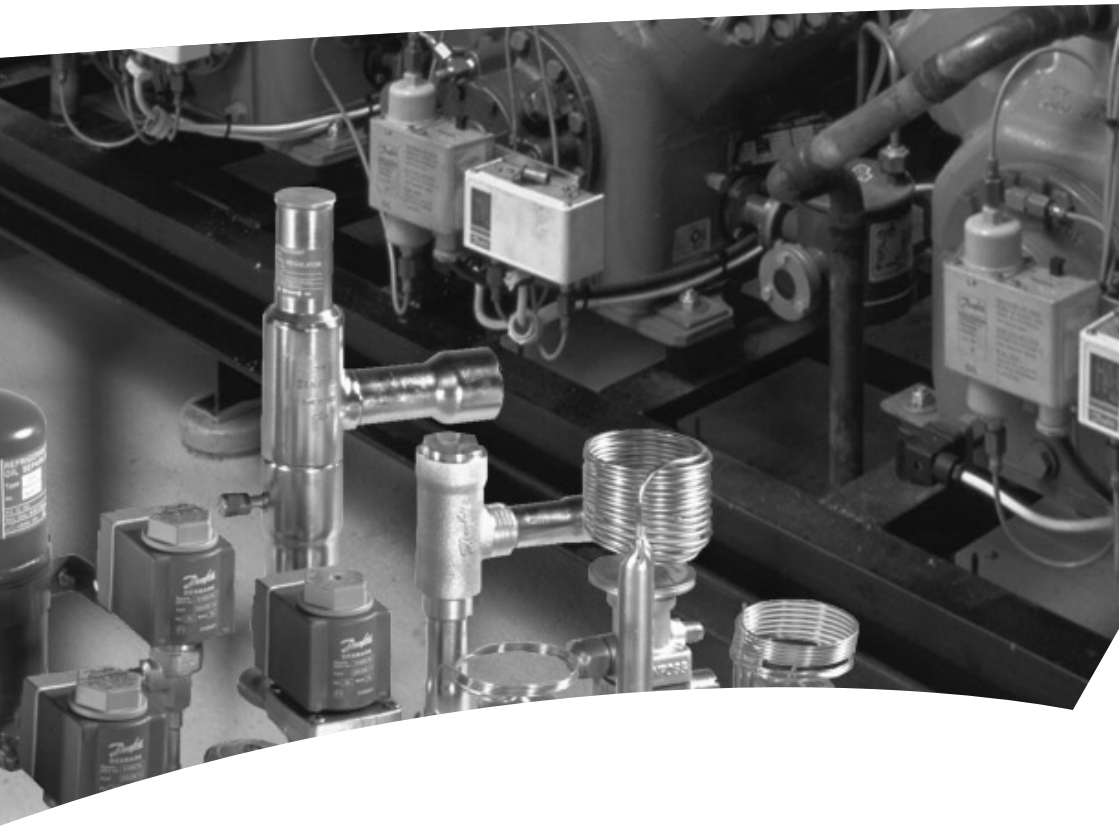


System Trouble Shooting
Fault Location

REFRIGERATION AND
AIR CONDITIONING

Fitters notes

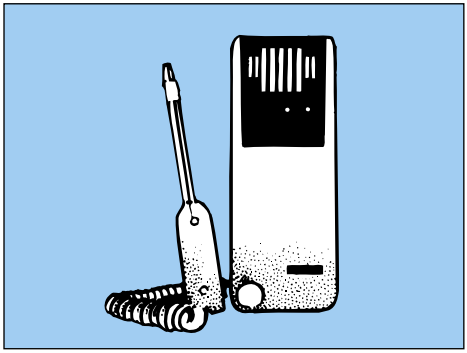
Contents Page

Faults on refrigeration systems, general

This booklet deals with common faults in small, relatively simple refrigeration systems.

The faults, fault causes, remedies and effects on system operation mentioned also apply to more complicated and large systems.

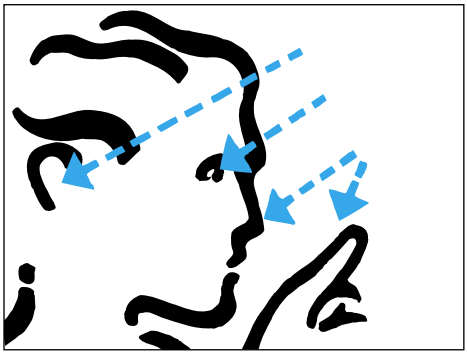
However, other faults can occur in such systems. These and faults in electronic regulators are not dealt with here.



Ae0_0001

Fault location without the use of instruments

After gaining a little experience, many common faults in a refrigeration system can be localised visually, by hearing, by feel, and sometimes by smell. Other faults can only be detected by instruments.

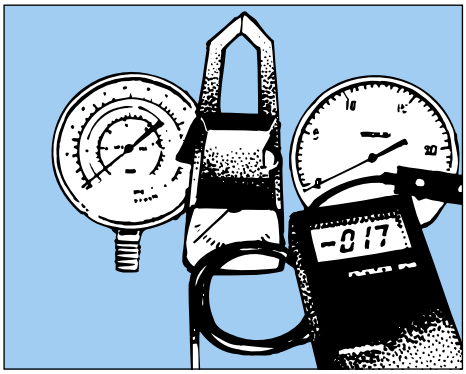


Ae0_0012

Categorisation

This booklet is divided into two sections. The first section deals exclusively with faults that can be observed directly with the senses. Here, symptoms, possible causes and the effect on operation are given.

The second section deals with faults that can be observed directly with the senses, and those that can only be detected by instruments. Here, symptoms and possible causes are given, together with instructions on remedial action.

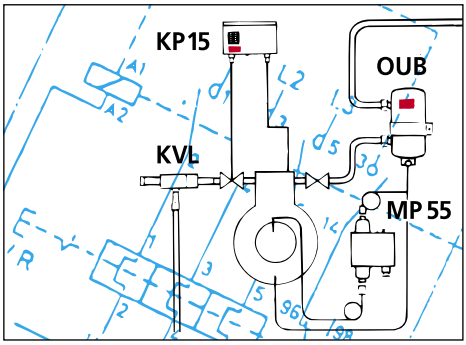


Ae0_0028

Knowledge of the system is required

An important element in the fault location procedure is familiarity with how the system is built up, its function and control, both mechanical and electrical.

Unfamiliarity with the system ought to be remedied by carefully looking at piping layouts and other key diagrams and by getting to know the form of the system (piping, component placing, and any connected systems, e.g. cooling towers and brine systems).



Ae0_0029

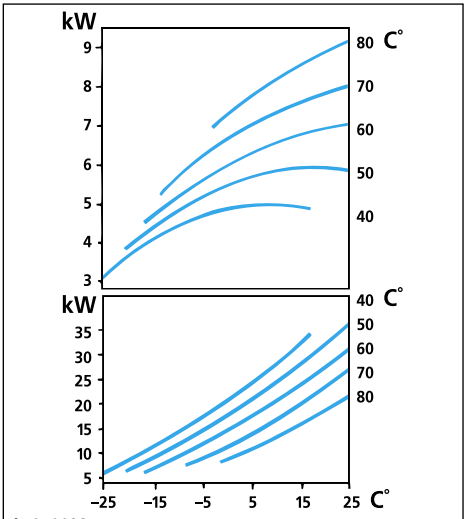
Theoretical knowledge is necessary

A certain amount of theoretical knowledge is required if faults and incorrect operation are to be discovered and corrected.

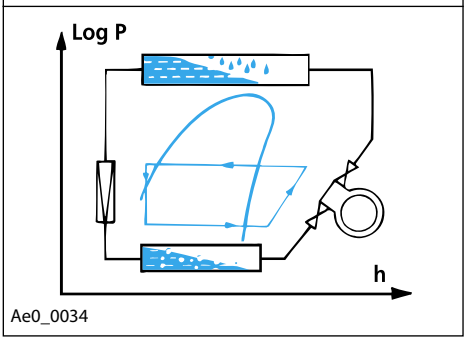
The location of all forms of faults on even relatively simple refrigeration systems is conditional on a thorough knowledge of such factors as:

- The build-up of all components, their mode of operation and characteristics.
- Necessary measuring equipment and measuring techniques.
- All refrigeration processes in the system.
- The influence of the surroundings on system operation.
- The function and setting of controls and safety equipment.
- Legislation on the safety of refrigeration systems and their inspection.

Before examining faults in refrigeration systems, it could be advantageous to look briefly at the most important instruments used in fault location.



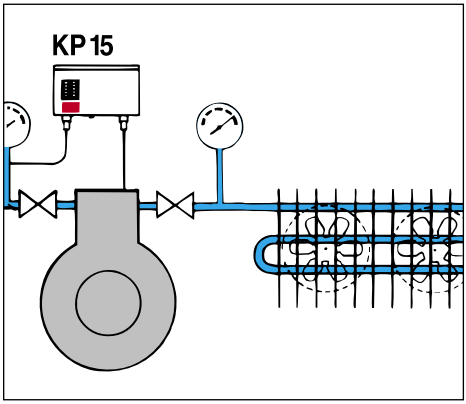
Ae0_0033



Ae0_0034

In the following description of faults in refrigeration systems, sections 1 and 2 take as their starting points the piping diagrams, figures 1, 2 and 3.

The systems are dealt with in the direction followed by the circuit. Fault symptoms that can occur are described in circuit order. The description starts after the compressor discharge side and proceeds in the direction of the arrows.



Ae0_0016

Fault location

Text in [ ] indicates fault cause

Visible faults	Effect on system operation
Air-cooled condenser a) Dirt, e.g. grease or dust, sawdust, dried leaves. [Lack of maintenance] b) Fan stopped. [Motor defect] [Motor protector cut-out] c) Fan rotates in wrong direction. [Installation error] d) Fan blades damaged. e) Fins deformed. [Rough treatment]	Faults under a), b), c), d), e) create: - Increased condensing pressure - Reduced refrigeration output. - Increased energy consumption. For an air-cooled condenser, the difference between air inlet and condensing temperatures should lie between 10°C and 20°C, preferably at the lower end.
Water-cooled condenser with sight glass: See "Receiver". **Receiver with sight glass** Liquid level too low. [Insufficient refrigerant in system] [Overcharged evaporator] [Overcharged condenser] Liquid level too high. [Overcharged system]	For a water-cooled condenser, the difference between condensing and water inlet temperatures should lie between 10°C and 20°C, preferably at the lower end. Vapour/vapour bubbles in liquid line. Low suction pressure or compressor cycling. Excessive condensing pressure possible. Excessive condensing pressure possible.
Receiver stop valve a) Valve closed. b) Valve partly closed. **Liquid line** a) Too small. [Sizing error] b) Too long [Sizing error] c) Sharp bends and/or deformed [Installation error]	System stopped via low-pressure control. Vapour bubbles in liquid line. Low suction pressure or compressor cycling. Faults under a), b) and c) cause: - Large pressure drop in liquid line - Vapour in liquid line
Filter drier Dew or frost formation on surface. [Filter partly blocked with dirt on inlet side] Sight glass a) Yellow. [Moisture in system] b) Brown. [Dirt particles in system] c) Pure vapour in sight glass. [Insufficient liquid in system] [Valve in liquid line closed] [Complete blockage, e.g. of filter drier] d) Liquid and vapour bubbles in sight glass. [Insufficient liquid in system] [Valve in liquid line partly closed] [Partial blockage, e.g. of filter drier] [No subcooling]	Vapour in liquid line. **Risk of:** - Acid formation. - Corrosion. - Motor burn-out. - Water freezing in thermostatic expansion valve Risk of wear in moving parts and blockage in valves and filters. Standstill via low-pressure control or compressor cycling. Standstill via low-pressure control. Standstill via low-pressure control. All faults under d): Compressor cycling or running at low suction pressure.

Text in [ ] indicates fault cause

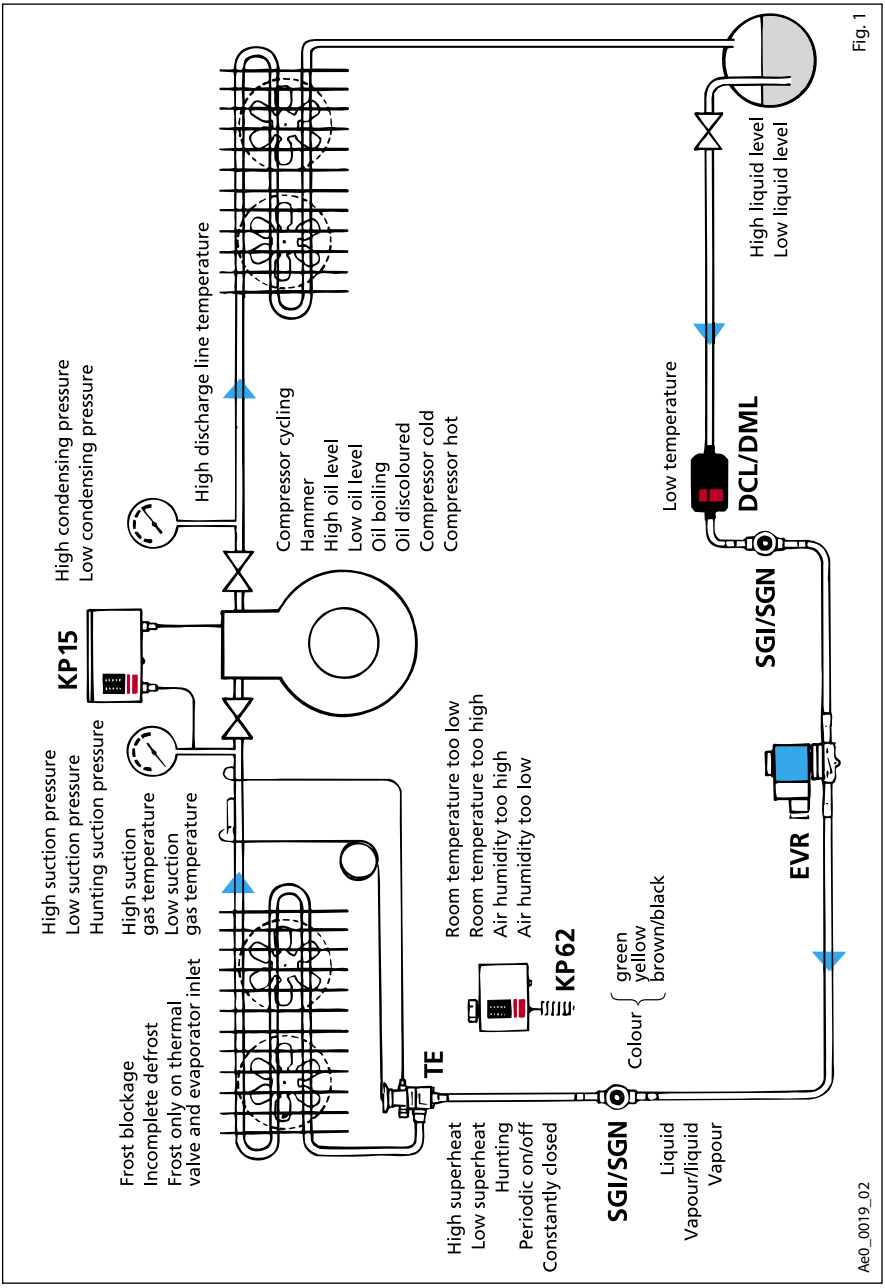
Visible faults	Effect on system operation
Thermostatic Expansion Valve a) Thermostatic expansion valve heavily frosted, frost on evaporator only near valve. [Dirt strainer partly blocked] [Bulb charge partly lost] [Previously described faults causing vapour bubbles in liquid line]	Faults under a) cause operation at low suction pressure or compressor cycling via low-pressure control..
b) Thermostatic expansion valve without external pressure equalisation, evaporator with liquid distributor. [Sizing or installation error] c) Thermostatic expansion valve with external pressure equalisation, equalising tube not mounted. [Installation error]	Faults under b), c) cause operation at low suction pressure or compressor cycling via low-pressure control.
d) Bulb not firmly secured. [Installation error] e) Entire bulb length not in contact with tube. [Installation error] f) Bulb placed in air current. [Installation error]	Faults under d), e), f) lead to overcharged evaporator with risk of liquid flow to compressor and compressor damage.
Air cooler a) Evaporator frosted only on inlet side, thermostatic expansion valve heavily frosted. [Thermal valve fault] [All previously described faults that cause vapour in liquid line]	Faults under a) cause: - High superheat at evaporator outlet and operation at mostly low suction pressure.
b) Front blocked with frost [Lacking, incorrect or wrongly set up defrost procedure] c) Fan does not run [Motor defect or motor protector cut-out] d) Fan blades defective. e) Fins deformed. [Rough treatment]	Faults under a), b), c), d), e) cause: - Operation with mostly low suction pressure - Reduced refrigeration output. - Increased energy consumption. For thermostatic expansion-valve controlled evaporators: The difference between air inlet and evaporating temperatures should lie between 6 K and 15 K, preferably at the lower end. For level-controlled evaporators: The difference between air inlet and evaporating temperatures should lie between 2 K and 8 K, preferably at the lower end.
Liquid cooler a) Thermostatic expansion valve bulb not firmly secured. [Installation error]	Causes overcharged evaporator with risk of liquid flow to compressor and compressor damage.
b) Thermostatic expansion valve without external pressure equalising on liquid cooler with high pressure drop, e.g. coaxial evaporator. [Sizing or installation error] c) Thermostatic expansion valve with external pressure equalisation, equalising tube not mounted. [Installation error]	Faults b), c) cause: - High superheat at evaporator outlet. - Operation at mostly low suction pressure. - Reduced refrigeration output. - Increased energy consumption. For thermostatic expansion valve controlled evaporators: The difference between air inlet and evaporating temperatures should lie between 6 K and 15 K, preferably at the lower end. For level-controlled evaporators: The difference between air inlet and evaporating temperatures should lie between 2 K and 8 K, preferably at the lower end.

Text in [ ] indicates fault cause

Visible faults	Effect on system operation
Suction line	
a) Abnormally severe frosting. [Thermal valve superheat too low]	Risk of liquid flow to compressor and compressor damage.
b) Sharp bends and/or deformation [Installation error]	Low suction pressure or compressor cycling.
Regulators in suction line	
Dew/frost after regulator, no dew/frost ahead of regulator. [Thermal valve superheat too low]	Risk of liquid flow to compressor and compressor damage.
Compressor	
a) Dew or frost on compressor inlet side. [Superheat at evaporator outlet too low]	Liquid flow to compressor with risk of compressor damage.
b) Oil level too low in crankcase. [Insufficient oil in system] [Oil collection in evaporator]	System stop via oil differential pressure control (if fitted). Causes wear of moving parts.
c) Oil level too high in crankcase. [Oil overfilling] [Refrigerant mixed with oil in too cold a compressor] [Refrigerant mixed with oil because superheat too low at evaporator outlet]	Liquid hammer in cylinders, risk of compressor damage: - Damage to working valves. - Damage to other moving parts. - Mechanical overload.
d) Oil boils in crankcase during start. [Refrigerant mixed with oil in too cold a compressor]	Liquid hammer, damage as under c)
e) Oil boils in crankcase during operation. [Refrigerant mixed with oil because superheat too low at evaporator outlet]	Liquid hammer, damage as under c)
Cold Room	
a) Dry surface on meat, limp vegetables. [Air humidity too low - evaporator probably too small]	Leads to poor food quality and/or wastage.
b) Door not tight, or defective.	Can give rise to personal injury.
c) Defective or missing alarm sign.	Can give rise to personal injury.
d) Defective or missing exit sign.	Can give rise to personal injury.
For b), c), d): [Lack of maintenance or sizing error]	
e) No alarm system. [Sizing error]	Can give rise to personal injury.
General	
a) Oil drops under joints and/or oil spots on floor. [Possible leakage at joints]	Oil and refrigerant leakage.
b) Blown fuses. [Overload on system or short-circuiting]	System stopped.
c) Motor protector cut-out. [Overload on system or short circuiting]	System stopped.
d) Cut-out pressure controls or thermostats, etc. [Setting error] [Equipment defect]	System stopped. System stopped.

Faults that can be felt	Effect on system operation
Solenoid valve	
Colder than the tubing ahead of the solenoid valve.	
[Solenoid valve sticks, partly open]	Vapour in liquid line.
Same temperature as tubing ahead of solenoid valve.	
[Solenoid valve closed]	System stopped via low-pressure control.
Filter drier	
Filter colder than tubing ahead of filter.	
[Filter partly blocked with dirt on inlet side]	Vapour in liquid line.
Faults that can be heard	**Effect on system operation**
Regulators in suction line	
Whining sound from evaporating pressure regulator or another regulator.	
[Regulator too large (sizing error)]	Unstable operation.
Compressor	
a) Knocking sound on starting.	
[Oil boiling]	Liquid hammer.
b) Knocking sound during operation.	Risk of compressor damage.
[Oil boiling]	Liquid hammer.
[Wear on moving parts]	Risk of compressor damage.
Cold room	
Defective alarm system.	
[Lack of maintenance]	Can give rise to personal injury.
Faults that can be smelled	**Effect on system operation**
Cold room	
Bad smell in meat cold room.	
[Air humidity too high because evaporator too large or load too low]	Leads to poor food quality and/or wastage.

Refrigeration System with Air Cooler and Air-cooled Condenser



~~RZ0ZH202~~ → DKRCC.PF.000.A1.02 / 520H0317

Refrigeration System with two Air Coolers and Air-cooled Condenser

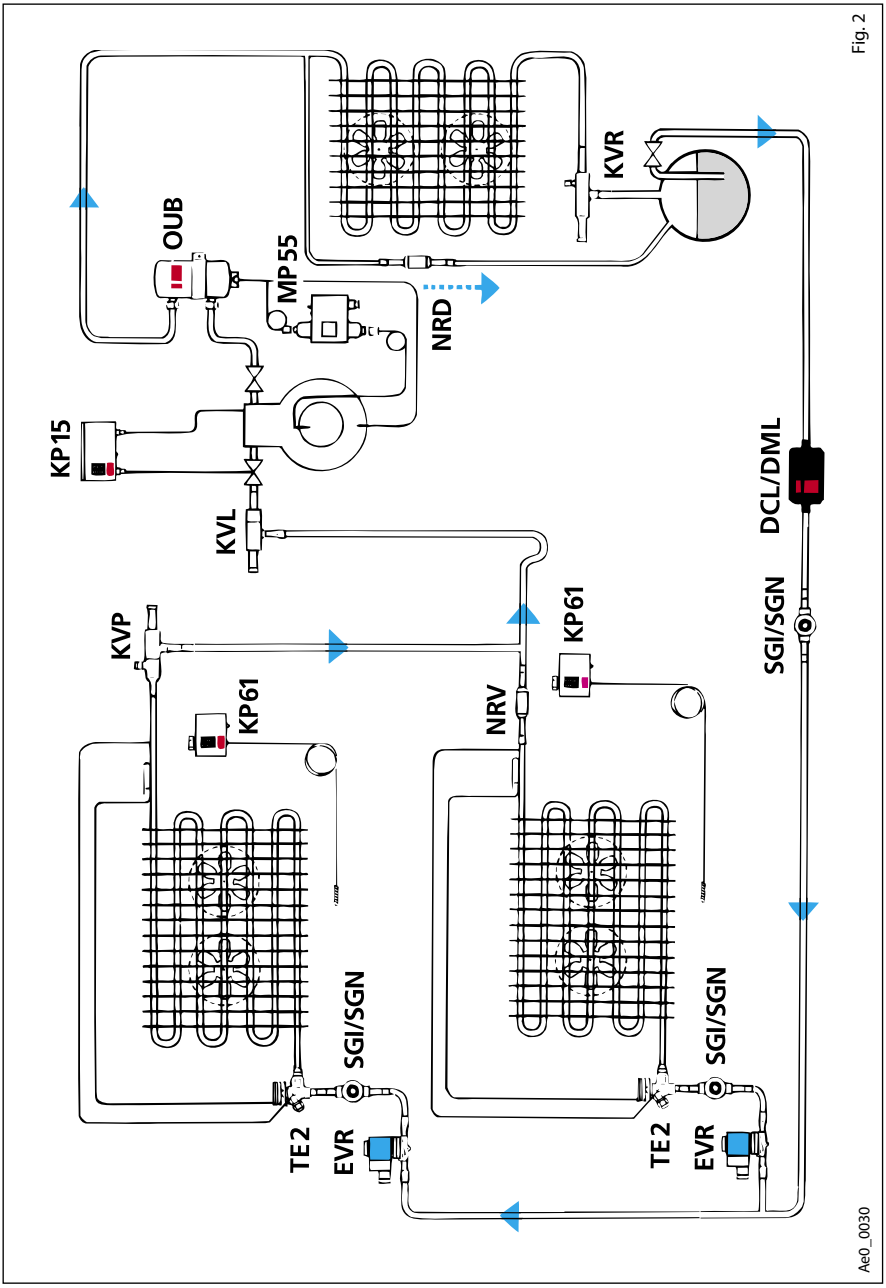


Fig. 2

Refrigeration System with Liquid Cooler and Water-cooled Condenser

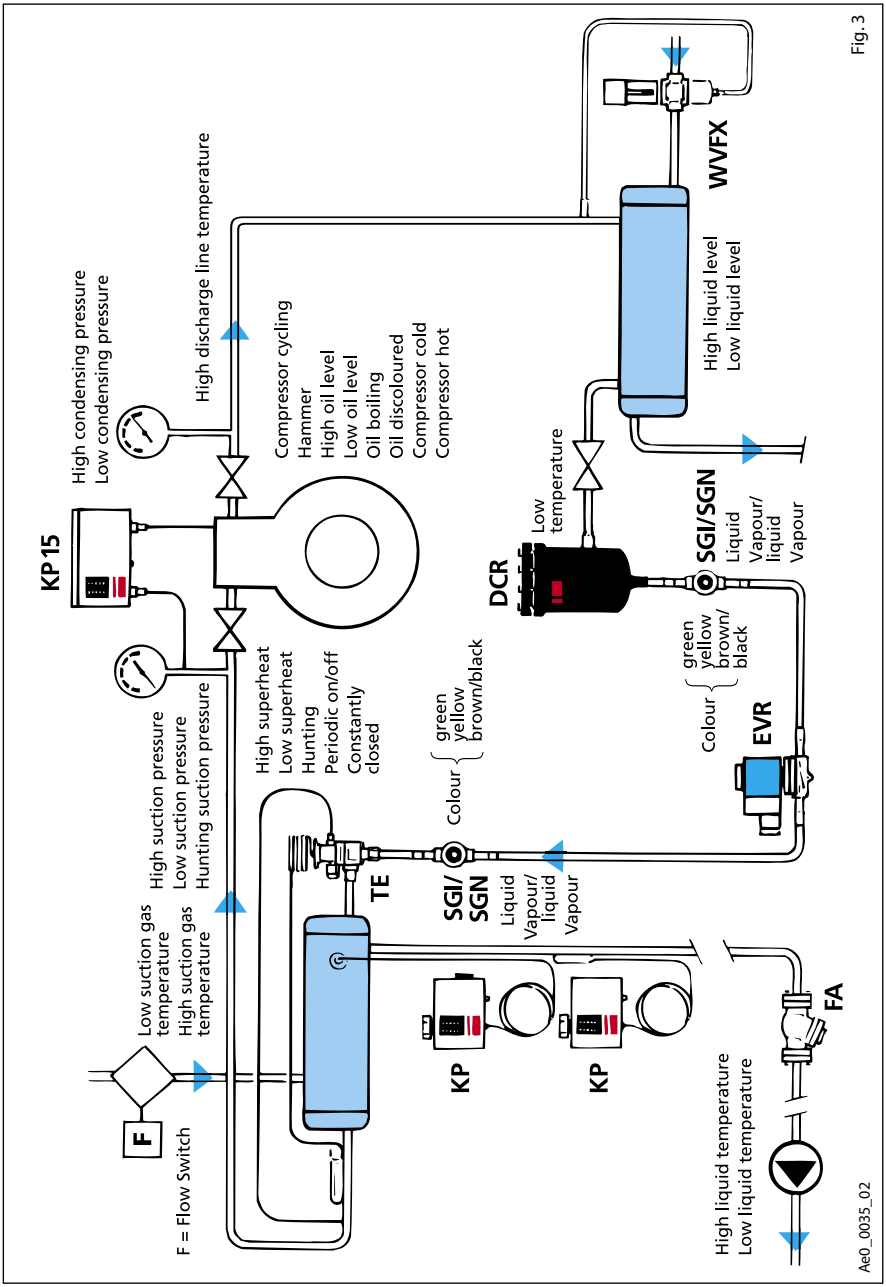


Fig. 3

~~RZ0ZH202~~ → DKRCC.PF.000.A1.02 / 520H0317

Follow the arrows in the diagrams, figs. 1 and 3, p. 10/12.
Begin after the compressor

Page

Fault location

Symptom	Possible cause	Action
Condensing pressure too high. Air- and water-cooled condensers.	a) Air or other non-condensable gases in refrigerant system.	Purge the condenser by using reclaim system, start and run system until it reaches running temperature. Purge again if necessary.
	b) Condenser surface too small.	Replace condenser with larger size.
	c) Refrigerant system charge too large (liquid collection in condenser).	Recover refrigerant until condensing pressure is normal. The sight glass must remain full.
	d) Condensing pressure regulation set for too high a pressure.	Set for the correct pressure.
Condensing pressure too high. Air-cooled condensers.	a) Dirt on condenser surface.	Clean condenser.
	b) Fan motor or blade defective or too small.	Replace motor or fan blade or both.
	c) Air flow to condenser restricted.	Remove air inlet obstruction or move condenser.
	d) Ambient temperature too high.	Create fresh air inlet or move condenser.
	e) Incorrect air flow direction through condenser.	Change rotation of fan motor. On condensing units, air must flow through condenser and then to compressor.
	f) Short-circuit between condenser fan airside pressure and suction sides.	Install a suitable duct, possibly to outdoor air.
Condensing pressure too high. Water-cooled condensers.	a) Cooling water temperature too high.	Ensure lower water temperature.
	b) Water quantity too small.	Increase water quantity, possibly using automatic water valve.
	c) Deposits on inside of water pipes (scale etc).	Clean out condenser water tubes, possibly by deacidification
	d) Cooling water pump defective or stopped.	Investigate cause, replace or repair cooling water pump if fitted.
Condensing pressure too low. Air- and water-cooled condensers.	a) Condenser surface too large.	Establish condensing pressure regulation or replace condenser.
	b) Low load on evaporator.	Establish condensing pressure regulation.
	c) Suction pressure too low, e.g. insufficient liquid in evaporator.	Locate fault on line between condenser and thermostatic expansion valve (see "Suction pressure too low").
	d) Compressor suction and discharge valves might be leaking.	Replace compressor valve plate.
	e) Condensing pressure regulator set for too low a pressure.	Set condensing pressure regulator for correct pressure.
	f) Un-insulated receiver placed too cold in relation to condenser (receiver acts as condenser).	Move receiver or fit it with suitable insulating cover.
Condensing pressure too low. Air-cooled condensers.	a) Temperature of cooled air too low.	Establish condensing pressure regulation.
	b) Air quantity for condenser too large.	Replace fan with smaller unit or establish motor speed regulation.
Condensing pressure too low. Water-cooled condensers.	a) Water quantity too large.	Install WVFX automatic water valve or set existing valve.
	b) Water temperature too low.	Reduce water quantity by using a WVFX automatic water valve, for example.

Symptom	Possible cause	Action
Condensing pressure hunts.	a) Differential on start/stop pressure control for condenser fan too large. Can cause vapour formation in liquid line for some time after start of condenser fan because of refrigerant collection in condenser. b) Thermostatic expansion valve hunting. c) Fault in KVR/KVD condensing pressure regulating valves (orifice too large). d) Consequence of hunting suction pressure.	Set differential on lower value or use valve regulation (KVD + KVR) or use fan motor speed regulation. Set thermostatic expansion valve for higher superheat or replace orifice with smaller size. Replace valves with smaller size. See "Suction pressure hunts".
Discharge line temperature too high.	a) Suction pressure too low because of: 1) Insufficient liquid in evaporator. 2) Low evaporator load. 3) Leaking suction or discharge valves. 4) Superheat too high in heat exchanger or suction accumulator in suction line. b) Condensing pressure too high.	Locate fault on line from receiver to suction line (see "Suction pressure too low"). Ditto. Replace compressor valve plate. Omit heat exchange or possibly select smaller heat exchanger. See "Condensing pressure too high".
Discharge line temperature too low.	a) Liquid flow to compressor (thermal valve superheat setting too low or bulb location incorrect). b) Condensing pressure too low.	See "Fitters notes, Thermostatic expansion valves: Fault location". See "Condensing pressure too low".
Liquid level in receiver too low.	a) Insufficient refrigerant in system. b) Evaporator overcharged. 1) Low load, leading to refrigerant collection in evaporator. 2) Thermostatic expansion valve fault (e.g. superheat setting too low, bulb location wrong). c) Refrigerant collection in condenser because condensing pressure lower than receiver pressure (receiver placed warmer than condenser)	Investigate cause (leakage, overcharge in evaporator), repair fault and charge system if necessary. See "Fitter notes, Thermostatic expansion valves: Fault location". See "Fitters notes, Thermostatic expansion valves: Fault location". Place receiver together with condenser. Air-cooled condensers: Establish condensing pressure regulation by fan motor speed regulation, e.g. type VLT.
Liquid level in receiver too high. Refrigeration output normal.	Refrigerant charge in system too large.	Recover a suitable quantity of refrigerant, but condensing pressure must remain normal and the sight glass free of vapour.
Liquid level in receiver too high. Refrigeration output too low (possible compressor cycling)	a) Partial blockage of a component in liquid line. b) Thermostatic expansion valve fault (e.g. superheat too high, orifice too small, lost charge, partial blockage).	Find the component and clean or replace it. See "Fitters notes, Thermostatic expansion valves: Fault location".

Symptom	Possible cause	Action
Filter drier cold, dew or frosting possible.	a) Partial blocking of dirt strainer in filter drier. b) Filter drier completely or partly saturated with water or acid.	Check whether there are impurities in the system, clean out where necessary, replace filter drier. Check whether there is moisture or acid in the system, clean out where necessary and replace filter drier (burn-out filter) several times if necessary. If acid contamination is severe, replace refrigerant and oil charge, install DCR filter drier with interchangeable core in suction line.
Moisture indicator discoloured. Yellow.	Moisture in system.	Check system for leakage. Repair if necessary. Check system for acid. Replace filter drier, several times if necessary. In severe cases it can be necessary to change refrigerant and oil.
Brown or black.	Impurities, i.e. small particles in system.	Clean out system if necessary. Replace SGI sight glass and filter drier.
Vapour bubbles in sight glass ahead of thermostatic expansion valve.	a) Insufficient liquid subcooling from large pressure drop in liquid line because: 1) Liquid line too long in relation to diameter. 2) Liquid line diameter too small. 3) Sharp bends, etc. in liquid line. 4) Partial blockage of filter drier. 5) Solenoid valve defect. b) Insufficient liquid subcooling because of heat penetration of liquid line, possibly from high temperature around liquid line. c) Water-cooled condensers: Insufficient subcooling because of wrong cooling water flow direction. d) Condensing pressure too low. e) Receiver stop valve too small or not fully open. f) Hydrostatic pressure drop in liquid line too high (height difference between thermostatic expansion valve and receiver too large). g) Badly or incorrectly set condensing pressure regulation causing liquid collection in condenser. h) Condenser pressure regulation by start/stop of condenser fan can cause vapour in liquid line for some time after fan start. i) Insufficient liquid in system.	Replace liquid line with tube of suitable diameter. Replace liquid line with tube of suitable diameter. Replace sharp bends and components causing too large a pressure drop. Check for impurities, clean out if necessary, replace filter drier. See "Fitters notes, Solenoid valves. Reduce ambient temperature or install heat exchanger between liquid and suction lines or insulate liquid line, possibly together with suction line. Swap over cooling water inlet and outlet. (Water and refrigerant flow must be opposite). See "Condensing pressure too low". Replace valve or open it fully. Install heat exchanger between liquid and suction lines ahead of rise in liquid line. Replace or reset KVR regulator at correct value. If necessary, replace regulation with condensing pressure regulation via valves (KVD + KVR) or with fan motor speed regulation, type VLT. Recharge system, but first make sure that none of the faults named under a), b), c), d), e), f), g), h) are present, otherwise there is a risk of the system becoming overcharged. See "Fitters notes, Installation: Refrigerant charging".

Symptom	Possible cause	Action
Air coolers. Evaporator blocked by frost.	a) Lack of or poor defrost procedure. b) Air humidity in cold room too high because of moisture load from: 1) Unpackaged items. 2) Air ingress into room through fissures or open door.	Install defrost system or adjust defrost procedure. Recommend packaging of items or adjust defrost procedure. Repair fissures. Recommend that door be kept closed.
Air coolers. Evaporator frosted only on line near thermostatic expansion valve, severe frost on thermostatic expansion valve.	Refrigerant supply to evaporator too small because of: a) Thermostatic expansion valve defect, e.g. 1) Orifice too small. 2) Superheat too high. 3) Partial loss of bulb charge. 4) Dirt strainer partly blocked. 5) Orifice partly blocked by ice. b) Fault as described under "Vapour bub bles in sight glass".	See "Fitters notes, Expansion valves: Fault location". See "Vapour bubbles in sight glass".
Air coolers. Evaporator damaged.	Fins deformed.	Straighten fins using a fin comb.
Air humidity in cold room too high, room temperature normal.	a) Evaporator surface too large. Causes operation at excessive evaporating temperature during short running periods. b) Load on room too low, e.g. during winter (insufficient dehumidification because of short total running time per 24 hours).	Replace evaporator with smaller size. Establish humidity regulation with hygrometer, heating elements and KP62 safety thermostat.
Air humidity in room too low.	a) Cold room poorly insulated. b) High internal energy consumption, e.g. lights and fans. c) Evaporator surface too small, causes long running times at mainly low evaporating temperatures.	Recommend improved insulation. Recommend less internal energy consumption. Replace evaporator with larger size.

Symptom	Possible cause	Action
Air temperature in cold room too high.	a) Room thermostat defect. b) Compressor capacity too small. c) Load on room too high because of: 1) Loading of non-cooled items. 2) High energy consumption, e.g. for lights and fans. 3) Cold room poorly insulated. 4) High air ingress. d) Evaporator too small. e) Insufficient or no refrigerant supply to evaporator. f) Evaporating pressure regulator set for too high an evaporating pressure. g) Cut-out pressure on low-pressure control set too high. h) Capacity regulating valve opens at too high an evaporating pressure. i) Opening pressure of crankcase pressure regulator set too low.	See "Fitters notes, Thermostats: Fault location". See "Compressor". Recommend placing of smaller load or increased system capacity. Recommend reduction of energy consumption or increased system consumption. Recommend better insulation. Recommend repair of fissures and least possible door opening. Replace evaporator with larger size. See "Vapour bubbles in sight glass ahead of thermal valve" and "Fitters notes, Thermostatic expansion valves: Fault location". Set evaporating pressure regulator at correct value. Use a pressure gauge. Set low-pressure control at correct cut-out pressure. Use a pressure gauge. Set capacity regulating valve at lower opening pressure. Set valve for higher opening pressure if the compressor will withstand it.
Air temperature in cold room too low.	a) Room thermostat defect: 1) Cut-out temperature set too low. 2) Bulb location wrong. b) Ambient temperature very low.	See "Fitters notes, Thermostats: Fault location" If absolutely necessary, establish thermostat controlled electrical heating.
Suction pressure too high.	a) Compressor too small. b) One or more compressor disc valves leaking. c) Capacity regulation defective or incorrectly set. d) System load too high. e) Hot gas defrost valve leaking.	Replace compressor with larger size. Replace valve plate. Replace, repair or adjust capacity regulation. Recommend less load or replace compressor with larger size, or install KVL crankcase pressure regulator. Replace valve.
Suction pressure too high and suction gas temperature too low.	a) Thermostatic expansion valve superheat setting too low or bulb located incorrectly. b) Thermostatic expansion valve orifice too large. c) Leaking liquid line in heat exchanger between liquid and suction lines.	See "Fitters notes, Thermostatic expansion valves: Fault location". Replace orifice with smaller size. Replace HE heat exchanger.
Suction pressure too low, constant running.	Low-pressure control set incorrectly, or defective.	Adjust or replace low-pressure control KP 1 or combined pressure control KP 15.

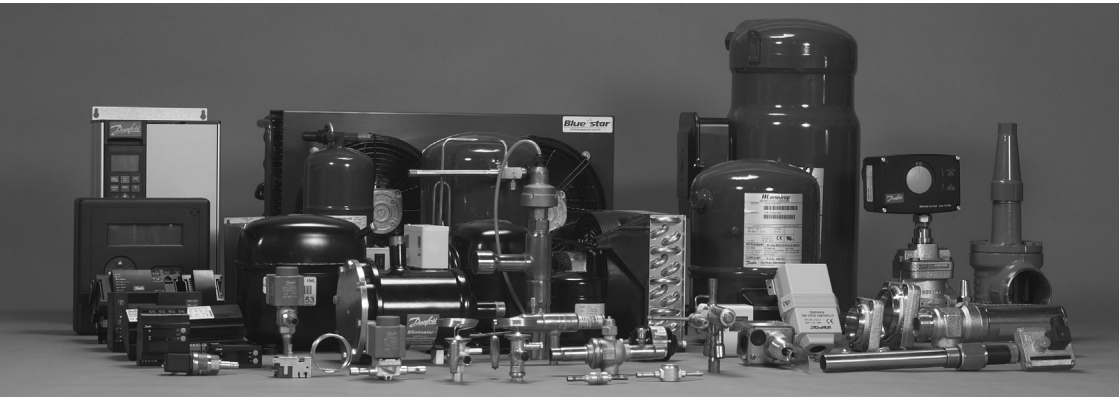
Symptom	Possible cause	Action
Suction pressure too low, normal operation or compressor cycling.	a) Low system load.	Establish capacity regulation or increase lowpressure control differential.
	b) Insufficient refrigerant in evaporator, because of:	
	1) Insufficient refrigerant in receiver.	See "Liquid level in receiver too low".
	2) Liquid line too long.	See "Vapour bubbles in sight glass."
	3) Liquid line too small.	Ditto.
	4) Sharp bends, etc. in liquid line.	Ditto.
	5) Filter drier partly blocked.	See "Vapour bubbles in sight glass".
	6) Solenoid valve sticks.	Ditto.
	7) Inadequate liquid subcooling.	Ditto.
	8) Fault at thermal valve.	See "Fitters notes, Thermostatic expansion valves: Fault location".
	c) Evaporator too small.	Replace with larger evaporator.
	d) Evaporator fan defective.	Replace or repair fan.
	e) Pressure drop in evaporator and/or suction line too large.	If necessary, replace evaporator and/or suction line.
	f) Lack of or inadequate defrosting of air cooler.	Establish a defrost system or adjust defrost procedure.
	g) Freezing in brine cooler.	Increase brine concentration and check frost protection equipment.
	h) Insufficient air or brine through cooler	Check cause and correct fault. See "Air coolers" and "Liquid coolers".
	i) Oil collection in evaporator.	See "Oil level in crankcase ton low"
Suction pressure hunts. Thermostatic expansion valve operation.	a) Thermostatic expansion valve superheat too low	See "Fitters notes, Thermostatic expansion valves: Fault location".
	b) Thermostatic expansion valve orifice too large.	
	c) Capacity regulation fault	
	1) Capacity regulating valve too large.	Replace KVC capacity regulating valve with smaller size.
	2) Pressure control(s) for stage regulation incorrectly set.	Set for greater difference between cut-in and cut-out pressures.
Suction pressure hunts. Electronic expansion valve operation.	Hunting normal	None
Suction gas temperature too high	Refrigerant supply to evaporator too small because:	
	a) System refrigerant charge too small.	Charge refrigerant to correct level. See "Fitters notes, Installation, refrigerant charging".
	b) Defect in liquid line or components in that line	See these entries: "Liquid level in receiver", "Filter drier cold", "Vapour bubbles in sight glass", "Suction pressure too low".
	c) Thermostatic expansion valve superheat setting too high, or bulb charge partly lost.	See "Fitters notes, Thermostatic expansion valves: Fault location".

Symptom	Possible cause	Action
Suction gas temperature too low.	Refrigerant supply to evaporator too large because: a) Thermostatic expansion valve superheat set too low. b) Thermostatic expansion valve bulb located incorrectly (too warm or in poor contact with piping).	 See "Fitters notes , Thermostatic expansion valves: Fault location". See "Fitters notes , Thermostatic expansion valves: Fault location".
Compressor Compressor cycling (cut-out via low- pressure control).	a) Compressor capacity too high in relation to load at any given time. b) Compressor too large. c) Opening pressure of evaporating pressure regulator set too high.	Establish capacity regulation using KVC capacity regulating valve or parallel-coupled compressors. Replace compressors with smaller size. Using a pressure gauge, set KVP regulator at correct value.
Compressor Compressor cycling (cut-out via high-pressure control).	a) Condensing pressure too high. b) High-pressure control defect. c) High-pressure control cut-out set too low.	See "Condensing pressure too high". Replace high-pressure control KP 5 or combined pressure control KP 15. Using a pressure gauge, set pressure control at correct value. Avoid compressor cycling by using high-pressure control with manual reset.
Discharge pipe temperature too high	Discharge pipe temperature too high	Replace valve plate. See also "Discharge temperature too high".
Compressor Compressor too cold.	Flow of liquid refrigerant from evaporator to suction line and possibly to compressor because of incorrectly set thermostatic expansion valve.	Set thermostatic expansion valve for lower superheat using MSS method, see "Thermostatic expansion valves, Setting and fault location".
Compressor Compressor too hot.	a) Compressor and possibly motor overloaded because evaporator load and thereby suction pressure too high. b) Poor motor and cylinder cooling because of: 1) Insufficient liquid in evaporator. 2) Low evaporator load. 3) Suction and discharge valves not tight. 4) Superheat too severe in heat exchanger, or in suction accumulator in suction line. c) Condensing pressure too high.	Reduce evaporator load or replace compressor with larger size. Locate fault on line between condenser and thermostatic expansion valve (see "Suction pressure too low"). Ditto Replace valve plate. Omit heat exchange or possibly select smaller HE heat exchanger. See "Condensing pressure too high".
Knocking sound: a) Constant. b) During start.	a) Liquid hammer in cylinder because of liquid flow to compressor. b) Oil boiling because of liquid build up in crankcase. c) Wear on moving compressor parts, especially bearings.	Set thermostatic expansion valve for lower superheat using MSS method. Install heating element in or under compressor crankcase. Repair or replace compressor.

Symptom	Possible cause	Action
Compressor. Oil level in crankcase too high. On high load, otherwise not. During standstill or start..	Oil quantity too large. Refrigerant absorption in crankcase oil because of too low an ambient temperature.	Drain oil to correct level, but first ensure that the large quantity is not due to refrigerant absorption in the oil. Install heating element in or under compressor crankcase.
Compressor. Oil level in crankcase too low.	a) Oil quantity too small. b) Poor oil return from evaporator because: 1) Diameter of vertical suction lines too large. 2) No oil separator. 3) Insufficient fall on horizontal suction line. c) Wear on piston/piston rings and cylinder. d) On parallel-coupled compressors: 1) With oil equalising tube: Compressors not on same horizontal plane. Equalising pipe too small. 2) With oil level regulation: Float valve partly or wholly blocked. Float valve sticking. e) Oil return from oil separator partly or wholly blocked, or float valve sticking.	Fill oil to correct level, but first be sure that the oil quantity in the crankcase is not a result of oil collection in the evaporator. Install oil lock at 1.2 m to 1.5 m from vertical suction lines. If liquid supply is at the bottom of the evaporator it can be necessary to swap inlet and outlet tubes (liquid supply uppermost). See also "Fitters notes, Installation". Replace worn components. In all circumstances: the compressor started last is most subject to oil starvation. See also Fitters notes, Installation". Line up compressors so that they are in same horizontal plane. Install larger equalising pipe. Fit vapour equalising pipe if necessary. Clean or replace level container with float valve. Ditto Clean or replace oil return pipe or replace float valve or whole oil separator.
Compressor Oil boils during start.	a) High refrigerant absorption in crankcase oil because of low ambient temperature. b) Systems with oil separator: Too much absorption of refrigerant in oil in separator during standstill.	Install heating element in or under compressor crankcase. Oil separator too cold during start. Install thermostat-controlled heating element or solenoid valve with time delay in oil return tube. Fit non return valve in discharge pipe after oil separator.
Compressor. Oil boiling during operation.	a) Flow of liquid refrigerant from evaporator to compressor crankcase. b) Systems with oil separator: Float valve not closing completely.	Set thermostatic expansion valve for higher superheat using MSS method. Replace float valve or whole oil separator.

Symptom	Possible cause	Action
Compressor. Oil discoloured.	System contamination arising from: a) Cleanliness not observed during installation. b) Oil breakdown because of moisture in system. c) Oil breakdown because of high discharge pipe temperature. d) Wear particles from moving parts. e) Inadequate cleaning after motor burn-out.	In all circumstances: Change oil and filter drier. Clean out refrigerant system if necessary. Clean out refrigerant system if necessary. Locate and remedy cause of excessive discharge pipe temperature. See "Discharge pipe temperature too high". Clean out system if necessary. Clean out refrigerant system if necessary. Replace worn parts or install new compressor. Clean out refrigerant system. Fit DA "burn-out" filter. Replace filter several times if necessary.
Compressor. Will not start.	a) Insufficient or no voltage for fuse group. b) Blown group fuses. c) Fuse in control circuit blown. d) Main switch not on. e) Thermal protection in motor starter cut out or defective, e.g. as a result of: 1) Excessive suction pressure. 2) Condensing pressure too high. 3) Dirt or copper deposition in compressor bearings, etc. 4) Supply voltage too low. 5) Single phase drop out. 6) Short-circuited motor windings (motor burn-out). f) Motor winding protectors cut out because of excessive current consumption. g) Contactors in motor starter burnt out because: 1) Starting current too high. 2) Contactor undersized. h) Other safety equipment cut out, incorrectly set or defective: Oil differential control. (no oil, oil boiling). High-pressure control. Low-pressure control. Flow switch. (insufficient brine concentration, brine pump failure, blocked brine circuit filter, evaporating temperature too low). Frost protection thermostat (insufficient brine concentration, brine pump failure, blocked brine circuit filter, evaporating temperature too low). i) Regulating equipment cut out, incorrectly set or defective: Low-pressure control, Room thermostat	Telephone electricity company. Locate fault. Have fault repaired and change fuses. Locate fault. Have fault repaired and change fuses. Switch on. Locate and repair fault or replace protector. See "Suction pressure too high". See "Condensing pressure too high". Clean out refrigerant system, replace compressor and filter drier. Telephone electricity company. Locate and remedy fault (often blown fuse). Clean out refrigerant system if necessary, replace compressor and filter drier. Locate and remedy cause of excessive current consumption, start system when windings have cooled down (can take a long time). Locate and remedy cause of motor overload, replace contactor. Replace contactor with larger size. In all circumstances, locate and repair fault before starting system: See "Compressor, Oil level too low" and "Compressor, Oil boiling...." See "Condensing pressure too high". See "Suction pressure too low". Locate and remedy cause of reduced or no flow in brine circuit. See "Liquid coolers". Locate and remedy cause of excessively low temperature in brine circuit. See "Liquid coolers". Locate and repair fault. Start system. See "Suction pressure too low" and "Fitters notes, Pressure controls: Fault location". See "Fitters notes, Thermostats, Fault location".

Symptom	Possible cause	Action
Compressor. Will not start.	j) Motor windings burnt out. Open compressor: Compressor and motor overloaded. Motor undersized Hermetic and semihermetic compressor: Compressor and motor overloaded. Acid formation in refrigerant system. k) Bearing or cylinder seizing because of: 1) Dirt particles in refrigerant system. 2) Copper deposition on machined parts because of acid formation in refrigerant system. 3) Insufficient or no lubrication as a result of: - Defective oil pump. - Oil boiling in crankcase. - Insufficient oil. - Oil collection in evaporator. - Poor or no oil equalisation between parallel-coupled compressors (oil starvation in compressor started last).	 Locate and remedy cause of overload, replace motor. Replace motor with larger size. Locate and remedy cause of overload, replace compressor. Locate and remedy cause of acid formation, remove compressor, clean out refrigerant system if necessary, fit new "burn-out" filter, refill with oil and refrigerant, install new compressor. Clean out system and install new filter drier and new compressor. Clean out system and install new filter drier and new compressor. In all circumstances: Locate and remedy the fault, replace defective parts or install new compressor. See "Compressor, Oil boiling--". See "Compressor, Oil level in crankcase too low". See "Compressor, Oil level in crankcase too low". See "Compressor, Oil level in crankcase too low" and "Fitters notes, Installation".
Compressor runs constantly, suction pressure too low.	Cut-out pressure of low-pressure control set too low, or defective control.	See "Suction pressure too low".
Compressor runs constantly, suction pressure too high.	a) Compressor suction and/or discharge valve not tight. b) Compressor capacity too low in relation to load at any given time.	Replace valve plate, Recommend lower load, or replace compressor with larger size.



The Danfoss product range for the refrigeration and air conditioning industry

Appliance Controls
General temperature controls for the home appliance industry. The product range comprises CFC-free electromechanical and electronic thermostats for refrigerators and freezers produced to customer specifications as well as service thermostats for all refrigeration and freezing appliances.

Commercial Compressors
Large hermetic reciprocating and scroll compressor technologies for commercial air conditioning and refrigeration. The compressors and condensing units are used in a large array of applications in both businesses. This ranges from water chillers, large packaged air conditioners as well as medium and low temperature refrigeration systems for food storage and processing.

Danfoss Compressors
Hermetic compressors and fan-cooled condensing units for refrigerators, freezers and light commercial applications such as bottle coolers and display counters. Danfoss also produces compressors for heating pump systems as well as 12 and 24 volt compressors for refrigerators and freezers used in mobile applications and solar power. The division has a leading position within energy utilisation, noise filtering and know-how about environment-friendly compressors.

Refrigeration and air conditioning controls
A comprehensive and highly reputed range of self-acting valves, electronic valves and regulators as well as system protectors and line components for the refrigeration and air conditioning market. These products include thermostatic expansion valves, solenoid valves, thermostat and pressure controls, modulation pressure regulators, filter driers, shut-off valves, sight glasses, check valves, non-return valves and water valves. Decentralised electronic systems for full regulation and control of refrigeration applications are also developed and produced at Danfoss.

Industrial Controls
Products and customer specific solutions for industrial monitoring and controls systems based on the principles of pressure and temperature measurement, electrical power and fluid control. Products include a wide range of automatic controls for process control and regulation such as contactors and motor starters, electrically, pneumatically and temperature activated valves as well as temperature and pressure transmitters and switches.