



**Kälte. Wärme.
Innovationen.**

DK-HEAT RECOVERY

FOR TRANSCRITICAL CO₂ REFRIGERATION SYSTEMS



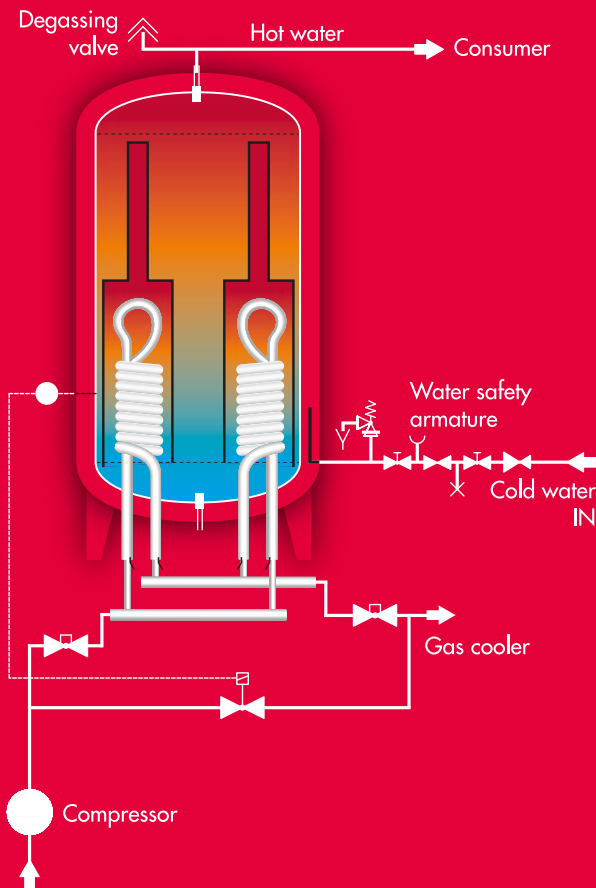
**The DK-
heat exchanger:
Certified for
maximum 130 bar
at maximum
150°C**

**CO₂
refrigerant is
the perfect partner
for heat recovery
due to the high
temperatures of
the refrigerant**

**The Unique
DK-options: Recovery
of waste heat energy
for heating potable water,
heating water for heating
buildings or the combi-
nation of both in
a single tank**

DK-Heat Recovery for potable water heating with internal heat exchangers

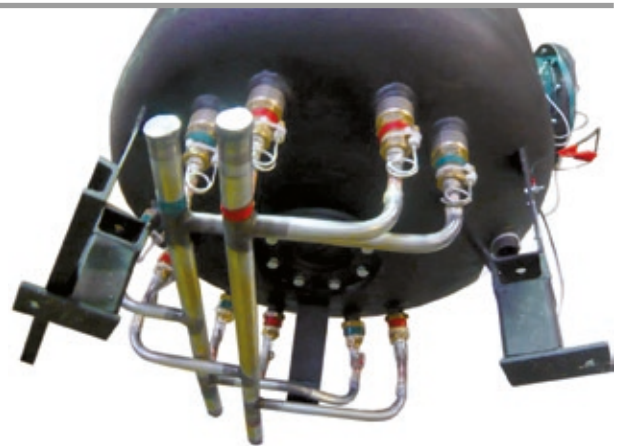
In 2008 DK supplied the first heat recovery for transcritical CO₂ refrigeration system for potable water heating to a supermarket in Germany.



Using the DK long established and proven system of internal double-walled safety heat exchangers.

The above shows the refrigerant-carrying inner tube (15.5 mm) of the heat exchanger type 22/16 is further strengthened to safely work with pressures of 130 bar at +150°C. Where a direct connection of the twin-walled tube 15.5 mm is not sufficient for the connection

to the transcritical refrigeration systems in the supermarket sector. The DK system utilises multiple heat exchangers connected in parallel, together with a stainless steel hydraulic tube providing a high pressure-resistant connection. For more options DK can provide a K65 connection on request.



Advantages

- Optimum use of waste heat through the chimney patented principle and by the direct transfer of heat into the water tank
- No pump and no additional installation work; no pump means no additional servicing or maintenance
- Additional charging circuit dispensed with safety equipment (expansion vessel and overpressure valve)
- Perfect water safety through enameled tanks and double wall heat exchanger (no risk water leakage into the refrigerant circuit and protection against compressor oil and refrigerant)

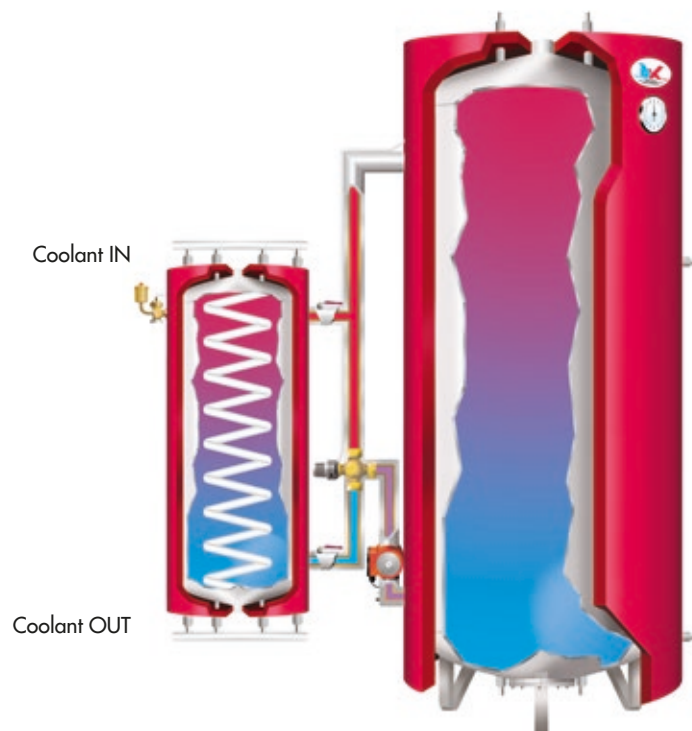
DK-Heat Recovery for potable water heating with external heat exchangers

Through the development of refrigeration systems in the early 90s, DK supplied an increasing number of heat recovery with external heat exchangers to several leading supermarkets throughout Europe. The external system offers the supermarket operator the benefit of separating the responsibilities of the refrigeration and plumbing contractors.

In 2011, DK pioneered the development of a double-walled external heat exchangers for transcritical CO₂ refrigeration systems. Based on the same twin-walled copper tube as used in the internal heat exchanger models. Incorporating special type copper casing tube 219 mm. For easy installation, a transition to K 65 is available on request.

Advantages

- Highest water temperature on demand using the DK pump and 3-way valve system
- Absolute safety through double-walled heat exchangers and internal enameled tanks
- Flexible mounting option at the tank or on the refrigeration unit
- Separation of refrigeration and plumbing work





DK-Heat Recovery for heating water for heating purposes

In previous years, eco-friendly energy design in German supermarkets was held back. Due to a strict separation between the refrigeration and plumbing trades, together with a misunderstanding of the technology surrounding using waste heat energy to heat water. Low cooling loads & condensing temperatures in winter concerned the refrigeration contractor & the plumber had always worked with standard fossil fuel systems. This situation has changed radically – particularly in transcritical CO₂ refrigeration systems.

On demand this system can be driven as transcritical in the winter to heat the supermarket without assistance from a fossil fuel fired boiler.

New CO₂ heat exchanger for heating water heating

Since 2013 DK has provided systems for waste heat utilization for building heating purposes. DK have now added a new development using a finned copper tube exchanger. This new exchanger has a larger free cross-section area, resulting in the need for less individual heat exchangers, whilst offering an increased level of heat transfer.

Advantages

- DK finned tube heat exchanger technology working for over 37 years, giving problem – free performance
- Increased performance using fewer heat exchangers in the new CO₂ heat exchanger
- Best utilization through direct heat transfer into the water
- A circulation pump is not needed, conserving electrical energy and saving the cost of a pump
- Additional equipment (expansion vessel and overpressure valve) are not required



DK-Heat Recovery for heating and drinking water heating in only one tank

Entirely new possibilities are available to the supermarket designer, now that DK have added a stainless steel spiral tube heat exchanger inside the tank to provide heated potable water. In addition to the advantages of the new CO₂ heat exchanger for the buildings heating, the new indirect DHW heating promises in flow system more advantages.

- Also an optimal protection against Legionella – due to there being no storage of potable water
- Two walls between refrigerant and water (meeting EN 1717 regulations)
- The use of spiral pipe, as opposed to corrugated pipe reduces pressure loss by 30% and no air lock potential
- Easy clean surface



Conclusion for drinking water heating

For more than eight years DK have been supplying systems for optimal utilization of waste heat from transcritical CO₂ refrigeration systems for potable water heating. Over 300 systems are now installed with more than 1,000 double-walled working heat exchangers (as of June 2016). In addition to safety through this experience, DK offers a further guarantee of water safety. The WESSLING seal confirms that the DK-Heat Recovery during operation is 100% safe, and designed to prevent Legionella growth. No other heat recovery manufacture has been awarded this coveted Seal of Approval.

Conclusion for heating and potable water heating in only one container

For 37 years DK has remained true to our original philosophy to be a customer focused company. This is why, so many customer bespoke requests can be fulfilled. Maximum flexibility is achieved by our 100% in-house design and manufacture and special production of numerous combinations of heat exchangers. Our continuous development of heat exchangers has provided the driving force behind the availability of new highly efficient heat exchangers for modern high pressure refrigeration systems.

 **WESSLING**
Quality of Life

**Konstruktiver
Legionellenschutz**
SICHERHEIT & HYGIENE



Prüfnummer: 1016-CAL-001

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Technical Data

Internal heat exchanger for CO₂ refrigerant / transcritical (130 bar) to heat potable water

Manufactured in double-walled design according to DIN 1998/EN 1717 in copper finned tube, tin-galvanized, maximum operating pressure 130 bar, maximum operating temperature 150°C, fitted internally in the storage tank.

Type	Outer tube (mm)	Inner pipe (mm)	Refrigeration	Surface area (m ²)
22/16 – 1,0 m ² /CO ₂	22	15,5		1,0
22/16 – 2,0 m ² /CO ₂	22	15,5		2,0

Heat Exchanger		Interconnection to stainless steel		Interconnection to K65	
No HX Type 22/16	Free cross-section HX (mm ²)	Dimension inter-connection (mm)	Free cross-section interconnection (mm ²)	Dimension inter-connection (")	Free cross-section interconnection (mm ²)
2	208	20 x 2	200	¾	212
3	312	26,9 x 2,6	369	1 ⅛	482
4	416	26,9 x 2,6	369	1 ⅛	482
5	520	33,7 x 2,6	637	1 ⅜	722
6	624	33,7 x 2,6	637	1 ⅜	722

External heat exchanger for CO₂ refrigerant / transcritical (130 bar) to heat portable water

Double-walled coil heat exchanger (finned) housed in copper piping type 22/16 CO₂, maximum operating pressure 130 bar, maximum operating temperature 150°C incl. flushing connection 3/4" ODM, complete with mounting supports and insulation for vertical installation.

Type	219/2 x 22/16	219/3 x 22/16	219/4 x 22/16	219/5 x 22/16
Number of coils	2	3	4	5
Total surface area (m ²)	4	6	8	10
Clear surface area refrigerant (mm ²)	207	311	414	519
Height (mm)	1300	1600	1900	2200
Dimension of the inter-connection (stainless steel)	20 x 2 mm 200 mm ²	26,9 x 2,6 mm 369 mm ²	26,9 x 2,6 mm 369 mm ²	33,7 x 2,6 mm 637 mm ²
Manifold to K65	¾" 212 mm ²	1 ⅛" 482 mm ²	1 ⅛" 482 mm ²	1 ⅜" 722 mm ²

Internal heat exchanger for CO₂ refrigerant / transcritical (130 bar) to produce heating water

Single-walled design in copper finned tube, maximum operating pressure 130 bar, maximum operating temperature 150°C, fitted internally within the storage tank

Type	22/0,5 CO ₂	22/1 CO ₂	22/2 CO ₂
Interconnection (mm)	22	22	22
Surface area outside (m ²)	1,45	2,9	5,8
Surface area inside (m ²)	0,26	0,52	1,04
Inside diameter (mm)	14,5	14,5	14,5
Free cross-section interconnection (mm ²)	160	160	160

Coiled stainless steel heat exchanger

Out of material stainless steel 1.4404 fitted in a raw tank

Type	½" / 20 m	¾" / 15 m	¾" / 30 m	1" / 30 m	1" / 50 m
Connection water (")	½	¾	¾	1	1
Length (m)	20	15	30	30	50
Weight (kg)	4	4	8	11	22
Surface (m ²)	1,5	1,7	3,4	4,3	7,3
Pressure loss (Δp)	0,6 bar bei 10 l/min	0,35 bar bei 16 l/min	0,65 bar bei 16 l/min	0,45 bar bei 20 l/min	0,75 bar bei 20 l/min

Other sizes of coiled stainless steel heat exchangers with larger water connections (1 ¼" and 1 ½") on request. These heat exchangers are welded connection.



Cool Solution – Hot Performance – DK

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