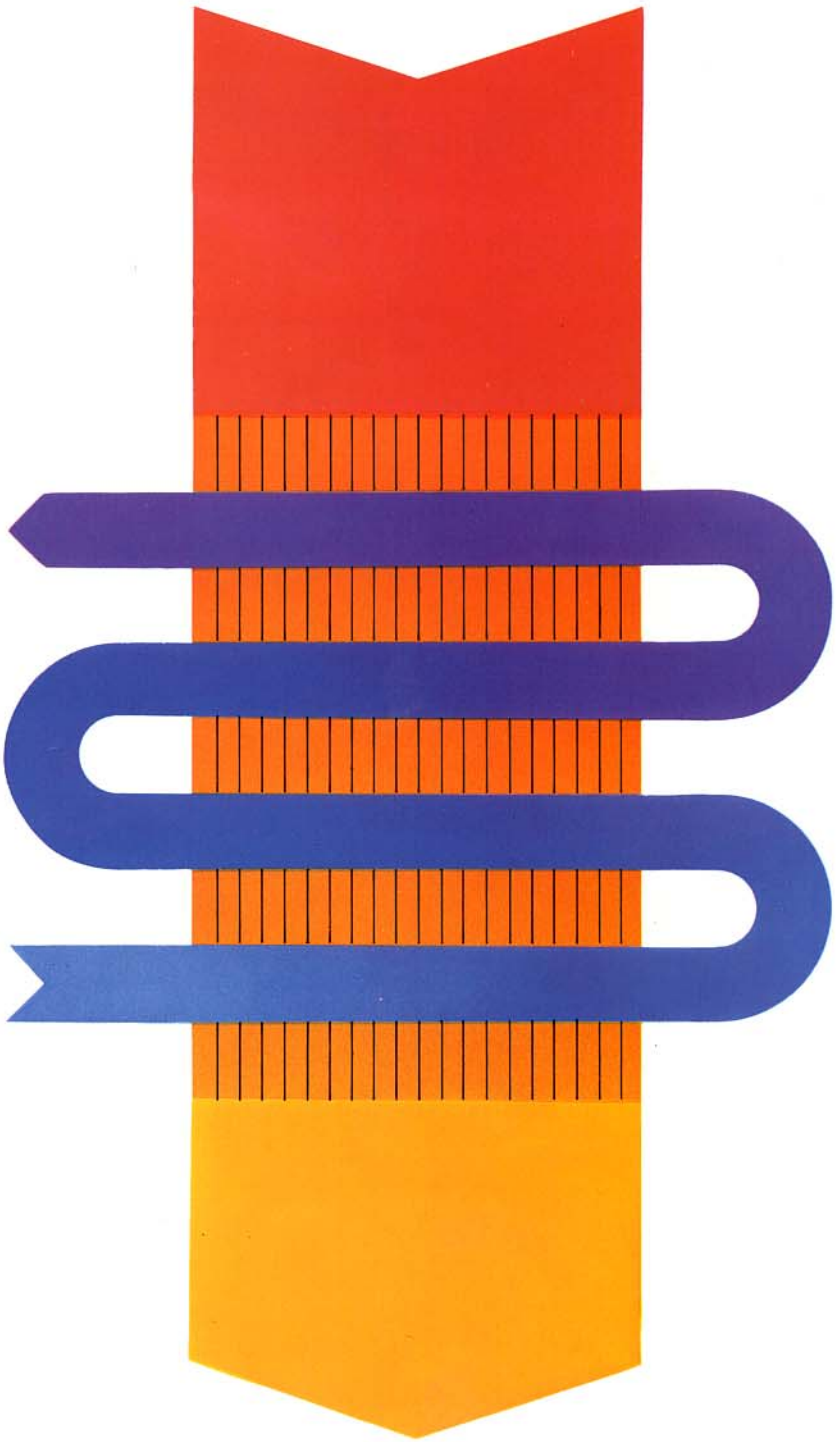
Reflux Cooler

for granular and free flowing
bulk materials



The reflux cooler

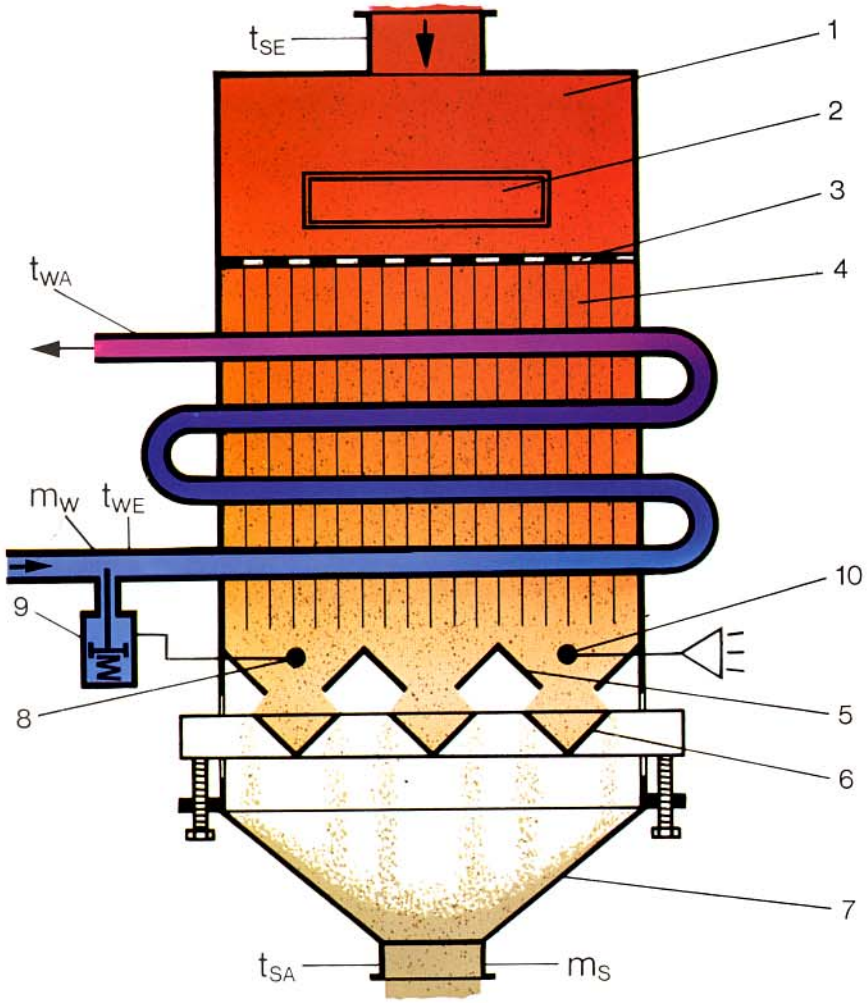
is especially suitable for granular and free flowing bulk materials, as it is a contact cooler. The material to be cooled graining < 1.5 mm slowly flows along the water cooled cooling faces in counter current fashion. Water does not of course come into contact with the bulk material.

The special design of the contact areas between the cooling segments and the cooling spirals ensures that a high degree of heat exchange is achieved. A constant temperature of the cooled bulk material is achieved by automatically controlling the flow of cooling water.

The reflux cooler is compact in design, e.g. 260 m^2 of cooling faces are incorporated in a cooler of 1 m^3. The result is a high cooling capacity in the smallest volume. Furthermore, due to unitised construction, sections can be added to increase cooling capacity. The complete cooling face is used to its optimum advantage, as a corresponding dosage closure device guarantees an equal distribution of the bulk material throughout the cooler.

The reflux cooler can also be used to heat free flowing bulk material.

Completely installed reflux cooler



Operation of the reflux cooler

Single-stage cooling

The material to be cooled runs out of a hopper via a charging box (1) and a sieve (3) into the cooling packet (4). Below the cooling packet there is a stationary part (5) and below it is the adjustable part of the dosage closure (6). This closure (6) is adjusted depending on the required cooling capacity and it ensures that the material will pass through the cooling packet (4) equally distributed over the whole cross section of the cooler and at the prescribed speed. The material passing through is collected in the discharging hopper (7). Between the cooling packet (4) and the dosage closure (5) a thermostat (8) is installed which regulates the temperature of the bulk material via the cooling-water control valve (9). The bimetal couple (10) only reacts if the max. required temperature of the cooled bulk material is exceeded. In this case the cooler outlet is closed and/or an optical or acoustic sign is given.

1. inlet box
2. cleaning flap
3. sieve
4. cooling packet
5. dosage closure
6. dosage closure
7. discharging container
8. temperature tester
9. cooling water control valve
10. bimetal couple.

double-stage cooling

In this case the cooling packet is provided with water by two separate cooling water circuits.

By means of a special circuit of water the peak temperatures of the bulk material are cooled down. The second water circuit with its regulation operates just like the one-stage cooling.

However, an indicating thermometer substitutes the bimetal couple.

Technical data:

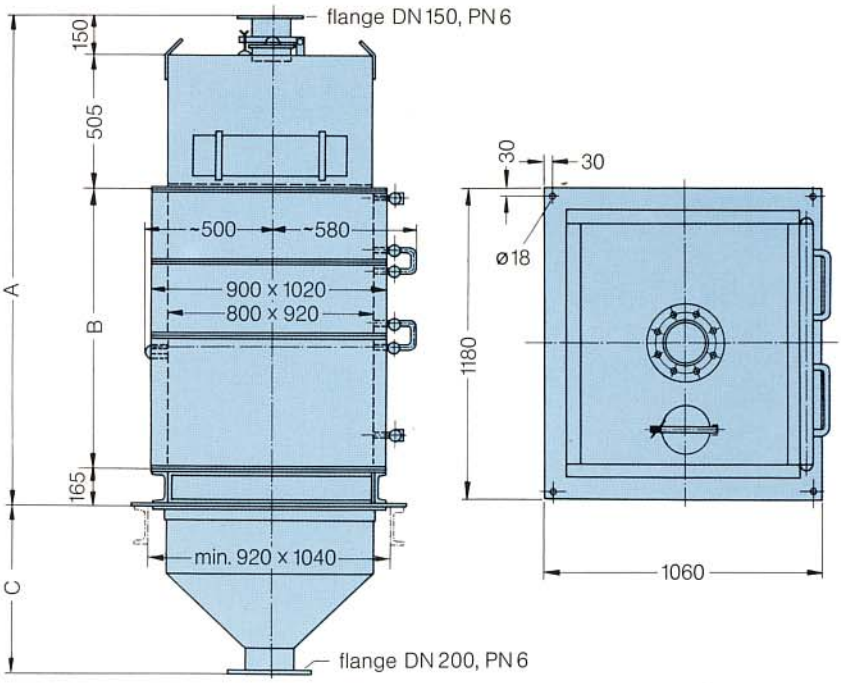
Auto regulating accuracy: ≤ ± 3 K

Temp. of inflowing water:
Normally 10° below the required temp. of the outflowing bulk material

Water pressure: see diagram

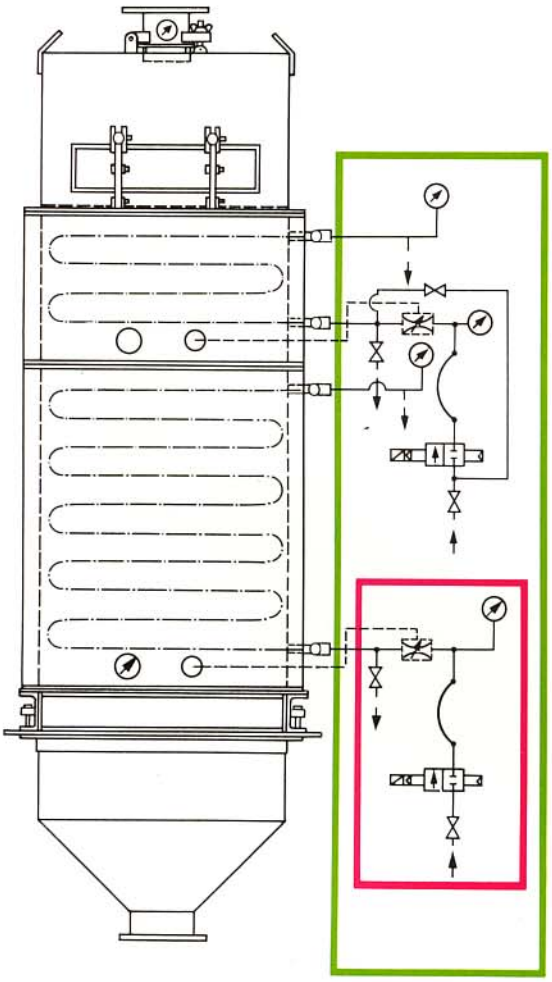
Basis of the cooler:
900 x 1020 mm., height is dependent on the capacity (see table)

type	cooling face [m²]	A [mm]	B [mm]	C [mm] Kü xxx/3	C [mm] Kü xxx/7	weight [kp] Kü xxx/3 empty	Kü xxx/3 filled	Kü xxx/7 empty	Kü xxx/7 filled
Kü 85/x	85	1320	500	703	1233	790	2560	840	3210
Kü 142/x	142	1593	773	703	1233	1020	3050	1070	3700
Kü 199/x	199	1866	1046	703	1233	1250	3540	1300	4190
Kü 256/x	256	2139	1319	703	1233	1480	4030	1530	4680
Kü 341/x	341	2642	1822	703	1233	1830	4880	1880	5530
Kü 398/x	398	2915	2095	703	1233	2060	5370	2110	6020
Kü 455/x	455	3188	2368	703	1233	2290	5860	2340	6510
Kü 540/x	540	3691	2871	703	1233	2640	6710	2690	7360
Kü 597/x	597	3964	3144	703	1233	2870	7200	2920	7850



Reduction of the cooling capacity

The following factors effectively reduce the cooling capacity of the reflux cooler: too little cooling water; too warm cooling water; humid bulk material blocks up the cooling segments; impurities in the bulk material block up the sieve; sediments in the water reduce the transfer of heat.



one stage cooling

double stage cooling

The size of the cooling face

of the reflux cooler is dependent on a number of factors, i.e.

with the bulk material to be cooled

1. on the grain spectrum of the bulk material: the more grains available per unit of weight, i.e., the larger the contact face, the more favourable the transfer of heat;
2. on the specific heat which directly influences the necessary cooling face, e.g., with silica sand it is 0.8 kJ/kg · K
3. on the thermal conductivity of the bulk material to be cooled: the better the T.C. the smaller the necessary cooler face may be;
4. on the temperature of the inflowing bulk material: the higher the termperature the larger the necessary cooling face must be;
5. on the temperature of the outflowing bulk material: the lower the temperature the larger the necessary cooling face;
6. on the bulk material output: the larger the quantity per unit of time, the larger the necessary cooling face;

with the cooling water

7. on the temperature of the inflowing water: the greater the temperature differential of the inflowing water to the bulk material cooled, the smaller the necessary cooling face may be;
8. on the water quantity: the more water available, the smaller the necessary cooling face may be;

with the cooler construction

9. the heat transfer can be considerably influenced and thus the necessary cooling face.

Application of
2 reflux coolers
type KUE 199 below
2 silos for used sand

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