



Assembly and Operating instructions

– Water Chiller –

Issue: 10-11



Preface

With the water chiller, you have acquired a DK-quality product. Water chillers by DK are manufactured according to the appropriate standards and recommendations. Each plant is carefully inspected and submitted to a test run, which allows us to supply you with a reliable unit.

A long and trouble-free service life requires an expert installation and starting of the plant. For your own benefit, the following assembly notes should be exactly observed. The documentation in your hand corresponds to the state of technology at the date of release. The manufacturer reserves the right to perform technical alterations according to the further development of the product.

We wish you a successful application of the DK-Water Chiller.

DK-Kälteanlagen GmbH
D- 48282 Emsdetten

In accordance with EC machine directive 2006/42/EG, article 6, paragraph 2, appendix II B

We herewith declare that DK-Water Chiller systems –described above- are designed to cool down drinking water and service water in the assembly of a machine in combination with other components.

Commissioning the same is prohibited until it has been determined that the machine into which DK machine components are to be installed complies with the stipulations of the EC directive.

Emsdetten, October 2011



DK-Kälteanlagen GmbH
Bernd Kappenberg(MD)



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1. Safety Notes

Please observe the following for your personal safety as well as for maintenance of your warranty rights:



Repairs exceeding the extent of maintenance work as prescribed by this technical documentation are solely to be performed by trained experts with the necessary licences and the knowledge of generally applicable regulations of the VBG20/UVV/VBGA for "Electrical plants and equipment" as well as all applicable VDE* - regulations. For this, please refer to your responsible refrigerant experts.

Maintenance work to be performed to the electrical plant is only permissible as long as it is guaranteed that the plant's electrical supply has been disconnected.

DK-Kälteanlagen cannot be held liable for any damage caused by inappropriate handling or unauthorized intervention caused in particular to the electronic and electrical as well as refrigerating functional unit.

The starting of the DK Water Chillers may solely be performed by those who are informed of the technical documentation concerning the appropriate use of the same. Knowledge of appropriate regulations for the prevention of accidents as well as other generally acknowledged instructions for technical safety is prerequisite.

When cleaning the plant, please observe that water does not reach those electrical functional units which do not correspond with protective system IP 55.

If you are using cleaning agents and disinfectants please observe the manufacturer's safety instructions carefully.

* German Association of Electricians

The written form of this documentation graphically emphasizes those instructions and notes to which particular attention should be paid.



...points out that non-observance may lead to personal injury or damage of the technical equipment.



... provides useful information concerning regulatory application or maintenance of the product's service value..

2. Service

In your own interest, please observe that necessary repair work within the warranty period may solely be performed by a service facility authorized by DK-Kälteanlagen GmbH.

You ensure your warranty rights by doing so. Repair and maintenance work on electrical and refrigerant equipment is only to be performed by concessioned refrigerant companies holding the necessary licenses. For this, please refer to "your" refrigerant specialists.

3. Fitting and Assembly

The place of installation should be protected against frost and be provided with a floor drain.

The DK-Water Chiller model KWE is a special enamelled steel tank with a fitted cathodic protection against corrosion. The tank's strong design ensures that during normal handling the internal thermo-glazing is not damaged. The storage tank of models KWR are made of raw steel. They are made for using in a closed water system e.g. air conditioning



It must be observed not to submit the equipment to hard concussions (e.g. by placing it hard on one foot when unloading from the lorry)!

No welding work may be performed to enamelled tanks!

Refinishing work on the enamelling is prohibited.

See furthermore instructions in addition!

Insulation consists of 2 pieces of PUR-shells with a glass fiber reinforced plastic coating which is sealed against diffusion of vapour by the manufacturer.

Plant models KWB 90/... are insulated with a soft foam to prevent diffusion of vapour.

The two shells may not be dismantled for assembly.



The tank may only be moved by means of the provided aids for transportation (colored marking).

Do not charge water or refrigerant pipes.

The plant is to be assembled in such a manner that it may be viewed from all sides and with sufficient room available for maintenance work to be carried out.

4. Water Connection

In order to limit flaws in the enamel coating as much as possible, the tanks are provided with inched external thread.



When performing the water connection, please observe not to use too much hemp, as too thick a hemp packing may damage the enamel in the connecting nipple. Due to the expansion of water during temperature changes it is necessary to protect the DK Water Chiller against excessive pressure.

Water connections are to be performed according to EN 1717 and local regulations, i.e. a safety relief valve is to be installed according to the permissible operational excess pressure of the tank without shut-off option towards the same. Standard operational excess pressure is 6bar.

Dimensions of safety valves

Nominal capacity of tank	Connection min.
up to 200 l	DN 15
over 200 up to 1000 l	DN 20
over 1000 up to 5000 l	DN 25

The exit side of the safety valves must be at least one nominal width larger than that of the entrance side.

The blow-out side must have at least the size of the safety valve - exit profile, however may not have more than 2 curves and may not be longer than 2 m. (see DIN 4753 Part 1). The blow-off mouth must be accessible, visible as well as of such design that no injury will be inflicted on any person during blowing off.



If the admission pressure is higher than the tank's permissible operational excess pressure, the cold water pipe is to be fitted with a pressure reducing valve. (DK offers the water safety armature in compliance with such demands. This armature is fitted to the cold water inlet.)



The water inlet has to be connected to the tank's casing (on top, on the side).
The cold water outlet (flow pipe to the point of consumption) has to be connected to the bottom, on the side of the tank.
For the connection of the circulation pipe, solely the connection intended for this purpose is to be used.
Fit the shell-and-tube exchanger connections – IF NO COOLING MACHINE IS FITTED.
For the exact position of the connections, please consult the attached drawing.

5. Electric Supply

Plants for alternating current require 1 x 230 V 50 Hz shock-proof socket.
Plants for rotating current require a CEE socket 3x400V, 50Hz.

For further details, please consult technical data of the refrigerant machine, item 14 and 16. The exact circuit diagram is enclosed with the Water Chiller and can be found in the switch box - ONLY IF NO COOLING MACHINE IS FITTED.



Electric wiring is to be performed in accordance with regulations by the electric supply company and according to VDE 0100.

6. Refrigeration Plant

if cooling machine is fitted

The refrigerating plant has undergone a leak test with a test pressure of 27.5bar.

ONLY DOUBLEWALLED EVAPORATOES TO COOL DRINKING WATER:

For the cooling of service water, DK's Water Chiller is generally fitted with a double-walled safety multi-pipe heat exchanger (90/x plants are equipped with a safety evaporator helix). The evaporator thereby corresponds to part 4 of EN 1717. For leakage indication, a capillary pipe with safety valve is soldered to the evaporator in the gap (Schrader-valve in 7/16"-double nipple). The opening pressure amounts to 0.5bar



The conventional dimension of 7/16" used in the refrigerant industry does not apply to the refrigerant connection, but serves solely as leakage indication of the double walls.

Attention!

If any liquid exits the mouth, the evaporator (heat exchanger) is defective. In such a case, an expert is to be called instantly and is to perform a pressure test according to DIN 1988 part 8. The safety mouth may by no means be sealed.

ALL PLANTS WITH FITTED COOLING MACHINE:



The refrigerant plant is equipped with high pressure (HP) switch(es) tuned to a condensation temperature of $+55^{\circ}\text{C}$ / $+63^{\circ}\text{C}$ / $+66^{\circ}\text{C}$

This value corresponds to an ambient temperature of approx. $+36^{\circ}\text{C}$ / 46°C

Maximum ambient temperature must be ensured by sufficient ventilation of the premises.

The low pressure (LP) switch of the refrigerant plant disconnects itself in such conditions as well as in case of a leak of refrigerant or icing of the evaporator.

Observe range!

7. Starting the Plant



The Water Chiller may only be started after having been completely filled with water and after conscientious ventilation.

- Fill water into tank (equipment is switched off) while opening the manual ventilating valve at the highest point of the pump line (see picture 2 page 6).
- Close manual ventilating valve only after air has completely escaped the tank
- With alternating current plants, the Water Chiller is switched on at the thermo regulator, with rotary current plants at the main switch. The thermo regulator is already set to desired value temperature and has been checked.
Do not change thermo regulator!
- Before starting, as well as at regular intervals, the functions of the CORREX® external current anode are to be verified; for this, please consult paragraph 8..
- For rotary current plants, attention must be paid to the correct rotating sense of the pump. The correct rotation sense will be shown by a green light-emitting diode. This light is always situated in or on the terminal box. Please the operating instructions of the pump. Furthermore the rotating sense off all electrical components has to be checked. Therefore please see the direction arrows on the components.



Light-emitting diode will be shine green by correct rotating sense



Charge pump

The sense of rotation is to be verified at maximum RPM (rotary current pumps)
Single-phase pumps are always running in the correct sense of rotation. The pump is vented automatically.
Please do the same if a circulating pump exists.



The sound pressure level is below the limits stipulated by EG regulation 98/37EG for machines.

8. Corrosion Protection

ONLY ENAMELED TANKS

The DK Water Chiller is equipped with anodes for cathodic protection against corrosion.



CORREX® - external current anodes are maintenance free and are to be connected to a 230V socket.

The green indicator lamp on the connector potentiostat of the CORREX® external current anode must light continuously (socket approx. at mid-level of the tank).
In case of flashing of the red lamp, see item 8.1.



The supplied double-wired line between the screw-in CORREX® anode connector potentiostat may by no means be elongated.

The possible reversal of polarity thereby entails an accelerated corrosion.

Electronics & Long Duration Anode, the maintenance-free protection against corrosion for Water Chillers. CORREX® UP - the external current anode for multi-purpose application in enameled storage tanks of all sizes.

CORREX® UP - long term solution for corrosion problems



- reliable long-term protection
- exact regulation of protective current
- no over protection (risk of electrolyt gas)
- no consumption of anodes
- no creation of anode mud
- no maintenance
- visual operational control
- VDE / GS-SEV -tested
- safety for long storage service life



9. *Malfunktion overview*

9.1. *Malfunktion CORREX® - Anode (if fitted)*

Light	cause • remedy
Green	operational control, full protection against corrosion
is not lit	no protection against corrosion- no supply voltage • re-connect supply voltage - supply voltage available, connector potentiostat defective • exchange connector potentiostat as soon as possible
flashes red	malfunktion indicator, no protection against corrosion <ul style="list-style-type: none">- no water in tank • fill with water- connecting wires reversed • see instructions for CORREX anode- wiring connection from connector potentiostat to anode rod interrupted • re-connect (observe polarity).- wiring connection from connector potentiostat to ground (tank) interrupted • check cable lugs on contact and corrosion- anode rod has contact to fittings in tank and therefore to ground • disable connection to ground and return electronics by quick pulling of the plug.

9.2. *Malfunktion overview Pumps*

Malfunktion : pump does not start -	cause • remedy : defective current supply • check fuses and possible loose clamps <ul style="list-style-type: none">- defective condenser • exchange condenser- pump inhibited by residues in the bearings • unblock rotor, insert screw driver in slot and turn manually (page 9)- dirty pump • dismantle pump and clean it
plant makes noise Pump makes noise	<ul style="list-style-type: none">- air in plant • vent plant (disconnect plant for this).- air in pump • vent pump (pic. 6 page 9).- admission pressure too low • increase admission pressure or check gas volume in expansion tank (if any).



9.3. Malfunction Plant

9.3.1. Alternating Current Plants 230V 50Hz

Malfunction	cause • remedy
Plant does not start	no voltage • check fuses and any possibly loose cable connections and other fitted switchgear • connect switching thermo regulator (red button)
Aggregate does not start circulation pump running	frost-protection thermo regulator, thermo regulator might be set too low • set thermo regulator higher - air in plant • vent tank once again above manual ventilating valve while disconnected
IF COOLING MACHINE IS FITTED	
Pressure switch (dis)connects plant Refrigerant	electro valve has activated via LP switch • have it checked by specialists - increased condensation pressure due to choked condenser • clean finned grid at the cooling aggregate - increased condensation pressure due to ambient temperature above +36sC • lower ambient temperature - evaporating pressure too low caused by too little refrigerant (bubbles in the viewing glass) • have it checked by refrigerant specialists - circulation pump does not deliver water via evaporator Have circulation pump checked• - insufficient ambient temperature • increase ambient temperature
Creation of - vapor on pipes or connectors	proof insulation damaged • overhaul insulation condensation



9.3.2. Rotary Current Plants 400V 50Hz

Malfunction:	cause• remedy:
Plant does not start	<ul style="list-style-type: none"> - no voltage supply • check fuses and any possibly loose cable connections and other fitted switchgear, connect main switch • operate switching thermo regulator (red button) - protective motor switch has activated (red control lamp) • verify voltage supply (fuses, missing external conductor), • release protective motor switch
Aggregate does not start, circulation pump running	<ul style="list-style-type: none"> - frost-protection thermo regulator, thermo regulator might be set too low (red control lamp) • set thermo regulator higher - air in plant • vent tank once again above manual ventilating valve while disconnected - pump operates in wrong sense of rotation • change sense of rotation
Pressure switch (dis)connects plant	<p>electro valve has activated via LP switch • have it checked by refrigerant specialists</p> <ul style="list-style-type: none"> - increased condensation pressure due to choked condenser • clean finned grid at the cooling aggregate - increased condensation pressure due to ambient temperature above +36sC • lower ambient temperature - evaporating pressure too low caused by too less refrigerant (bubbles in the viewing glass) • have it checked by refrigerant specialists - circulation pump does not deliver water via evaporator • have circulation pump checked - insufficient ambient temperature • increase ambient temperature
Creation of - vapor on pipes or connectors	proof insulation damaged • overhaul insulation condensation

10. Maintenance

DK's enameled Water Chillers are standard-equipped with a CORREX® external current anode.

This form of corrosion protection is maintenance-free.

Attention is to be paid to the green control lamp, which should be lit. When the red light flashes, please consult item 9.1, 'Causes of malfunction'.

The operation of water relief valve is to be verified at regular intervals (s paragraph 101.)



IF COOLING MACHINE IS FITTED

The air-cooled finned condenser - refrigerant machine - guides waste heat into the surrounding air.

In order to guarantee a trouble free operation, the fins are to be cleaned, depending on the degree of soiling.

10.1 Maintenance of Water Relief Valve



During the operation of the plant, the operational control is to be verified at regular 6-monthly intervals by checking the responsiveness of the water relief valve. It is to be observed whether the valve closes again after release of venting equipment and whether the collected water drains off completely via the funnel or the blow-off pipe

10.2 Maintenance of Pressure Reducer (if exists)



During operation of the plant, the set delivery pressure at the pressure gauge (visual control) is to be verified at zero flow rates and at peak flow rates (large output). The operator is to perform such an inspection on an annual basis.

Pressure reducers are regulatory devices with low adjusting force and are therefore extremely prone to impurities.

The sieve is to be cleaned and in certain circumstances to be replaced. The interior components are to be checked on their perfect state and if necessary, be replaced. Such maintenance procedures are to be performed by the installation specialists every 1 to 3 years, depending on the local operational conditions.

11. Decommissioning (Closing Down)

Switch off cooling supply, e.g. cooling machine, by thermo regulators (red button). For service water chillers with built-in CORREX external current anodes, the latter may only be disconnected after the water has exited the tank.

In order to empty the tank, disconnect the water inlet, vent the tank and empty it at the lowest point. After this, the system may be released from voltage by unscrewing the fuses or by pulling the supply plug or by disconnecting the main switch.



Tap water plants which are not taken into operation within 4 weeks after their assembly, or which have been closed down for more than six months, are to be shut off at the house connection (mains shut off armature) and emptied.

Tap water plants which may be submitted to frost effects are to be emptied in time.

11. Re-Starting

When re-starting, after having interrupted operation, it is usually sufficient to completely open the individual points of outlet for a short time (approx. 5 minutes) in order to drain residual water in the pipes.

Re-start plant according to instructions in item.



12. Plant Description

The refrigerant plant is designed for and set to the cooling down of service water or water glycol mixing of a maximum temperature of +25°C to a minimum temperature of +2°C (glycol: deeper temperatures possible).

The evaporator consists of a double-walled safety multi-pipe heat exchanger (for tap water cooling) with a water conduit system and is fitted to the service water reservoir (pos.1). The evaporator for closed water systems is single walled. On the water-carrying side, the safety heat exchanger is flooded via the charge pump.

On the refrigerant-carrying side, the same heat exchanger must be equipped with a thermo regulator expansion valve and a cooling aggregate.

The cooling aggregate must be equipped with a condenser, a dryer, a viewing glass and a solenoid valve also a HP and an LP switch, a compressor and rotary current plants have to have an additional switch box.

As anti-freezing protection, a frost-protection thermo regulator is mounted (NOT for glycol) to the safety multi-pipe heat exchanger and if the need arises, the cooling aggregate is disconnected whilst the charge pump remains activated in order to avoid freezing.

The water temperature is adjusted via the thermostats installed above the service water reservoir which controls the cooling aggregate.

For adjustment of the permissible operating excess pressure of the individual pressure level (LP and HP side), the HP or the LP switch respectively operate the cooling aggregate..

13. Technical Data – to be completed by the costumer

Company installing plant (stamp)

_____ User: _____
_____ Inventory-No.: _____
_____ Monitoring No.: _____
_____ Place of installation: _____

Technical data of the refrigerant plant - if fitted

Manufacturer : L'unite - Maneurop - DWM - other _____
Design of compressor : fully airtight / semi-airtight
Condenser : air cooled



MODEL : _____
Year of construction: _____ Design Nr.: _____
Capacity (kg) : _____ Refrigerant : R _____
Permissible operating excess pressure (bar) : _____
Nominal performance of driving motor (kW) : _____
Voltage (V/Ph/Hz) : _____
Nominal current (A) :: _____



FIRST AID

In case of injuries, accidents or intoxication, please contact the following telephone numbers immediately :

Emergency Tel.: _____

Fire Tel.: _____

Management Tel.: _____



Refrigerant filling - IF COOLING MACHINE IS FITTED

Only use the prescribed R _____ refrigerant!

Physical protection equipment:

In case of larger escapes of refrigerant, if necessary, enter the machine room solely with a gas mask or with respiratory equipment and protect face and hands from direct exposure to refrigerant.

Please note the section 3.6 of the accident prevention regulation BGR 500 part 2, chapter 2.35 "personal protection gear against effects of refrigerants"



14. Certificate

- IF COOLING MACHINE IS FITTED -

for the testing of a refrigerant plant according to **BGR500, Part2, Chapter 2.35, Section 3.13**

1.) Identifikation Data

DK-Kälteanlagen GmbH, D-48282 Emsdetten

Manufacturer's number: _____ Year of construction: _____

Model: _____ Refrigerant: _____

Highest capacity of refrigerant plant (kg): _____

Permissible operating excess pressure (bar): _____

Total weight of plant (kg): _____

Type of plant: _____ Compressor refrigerant plant with piston compressor

2.) Leak Test

The refrigerant plant was submitted to a leak test at the site of fabrication by _____ (expert) on _____ (date).

Means of testing: _____, excess testing pressure _____ bar.

No defects became evident during the leak test performed

3.) Acceptance test according to regulations on pressure tanks

The first testings of the refrigerant plant's pressure tanks have been certified by means of certificates and /or stamps.

The pressure tanks of testing groups II and V have been submitted to an acceptance test according to TRB 531. No objections resulted from the testing.

Checking the installation of the pressure tanks of the testing groups III and IV, for which an acceptance test has been completed, entailed no objections.

The acceptance test of pressure tanks of the testing groups III and IV by the expert (§31 of pressure tank regulation) before installation

- is to be performed.

- has been performed.



4.) Proper Conditions

The proper condition of the refrigerant plant was checked by _____ (expert) on _____ (date) at the site of manufacture.

Testing resulted in no objections

5.) Functional testing of the safety equipment

Before initial operation of the plant, the following safety equipment was checked on their operation by the expert :

Pressure control device : Disconnecting pressure R _____ : _____ bar

Connecting pressure R _____ : _____ bar

Low pressure control device Disconnecting pressure R _____ : _____ bar

Frost protection thermo regulator : Disconnecting temperature: -1 °C

6.) Remarks

This certificate is to be kept and stored in a safe place..

Emsdetten, date _____

The expert



15. General Data of Refrigeration Plant *(to be completed by the costumer)*

Cooling unit:	
current consumption (A)	
Voltage (V / Ph / Hz)	

16. Electrical Wiring *(to be completed by the costumer)*