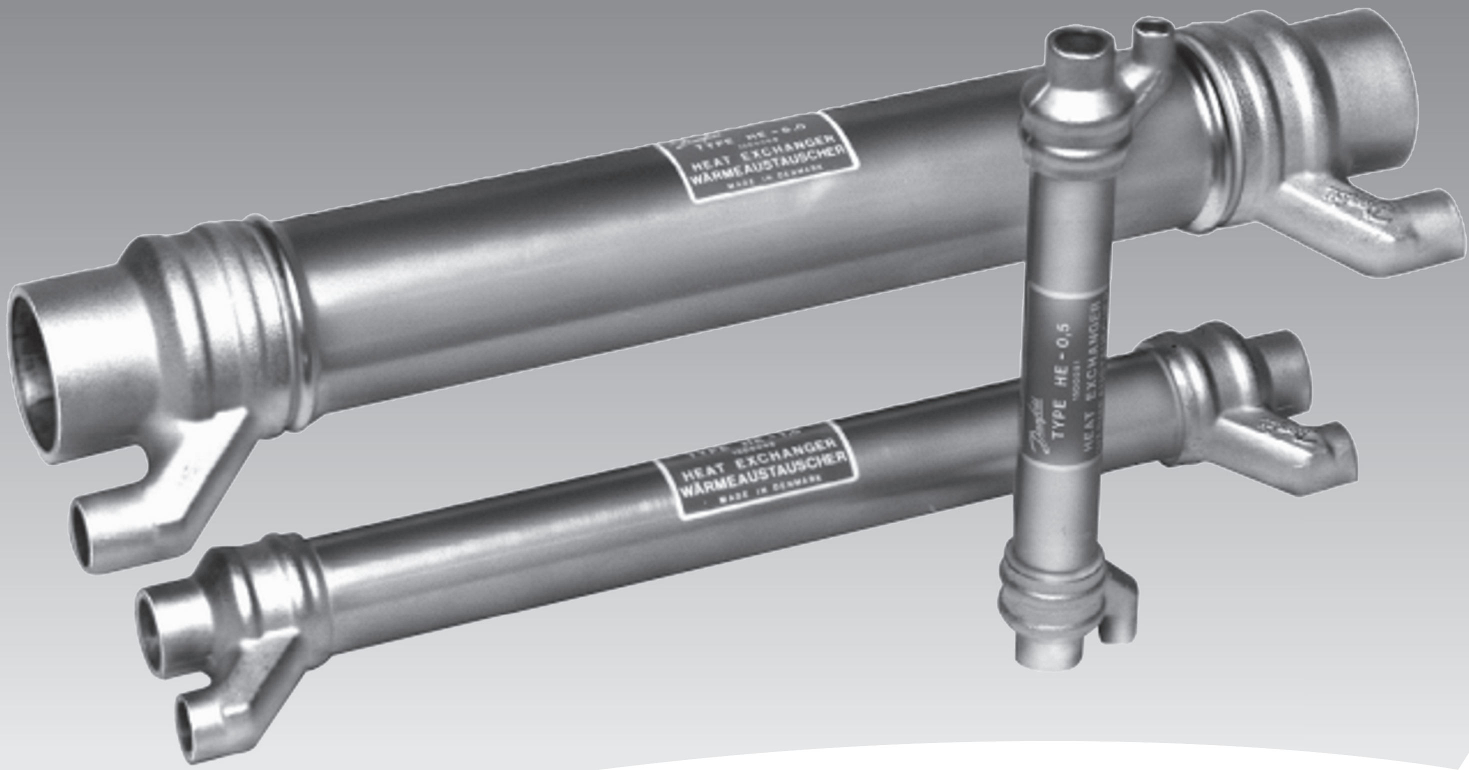


Heat exchangers,
type HE

REFRIGERATION AND
AIR CONDITIONING

Technical leaflet

Introduction

Heat exchanger type HE is used primarily for heat transfer between the liquid and suction lines of the refrigeration plant.

The purpose is to utilize the cooling effect which without a heat exchanger is otherwise lost to the ambient air via uninsulated suction lines.
In the heat exchanger, this effect is used to subcool the refrigerant liquid.

Features

- High refrigeration capacity in evaporator
- Helps ensure vapour-free liquid ahead of expansion valve.
- Maximum utilisation of evaporator on setting the thermostatic expansion valve for minimum superheat.
- Helps prevent sweating and iced-up suction lines.

Technical data

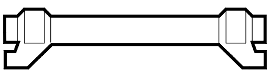
Refrigerants
All fluorinated refrigerants.

Operating temperature
–60 → +120°C

Max. working pressure
HE 0.5, 1.0, 1.5, 4.0: PS = 28 bar
HE 8.0: PS = 21.5 bar

Max. test pressure
HE 0.5, 1.0, 1.5, 4.0: p' = 40 bar
HE 8.0: p' = 28 bar

Ordering



Type	Solder connection ODF				Code no.
	Liquid line		Suction line		
	in.	mm	in.	mm	
HE 0.5		6		12	**015D0001**
	$^{1}/_{4}$		$^{1}/_{2}$		**015D0002**
HE 1.0		10		16	**015D0003**
	$^{3}/_{8}$		$^{5}/_{8}$		**015D0004**
HE 1.5		12		18	**015D0005**
	$^{1}/_{2}$		$^{3}/_{4}$		**015D0006**
HE 4.0		12		28	**015D0007**
	$^{1}/_{2}$		$1^{1}/_{8}$		**015D0008**
HE 8.0		16		42	**015D0009**
	$^{5}/_{8}$		$1^{5}/_{8}$		**015D0010**

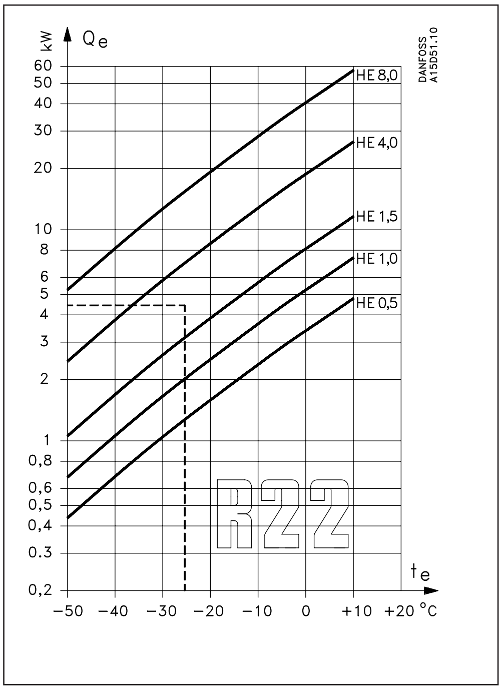
Generally, the size of an HE exchanger can be determined from the connections corresponding to the pipe dimensions of the refrigeration plant.

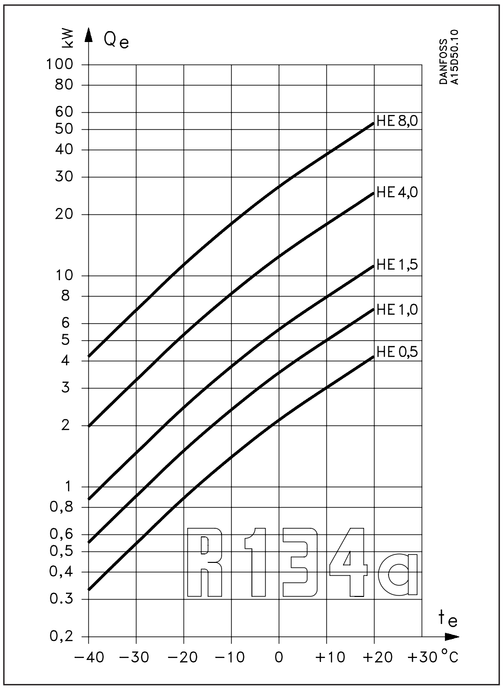
The design is such that normal suction gas velocities are achieved, with a subsequent small pressure drop. Thus the heat exchanger capacity will match plant capacity.

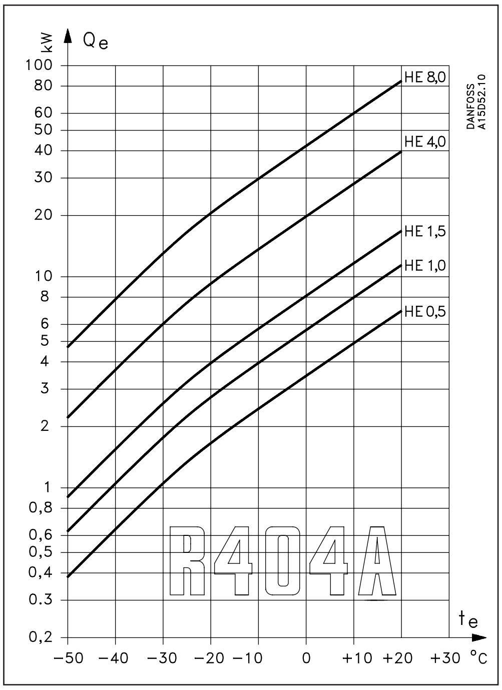
At the same time, oil return to the compressor is ensured.

If the main object is to avoid sweating and frosting-up of the suction line, the HE can be chosen one size larger than the size determined by the capacity. An HE used as an auxiliary condenser must always be selected according to the connection dimensions.

Capacity







Precise heat exchanger sizing can be obtained from the curves which show plant capacity Q_e for R22, R134a and R404A depending on evaporating temperature t_e.

Example
Plant capacity Q_e = 4.5 kW
Refrigerant = R22
Evaporating temperature t_e = –25°C

The curve for R22 shows that an HE 4.0 is suitable. The curve for HE 4.0 lies immediately above the intersection of the lines through Q_e = 4.5 kW and t_e = –25°C.

The heat flow Q during heat exchange is calculated from the formula: $Q = k \times A \times \Delta t_m$

Q heat flow in W
k heat transfer coefficient in W/m^2 °C
A transfer area of the heat exchanger in m^2
Δt_m the average temperature difference in °C, calculated from the formula:

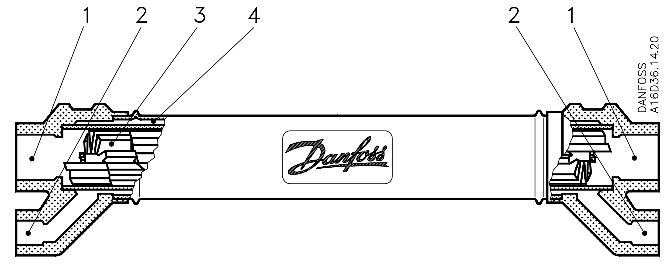
$$\Delta t_m = \frac{\Delta t_{max.} - t_{min.}}{\ln \dfrac{\Delta t_{max.}}{\Delta t_{min.}}}$$

k × A values
Determined by experiment (see table).

Type	K × A 1) Dry suction gas / refrigerant liquid (normal use in refrigeration plant with fluorinated refrigerants) W / °C
HE 0.5	2.3
HE 1.0	3.1
HE 1.5	4.9
HE 4.0	11.0
HE 8.0	23.0

1) These figures apply to dry gas only. Even if a thermostatic expansion valve is used, the suction gas will carry very small liquid drops into the suction line.
The fins of the HE catch these drops which then evaporate. This may result in a smaller superheat than the theoretically calculated value.

Design
Function

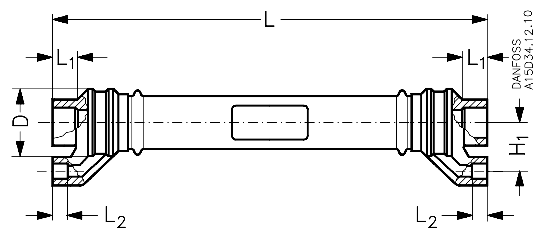


1. Suction line connection
2. Liquid line connection
3. Inner chamber
4. Outer chamber

Offset fin sections are built into the inner chamber (3) and result in turbulent gas flow with minimum flow resistance.
Gas flow is straight through, without changes of direction and without oil pockets.

Refrigerant liquid flows counter to the gas flow, through the small outer chamber (4).
The flow is guided by a built-in wire coil so that maximum heat transfer is achieved.
The hot liquid flowing through the outer chamber normally protects the outer tube from "sweating".

Dimensions and weights



Type	H_1 mm	L mm	L_1 mm	L_2 mm	∅ D mm	Weight kg
HE 0.5	20	178	10	7	27.5	0.3
HE 1.0	25	268	12	9	30.2	0.5
HE 1.5	30	323	14	10	36.2	1.0
HE 4.0	38	373	20	10	48.3	1.5
HE 8.0	48	407	29	10	60.3	2.3

Type	Volume	
	Outer chamber cm^3	Inner chamber cm^3
HE 0.5	8.5	23.0
HE 1.0	25.0	45.0
HE 1.5	40.0	100.0
HE 4.0	80.0	260.0
HE 8.0	175.0	475.0