Kälte. Wärme.
Innovationen.

Installation and operating instructions

DK energy storage
and
DK energy buffer

TÜV CERT
DIN EN ISO 9001

Edition: 08-2015

Preliminary note

With this DK energy storage / DK energy buffer you purchased a DK quality product.

The DK energy storage / DK energy buffer is produced in compliance with relevant standards and recommendations.

Each system is carefully checked and all the components are subject to a pressure test, whereby we provide you with a reliable system.

For a permanent, proper use, as a matter of course it is also required a professional installation and commissioning. For your own benefit, you should exactly follow the subsequent assembly instructions.

This document corresponds to the technical status of the issue date. The manufacturer reserves the right to technical modifications in terms of further development.

All water and brine tanks supplied by DK are pressure equipment which according to the Pressure Equipment Directive 97/23 /EC, Art. 3, para. 3 pursuant to points 1.1 to 1.3 as well as paragraph 2 is below the limits.
Thus, the CE marking is not required.

We wish you a lot of success with the **DK energy storage**

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1. Safety Instructions

**Please note for your own safety
and to maintain your warranty claim:**

- The electrical installation and the refrigeration installation and commissioning shall only be carried out by approved professionals who possess the necessary approvals. The installation personnel must comply with the generally applicable rules considering the UVV / VBGA "Electrical Systems and Equipment" as well as all applicable VDE regulations. Repairs that go beyond the maintenance works prescribed in this technical documentation shall only be carried out by trained professionals. Please contact "your" competent refrigeration specialist.

- Maintenance on the electrical system shall be permitted only if it is ensured that the system is unpowered.

- DK-Kälteanlagen GmbH is not liable for damage caused by improper use or unauthorized intervention, especially in the electronic and electrical as well as refrigeration function modules.

- Only persons, which are informed about the intended use in these installation and operating instructions are entitled for the commissioning of the heat recovery. The knowledge of the relevant accident prevention regulations and other generally recognized safety-related rules is assumed.

- For the cleaning it is important to pay attention that no jets of water reach the electrical functional modules that do not at least comply with degree of protection IP 55.

- When working with cleaning and disinfecting agents, the manufacturer's safety instructions must be strictly observed.

In the textual versions of this document, the instructions and warnings with special importance are graphically highlighted.

...indicates that failure to observe can cause injury or damage to the equipment.

... provides useful information for the intended use or utility value preservation of the product.

2. Service

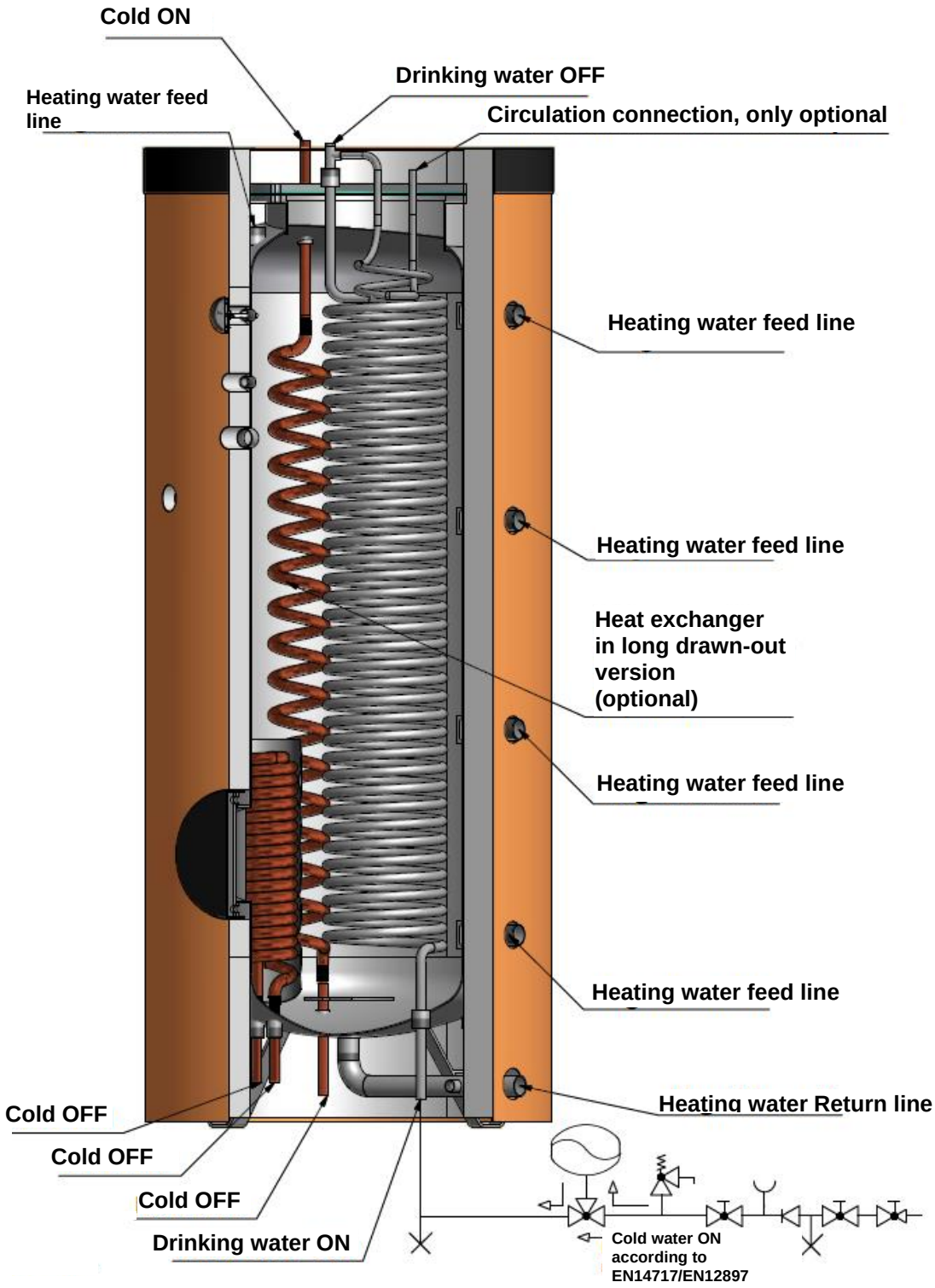
Please note in your interest that necessary repairs during the warranty period shall only be performed by service centres authorised by DK-Kälteanlagen GmbH.
So you protect your warranty rights.

Repair and maintenance of electrical and refrigeration equipment shall only be carried out by approved refrigeration companies that possess the necessary approvals. Please contact "your" refrigeration specialist.

The following conditions must be met in order to assert the condition of warranty claims:

- Delivery must be checked (if necessary contact DK-Kälteanlagen GmbH)
- Operation only in closed systems
- Frost-proof installation
- Fine filter in the cold water supply
- Maximum temperatures and pressures must be observed
- Regular inspection of storage density and storage connections
- Every two years a general review must be performed

3. Tank with internal, single-walled heat exchangers



3.1 Handling and installation

A qualified professional is responsible for installation, repairs, modifications, maintenance and inspection work of the storage.

At the site of the storage, a floor drain must be present.

The installation of the storage should only be carried out only in areas with antifreeze protection. Should it still happen that the decommissioned storage is placed in an unheated room without antifreeze protection for a long time, the storage, the heat exchanger and the tubular capacitor must be completely emptied.

When installing several heat exchangers, a U-shaped profile is screwed to the tank base as installation aid. This profile can be disassembled after installation.

However, it is important to ensure that there are no harsh impacts. This may occur when unloading from trucks or from the pallet.

It is important to ensure that the water and refrigerant connections are only fitted when there is no insulation on the tank. Before removing the insulation of the storage, the thermometer should be removed from the immersion sleeve

The DK energy storage can be delivered with a PVC or PP/PVC insulation, consisting of polyester fleece and PVC or PP/PVC outer sheath or a soft foam insulation.
The PVC and the soft foam insulation is supplied with a lace fastening.
The PP/PVC insulation on the joints is provided with a terminal strip.
For larger or more complex tanks, it can happen that the insulation is delivered in several parts.

3.1.1 Heating water tank

The DK energy storage for heating water in closed systems is an inside raw-black tank. This tank has no corrosion protection.
The filling of the heating circuit must be made with oxygen-free heating water according to VDI guideline 2035 sheet 2.

If the heating system is equipped with tubes or components that are not impervious to oxygen diffusion, the storage filling must be carried out with water and suitable corrosion protection inhibitors. It should be observed that this results in a reduction in performance of the heat exchanger and the pump.

For the compatibility of the additives in the rest of the heating system and for their effectiveness DK-Kälteanlagen GmbH assumes no liability.

3.1.2 Connection of the heating water tank

For the supply and return connection must be paid attention not to use too much hemp, since an excessively thick hemp package may damage the connection nipple. The water connections must be made in accordance with local regulations. Without locking opportunity to the tank, a pressure relief safety valve must be installed according to the maximum allowable operating pressure of the tank. Standard operating pressure is 3.0 bar.

Nominal width		DN 15	DN 20	DN 25	DN 32	DN 40
Construction dimensions	A	G 1/2"	G 3/4"	G 1"	G 1 1/4"	G 1 1/2"
	A1	G 3/4"	G 1"	G 1 1/4"	G 1 1/2"	G 2"

	Reaction pressure (bar)	max. heat output of the heat generator (kw)				
	3	56	112	224	395	678

3.2.1 Water connection of stainless steel spiral tube coil

For the hot and cold water connection must be paid attention to hold up the attached press fittings during assembly, otherwise they will be leaking.
The water connections must be made according to DIN EN 806 and according to local regulations. Without locking opportunity to the tank, a pressure relief safety valve must be installed according to the maximum allowable operating pressure of the stainless steel spiral tube heat exchanger.

The discharge side of the safety valves must be at least one nominal width greater than the inlet side. The air outlet tube should have at least the same cross section as the safety valve outlet, shall have as a maximum two sheets and not be longer than 2 meters (see DIN 4753 Part 1, DIN EN 806 and DIN EN 1488).

The function of the safety valve should be checked after installation. The safety valve should be serviced regularly.

The connection of galvanized tubes should be avoided.

In the cold water tube, a fine filter should be installed to prevent foreign objects entering the system.

Standard operating pressure 6 bar - Further operating pressures see nameplate on the tank.

To enable a flushing possibility of the stainless steel spiral tube heat exchanger, suitable connections must be installed on site.

The connections of the stainless steel spiral tube heat exchangers are designed as follows:

Stainless steel spiral tube heat exchanger with connections ½", ¾" and 1"

- Press fitting with male thread of equal dimensions

Stainless steel spiral tube heat exchanger with connections 1 ¼" and 1 ½"

- With fixed welded, tube socket / female thread of equal dimensions

The cold water and the hot water connections are marked accordingly.

Danger of burns!
On the hot water connection shall be installed a drinking water mixing valve, which is responsible for temperature limitation. This serves to prevent burns from hot water.

3.2.2 Corrosion protection of steel spiral tube coil

In the drinking water network, in which the stainless steel spiral tube heat exchanger is installed, shall not be any galvanized tubes.
Further must be made sure to comply with the correct sequence and dimensioning of the individual fittings and safety equipment.

To prevent deposit of foreign objects in the corrugated tube/spiral tube, which would then cause great damage, a dirt filter should be installed in the cold water supply line.

3.2.3 Pressure compensation in drinking water network

One reason for strong pressure fluctuations and pressure surges in the domestic hot water systems could be the pressure conditions in the cold water network. We recommend placing a drinking water expansion tank. This protects the stainless steel spiral tube heat exchanger against overload and a loss of warranty. For these expansion tanks please follow the dimensioning given by the manufacturer.

Pressure surges in the tube network should be absolutely avoided

3.2.4 Pressure ratio in drinking water network

At higher system pressure than the allowed operating pressure of the stainless steel spiral tube heat exchanger, in the cold water supply line must be used a pressure reducing valve. (DK offers water safety fittings, which fulfil these requirements. This fitting is installed in the cold water supply).

3.2.5 Connection circulation line (optional)

Basically, the hot water line should be kept as short as possible from the energy storage to the extraction point (approximately 6 m). In addition, a circulation tube should be planed. The circulating pump should be controlled by pulses at the required time (depending on demand) and temperature dependent controlled.
If a circulation coil is installed, there is a circulation connection on top of:

- the flange plate
- next to the TW outlet

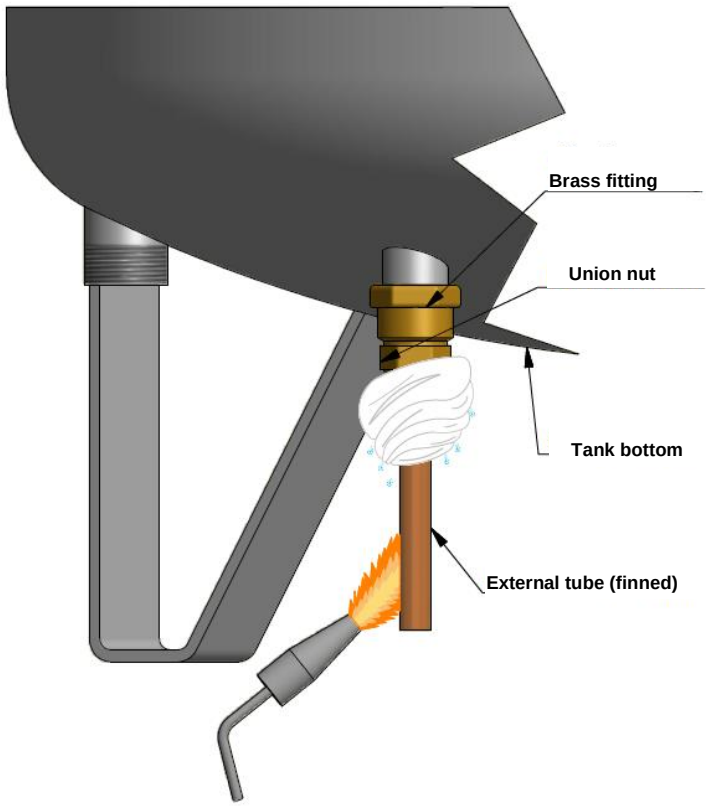
3.3. Refrigerant connection

The hot gas line (from the compressor to the inlet of the heat exchanger) must be properly fixed. Under unfavourable operating properties of the refrigerant compressor (pulsation strokes), appropriate measures for vibration damping should be provided. The structure of the heat exchanger in the DK heat recovery (finned tube coil installed in PE housing) makes the use of a silencer (muffler) in most cases not necessary.

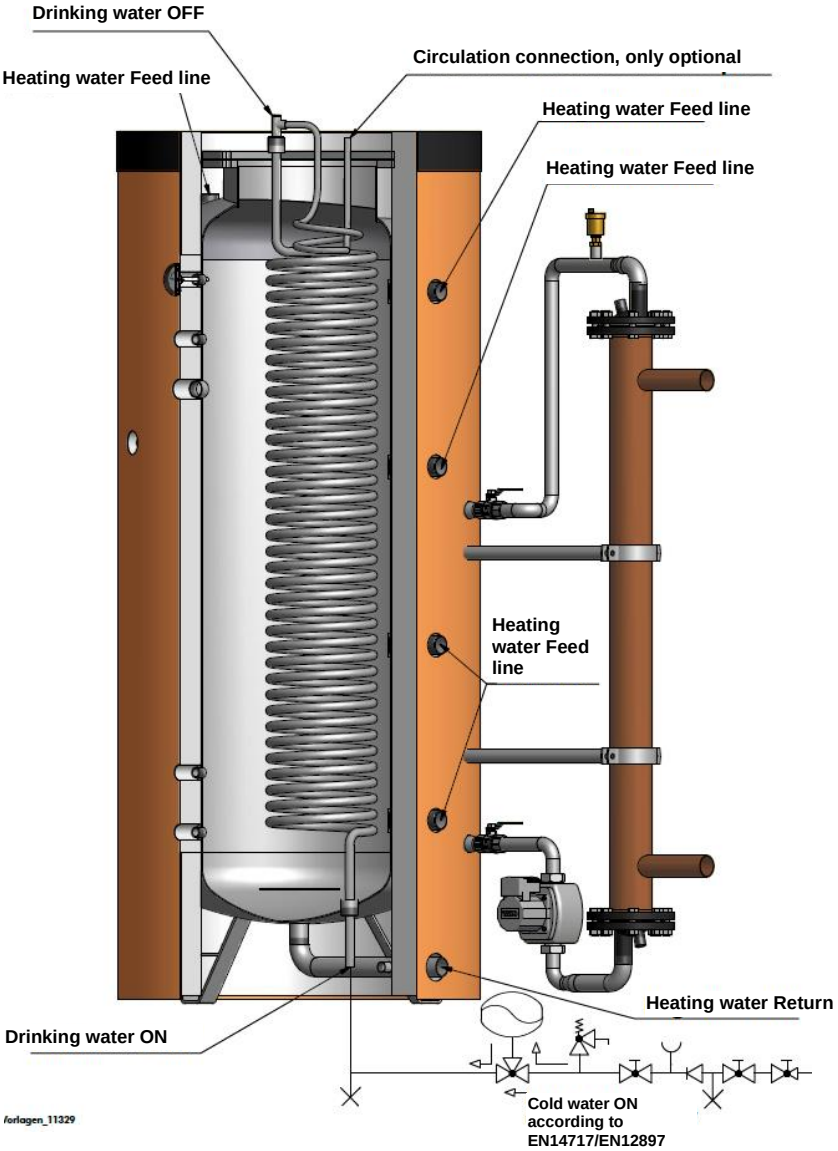
For longer unfixed hot gas lines, the vibrations are transmitted through the lines to the compression fitting on the respective tank connections. The rigid support can lead to cracking immediately prior to fitting.

The hot gas inlet is marked with a red colour strip, the refrigerant outlet with a green colour strip.
Some exchanger types are marked to avoid errors. The determination of the types is made through the dimension of the connection.

When soldering the refrigerant tubes to the heat exchanger input or output, make sure that the brass compression fittings, with which the heat exchanger is water side sealed to the tank, do not overheat, otherwise the sealing is destroyed.



4. Tank with external heat exchangers



4.1 Handling and installation

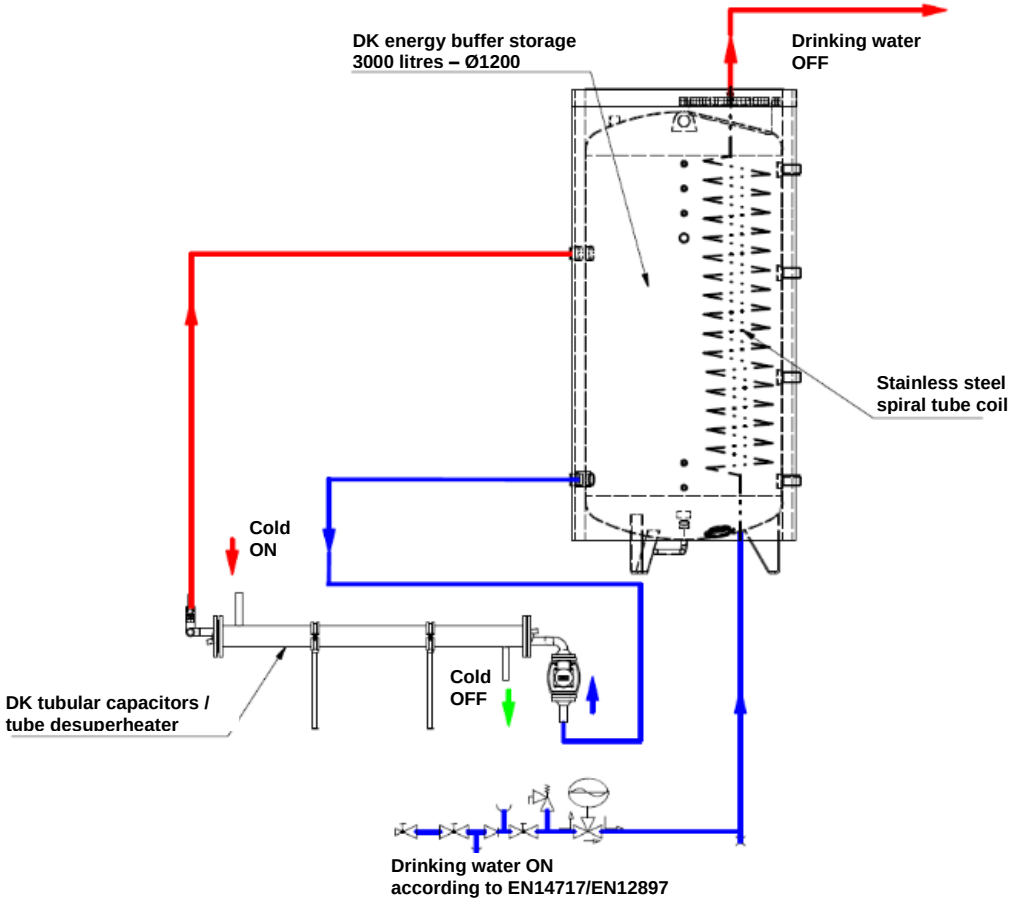
- see notes in point 3.1 -

4.2 Water connection tank

- see notes in point 3.2 –

4.2.1 Water connection of external heat exchanger

Tube bundle heat exchangers (tubular capacitors / tube desuperheater) that were not installed at the tank of DK must be connected on the water side with the appropriate safety equipment on site. The water inlet is marked with a blue colour strip, the water outlet with a red colour strip.



The DK tube bundle heat exchanger (tube desuperheater/ tubular capacitors) is a water heater, which is equipped with a type-tested safety valve on the water side in accordance with DIN 4753 and EN 1488 .

- The safety valve must be mounted so that it cannot be shut-off to the heat exchanger (external heat exchanger). If shut-off devices are installed between the heat exchanger and safety valve, they must be secured against closing during operation.
- The discharge side of the safety valves must be at least one nominal width greater than the inlet side. The air outlet tube must be designed at least in size of the safety valve - outlet cross section, shall have as a maximum two sheets and not be longer than 2 meters
- Design of the safety valve according to EN 1489 or EN 1491

5. Electrical connection

All electrical components must be carried out according to local EVU regulations and VDE 0100

The charge pump should be controlled parallel to the refrigeration system or optional with the thermostat, which is located in the lower tank area. The indications given in the assembly instructions of the pump manufacturer must be strictly observed. See assembly instructions of the pump manufacturer.

Danger of electric shock!
Before working on the pump, the supply voltage must be interrupted at all poles. Due to the touch voltage that is hazardous to humans (capacitors), the work at the module may be started only after the period of 5 minutes (only with AC 1 ~ version). Check that all connections (including potential-free contacts) are voltage-free.

6. Commissioning

6.1. Commissioning of the system

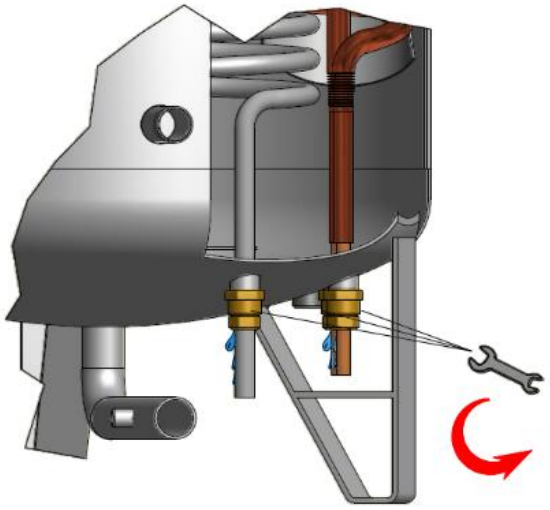
A professional is responsible for the commissioning and the distribution of all maintenance information to the plant operator.
To avoid damage to the plant by foreign bodies in the system, we recommend to thoroughly rinse the entire plant prior to first use.

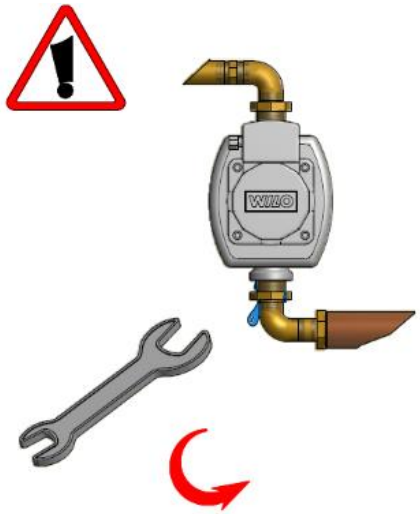
> The DK heat recovery shall be put into operation only after complete filling with water and careful venting.

6.2. Sequence for commissioning

1. Fill stainless steel spiral tube heat exchanger, whilst simultaneously venting at the highest extraction point.
2. Close extraction point again, when the air has fully escaped from the coil.
3. Fill the DK energy storage / DK energy buffer (see point 3.1.1 and 3.1.2)
4. Pay attention to leaks, if necessary tighten fittings.

With the transport it is possible that the heat exchangers have been set or the pump fittings have become loose, so that in case of water pressure, the seal is no longer guaranteed. In such a case, the corresponding union nut of the brass and pump fitting must be re-tightened at the connections of the tank.





6.3. Commissioning of the pump

High-efficiency pumps vent themselves. See also installation and operating instructions of the pump manufacturer.

Danger of burns when touching the pump!
Depending on the operating status of the pump or system (liquid temperature) the entire pump can become very hot.

The volume rate of the pump must be adapted to the external heat exchanger in order to avoid damage due to excessively high flow rate.

The noise level of the pump is below the limit values, which are indicated in the guideline 2006/42/EC for machinery.

7. Decommissioning

To be able to perform work on the DK energy storage, all electronic components must be switched off and secured against accidental operation.

For work on the water system (drinking water / heating water) in any case must first be depressurised the heating storage - before the stainless steel spiral tube heat exchanger is depressurised.

7.1. Recommissioning

When recommissioning after longer operational interruptions, it is usually sufficient that the individual extraction points each are fully opened for a short time (about 5 minutes) to drain the stale drinking water in the tubes. Recommission the plant according to section 6.

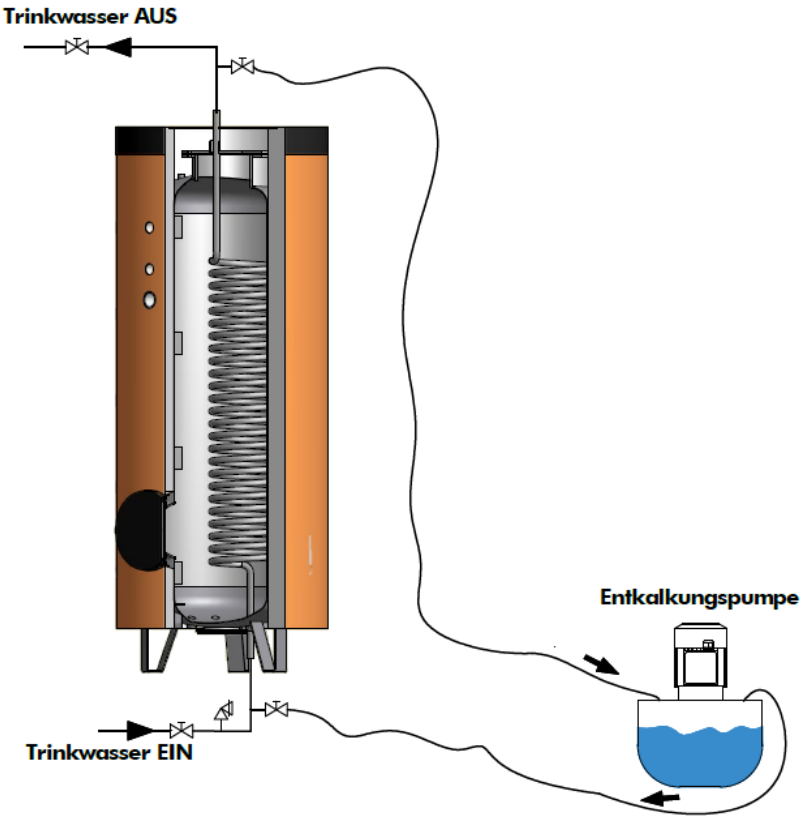
8. Maintenance

A qualified professional is responsible for the maintenance and inspection work as well as for repairs! Maintenance of the entire system must be carried out regularly.
It is important to check all the heating and domestic hot water fittings for leaks. If necessary, please tighten all fittings again.

8.1. Maintenance of stainless steel spiral tube coil

(flushing with chemical descaling agents)

In case of significantly reduced performance, the reason can be the contamination of the heat exchanger (calcification). The coil can be cleaned with chemical cleaning agents. First the water must be drained. The provisions of the detergent manufacturer must be strictly observed.



Illustrated flushing connections are not included in delivery and must therefore be carried out on site.

Please only use acid free boiler scale solvent specifically used for stainless steel!

The heat exchanger inside must be adequately flushed prior to recommissioning.

8.2. Maintenance of water safety valve

During operation of the plant, the control function shall be performed in regular intervals of 6 months by checking the response capability of the water safety valve.
It shall be observed if the valve after releasing the lifting device closes again and if the water flows away completely through the funnel or blow-off line.

9. Retrofitting of components

To retrofit an electric heater or other heat exchangers, the plugs or caps on the tank must be removed. They are glued with liquid sealant and can only be removed after temperature increase to about 120 ° C + (heat gun or soft gas flame).

When retrofitting of electric heaters must be checked if sufficient mounting depth is present in the storage.

If heat exchanger shall be retrofitted and therefore flange openings must be loosened, it is recommended that the seals are also renewed.

After installing the mounting parts, it might be necessary to make corresponding holes and cutouts in the insulation. See also assembly instructions for the individual components. Specific instructions can be requested at the plant and will be attached to the delivery of spare parts.

10. Causes of malfunction

10.1. Causes of malfunction of pumps

Malfunction	Cause	Troubleshooting
Pump does not start	Faulty power supply	Check fuses and any loose cable clamps
	Motor protection has tripped	see assembly instructions of the pump manufacturer.
Noisy pump operation	Air in the pump	see assembly instructions of the pump manufacturer.
	System pressure too low	Increase supply pressure

Also see manufacturer specification!!