Annular Groove Condensers for Multi-purpose Plants

Works Standard

1. General

This Works Standard takes into account the standardization of different types of condensers (8 sizes), vent condensers (5 sizes) and coolers (4 sizes).

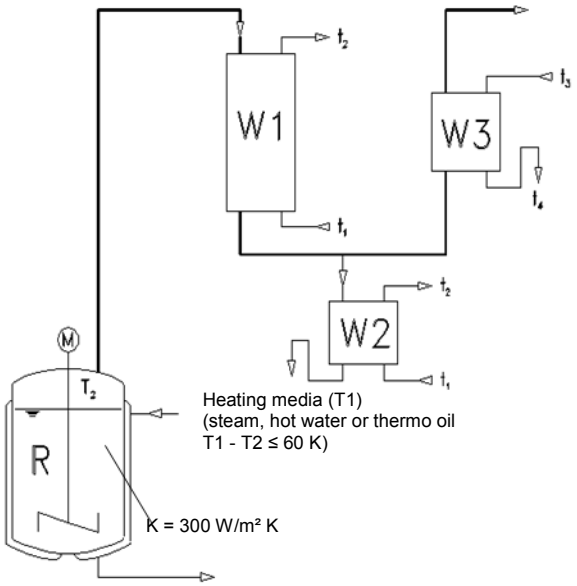
2. Basic data and instructions for use

The heating capacity of the vessel is completely utilized. The main condenser (W1) is for falling condensation, and the vent condenser (W3) is for reflux condensation, but each of them can also be operated horizontally (type H-B-)..

The sub-cooler (W2) is made to be flooded and must be vertically installed. The cooling medium for items W1 and W2 is water, which warms from t_1 = 25°C to t_2 = 35°C *

When other coolants are used (e.g. thermo oils with higher viscosity and/or lower temperature) we will gladly check the design if you provide us with the details.

For the W3 vent condenser we recommend the use of chilled water, brines etc.



Overall heat transfer value (W/m²K)

Item	Condensing of	
	water	organic solvents
W1 main condenser	1300	800
W1 for sub cooling condensate	700	400
W2 sub cooling	900	500
W3 vent condenser	600	350

*) The condensation of media such as Methylene chloride (approx. 40°C) requires very large areas when operating with 25°C cooling water (50 % more compared to Acetone). Other coolants, e.g. chilled water ≤ 10°C, are recommended for low boiling solvents.

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3. Main Condenser, W1

Type	Reactor Area m²	Heat load kW	Required transfer area (m²) at condensing temperature of…. > 100 °C Toluol, Water	> 75 °C Benzene, Ethanol	> 65 °C Methanol	> 55 °C Acetone
AE 63	0.56	10	0.2 1)	0.3 1)	0.37 1)	0.6 1)
AE 100	0.88	16	0.27 1)	0.45 1)	0.59 1)	1.0 1)
AE 160	1.25	23	0.38 1)	0.65 1)	0.85 1)	1.4 2)
AE 250	1.7	31	0.52 1)	0.88 1)	1.14 1)	1.9 2)
AE 400	2.5	45	0.75 1)	1.3 2)	1.7 2)	2.1 2)
AE 630	3.1	56	0.93 1)	1.6 2)	2.1 2)	2.6 3)
AE 1000	4.6	83	1.4 2)	2.4 3)	3.1 3)	3.8 3)
BE 1600	7.3	131	2.2 2)	3.7 3)	4.8 4)	6.1 4)
BE 2500	9.7	175	2.9 3)	5.0 4)	6.4 4)	8.1 5)
BE 4000	13.4	241	4.0 4)	6.8 4)	8.9 5)	11.2 5)
BE 6300	18.1	326	5.4 4)	9.3 5)	12.0 5)	15.1 6)
BE 8000	18.0	324	5.4 4)	9.2 5)	11.9 5)	15.0 6)
BE 10000	20.7	373	6.2 4)	10.6 5)	13.7 6)	17.3 7)
BE 12500	25.2	454	7.6 5)	12.9 6)	16.7 6)	21.0 7)
BE 16000	29.5	531	8.9 5)	15.1 6)	19.5 7)	24.6 8)
BE 20000	34.0	619	10.2 5)	17.4 7)	22.5 8)	28.3 8)

1) GN1-06-9 (1,08 m²)
2) GN3-06-9 (2,3 m²)
3) GN4-06-9 (3,9 m²)
4) NB6-08 (6,4 m²)
5) NB7-10 (11,5 m²)
6) NB7-14 (16,1 m²)
7) NB7-18 (20,7 m²)
8) NB7-26 (29,9 m²)

The transfer area (m²) of the condensers (left) is related to the -1/+3 bar g design pressure.

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4. Sub-cooler, W2

Cooling of condensate to 35 - 40°C, cooling water warming up from 25 to 30°C.
When operating the main condenser vertically as a falling-film condenser, a separate sub cooler is generally not required.

up to reactor type AE 630:	Type RA7.3-02-01/01 (1.0 m²)
up to reactor type AE 1.000 bis 2.500:	Type RA7.1-02-02/02 (2.3 m²)
up to reactor type BE 4.000 bis 8.000:	Type RA7.1-04-05/03 (4.6 m²)
beyond reactor type BE 10.000:	Type RA7.1-06-05/03 (6.9 m²)

5. Vent Condenser, W3

We generally recommend having15 - 20 % of the transfer area of the main condenser for the vent condenser (W1); Therefore we propose:

for main condenser up to 4 m²:	Type GN1-06-9 (1.09 m²)
for main condenser between 4 and 10 m²:	Type GN3-06-9 (2.28 m²)
for main condenser between 10 and 16 m²:	Type GN3-08-9 (2.99 m²)
for main condenser between 16 and 25 m²:	Type GN4-08-9 (5.15 m²)
for main condenser beyond 25 m²:	Type GN5-06-9 (6.91 m²)

A suitable cooling medium must be chosen according to the condensing temperature and partial-pressure as well as the required vent temperature.

6. Graphite Nozzle Connection

All graphite nozzles must be unstressed when fitted and operated, we recommend using PTFE bellows (WS 1070 and 1270). The heat exchangers will be delivered with fitted bellows upon request.

7. Product Information and Data Sheets, General Instructions

For condensers see our product information and data sheets. For installation and operating instructions see our work standards 1501 and 1504, for special applications see the technical Information in our catalogues.

8. Design Data

Pressure	cooling side:	-1/+3 (+6) bar	process side:	-1/+3 bar
Temperature	cooling side:	-30 to +80°C	process side:	-30 to +180°C

Heat exchangers for deviating design data available upon request.