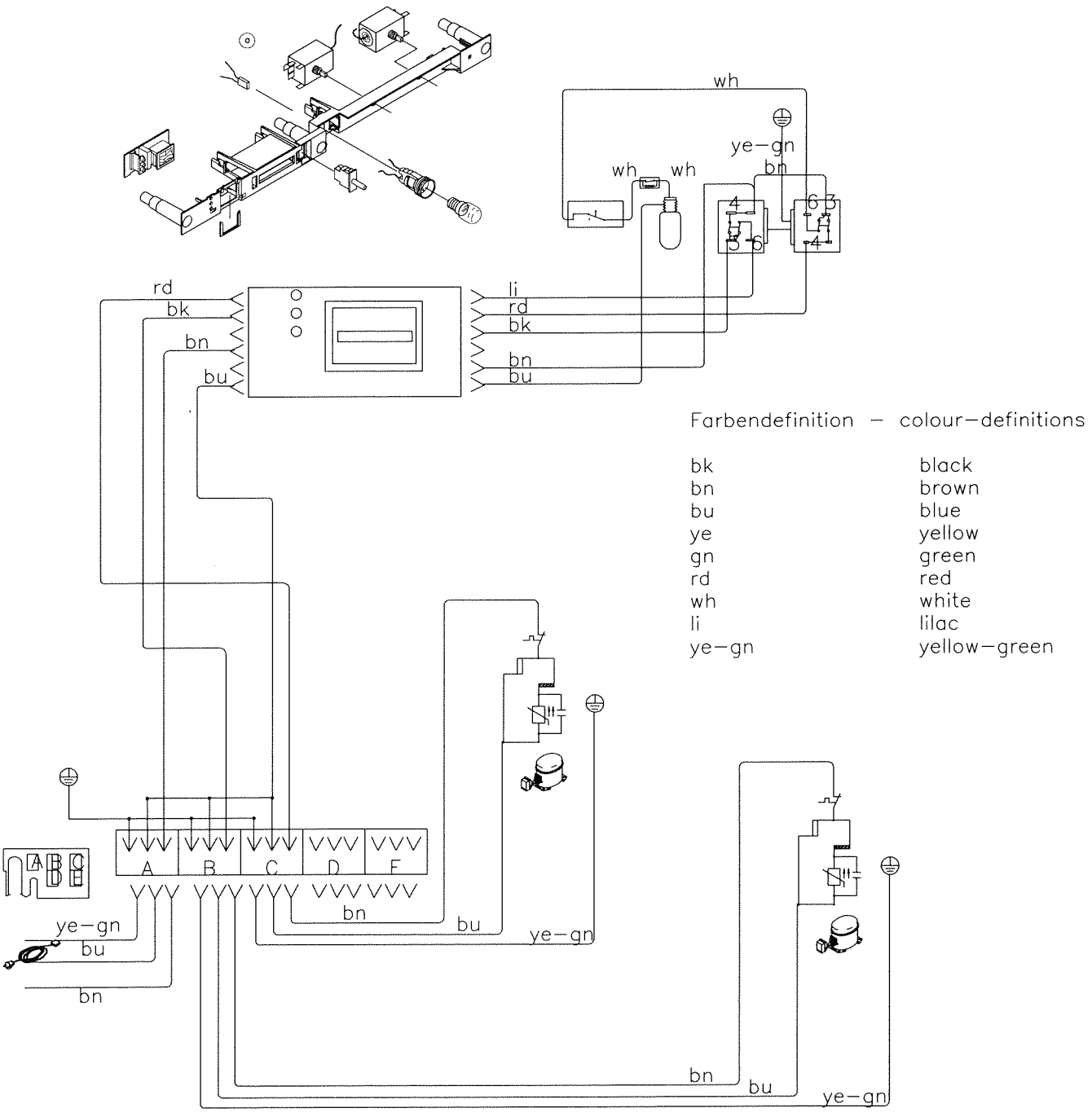
| Disturbance | Cause | Equipment Required | Trouble-Shooting | Remedy |
|---|---|---|---|---|
| | | | $N_2$ through charging pipe and check flow through capillary tube and filter. | |
| | Ice blockage in capillary tube. | Hot water and a piece of cloth. | Heat injection area on evaporator with cloth with hot water. If refrigerant now can be heard to flow more quickly through the system, ice blockage in capillary tube is indicated. Alternatively: Stop compressor and let evaporator defrost. Start compressor again. In case of ice blockage, frost formation on the evaporator will increase initially and then return to its original level. | See Section 4.1.: Opening the Refrigerating System with R600a for Repairs and Section 4.1.1.: Opening the Refrigerating System for Repairs with Recovery of Refrigerant. Blow $N_2$ through sytem. Install outsize service filter. Ensure careful evacuation. Start compressor. Stop when warm. Evacuate system again. With heavy contamination of system it is necessary to repeat this process several times. Filter can be replaced again. |
| | No or very little compressor capacity. | Service valve, manometer and volumetric gauge. | Mount a service valve on charging pipe and check suction pressure. Pressure conditions indicate no or very little compressor capacity. Test compressor. See Section 7.10: Using a Volumetric Gauge. | If volumetric check indicates insufficient compressor capacity, replace compressor. Note that defects in the compressor can be caused by complete or partial blockage at another point in the system. This situation must be remedied before a new compressor is installed. |
| | Capillary tube mounted incorrectly at injection site (roll-bond evaporator). | | Symptoms resemble those of loss of refrigerant. | Replace refrigerating evaporator. See Section 4.4.: Replacing the Evaporator. |
| Insufficient refrigerating/freezing. | Thermostat is set too high. | Electronic thermometer. | | Turn thermostat knob clockwise. Inform user. |
| To be continued on the next page. | Thermostat is set too high. | Electronic thermometer. | Turn thermostat knob clockwise. Check to ensure that phial is correctly installed. See Section 4.5.: Replacing the Thermostat. If necessary, see remedy. | Replace thermostat. |

## 3.2. Trouble-Shooting in the Electric Circuit.

Before systematic trouble-shooting is commenced, check to ensure that:

- The fuses are intact.
- The correct voltage has been used (voltmeter).
- The electrical equipment used is suitable for the compressor.
- The wiring has been correctly installed (compare with wiring diagram as found in the spare parts list).
- There is no leakage between the live parts and the frame (see Section 3.3).

Example of wiring diagram: Diagram BKF, BMC, BSKF.




Farbendefinition – colour–definitions

| | |
|---|---|
| bk | black |
| bn | brown |
| bu | blue |
| ye | yellow |
| gn | green |
| rd | red |
| wh | white |
| li | lilac |
| ye–gn | yellow–green |

A/S Vestfrost
Spangsbjerg Møllevej
DK-6705 Esbjerg Ø . Denmark
Phone: +45 79 14 22 22*

**Nr.: 95.54.600**
Version G
November 2000

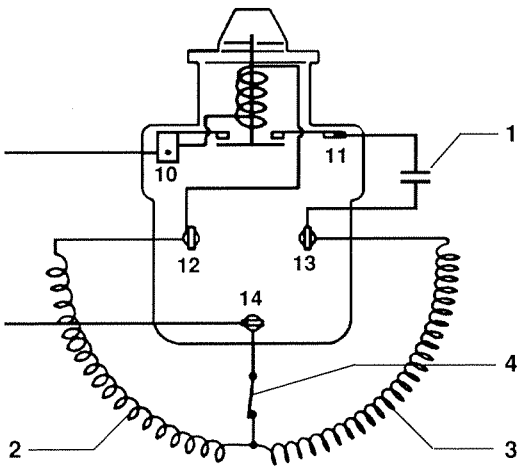
Starting device with HST

Connect a voltmeter between terminals 10 and 13 on the starting device. If no voltage can be measured, either the mains cable or the socket is defective.

Connect a voltmeter between terminals 10 and 14 on the starting device. If no voltage can be measured, a defective thermostat or thermostat wiring is indicated.

Dismount the red and brown wires on the thermostat and short-circuit them. If the compressor runs now, the thermostat is defective. If the compressor does not run, a break in the thermostat wiring is indicated.

If there is voltage between terminals 10 and 14 on the starting device, a defect in the starting device, starting condenser, compressor or refrigerating system is indicated.



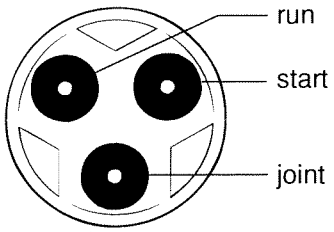

1. Starting condenser
2. Run winding
3. Start winding
4. Winding protector

## 3.5. Trouble-Shooting for Electrical Faults in the Compressor

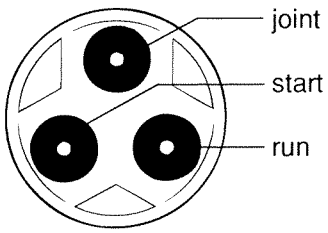
Separate the starting device from the compressor and use an ohmmeter to test the main and start winding of the compressor.
Connect the ohmmeter between "Run" and "Joint" to determine the resistance of the main winding. And between "Start" and "Joint" to determine the resistance of the start winding.
NB: Measurements must be made when the compressor is cold.
If the measurements indicate a damaged winding, replacement of the compressor is necessary.
If the measurements indicate that the windings are not defective, a new starting device should be installed. If the compressor still does not start, check the refrigerating system and compressor for possible blockage.

**Compressor Connecting**

**Pins Location**
**Danfoss Compressors**




**Zanussi Compressors**
**Unidad Hermética Compressors**

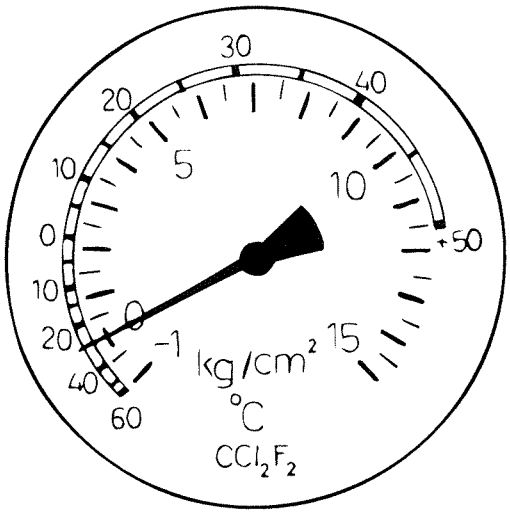


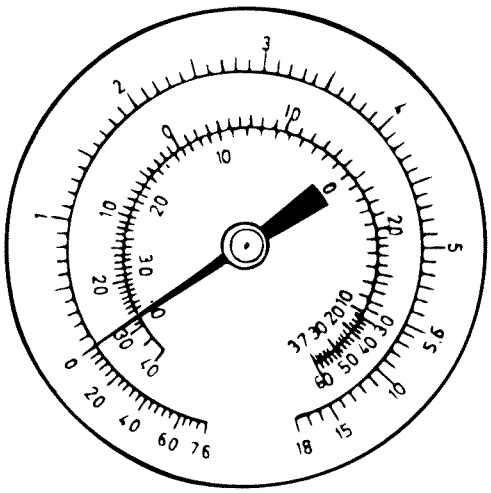

A/S Vestfrost
Spangsbjerg Møllevej
DK-6705 Esbjerg Ø . Denmark
Phone: +45 79 14 22 22*

**Nr.: 95.54.600**
Version G
November 2000

### 3.7. Using a Manometer in Trouble-Shooting

The pressure in a refrigerating system is directly dependent on the temperature. For this reason, the manometer can indicate both temperature in degrees Celsius and pressure in bar.



By mounting a manometer on the suction side of the compressor (process pipe), the temperature in the evaporator at which the refrigerant evaporates can be read. This temperature is normally from -15°C to -25°C in a refrigerator and from -30°C to -35°C in a freezer. These temperatures apply when the unit is set at its coldest position.

The pressure equalizing time is the time taken to reach an identical liquid pressure in the condenser and the evaporator after stop of the compressor. This is usually 8 minutes in freezers and slightly less in refrigerators.

A/S Vestfrost
Spangsbjerg Møllevej
DK-6705 Esbjerg Ø . Denmark
Phone: +45 79 14 22 22*

**Nr.: 95.54.600**
Version G
November 2000

Vestfrost

# 4. Making Repairs to the Refrigerating System




A/S Vestfrost
Spangsbjerg Møllevej
DK-6705 Esbjerg Ø . Denmark
Phone: +45 79 14 22 22*



**Nr.: 95.54.600**
Version G
November 2000

**Actual Evacuation**

After mounting of the filling hose, the system is ready for the actual evacuation. Evacuate until a stable vacuum of 1 mbar has been reached. Check for stability of the vacuum by closing the valve for the vacuum pump (12). If the vacuum gauge needle falls appreciably, possible leakage in the system is indicated.

When a stable vacuum of 1 mbar has been reached, evacuate further 5-10 minutes, close the valve for the vacuum gauge (10) and the vacuum pump (12) and the spherical valve of the filling hose (18).

**Filling of R600a**

Thereafter, test the microscales with a weight so as to check the exactitude of the scales.

The refrigerant tank is connected to the filling hose (16) and the valve (9) is opened. Evacuate the filling hose and the manifold by opening the valve for the vacuum pump (12) and the vacuum gauge (10).

Close the valves (12 and 10) after evacuation. Fill the hose from the tank and the manifold with refrigerant by opening the refrigerant tank.

Place the tank on the scales.

Make sure that the plastic hose hangs freely.

Set the scales to 0 and fill the system with the exact amount of refrigerant that is given on the rating plate, by opening the refrigerant valve (9).

If the pressure in the refrigerant tank is too low, so that the refrigerant does not flow over in the system, you can either warm up the refrigerant tank with warm water (the refrigerant tank must not be subjected to temperatures which exceed +50°C) or start the compressor at the thermostat. (Remember to control around the thermostat if there is any refrigerant).

After having filled the system, the valve is closed (9).

Start the compressor and check the suction pressure. Close the valve on the drilling tongs. Close the process pipe and check the tube joining system. - Pressure equalize the refrigerant hose by closing the refrigerant tank and by opening the manifold (9) and the vacuum pump (12.

Dismount the filling hose and open the sperical valve (18. Blow though the filling hose with nitrogen, and close the valve (11)

Dismount and blow through the hose for the refrigerant tank (16) and the filling station.

Control if there is any trace of refrigerant at the mouth of the outlet hose.

Search for leakages on all joints on the refrigerating system.

Check the pressure side when the compressor is in operation, and the suction side when the system is pressure equalized.

Test the unit. Check to ensure that the evaporator frosts over as usual.

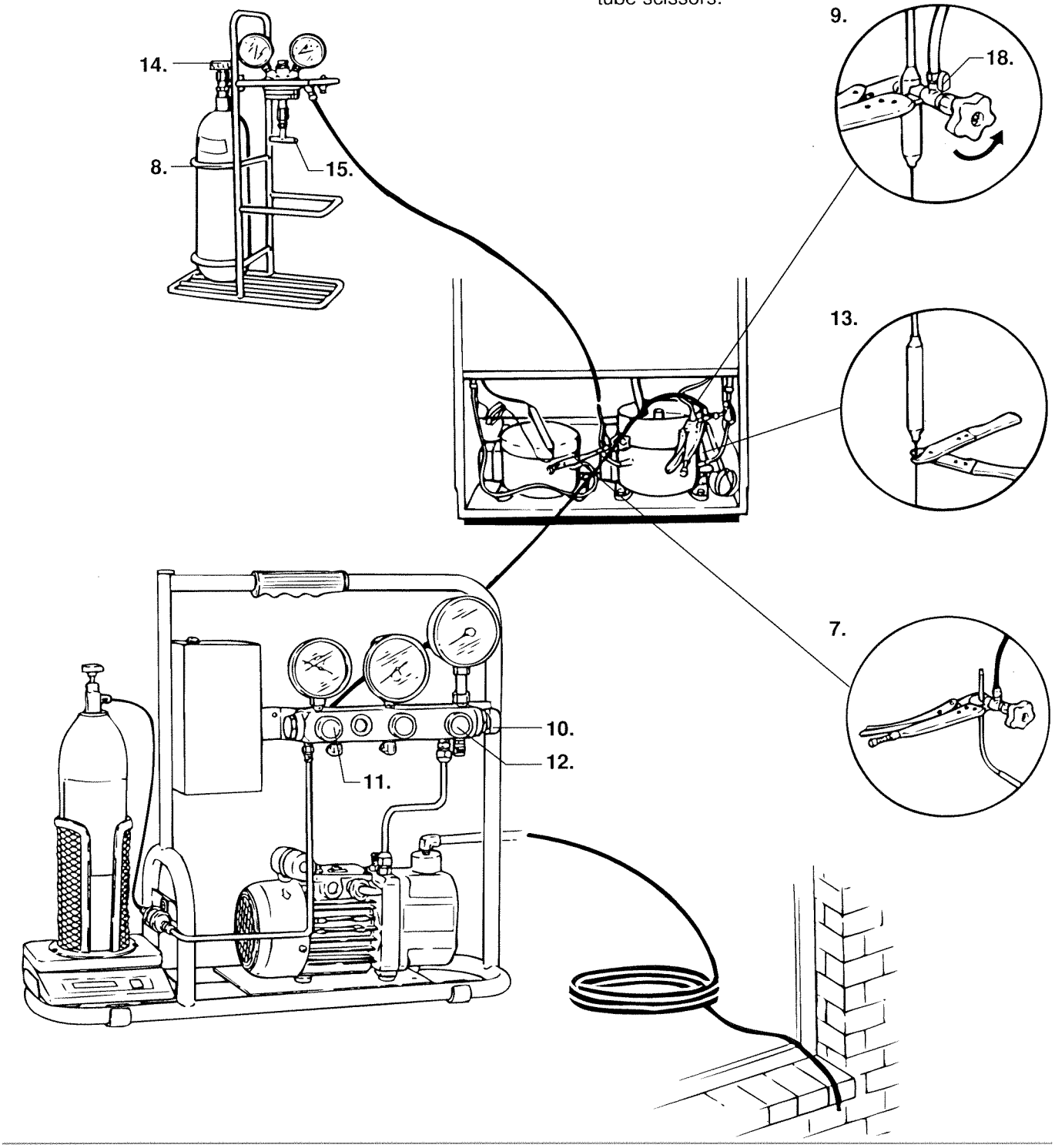
A/S Vestfrost
Spangsbjerg Møllevej
DK-6705 Esbjerg Ø . Denmark
Phone: +45 79 14 22 22*

**Nr.: 95.54.600**
Version G
November 2000

Vestfrost

## The Blowing Process of the System, the Filling Station and the Vacuum Pump and Opening of the System

7. Drilling and tapping of the process pipe.
8. Connect dry nitrogen and equalize the pressure in the system.
9. Open the valve on the tongs at the filter drier and the spherical valve (18).
10. Open the valve for the filling station (11).
11. Slowly open the valve for the vacuum pump (12) and blow the system, the filling station and the vacuum pump through.
12. The system can then be opened with capillary tube scissors.




A/S Vestfrost
Spangsbjerg Møllevej
DK-6705 Esbjerg Ø . Denmark
Phone: +45 79 14 22 22*

Nr.: 95.54.600
Version G
November 2000

### 4.1.1. Opening the Refrigerating System for Repairs with Recovery of Refrigerant.

If a hermetic refrigerating system is to function correctly and have a reasonably long life, it is essential that the amount of impurities pre-sent in the system, i.e. moisture, foreign gases, dirt, etc., be kept at a minimum.

This fact must be taken into consideration when repairs are to be made, and the necessary precautions must be taken.
Before commencing repairs, make sure that all other possible faults have been eliminated and that an exact diagnosis of the problem has been made.
Mount a service valve or drilling tongs on the charging pipe (process pipe) and confirm the diagnosis with a suction manometer.
Close the valve.
After thorough cleaning of the spot where the gasket of the drilling tongs is to seal and adjusting of the tongs into filter size (if the tongs are tightened too much, the filter will be deformed), the drilling tongs are mounted on the top of the filter drier just below the curve (at the pressure pipe - see fig. 1.) and drill the filter. Mount the hose on the threaded branch of the drilling tongs. After the mounting of the refrigerant bag, the valve on the drilling tongs is opened, and the refrigerant will pressure equalize into the refrigerant bag. After the pressure equalization the valve is closed, and the refrigerant bag is dismounted and mounted on the vacuum pump outlet - see fig. 4. Connect the hose for the filling station on the valve for the filter and open the valve - see fig. 5 and 6. The refrigerating system is now ready for the first evacuation with recovery of refrigerant. Evacuate to a pressure of approx. 1 mbar. There must not be any appreciable overpressure in the refrigerant bag, as this may damage the vacuum pump. When changing refrigerant bag the evacuation is stopped by closing the valve for the vacuum pump. After the evacuation the valve is closed at the filter drier. - Dry nitrogen ($N_2$) is connected to the valve on the process pipe and the pressure is equalized - see fig. 7 and 8.
Plan the repair work so that the refrigerating system will not be open for more than 10 - 15 minutes.
Assemble the special equipment required for the repairs (see Section 7: Special Equipment and its Use).
Assemble any spare parts required.

Open the system by breaking off the capillary tube at the filter drier. This is done using special-purpose pliers or capillary tube scis-sors, so that burrs and deformation of the tube are avoided.
Cut out the filter drier with a pipe cutter - see fig. 9. The filter must never be soldered off, as any moisture collected in the filter will evaporate and be pressed back into the system, where it can later lead to the formation of ice in the capillary tube. Blow dry nitrogen ($N_2$) through the process pipe and into the system. The inlet pressure should be approx. 5 bar.
Continue blowing for 1 - 2 minutes. This creates an inactive atmosphere, which is a pre-requisite if soldering is to be carried out.

The blowing process also allows the localization of any obstructions in the piping.
Investigate the filter as well for possible blockage.

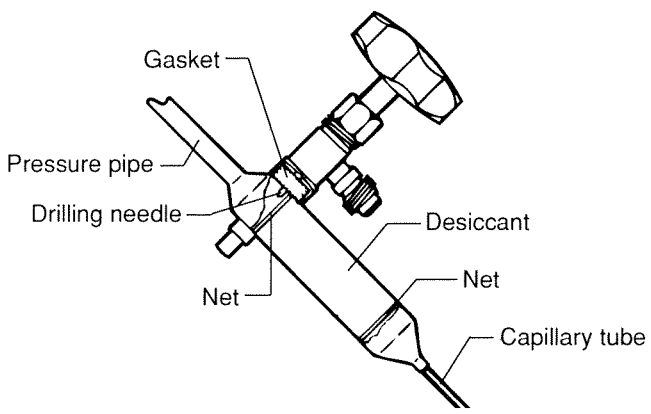
The refrigerating system is now ready for soldering.
Any leakages can be remedied and components remounted.
All pipes which have been cut over (eg. when replacing the compressor) must be plugged during the repair work. See Sections 4.2.: Replacing the Filter Drier, 4.3.: Replacing the Compressor and 4.4.: Replacing the Evaporator.
Solder on the pipes and blow $N_2$ through the system again. Use special-purpose pliers to make a wave in the capillary tube (4.2.).
Mount a service filter which is larger than the filter originally used (as specified in the spare parts list). The filter drier must be hermetically sealed until it is mounted.

When soldering the filter, note that the thin capillary tube cannot with-stand high temperatures due to the risk of melting and that heating must therefore be confined to the filter.
Evacuate the system through the process pipe to a pressure of ap-prox. 1 mbar. Rinse thereafter with approx. 30 g refrigerant. This causes any moisture or non-condensable gases present to be mixed together and discharged.
By letting the compressor run warm, this process can be furthered. With very contaminated systems, the above process must be repeated several times.

The system is now ready for the actual evacuation. Evacuate until a stable vacuum of 1 mbar has been reached. Check for stability of the vacuum by closing the valve for the vacuum pump. If the vacuum gauge needle falls appreciably, possible leakage in the system is indicated.
When a stable vacuum of 1 mbar has been achieved, close the valve for the vacuum gauge and commence charging.
Switch on the heating element for the filling glass. Read the manometer on the filling glass and select the column height.
The amount of refrigerant to be added is specified in grams on the rating plate. Fill the unit with the exact amount and start the compressor.
Use the suction manometer to check for correct charging.

**Mounting of Drilling Tongs on Filter Drier.**

**1.**

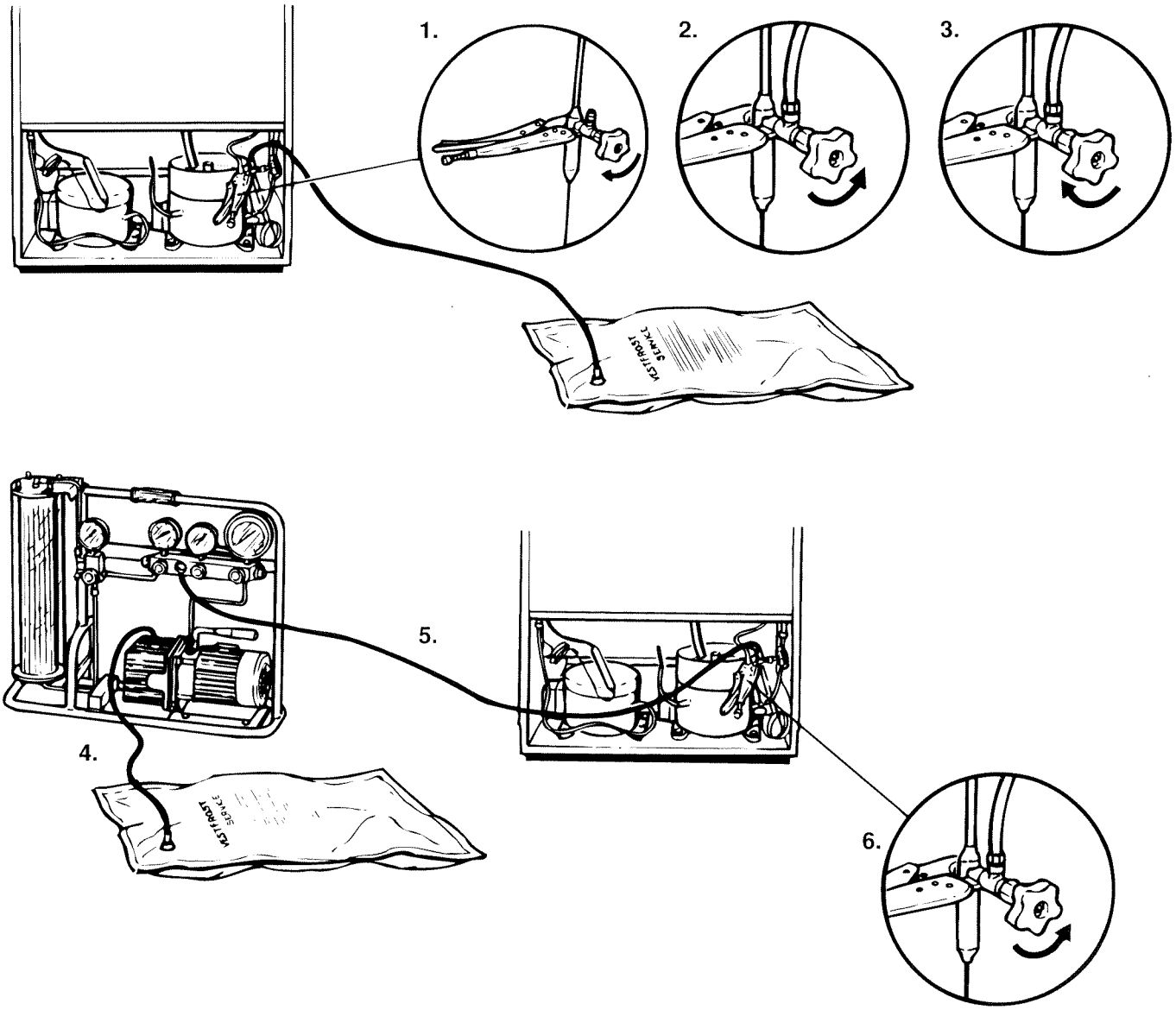



A/S Vestfrost
Spangsbjerg Møllevej
DK-6705 Esbjerg Ø . Denmark
Phone: +45 79 14 22 22*

Vestfrost

## Evacuation with Recovery of Refrigerant

1. Drilling and tapping of filter drier after thorough cleaning where the gasket of the tongs must be tight.
2. Mount the refrigerant bag - open the valve.
3. Close the valve after pressure equalizing - dismount the refrigerant bag.
4. Mount the refrigerant bag on the vacuum pump outlet.
5. Mount the hose for the filling station on the valve for the filter drier.
6. Open the valve and start evacuation.




A/S Vestfrost
Spangsbjerg Møllevej
DK-6705 Esbjerg Ø . Denmark
Phone: +45 79 14 22 22*

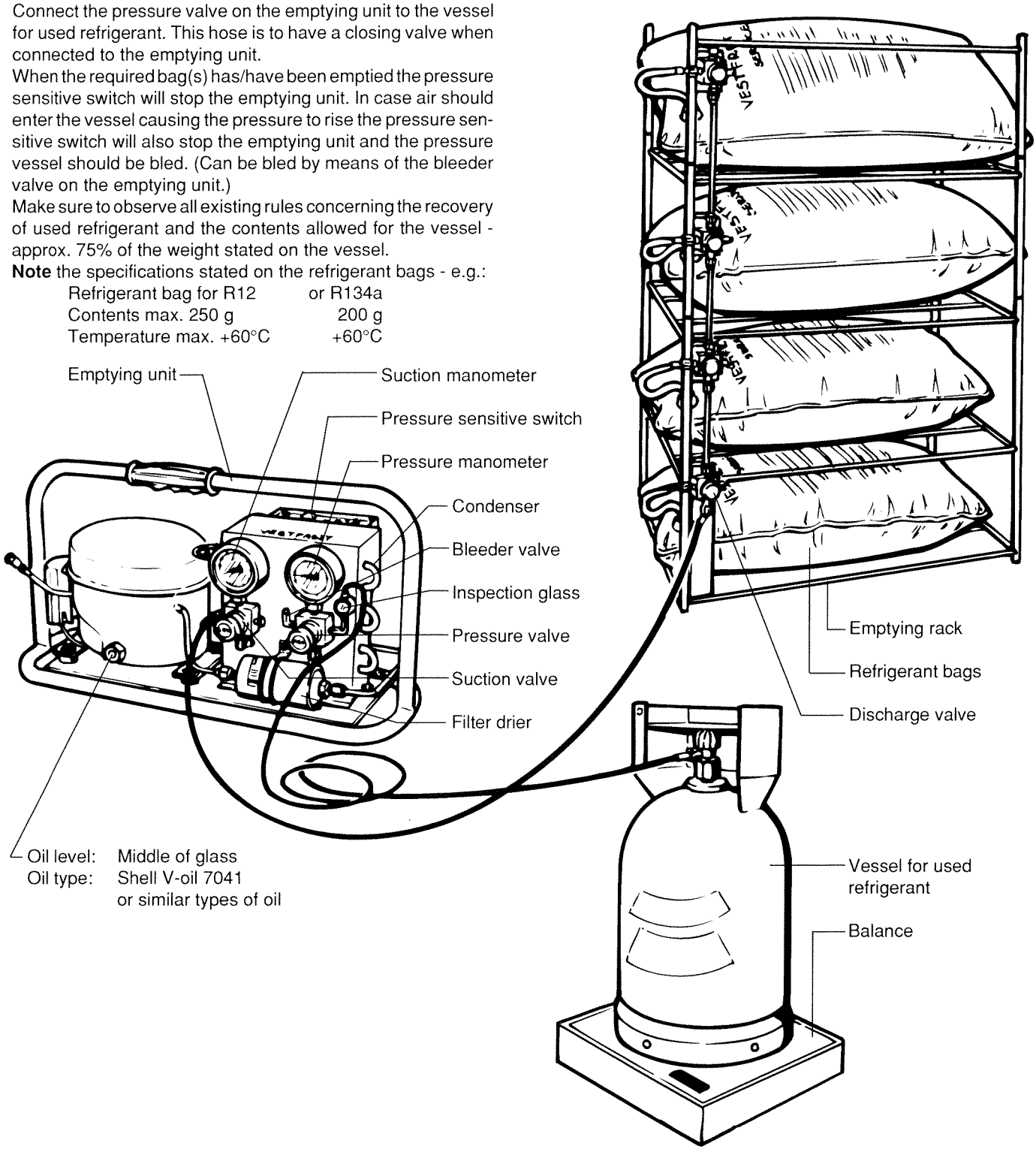
**Nr.: 95.54.600**
Version G
November 2000

### 4.1.2. Emptying used Refrigerant to Pressure Vessel from Refrigerant Bag

Connect the suction valve on the emptying unit with hose to the outlet valve on the emptying rack for refrigerant bags. Open the main valve and the valve for the bags to be emptied.

Connect the pressure valve on the emptying unit to the vessel for used refrigerant. This hose is to have a closing valve when connected to the emptying unit.
When the required bag(s) has/have been emptied the pressure sensitive switch will stop the emptying unit. In case air should enter the vessel causing the pressure to rise the pressure sensitive switch will also stop the emptying unit and the pressure vessel should be bled. (Can be bled by means of the bleeder valve on the emptying unit.)
Make sure to observe all existing rules concerning the recovery of used refrigerant and the contents allowed for the vessel - approx. 75% of the weight stated on the vessel.
**Note** the specifications stated on the refrigerant bags - e.g.:

| | |
|---|---|
| Refrigerant bag for R12 | or R134a |
| Contents max. 250 g | 200 g |
| Temperature max. +60°C | +60°C |



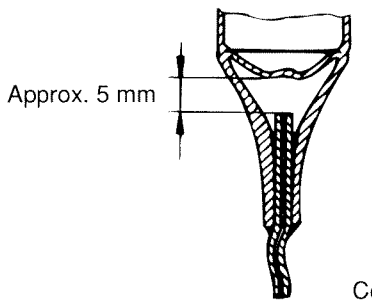

A/S Vestfrost
Spangsbjerg Møllevej
DK-6705 Esbjerg Ø . Denmark
Phone: +45 79 14 22 22*

**Nr.: 95.54.600**
Version G
November 2000

## 4.2. Replacing the Filter Drier

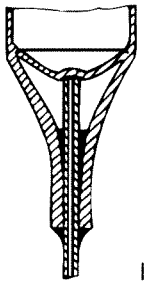
Some moisture and impurities will always be accumulated in the filter drier, both from residue left in the system after installation and from contamination given off by the compressor, pipe system and refrigerant. When repairs are made to the refrigerating system, the filter will often be unable to absorb the extra contamination which results, and ice blockage and contamination of the capillary tube can result.
It is therefore important to note that REPAIRS MADE TO THE REFRIGERATING SYSTEM HAVE NOT BEEN CORRECTLY CARRIED OUT UNLESS THE FILTER DRIER HAS ALSO BEEN REPLACED.

**The following procedure should be used:**
Open the refrigerating system by breaking off the capillary tube approx. 5 cm after the filter drier (use special-purpose pliers or capillary tube scissors).
Discharge the refrigerant. In case of recovery of refrigerant - see Section 4.1.1. + 4.1.3.
Cut out the filter using a pipe cutter.
THE FILTER MUST NOT BE SOLDERED OFF, AS ANY MOISTURE COLLECTED IN THE FILTER WILL EVAPORATE BACK INTO THE SYSTEM.
Open the system at the process pipe and blow dry nitrogen ($N_2$) through the system. In case of recovery of refrigerant - see Section 4.1.1. + 4.1.3.
Install an outsize service filter (as specified in the spare parts list).
Ensure that the capillary tube does not touch the compressor when the filter is positioned.
Should this happen, the flow through the capillary tube can be reduced (moisture barrier). This problem can be confused with slight under-filling of the system.

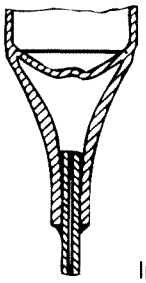


Correct installation

This filter drier has been installed correctly.
Special-purpose pliers have been used to make a wave in the capillary tube.


Incorrect installation

The filter drier shown here has been installed incorrectly, with the capillary tube touching the filter net. The end of the tube is not free, and the resistance is thus increased. The tube will become completely blocked after a period of use. Special-purpose pliers should therefore be used.


Incorrect installation

Here the capillary tube has not been inserted far enough into the filter. This will increase the risk of the tube becoming plugged with flux or silver during soldering. The risk of the tube becoming plugged during operation is also high, as circulating particles will be led directly down into the capillary tube. Special-purpose pliers should therefore be used.

## 4.3. Replacing the Compressor

If trouble-shooting in the electric circuit or volumetric measurements indicate that the compressor is defective, a new compressor must be installed.

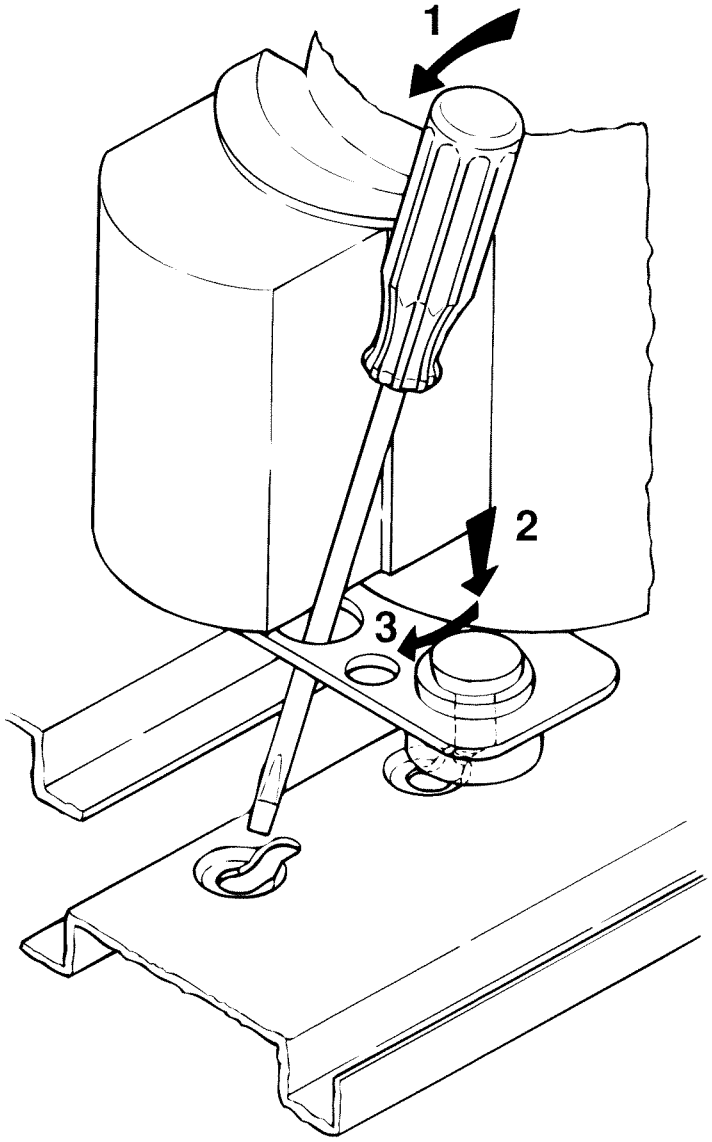
**The following procedure is to be used:**

Ensure that the new compressor is ready for installation.
Replace the electrical equipment.
Clean a good area of the pipes at the compressor branches with a wire brush. This makes it easier to solder on the new compressor and prevents contamination inside the pipes. Remove the filter. Open the process pipe and blow dry nitrogen ($N_2$) through the system. Cut off the pipes approx. 2 cm from the compressor branches using a pipe cutter. Plug the pipes.

The dismounting of the compressor is carried out as shown in the diagram:

1. Insert a robust screwdriver or similar tool through the hole in the base plate and press against the compressor track in the direction of the arrow.
2. Press the bolt downwards to free it from the attachment hole.
3. Release the bolt by pressing in the direction of the arrow.

When mounting the new compressor, carry out the above steps in the reverse order.



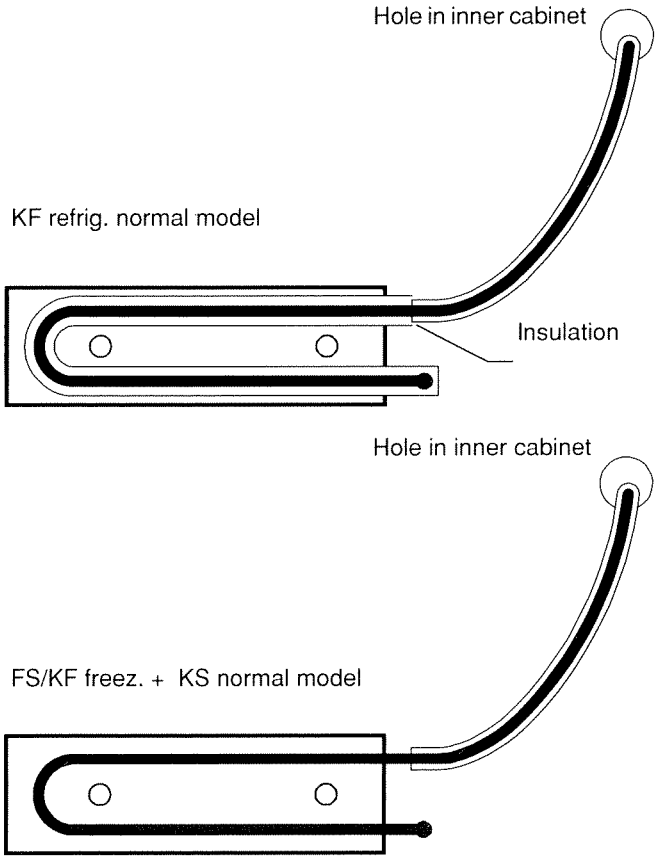

A/S Vestfrost
Spangsbjerg Møllevej
DK-6705 Esbjerg Ø . Denmark
Phone: +45 79 14 22 22*

## 4.5. Replacing the Thermostat

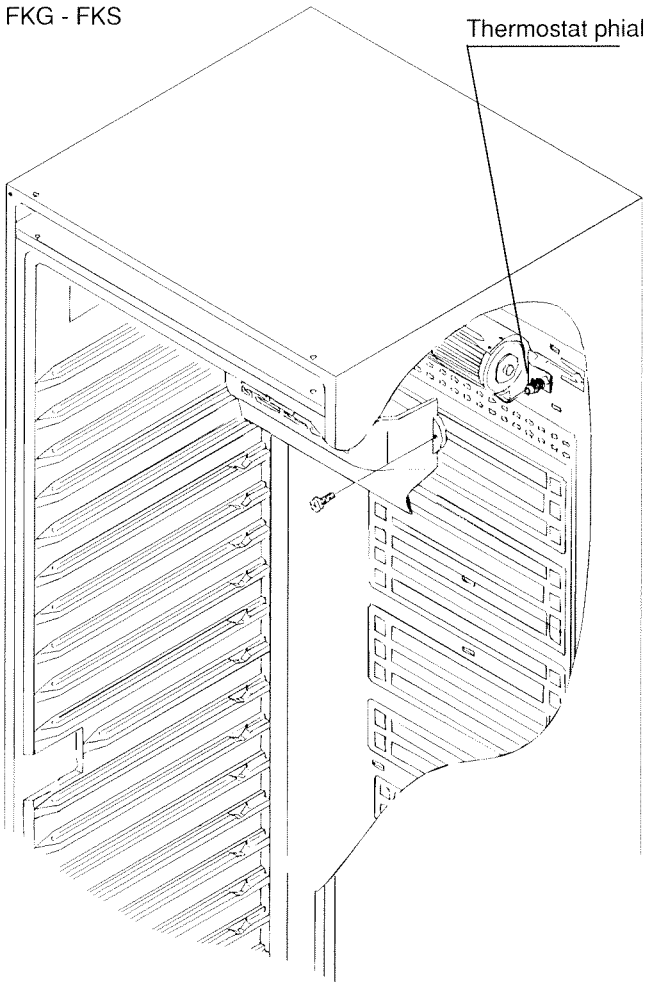
**Uprights**
Dismount the phial tube and straighten out the phial. Draw off the insulation, if any, around the phial. The phial can now be drawn out of the lead-in pipe from the back of the unit.
After the plug has been removed from the socket, remove the cover for the top panel and the panel box.
Remove the thermostat knob, nut and thermostat wiring.
Install the new thermostat in reverse order.

**Chest freezers**
The procedure for replacing the thermostat can readily be seen on chest units. Ensure that the phial is inserted as far as possible inside the phial tube.
See Section 5.21.: Soldering Joints and Positioning of the Thermostat Phial Tube in Chest Freezers.

### Installing the Thermostat Phial

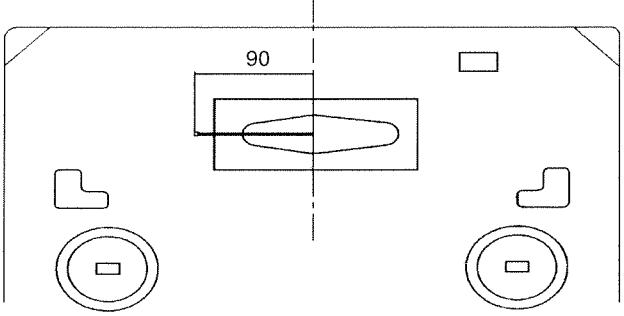



FKG - FKS




**Positioning of the Thermostat Phial in NFG 307 till Serial No. 501 - - - - -**
In order to ensure the proper functioning of the thermostat 90 mm of the free end of the capillary tube is to serve as thermostat phial.

In case of failing thermostat functioning and a possible replacement of the thermostat, be sure that the phial part is placed sufficiently far into the cabinet. This can be done visually by loosening the screws holding the evaporator box against the top of the inner cabinet and lowering the evaporator box so that the phial can be seen at the back of the cabinet.




A/S Vestfrost
Spangsbjerg Møllevej
DK-6705 Esbjerg Ø . Denmark
Phone: +45 79 14 22 22*

**Nr.: 95.54.600**
Version G
November 2000

Vestfrost

# 5. Other Service Work




A/S Vestfrost
Spangsbjerg Møllevej
DK-6705 Esbjerg Ø . Denmark
Phone: +45 79 14 22 22*



**Nr.: 95.54.600**
Version G
November 2000

# 5. OTHER SERVICE WORK

## 5.1. General

The preceding pages have dealt with repairs to the hermetic refrigerating system and the electrical installations in Vestfrost refrigerating and freezing units. Problems in connection with the external parts of the units can also give rise to service calls. These problems are, however, relatively easy to solve, as it is always possible to investigate the function and installation of the part in question before a new part is installed.

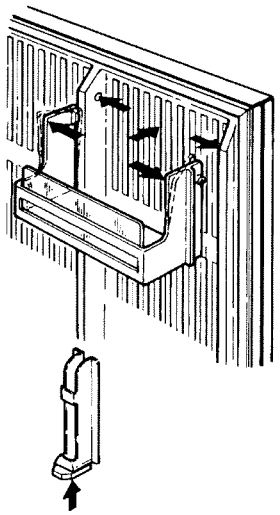
A/S Vestfrost
Spangsbjerg Møllevej
DK-6705 Esbjerg Ø . Denmark
Phone: +45 79 14 22 22*

**Nr.: 95.54.600**
Version G
November 2000

## 5.5. Door Shelves in Upright Cabinets

The door shelves are dismounted by twisting the front parts of the sides outwards. This pulls the pivots out of the holes and allows removal of the shelf.

Dismounting the support for long door shelf.



The door shelf is mounted by pushing it in against the door liner and by letting it slide down into the mesh (see fig. 1).
The lid for door shelf is mounted by pressing the sides, where the pivots are, in against the middle 1 and is mounted in the holes in the door liner 2 + 3 (see fig. 2).

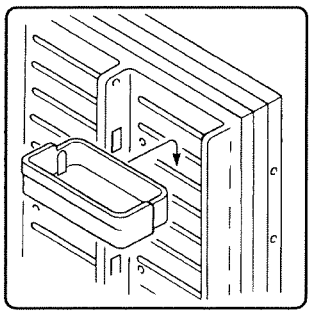


**Fig. 1.**

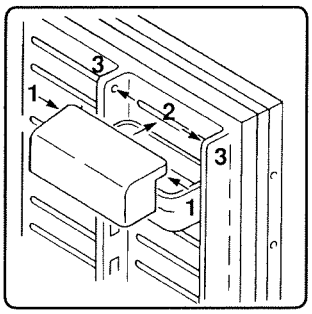


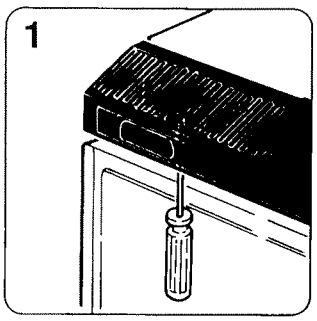

**Fig. 2.**

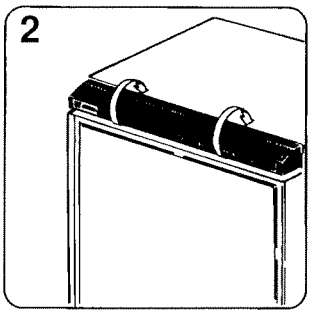
A/S Vestfrost
Spangsbjerg Møllevej
DK-6705 Esbjerg Ø . Denmark
Phone: +45 79 14 22 22*

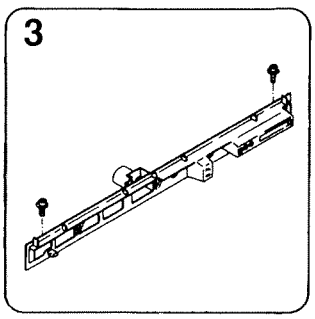
**Nr.: 95.54.600**
Version G
November 2000

### 5.6.1. Removing the Cover for the Top Panel, Panel Box and Cover for Electrical Unit

Pull out the plug from the socket.
Loosen the screws mounted vertically under the top panel cover (fig. 1), turn the top panel cover backwards and lift the back edge of the meshes in panel box (fig. 2).
Remove the screw in the middle of the panel box and the vertically mounted screws (fig. 3), then pull out the left side of the panel box by loosening it from the edge behind the contact face for hinge and disengage the right side of the panel box.
The cover for electrical unit is clipped on to the back of the panel box.



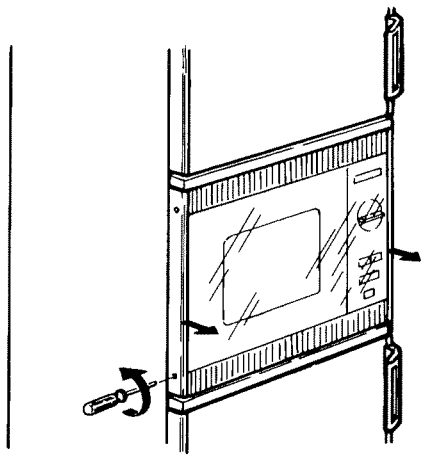

A/S Vestfrost
Spangsbjerg Møllevej
DK-6705 Esbjerg Ø . Denmark
Phone: +45 79 14 22 22*

### 5.10. Dismounting the Oven in MC 280

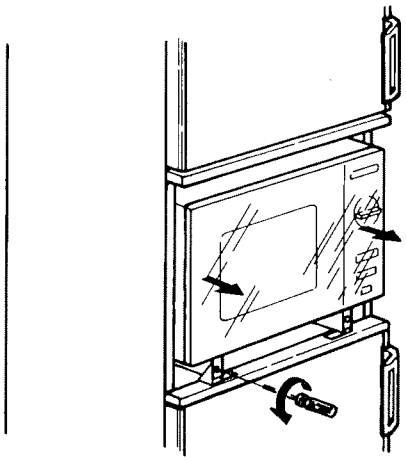
Remove the two screws in the side list and pull out the front frame (fig. 1).

Remove the screws of the fittings for oven and pull out the oven (fig. 2).

1.

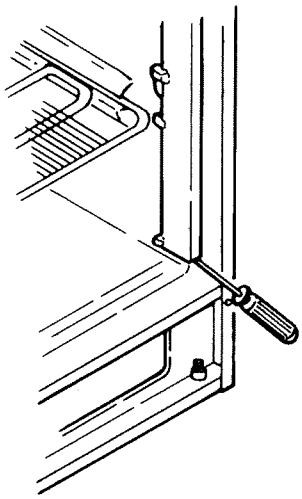


2.



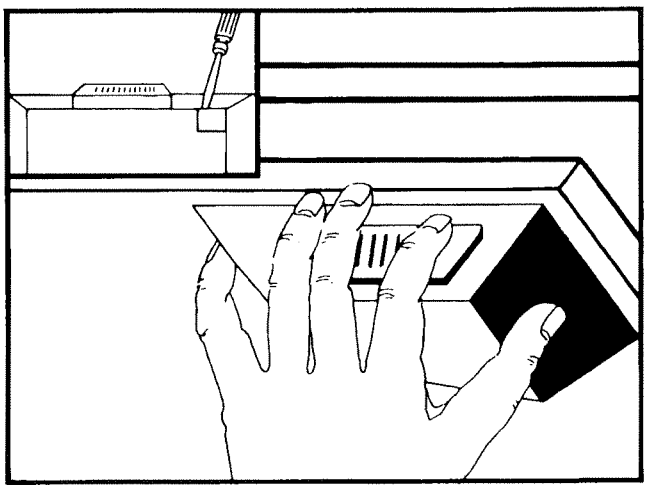
### 5.11. Dismounting the Side Lists on SFS 180 - 181 - 230 - 231

The side lists are clipped on to the inner cabinet and can be pulled out of the passes in the inner cabinet by means of a screwdriver, starting at the bottom.



### 5.20. Interior Light - Chests

The bulb is protected by a cover, which is snapped on and held in place with a screw. The screw is hidden by a square plastic plug which can be removed using a knife or screwdriver.



A/S Vestfrost
Spangsbjerg Møllevej
DK-6705 Esbjerg Ø . Denmark
Phone: +45 79 14 22 22*

**Nr.: 95.54.600**
Version G
November 2000

Vestfrost

# 6. Doors/Lids



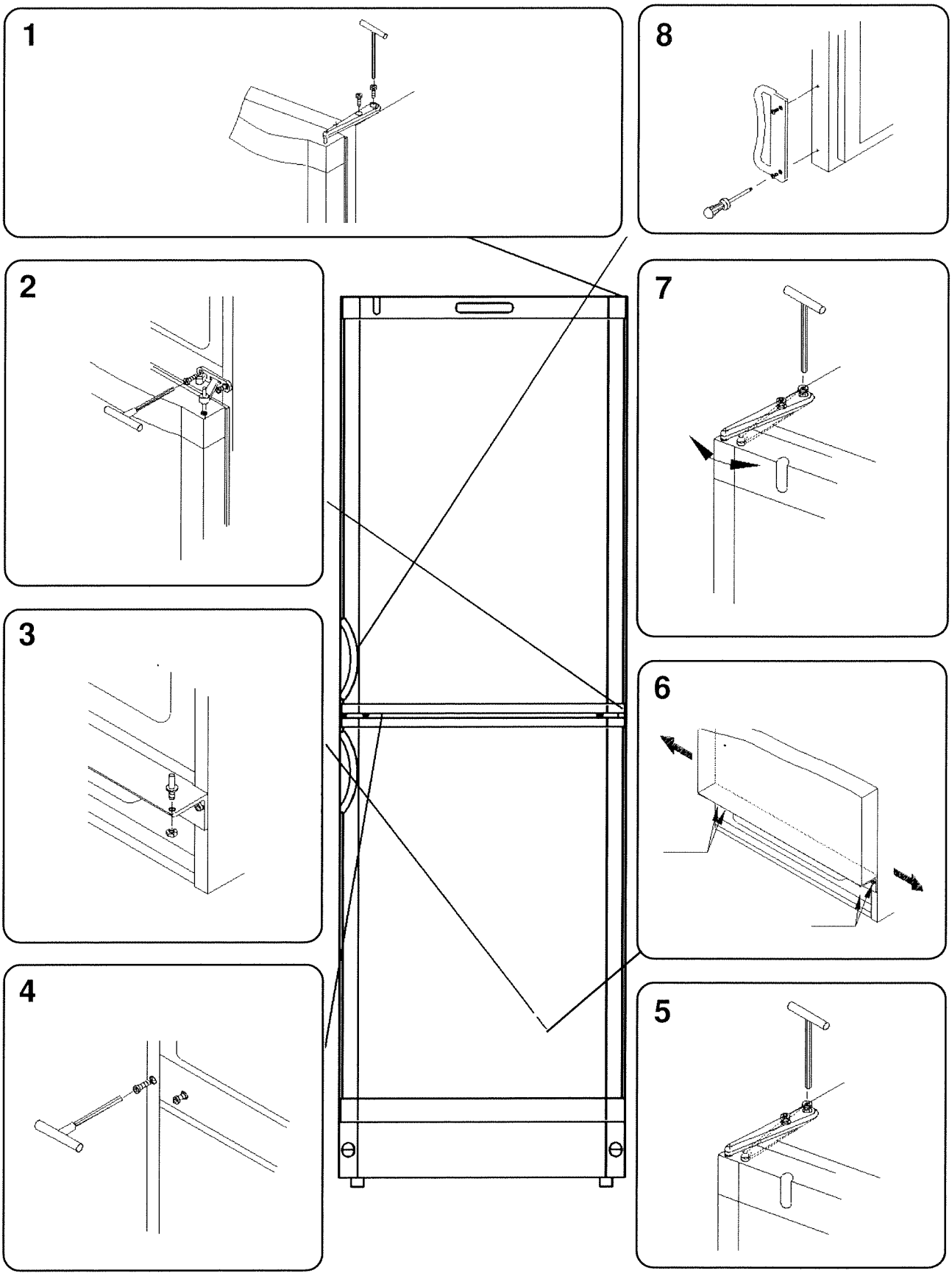

A/S Vestfrost
Spangsbjerg Møllevej
DK-6705 Esbjerg Ø . Denmark
Phone: +45 79 14 22 22*



**Nr.: 95.54.600**
Version G
November 2000

Vestfrost

6.1.

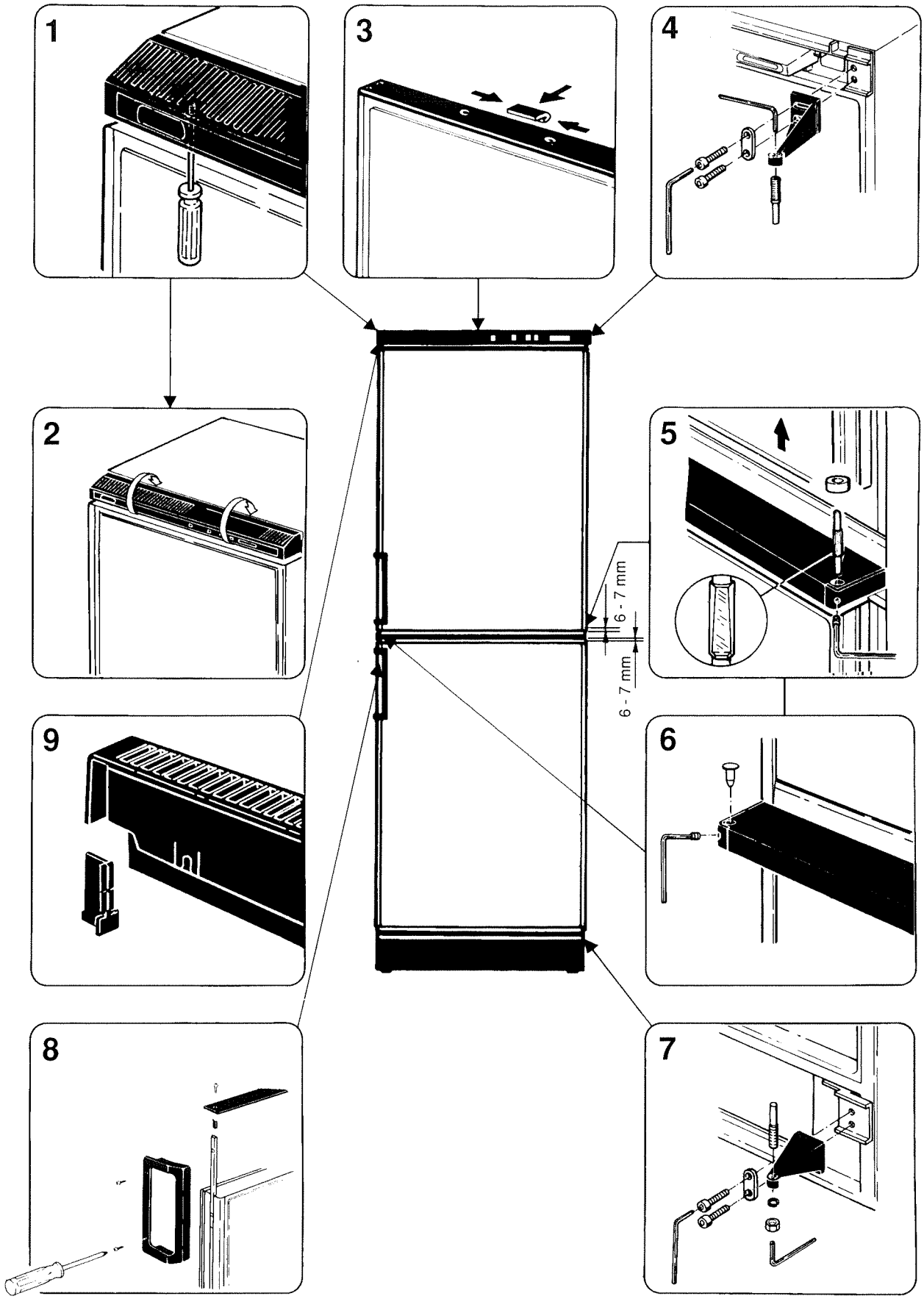



**A/S Vestfrost**
Spangsbjerg Møllevej
DK-6705 Esbjerg Ø . Denmark
Phone: +45 79 14 22 22*

**Nr.: 95.54.600**
Version G
November 2000

Vestfrost

6.1.1.

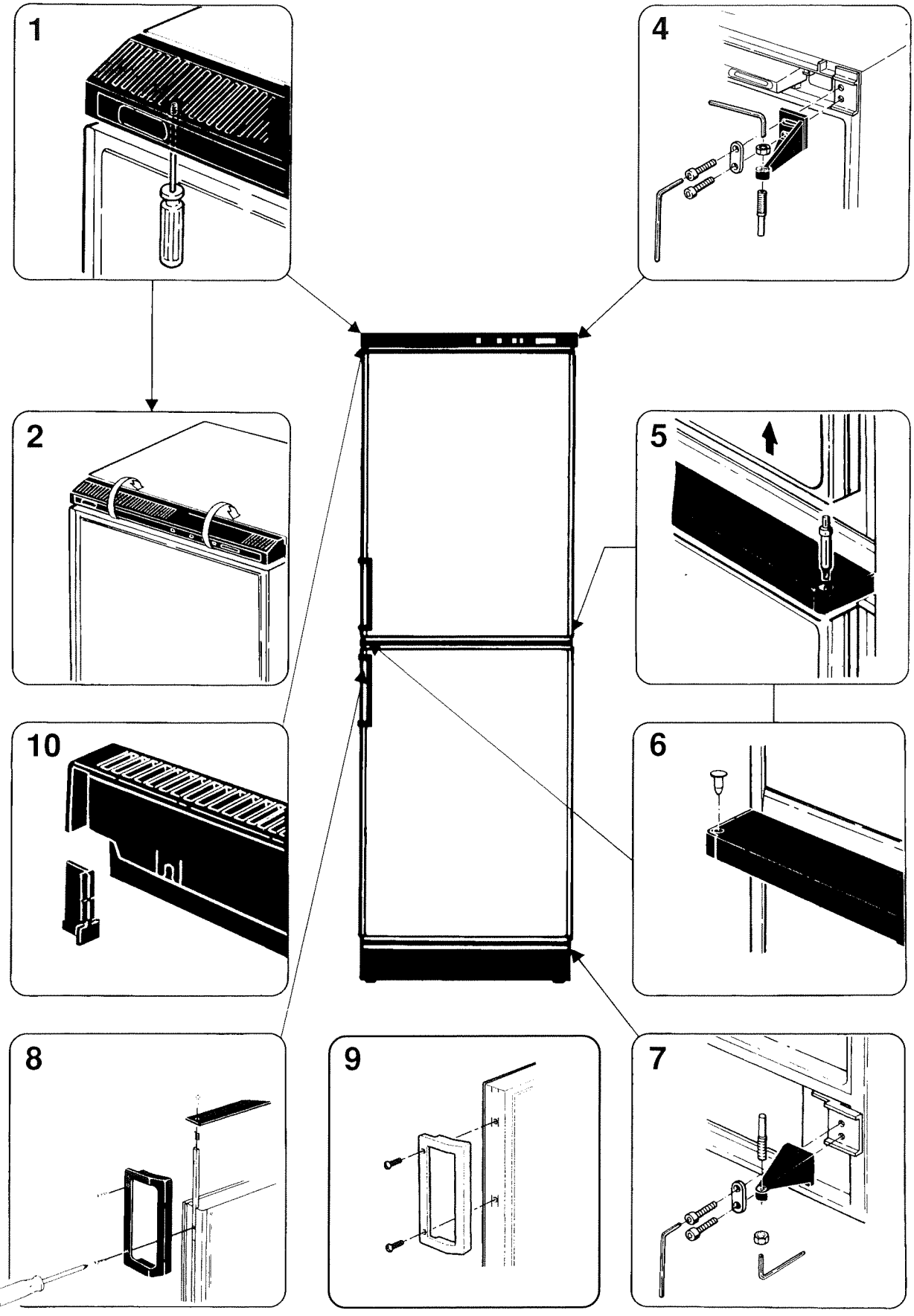



A/S Vestfrost
Spangsbjerg Møllevej
DK-6705 Esbjerg Ø . Denmark
Phone: +45 79 14 22 22*

**Nr.: 95.54.600**
Version G
November 2000

Vestfrost

6.1.2.

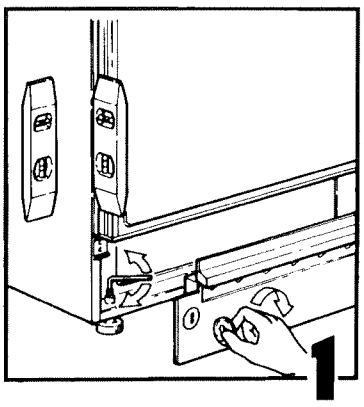


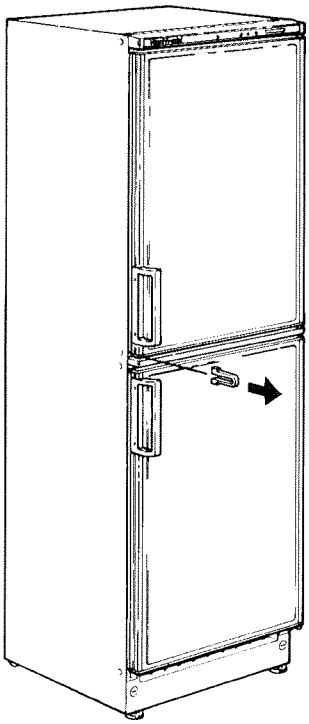

A/S Vestfrost
Spangsbjerg Møllevej
DK-6705 Esbjerg Ø . Denmark
Phone: +45 79 14 22 22*

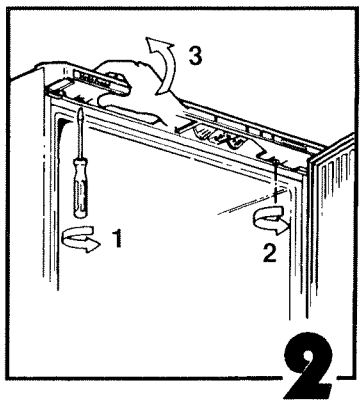
**Nr.: 95.54.600**
Version G
November 2000

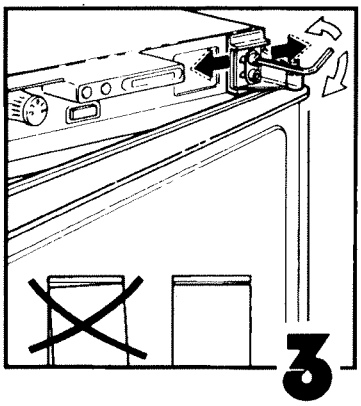
Vestfrost

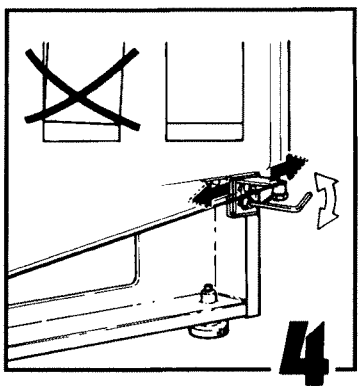
6.3.

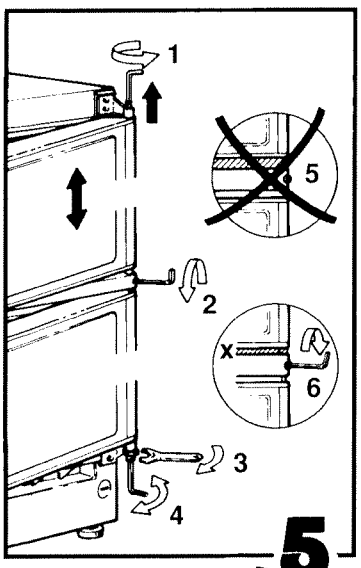


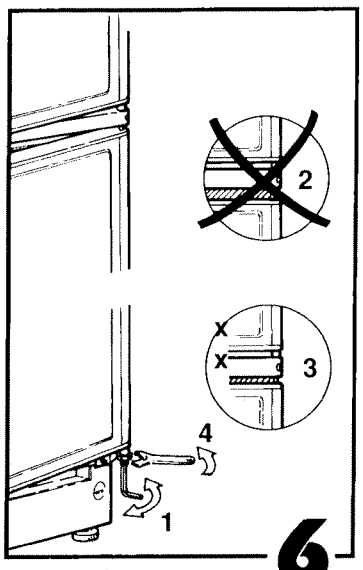



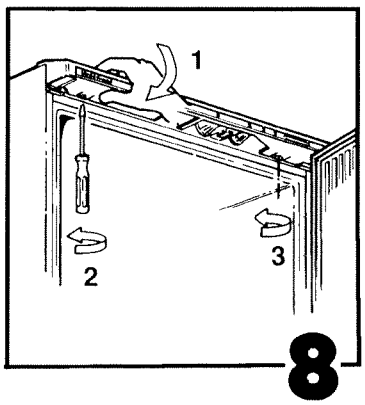


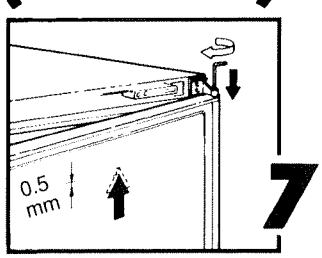



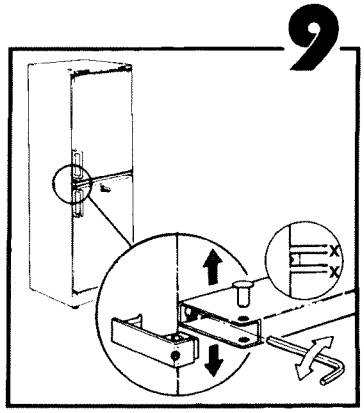



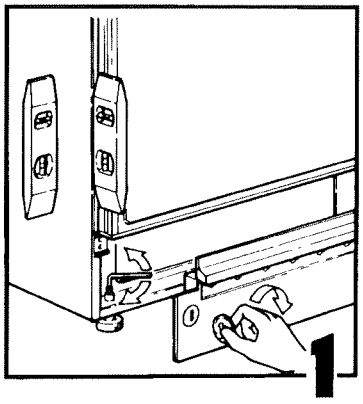



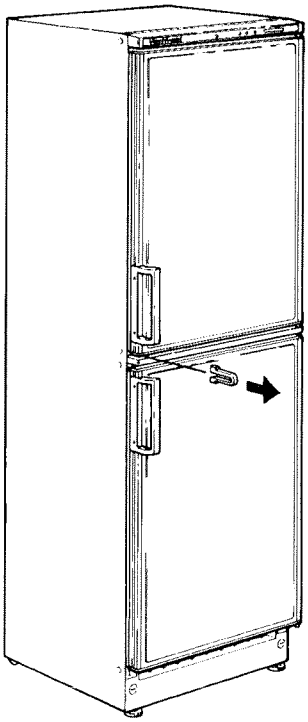

**A/S Vestfrost**
Spangsbjerg Møllevej
DK-6705 Esbjerg Ø . Denmark
Phone: +45 79 14 22 22*

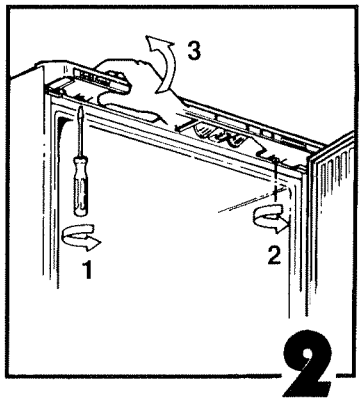
**Nr.: 95.54.600**
Version G
November 2000

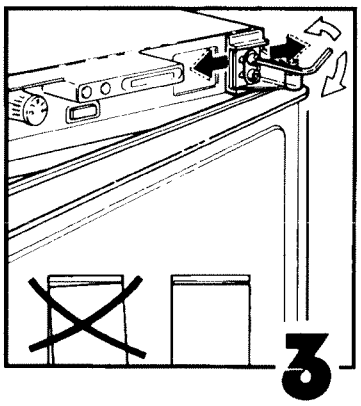
Vestfrost

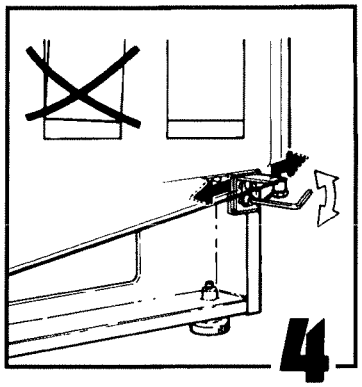
6.3.1.

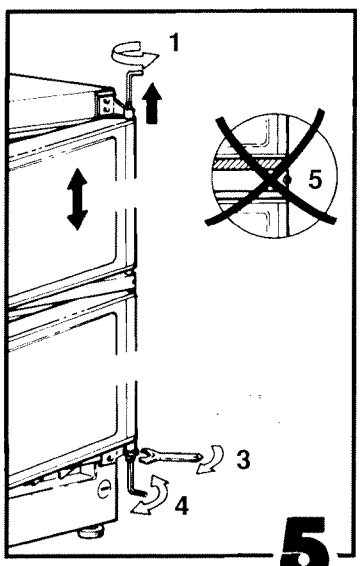


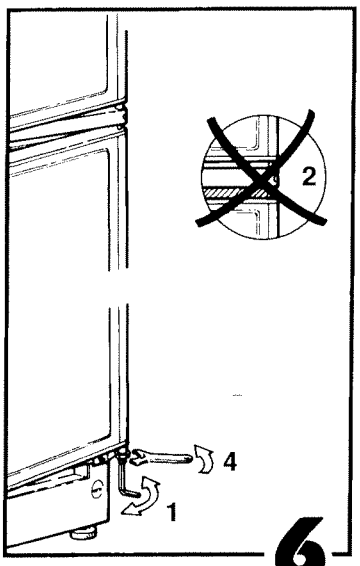



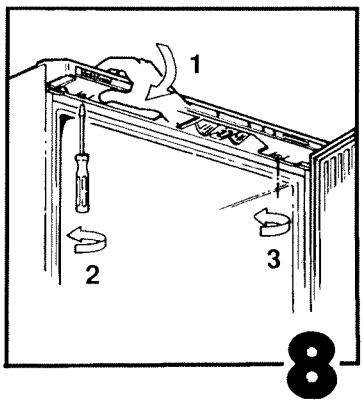


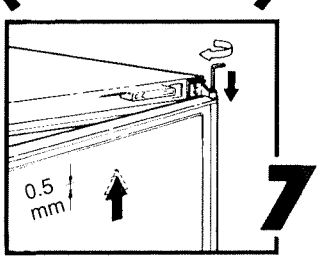



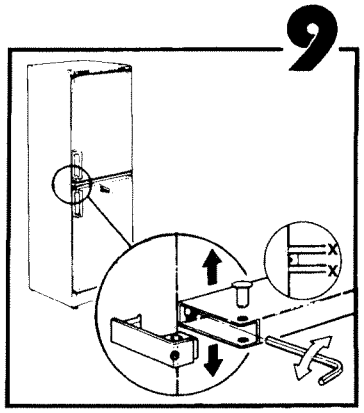




**A/S Vestfrost**
Spangsbjerg Møllevej
DK-6705 Esbjerg Ø . Denmark
Phone: +45 79 14 22 22*

**Nr.: 95.54.600**
Version G
November 2000

### 6.4.3 Replacing the Gasket on Chests Lids

Follow the instructions in section 6.4.1.: Replacing the Gasket on Cabinet Doors with Exhangeable Door Plates. The end-pieces are not removed, however, as these are foamed together with the lid.

Cut away the defective gasket by inserting a knife behind the gasket under the lid lining. The new gasket can then be mounted.

### 6.5. Replacing Hinges and Adjusting Lids - Chests

When replacing the hinges of a chest freezer, the plastic hinge cover must first be removed. This is done easily and without the use of tools. The screws are then accessible and the hinges can be replaced. (NB: Always remove the hinges with open lid.)

Note that the upper hinge joint is provided with horizontal slots and the lower hinge joint with vertical slots, which allows for a satisfactory positioning of the lid. If the lid is to be adjusted backwards or forwards, this can be done by placing 3/16" washers on the screws and between the hinge and the back plate, under either the upper or lower hinge joint.

A PVC distance piece is available for easy adjusting. See the spare parts list.

Vestfrost

# 7. Special Equipment and its Use



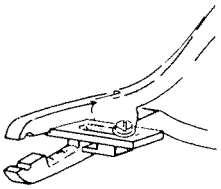

A/S Vestfrost
Spangsbjerg Møllevej
DK-6705 Esbjerg Ø . Denmark
Phone: +45 79 14 22 22*

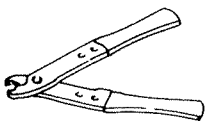


**Nr.: 95.54.600**
Version G
November 2000

### 7.4. Capillary Tube Pliers + Scissors

Clamp the groove in the tip of the pliers around the capillary tube. Twist the pliers carefully until the tube breaks. It is also possible to use capillary tube scissors which will secure a clean cut without deforming the tube. **NB:** This procedure is important, as it prevents any deformation of the tube.
By using another area of the pliers it is possible to make a wave in the capillary tube. Adjust the end pivot of the pliers to position the wave from 13 to 25 mm from the end of the capillary tube. This procedure prevents the capillary tube from being inserted too far up in the filter.

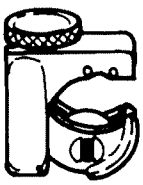


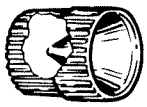


### 7.5. Pipe Cutting

Use a small pipe cutter for cutting through the pipes. Remove any burrs or deformation resulting from the operation. Blow $N_2$ through the pipe from the end opposite the cutting site, so that any metal shavings will be blown out of the pipe end.
NEVER USE A SAW FOR CUTTING THE PIPES.

Pipe Cutter

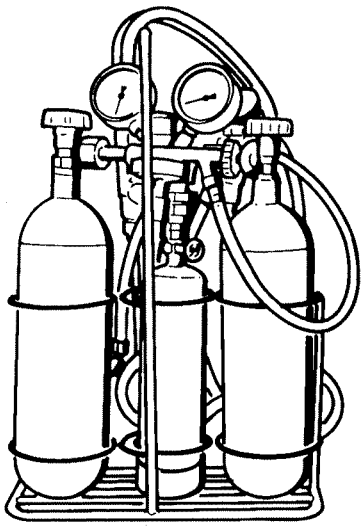


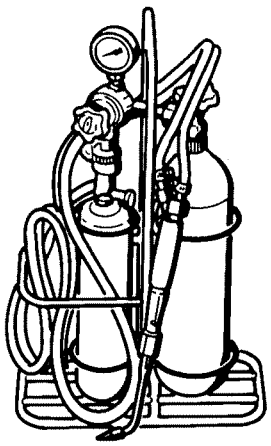


Burr Trimmer

### 7.6. Soldering

**Material required:**
Soldering apparatus
Oxygen and gas with manometer, hoses, burner and support.

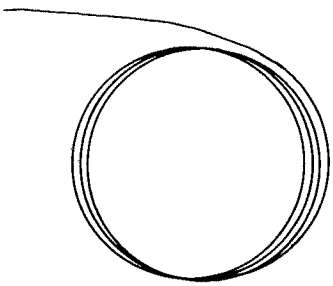




Soldering apparatus

Soldering apparatus with a 2-litre Nitrogen Unit

Soldering Silver and Flux

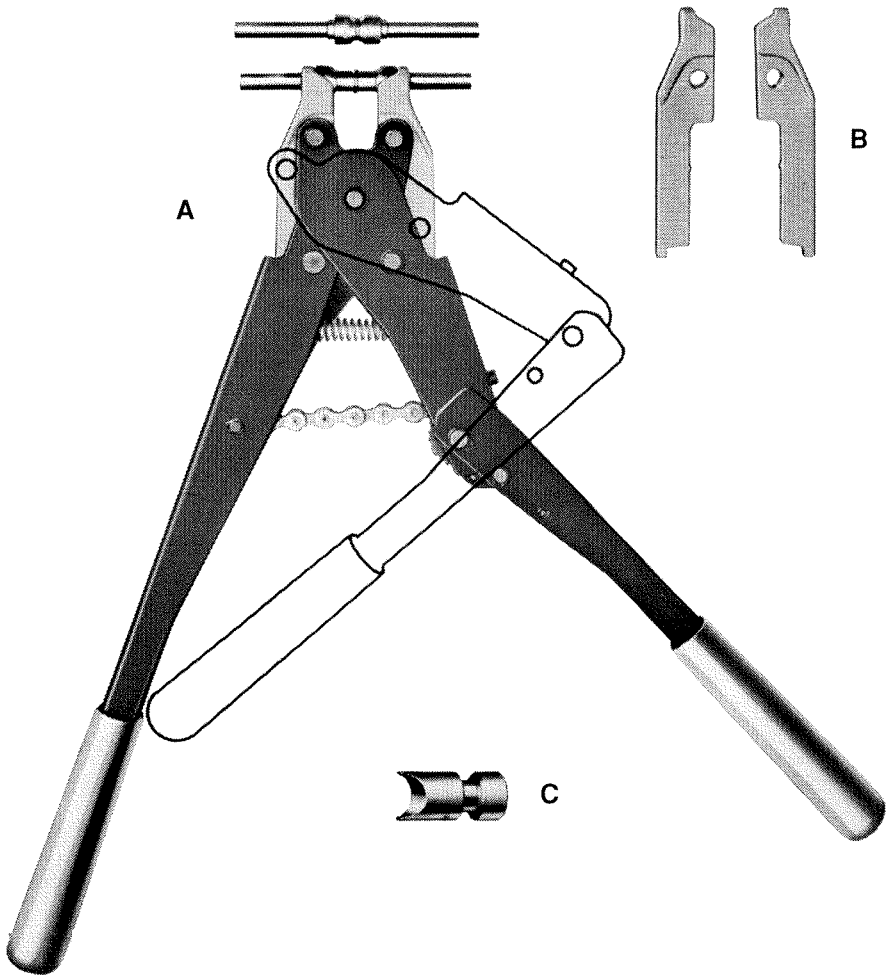
**Procedure:**
The use of oxygen and gas and a burner nozzle of size 2 - 4 is recommended, although requirements will vary with varying conditions. Soldering silver which contains approx. 40% silver and no phosphorus is also recommended. The use of flux is necessary. In order to ensure an adequate penetration of flux, it can be dissolved in alcohol and applied with a brush. NEVER USE WATER.
Always solder so that the silver penetrates deeply and all around the joint. Remember that silver is always attracted to the hottest point.
When soldering the filter and the capillary tube together, note that the thin capillary tube cannot withstand overheating due to the risk of melting.
HEATING MUST THEREFORE BE CONFINED TO THE FILTER ONLY.

A/S Vestfrost
Spangsbjerg Møllevej
DK-6705 Esbjerg Ø . Denmark
Phone: +45 79 14 22 22*

**Nr.: 95.54.600**
Version G
November 2000

Vestfrost

## Assembly Hand Tool for Tube Joints




| A | | B | C |
|---|---|---|---|
| Assembly hand tool | | Assembly jaws | NTR-insert |
| Code No. | Tube outer diameter | Code No. | Code No. |
| HMRK-L 8 | up to 8 mm | MB 8 | NTR 8 |
| HMRK-L 10 | 9 to 11 mm | MB 10 | NTR 10 |
| HMRK-L 12 | 12 to 13 mm | MB 12 | NTR 12 |
| HMRK-L 16 | 14 to 16 mm | MB 16 | NTR 16 |



A/S Vestfrost
Spangsbjerg Møllevej
DK-6705 Esbjerg Ø . Denmark
Phone: +45 79 14 22 22*

**Nr.: 95.54.600**
Version G
November 2000

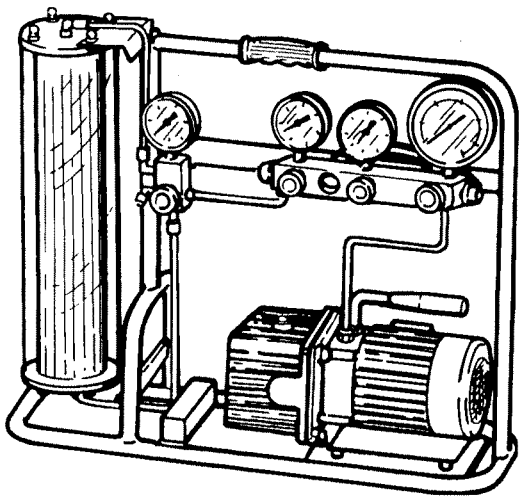
## 7.8. Evacuating and Filling

**Equipment required:**

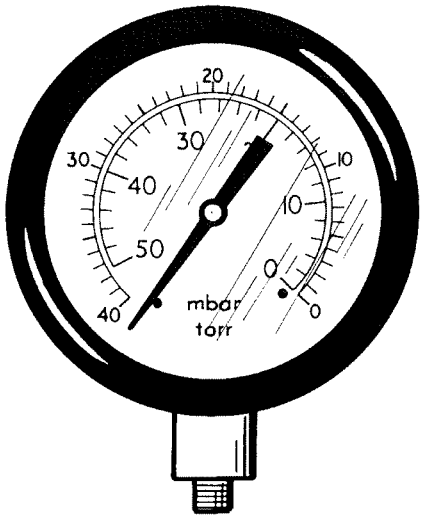
Evacuating and filling station
Vacuum pump
Absolute vacuum gauge calibrated from e.g. 50 - 0 mbar
Filling glass calibrated in grams
Heating element and manometer for filling glass
Manometer with temperature scale for refrigerant
These instruments are available as a complete set
1/4" flange thread on the vacuum pump outlet

**Procedure:**

See Section 4.1.: Opening the Refrigerating System with Refrigerant R600a (Isobutane) for Repairs, Section 4.1.1.: Opening the Refrigerating System for Repairs with Recovery of Refrigerant, Section 4.1.3.: Opening the Refrigerating System with R134a for Repairs and Section 3.7.: Using a Manometer in Trouble-Shooting.

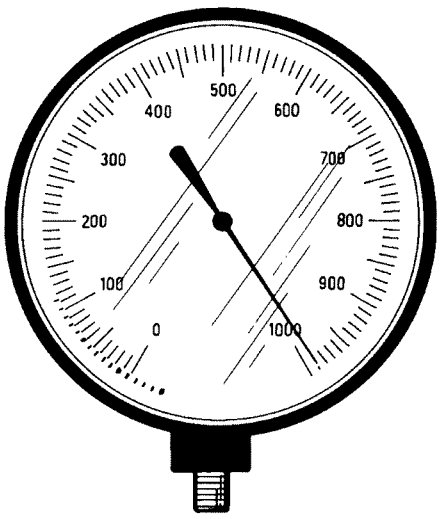


Filling station




**Advantages when using an absolute vacuum gauge**

1. The absolute vacuum gauge compensates for changes in the atmospheric pressure which makes it possible to measure the effective vacuum in the refrigerating system.
2. The absolute vacuum gauge has a fine scale division.
3. The capacity of the vacuum pump can be measured and leakages in the system can be demonstrated.
4. Time can be saved, as you can see when a pressure of 1 mbar has been achieved.



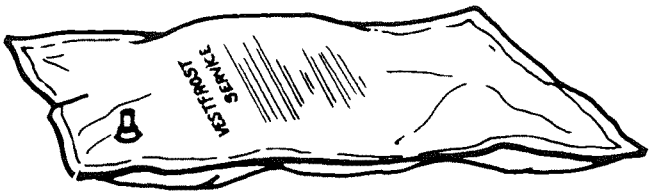

**Disadvantages when using a relative vacuum gauge**

1. The relative vacuum gauge depends on the atmospheric pressure.
2. The relative vacuum gauge has a rough scale division.
3. The capacity of the vacuum pump cannot be measured and leakages in the system cannot be demonstrated.
4. You cannot see when a pressure of 1 mbar has been achieved. You are inclined to let the vacuum pump work longer than necessary in order to be sure that there are no residues of moisture and unknown gases left in the system.

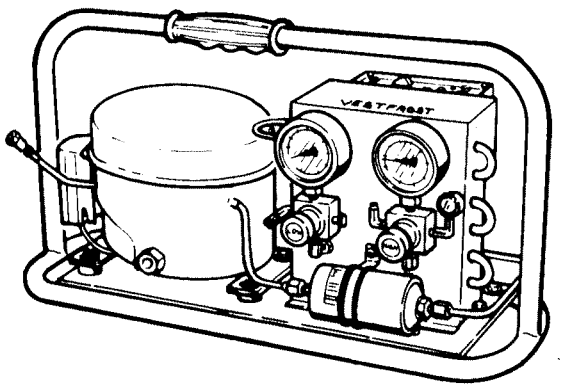
A/S Vestfrost
Spangsbjerg Møllevej
DK-6705 Esbjerg Ø . Denmark
Phone: +45 79 14 22 22*

**Nr.: 95.54.600**
Version G
November 2000

## 7.8.2. Recovery of Refrigerant

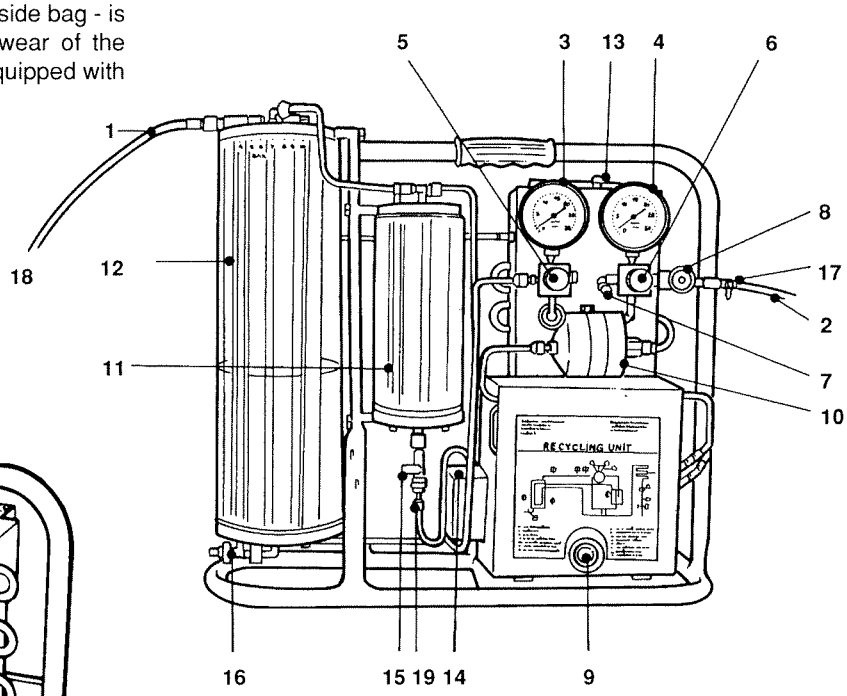



For the recovery of refrigerant a bag designed to this purpose is used. The bag is made of a foil inside which is resistant to the specific refrigerant. Then there is a layer of gasproof aluminium foil and over this one a foil which impedes the penetration of oxygen. The outside bag - for protection of the inside bag - is ribbed on the inside in order to minimize the wear of the gasproof bag as much as possible. The bag is equipped with a 1/4" flange thread with schrader valve.



**Emptying Unit**
When emptying the refrigerant from the bag to a steel vessel designed to used refrigerant the emptying unit is used. The refrigerant is pumped out of the bag through the emptying rack and the filter drier of the unit into the compressor and condenser, where the gas is condensed, and further through the inspection glass and into the steel vessel.
The emptying unit is equipped with a pressure sensitive switch which stops the compressor when the bags are empty or a pressure of about 15 bar on the pressure side is achieved.

**Recovery and Recycling Unit**
The recovery and recycling unit functions in the same way as the emptying unit, but it also purifies the refrigerant for reuse.

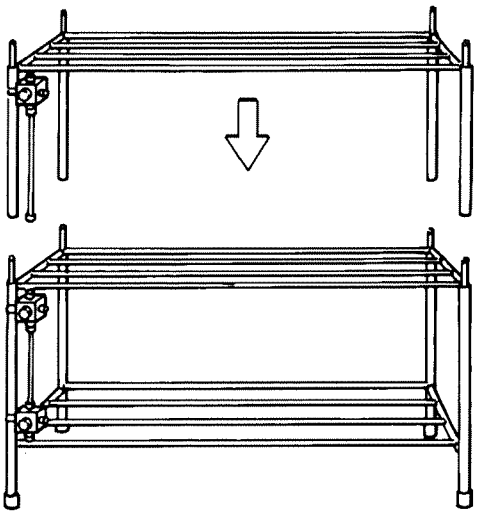



1. Suction hose
2. Pressure hose
3. Suction manometer
4. Pressure manometer
5. Suction valve
6. Pressure valve
7. Bleeder valve, pressure side
8. Inspection glass (pressure)
9. Oil level inspection glass
10. Filter
11. Measuring glass for small separator
12. Measuring glass for large separator
13. Pressure sensitive switch
14. Switch
15. Valve
16. Valve for discharging of dirt, oil etc.
17. Spherical valve on pressure side
18. Spherical valve on suction side
19. Process tube

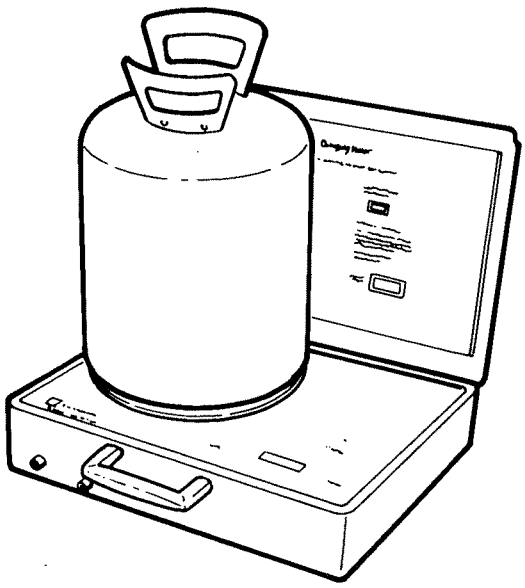
A/S Vestfrost
Spangsbjerg Møllevej
DK-6705 Esbjerg Ø . Denmark
Phone: +45 79 14 22 22*

**Nr.: 95.54.600**
Version G
November 2000

For the protection of the refrigerant bags the emptying rack is used. This one is equipped with hoses and a valve for each bag. The rack consists of a basic module for two bags. The emptying unit may stand on the bottom shelf.



If room for more bags is required an extra module for one bag can be mounted on the top of the basic module. You may pile as many emptying racks on top of each other as you have room for.
A tubing system with a valve for each bag is mounted on the racks. The bags are connected to the valve by means of a hose.



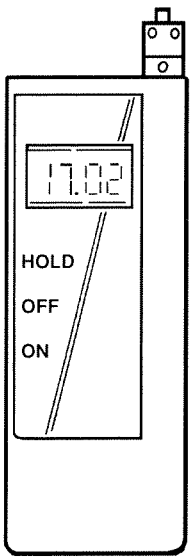
**Balance for the Vessel for Used Refrigerant**
A balance is used for the current checking of the amount of refrigerant filled into the steel vessel. An accurate balance should be used as it is important that not too much used refrigerant is filled into the vessel.

A/S Vestfrost
Spangsbjerg Møllevej
DK-6705 Esbjerg Ø . Denmark
Phone: +45 79 14 22 22*

**Nr.: 95.54.600**
Version G
November 2000

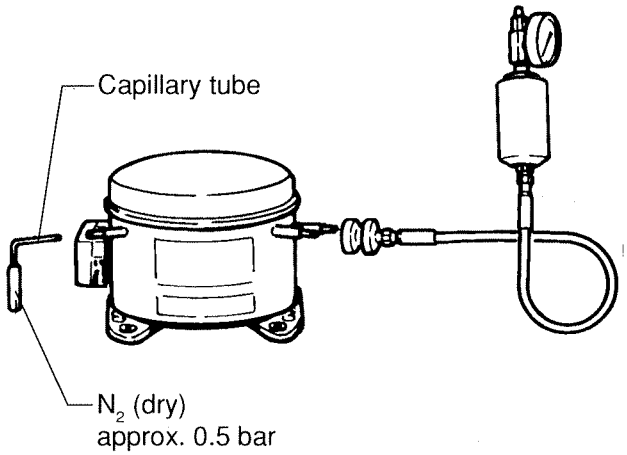
## 7.9. Measuring Temperatures

A reliable thermometer is necessary both for trouble-shooting purposes and for testing the system after repairs have been made.
An electronic thermometer with high accuracy is therefore an invaluable piece of equipment.
It should be remembered that the thermometers used by customers can be extremely unreliable.
By mounting a thermometer phial on the condenser pipe when installing a suction pressure manometer on the process pipe, any defect present can be found with great accuracy.




## 7.10. Using a Volumetric Gauge

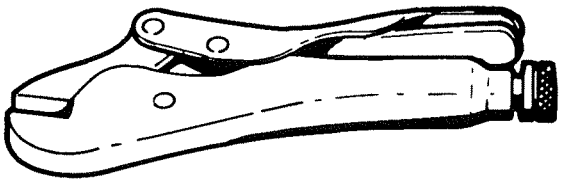
A volumetric gauge is used to check whether the compressor is able to produce a pre-set maximum pressure, for example 9 bar.
Test thereafter for leakage. This can be done after stop of the compressor, as the built-in back-pressure valve will close with a slight pressure drop.
Dry nitrogen must always be blown into the process pipe during use of a volumetric gauge. This is done through a capillary tube with a positive pressure of 0.5 bar.
Testing is carried out while the compressor is connected to the refrigerating system. The volumetric gauge is mounted at the condenser outlet.
Condition: The temperature of the condenser must be equal to the ambient temperature. In addition, dry nitrogen must be blown through the condenser.
Experience shows that if the compressor passes the above test, the possibility of capacity defects should be eliminated.
Mountable on support for pressure tank, dry nitrogen. See Section 7.3.




A/S Vestfrost
Spangsbjerg Møllevej
DK-6705 Esbjerg Ø . Denmark
Phone: +45 79 14 22 22*

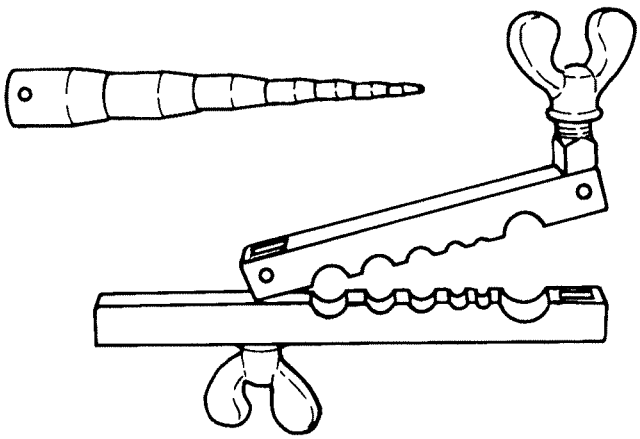
### 7.11. Pinching the Process Pipe

Process pliers (closing pliers) are used to pinch the process pipe prior to removal of the service valve on completion of repairs to the refrigerating system.
The pliers must be constructed so that the process pipe can be gripped tightly during soldering. If refrigerant does manage to slip out, and soldering thus becomes impossible, the pressure in the process pipe can be reduced by starting the compressor.



### 7.12. Other Pipe Work

A step drift is used for drifting the compressor branches if residual silver inhibits new installation.
Together with a pipe holder, a step drift is also used for drifting pipes.



A/S Vestfrost
Spangsbjerg Møllevej
DK-6705 Esbjerg Ø . Denmark
Phone: +45 79 14 22 22*

**Nr.: 95.54.600**
Version G
November 2000

Vestfrost

# 8. Compensation Tables

A/S Vestfrost
Spangsbjerg Møllevej
DK-6705 Esbjerg Ø . Denmark
Phone: +45 79 14 22 22*

**Nr.: 95.54.600**
Version G
November 2000

Vestfrost

# 9. Service Bulletins

A/S Vestfrost
Spangsbjerg Møllevej
DK-6705 Esbjerg Ø . Denmark
Phone: +45 79 14 22 22*

**Nr.: 95.54.600**
Version G
November 2000

Vestfrost

# 10. Spare Parts Lists and Price Lists

A/S Vestfrost
Spangsbjerg Møllevej
DK-6705 Esbjerg Ø . Denmark
Phone: +45 79 14 22 22*

**Nr.: 95.54.600**
Version G
November 2000

Vestfrost

# 11. Vestfrost Information

A/S Vestfrost
Spangsbjerg Møllevej
DK-6705 Esbjerg Ø . Denmark
Phone: +45 79 14 22 22*

**Nr.: 95.54.600**
Version G
November 2000