THERMAL SOLUTIONS

Wieland

COAXIAL HEAT EXCHANGERS

WKE, WKC

COAXIAL HEAT EXCHANGERS WKE, WKC

APPLICATIONS

Wieland coaxial heat exchangers are used as evaporators (WKE) or as condensers (WKC). They consist of one or more inner tubes and one outer tube. This tube bundle is coiled in a spiral shape and brazed at the ends with T-fittings.

TYPICAL APPLICATIONS

- Heat pumps for hot water
- Chillers
- Cascade heat exchangers in multistage refrigeration systems
- Temperature control units/climate chambers
- Air conditioning and heating in marine applications

BEST PERFORMANCE WITH OPTIMISED SURFACES

Wieland coaxial heat exchangers, developed at our in-house thermal engineering laboratory, have inner tubes specially optimised for evaporation respectively condensation. This results in a much higher specific performance and a very compact and comparatively lightweight design.

COAXIAL EVAPORATORS WKE

Coaxial evaporators are the preferred choice in applications where water needs to be cooled significantly. At the same time they also offer reliable superheating of the suction vapour, which is facilitated by the counter-flow layout. A low-noise operation is achieved by spacer rings in the jacket tube.

COAXIAL CONDENSERS WKC

Coaxial condensers are normally used in applications which require high water temperatures in conjunction with the use of hot gaseous refrigerant. In counter-flow operation this is achieved with an optimised heat exchange. For a low-noise, non-vibration operation, dents are pressed into the jacket tube. Coaxial condensers offer excellent value for money.

BENEFITS

- HIGH SPECIFIC PERFORMANCE THROUGH OPTIMISED INNER TUBES
- COUNTER FLOW
- FROST-PROOF
- LOW FOULING
- LONG LIFE
- HIGHER SYSTEM PRESSURE THAN 35 BAR ON REQUEST
- REVERSIBLE OPERATION POSSIBLE
- STANDARD HEAT EXCHANGERS AVAILABLE FROM STOCK

INDIVIDUAL ADVICE

We support you from the very early product planning stages in order for you to obtain optimum results for both the installation and your specific application, thus finding a cost-effective solution.

For this, we offer you support in heat transfer engineering and heat exchanger design.

QUALITY ASSURANCE

To ensure consistent product quality, Wieland-Werke AG has a sophisticated quality control system according to DIN EN ISO 9001 which has been verified and certified by an independent certification company. Our test laboratories in the Central Laboratory and Development Services have been accredited to DIN EN ISO/IEC 17025 and DIN EN ISO 9001 as test and certification laboratories.

SOURCES OF SUPPLY

Larger quantities of standard products are available from stock. For minor quantities or special requests, please contact us.

MATERIALS

Component	Material designation	Material No.
Inner tube(s)	Cu-DHP	CW024A
Jacket tube	Cu-DHP	CW024A
T-fittings	Cu-DHP	CW024A

Other copper alloys and materials (e.g. aluminium or titanium) are available on customer request.

PRESSURE EQUIPMENT DIRECTIVE 2014/68/EU

Wieland coaxial heat exchangers meet the requirements of the European Pressure Equipment Directive 2014/68/EU. They are normally classified into the categories laid out in tables 2 and 4 and are manufactured and supplied in accordance with the measures designated for this purpose. Operating conditions which exceed these specifications are subject to special requirements which should be agreed separately for each individual case.

APPLICATION

		WKE (evaporator)		WKC (condenser)	
		Refrigerant (in the tubes)	**Heating medium (inside the coil)**	**Refrigerant (inside the coil)**	**Coolant (in the tubes)**
Max. working pressure	[bar]	35	15	35	15
Working temperature	[°C]	–50 to +150	–50 to +150	–50 to +150	–50 to +150
Media e.g.		R134a, R404A, R407C, R410A, R22, R32, R507 (other refrigerants on request)	Circulating water (e.g. heating water), groundwater*, water with anti-freeze additives (e.g. Antifrogen N®) (other heating media on request)	R134a, R404A, R407C, R410A, R22, R32, R507 (other refrigerants on request)	Hot water, circulating water, (e.g. heating water), groundwater*, swimming pool water** (other cooling media on request)

Table 1 – *Individual case assessment recommended; **Up to approx. 5 mg/l free chlorine

INSTALLATION INFORMATION

Coaxial heat exchangers should preferably be operated in counter-flow operation.

The installation of evaporators WKE preferably allows the refrigerant to enter through the upper connection. If several evaporators of the same size are to be connected in parallel, then it must be ensured that each evaporator is supplied with even pressure both on the refrigerant side and on the heating medium side.

Condensers WKC are installed so that the liquefied refrigerant is free to drain away to the bottom. The hot gaseous refrigerant enters the jacket space at the top, whereas the cooling medium (e.g. water) enters the inner tube(s). Coaxial condensers are also installed standing on the windings (winding axis horizontal). If an application requires several condensers to be connected in parallel, then the tubing should be designed in such a way that each condenser can be supplied with even pressure on both the refrigerant side and the cooling medium side.

The routing of the hot-gas line should be installed avoiding any vibrations. This is normally achieved by installing vibration dampers (compensators). In order to avoid pulsating noises, we recommend installing a sound muffler between the compressor and the condenser. Please follow the manufacturer's instructions when installing these components.

With Wieland coaxial heat exchangers, the following proportions of the refrigerant side volume (taken from table 2 and table 4) should be used as an approximation for the calculation of the refrigerant capacity of the overall system:

- for the coaxial evaporator WKE: 40 %
- for the coaxial condenser WKC: 30 %

PERFORMANCE RATING OVERVIEW

The tables 3 and 5 can be used to pre-select your Wieland coaxial heat exchanger according to the performance of the evaporator/condenser. The specified values are based on our own measurements. They should be used as reference values only and apply under the described nominal conditions which conform as far as possible to the corresponding standards (e.g. EN 1117: Liquid cooled refrigerant condensers – test procedures for establishing the performance).

Operating conditions which vary from these conditions may result in different values.

LEGEND

Q_{c_nom}	[kW]	Condenser performance under nominal conditions
Q_{0_nom}	[kW]	Evaporator performance under nominal conditions
Δt_{sub}	[K]	Subcooling of the refrigerant in the condenser
Δt_{sub_evp}	[K]	Superheating of the suction vapour
Δt_c	[K]	$t_c - t_{w\_in}$ temperature difference in the condenser
Δt_0	[K]	$t_{w\_in} - t_0$ temperature difference in the evaporator
t_0	[°C]	Evaporation temperature of the refrigerant at the evaporator outlet
t_c	[°C]	Condensation temperature of the refrigerant in the condenser
t_{sup}	[°C]	Temperature of the hot gas refrigerant
t_{w_in}	[°C]	Water temperature at the inlet
$\dot{V}$	[m³/h]	Water volume flow
w	[m/s]	Water velocity
x	[–]	Vapour quality at the evaporator inlet
Δp	[mbar]	Pressure drop

DIMENSIONS AND WEIGHTS OF COAXIAL EVAPORATORS WKE

Model	Number of inner tubes	Maximum installation dimensions			Connection dimensions (see drawing)			Other dimensions						Volume [l]		Classification PED 2014/68/EU	Appr. weight
					Heating medium	Refrigerant								Heating medium	Refrigerant		
		A	B	H	d_1*	in d_2*	out d_3*	a	h	l_1	l_2	l_3	D				[kg]
WKE 10 ***	1	330	325	130	16	13	13	290	94	312	65	24	25	0.8	0.4	sound engineering practice	4.1
WKE 16	2	340	390	190	28	22	22	290	140	384	91	41	35.6	1.8	0.9	sound engineering practice	8.1
WKE 24	3	435	465	175	28	18	18	380	122	457	125	102	43	2.4	1.3	Category 1, Module A	11.1
WKE 44	5	605	600	220	35	22	28	530	150	564	123	54	54	4.9	2.9	Category 1, Module A	24.7

Table 2 – All dimensions in mm (unless specified otherwise); *Internal soldering ends; ***For WKE 10 the fitting on the refrigerant side can also be used as external soldering end d4 with Ø 16 mm (e.g. for tube Ø 18 x 1.0 mm).

EVAPORATORS WKE

Example: Refrigerant: R134a; t_0 = 0 °C; x = 20 %; Δt_{sup_evp} = ca. 5 K Heating medium: water; w ≈ 0.5 to 2 m/s

Type	$\dot{V}$	Δp	Q_0 R134a				Q_0 R404A/R507				Q_0 R410A			
Δt_0 [K]			6.0	9.0	12.0	15.0	6.0	9.0	12.0	15.0	6.0	9.0	12.0	15.0
Units	m³/h	mbar	kW	kW	kW	kW	kW	kW	kW	kW	kW	kW	kW	kW
WKE 10	0.4	56	1.5	2.2	3.4	4.2	2.0	2.9	4.5	5.6	1.8	2.7	4.2	5.2
	0.6	108	1.9	2.9	4.4	5.5	2.6	3.9	5.9	7.4	2.4	3.6	5.5	6.9
	0.8	177	2.4	3.6	5.2	6.5	3.2	4.8	7.0	8.8	3.0	4.5	6.5	8.2
	1.0	263	2.9	4.4	6.0	7.5	3.9	5.9	8.0	10.0	3.6	5.5	7.5	9.4
	1.2	364	3.2	4.9	6.8	8.5	4.3	6.5	9.1	11.3	4.0	6.0	8.4	10.6
	1.4	483	3.5	5.2	7.5	9.3	4.6	7.0	10.0	12.5	4.3	6.5	9.3	11.6
	1.6	617	3.7	5.5	8.2	10.2	4.9	7.4	10.9	13.6	4.6	6.9	10.2	12.7
WKE 16	1.0	65	2.5	4.2	6.1	9.0	3.4	5.6	8.2	12.1	3.2	5.3	7.6	11.2
	1.5	126	3.5	5.9	8.5	10.6	4.7	7.9	11.4	14.2	4.4	7.3	10.6	13.2
	2.0	206	4.3	7.1	10.3	12.5	5.8	9.5	13.8	16.7	5.4	8.8	12.9	15.6
	2.5	306	4.9	8.5	11.8	13.8	6.6	11.3	15.8	18.4	6.1	10.6	14.7	17.2
	3.0	424	5.5	9.2	12.8	15.3	7.3	12.4	17.1	20.5	6.8	11.5	15.9	19.1
	3.5	562	5.6	9.5	13.4	16.7	7.5	12.8	17.9	22.4	7.0	11.9	16.7	20.8
WKE 24	1.5	58	3.7	6.9	9.4	13.2	4.9	9.2	12.6	17.6	4.6	8.5	11.7	16.4
	2.0	95	4.3	7.9	11.1	15.4	5.8	10.6	14.8	20.6	5.4	9.9	13.8	19.2
	2.5	141	5.0	9.0	12.6	17.6	6.7	12.1	16.9	23.6	6.2	11.2	15.7	22.0
	3.0	195	5.5	9.9	14.2	19.3	7.4	13.3	19.0	25.8	6.9	12.4	17.7	24.0
	3.5	258	6.2	10.9	15.6	20.8	8.2	14.5	20.9	27.8	7.7	13.5	19.5	25.9
	4.0	330	6.5	11.6	17.0	22.5	8.8	15.6	22.8	30.1	8.2	14.5	21.2	28.0
	4.5	410	6.9	12.2	18.3	23.4	9.3	16.4	24.5	31.3	8.6	15.3	22.8	29.2
WKE 44	2.0	58	6.2	13.1	16.5	19.9	8.2	17.5	22.0	26.6	7.7	16.3	20.5	24.8
	3.0	120	8.4	15.8	20.8	27.0	11.2	21.1	27.8	36.1	10.5	19.7	25.9	33.6
	4.0	205	10.3	17.7	24.6	32.1	13.8	23.7	33.0	43.0	12.9	22.1	30.7	40.0
	5.0	311	12.0	20.0	28.0	36.6	16.1	26.8	37.5	48.9	15.0	25.0	34.9	45.6
	6.0	440	13.4	21.9	31.0	41.1	17.9	29.3	41.4	55.0	16.7	27.3	38.6	51.3
	7.0	590	14.6	23.3	33.6	43.6	19.5	31.1	44.9	58.3	18.1	29.0	41.9	54.3

Table 3 – Pressure drop data atT_{w_in}=20 °C; performance data at t_0 = 0 °C

DIMENSIONS AND WEIGHTS OF COAXIAL CONDENSERS WKC

Model	Number of inner tubes	Maximum installation dimensions			Connection dimensions (see drawing)			Other dimensions						Volume [l]		Classification PED 2014/68/EU	Appr. weight
					Coolant		Refrigerant							Coolant	Refrigerant		
		A	B	H	d_2* and d_3*	d_4**	d_1*	a	h	l_1	l_2	l_3	D				[kg]
WKC 10	1	225	270	135	12.7	15.9	16	190	98	262	55	26	25	0.3	0.6	sound engineering practice	3.5
WKC 15	1	230	290	235	16	19	18	190	196	282	71	28	28	0.8	1.0	sound engineering practice	7.5
WKC 20	1	350	360	220	21.7	25.5	22	300	172	350	77	36	35.6	1.75	1.8	Category 1, Module A	10.5
WKC 45	4	520	530	225	28	31.9	35	445	152	522	142	76	54	2.9	3.7	Category 1, Module A	21.0

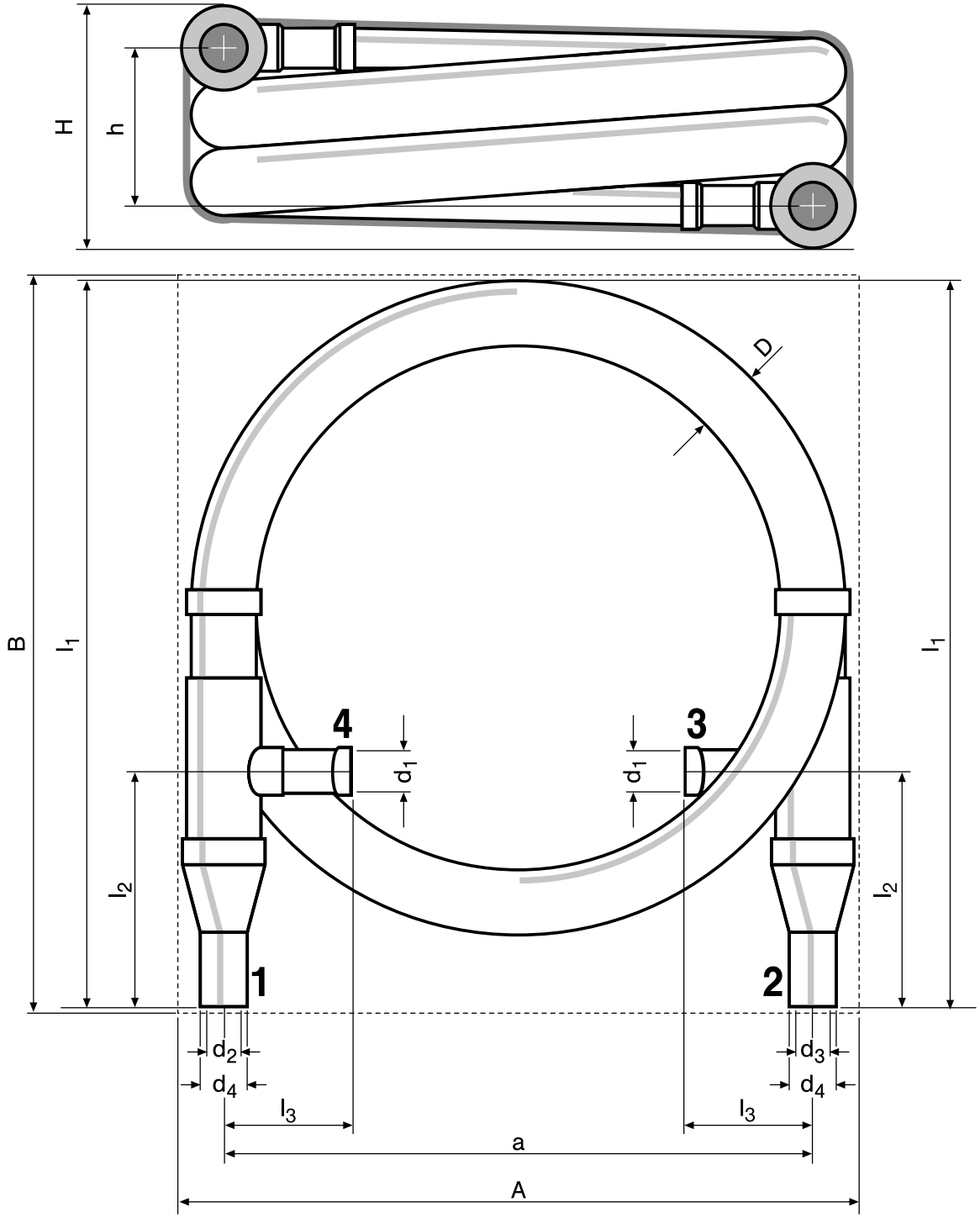
Table 4 – All dimensions in mm (unless specified otherwise); *Internal soldering ends; **External soldering ends

CONDENSERS WKC

Example: Refrigerant: R134a; t_c = 45 °C; t_{sup} = ca. 65 °C; Δt_{sub} = 4 K Coolant: water; w ≈ 0.5 bis 2 m/s

Type	$\dot{V}$	Δp	Q_c R134a				Q_c R404A/R507				Q_c R410A			
Δt_c [K]			7.0	10.0	15.0	20.0	7.0	10.0	15.0	20.0	7.0	10.0	15.0	20.0
Units	m³/h	mbar	kW	kW	kW	kW	kW	kW	kW	kW	kW	kW	kW	kW
WKC 10	0.2	30	1.5	2.2	3.3	4.4	1.8	2.5	3.7	5.0	1.8	2.5	3.7	5.0
	0.4	91	2.2	3.1	4.6	6.2	2.5	3.5	5.2	7.0	2.5	3.5	5.2	7.0
	0.6	185	2.7	4.0	5.9	7.9	3.1	4.5	6.7	9.0	3.1	4.5	6.7	9.0
	0.8	311	3.3	4.8	7.2	9.7	3.8	5.5	8.2	11.0	3.8	5.5	8.2	11.0
	1.0	469	4.0	5.6	8.4	11.3	4.5	6.4	9.6	12.8	4.5	6.4	9.6	12.8
WKC 15	0.3	33	2.5	3.5	5.3	7.0	2.8	4.0	6.0	8.0	2.8	4.0	6.0	8.0
	0.4	51	3.1	4.4	6.6	8.8	3.5	5.0	7.5	10.0	3.5	5.0	7.5	10.0
	0.8	159	5.4	7.7	11.5	15.3	6.1	8.7	13.1	17.4	6.1	8.7	13.1	17.4
	1.2	323	7.3	10.4	15.6	20.8	8.3	11.8	17.7	23.6	8.3	11.8	17.7	23.6
	1.6	543	8.6	12.3	18.5	24.6	9.8	14.0	21.0	28.0	9.8	14.0	21.0	28.0
WKC 20	0.7	36	4.6	6.6	9.9	13.2	5.3	7.5	11.3	15.0	5.3	7.5	11.3	15.0
	1.0	63	6.2	8.8	13.2	17.6	7.0	10.0	15.0	20.0	7.0	10.0	15.0	20.0
	1.5	123	8.6	12.3	18.5	24.6	9.8	14.0	21.0	28.0	9.8	14.0	21.0	28.0
	2.0	201	11.1	15.8	23.8	31.7	12.6	18.0	27.0	36.0	12.6	18.0	27.0	36.0
	2.7	343	13.4	19.2	28.8	38.4	15.3	21.8	32.7	43.6	15.3	21.8	32.7	43.6
WKC 45	1.4	32	9.2	13.6	20.7	27.3	10.5	15.5	23.5	31.0	10.5	15.5	23.5	31.0
	2.0	60	12.8	18.9	28.2	37.8	14.5	21.5	32.0	43.0	14.5	21.5	32.0	43.0
	3.0	125	17.6	26.4	40.5	52.8	20.0	30.0	46.0	60.0	20.0	30.0	46.0	60.0
	4.0	213	22.0	33.4	50.2	66.9	25.0	38.0	57.0	76.0	25.0	38.0	57.0	76.0
	5.0	324	25.5	39.6	59.0	79.2	29.0	45.0	67.0	90.0	29.0	45.0	67.0	90.0
	5.4	375	27.3	41.4	61.6	82.7	31.0	47.0	70.0	94.0	31.0	47.0	70.0	94.0

Table 5 – Pressure drop data at T_{w_in} = 20 °C; performance data at t_c = 45 °C



Evaporators WKE

1 Refrigerant inlet
2 Refrigerant outlet
3 Heating medium inlet
4 Heating medium outlet

Condensers WKC

1 Coolant outlet (e.g. heating water)
2 Coolant inlet (e.g. heating water)
3 Refrigerant outlet
4 Refrigerant inlet

INNOVATIVE SPIRIT. OUTSTANDING RESULTS.

For further information please contact

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