

LOK Tube Coil Heat Exchanger

Finned tube coils and meanders

Heat exchanger for industrial applications for the temperature control of oil and other process liquids and gases



- Resistant to major temperature amplitudes
- Resistant to high temperatures
- Easy installation and maintenance
- Low cooling water consumption
- Standard construction forms deliverable ex stock at short notice
- Special construction forms according to customer specifications

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SCHMÖLE

we change energy

Schmöle GmbH

The Company

- More than 160 years of experience
- Outstanding quality
- 3 different finning processes
- 16 finning machines
- Different coiling and bending processes
- R & D partnership for your projects
- Highly skilled craftsmen
- Robust financial status and strong owners

The Product Range

Finned tubes and heat exchanger

- Rolled finned tubes
- Laser welded finned tubes
- Soldered finned tubes
- Corrugated tubes
- Finned coil
- Finned coil with fittings
- Coaxial heat exchanger
- Heat exchanger up to 150 kW
- Special constructions

Tube systems and surface heat exchanger

- Tubes with different dimensions and profiles
- Tube register
- Tube register with connecting elements
- Tube register on carrier
- Module with additional options
- Module with insulation
- Space solutions

Certification of Quality Management Systems

Our company is certified by independent bodies to the quality standards ISO 9001:2008 and PED 97/23/EC. Due to consistent quality awareness, we have gained a worldwide reputation as a reliable supplier.



SCHMÖLE

we change energy

Highest efficiency
meets effectiveness.

The advantages of the finned tube coil design for operation and maintenance:

Resistant to high temperatures

Deployable with great temperature amplitudes

Low cooling water consumption – Easy to assemble



LOK tube coil heat exchanger Finned tube coils and meanders

with Trufin or Laserfin[®] finned tubes

Application areas

Finned tube coil heat exchangers by Schmöle are, among other things, suitable for cooling and heating oil, emulsion, and water from closed circuits.

LOK and finned tube coil heat exchangers made according to customer specifications are particularly used in the following systems:

- Plastic injection molding machines
- Plastic extruder systems
- Hydraulic systems, compactors
- Machine tools
- Clutches and transmissions
- Compressors and pumps
- Tempering units
- Waste heat utilization

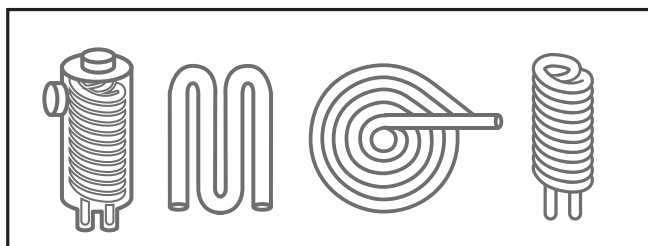
Materials

With its technical equipment and expertise, Schmöle is skilled in processing all metallic materials.

Aside from the materials aluminum, copper, and copper alloys, Schmöle also manufactures heat exchangers from corrosion-resistant materials such as stainless steel, nickel-base alloys, and titanium. These are used in cases of increased corrosion stress caused by the use of process liquids such as surface water, seawater, and water from closed circuits.

Types of construction

Schmöle's industrial heat exchangers are divided into two construction forms - with and without shell.



Heat exchangers with shell (LOK)

The LOK standard design types S, M, T are assembled from prefabricated components and can be delivered at short notice.

Schmöle manufactures LOK special design types with specific requirements due to operating conditions (temperature and pressure) as well as assembly space and assembly for its customers in economical batch sizes.

Heat exchanger without shell

Schmöle finds solutions for customers that are tailored to the available assembly space and the operating conditions of the machines and plants to be tempered. Depending on demand, Schmöle constructs finned tube heat exchangers in the form of meanders, spirals, or complex multi-dimensional.

Customer-Specific Finned Tube Heat Exchanger



Possible design types

- Tube coils
- Spirals
- Meanders
- Freely selectable geometric shapes

Processing procedure

- Finning
- Bending
- Coiling
- Soldering
- Welding

Together with the customers, Schmöle develops custom solutions for the heat transfer between media such as operating liquids, products, or gaseous substance flows and the accompanying liquid or gaseous cooling or heating media.

Schmöle takes advantage of its high-performance finned tubes to increase the transferable heat output, to adapt the geometric shapes on the available construction space, and to improve the availability and durability of the heat exchanger.

Examples of this include:

- Tempering coolants and oil in machine tools
- Heat exchangers for compressors
- Tempering of dielectric eroding liquids
- Oil cooling in gearboxes for automobile manufacture

Adapting the heat exchanger to the available construction space

Integrating heat exchangers for oils, cooling water, or other operating liquids into shells or containers is often made difficult by the limited available construction space. Together with the customers and taking into account the media to be tempered, Schmöle develops geometrically optimized heat exchangers.

Transferable heat output

To optimize the heat transfers, customers can select suitable high-performance tubes ranging from low- to high-finned tubes from Schmöle's finned tube coil portfolio, depending on the respective applications

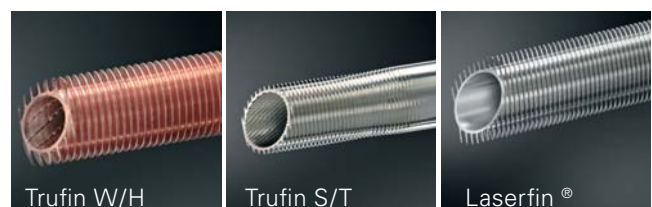
with natural or forced convection, condensation, or evaporation.

Availability and service life

To increase availability and fulfil higher security requirements, finned tube coil heat exchangers can also be manufactured with double-walled safety tubes. The high weld integrity of the tube connection ensures good heat conduction in the tube wall. Furthermore, the safety heat exchangers are suitable to be equipped with leak displays.

The right choice of materials is crucial for the durability of the heat exchangers. Among other things, Schmöle processes:

- Copper
- Cupronickel
- Aluminum
- Steel
- Stainless steel



LOK Tube Coil Heat Exchanger



Standard tube coils

The finned tube coils made of Cu-DHP can be electroplated on the outside upon request.

The LOK tube coil heat exchangers are characterized by a resistance to high temperatures, their usability in large temperature amplitudes, and their low consumption of cooling water. Together with the LOK heat exchanger's easy assembly, these qualities make it stand out from traditional oil coolers.

Resistance to high temperatures and usability with great temperature amplitudes

Thanks to the tube coil design, the spiral can freely expand in case of temperature stress. Thermally induced tensions are thereby avoided.

Due to the selection of suitable seals and tube materials such as cupronickel alloys and stainless steels, the temperature range can be even further increased.

Low consumption of cooling water

LOK tube coil heat exchangers are manufactured with the high-performance finned tubes Trufin W/HT Turbo-Chil in single to triple versions. In combination with a low coolant requirement, this results in large surfaces on the shell side.

The spiral-shaped inside ridges of the Trufin W/HT tubes optimize the internal transfer of heat to the coolant.

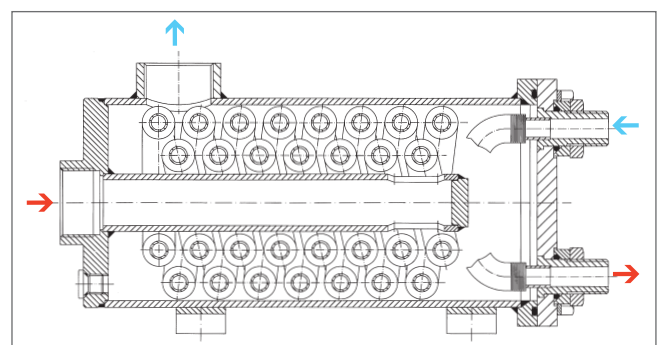
Easy assembly

The finned tube coil heat exchanger is fitted and sealed with O-rings in the cover flange. This is screwed into the shell flange, and sealing also takes place with an O-ring. In the T design type, the cover flange is firmly welded with the steel shell. The finned tube coil is inserted into the shell from the back, fitted into the cover flange, and sealed with O-rings.

Maintenance work and cleaning is easy and effective thanks to the option of dismantling the LOK tube coil heat exchanger.

Operating condition	Permitted application area	
	Shell space	Tube space
Pressure	≤ 16 bar (S+M) $\leq 7,5$ bar (T)	≤ 16 bar
Temperature	Cu ≤ 150 °C CuNi ≤ 300 °C Stainlesst.* ≤ 400 °C	≤ 90 °C

*Special construction forms



LOK tube coil heat exchanger from the design types S, M, and T

For a power range up to about 111 kW,
we deliver LOK coil heat exchangers serially in three different ranges:



Design type S

**Standard version with a shell connection
for the oil outlet and fixing consoles**



Design type M

**Heat exchanger with two
shell connections for the oil inlet and oil outlet**

Upon request, fixing straps like those depicted
can be ordered as accessories
(2 per heat exchanger).



Design type T

**Heat exchanger with an open construction,
suitable for tank installation**

For special applications, LOK tube coil heat
exchangers from design type T can be supplied
with a flat seal.

The shell is delivered with the following primer: Color grey - RAL 7035.

Materials

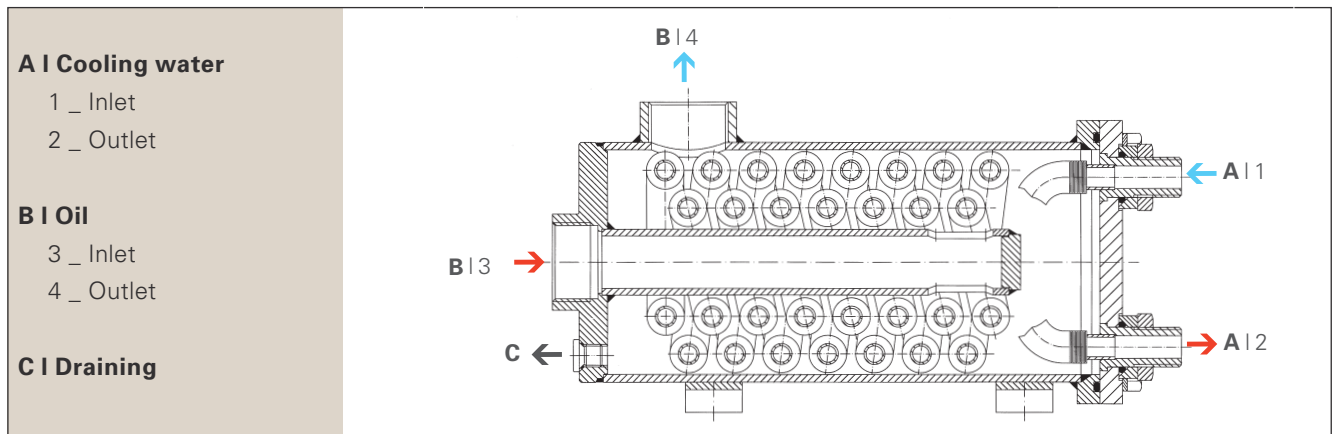
The following materials are used for the standard versions of the copper or cupronickel LOK heat exchangers

Components	Copper version		Cupronickel version	
	Material	Norm	Material	Norm
Shell	P235 GH	AD-2000 W4	P235 GH	AD-2000 W4
Cover flange	S235 JRG2	AD-2000 W1	S235 JRG2	AD-2000 W1
Finned tube coil	Cu-DHP	DIN EN 12451	CuNi10Fe1Mn	DIN EN 12451
Shell connections	P235 TR2	DIN EN 10216-1	P235 TR2	DIN EN 10216-1
Tube connections	CuZn39Pb3	DIN EN 12163	CuNi10Fe1Mn	DIN EN 12163
O-ring seals	FPM 70	DIN ISO 3601	FPM 70	DIN ISO 3601

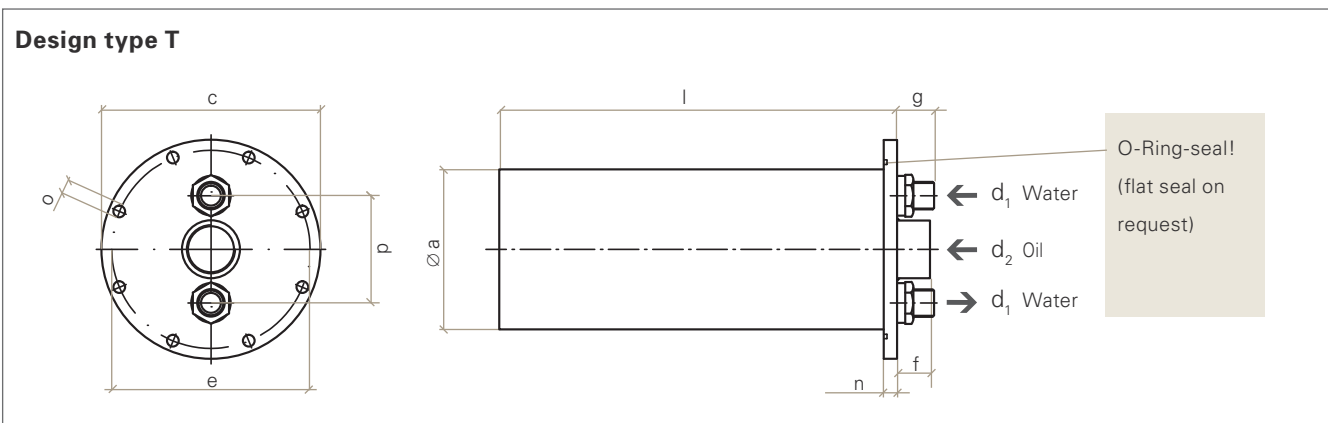
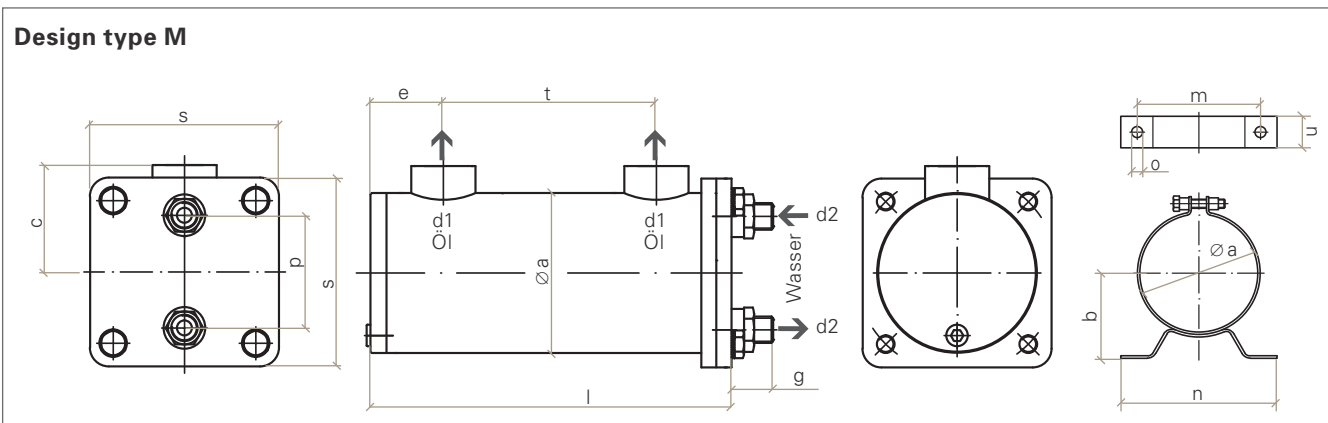
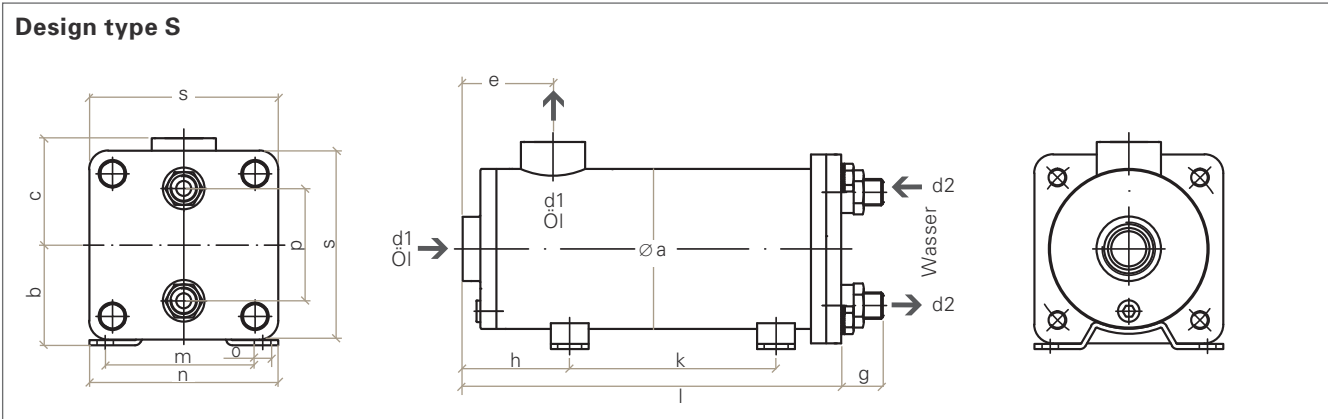
The following materials are used for the individual design types and sizes of the finned tube coil:

LOK tube coil heat exchanger	Sizes	Materials	
Design type S	all	Cu-DHP	CuNi10Fe1Mn
Design type M	all	Cu-DHP	CuNi10Fe1Mn
Design type T	up to T 9-03.23-1	Cu-DHP	CuNi10Fe1Mn
Design type T	from T 9-03.31	–	CuNi10Fe1Mn

Depiction of a design type S LOK coil heat exchanger



Dimensions and nominal capacities



Coding* of the LOK tube coil heat exchangers:

Example	LOK	S	9-01.	14-	2	Cu
Type						
Design type						
Series						
Shell size						
Size of the finned tube coil						
Number of tubes coiled in parallel						
Finned tube coil material						

The nominal capacities refer to the following operating conditions:

- Medium oil temperature $\vartheta_{om} = 45 \text{ }^\circ\text{C}$
- Kinematic oil viscosity $\nu_o = 40 \cdot 10^{-6} \text{ m}^2/\text{s}$
- Oil velocity $V_o = 1 \text{ m/s}$
- Medium cooling water temperature $\vartheta_{wm} = 20 \text{ }^\circ\text{C}$
- Cooling water velocity $V_w = 2 \text{ m/s}$

*When making inquiries or placing orders, please indicate the complete order number (coding), i.e. including the abbreviations for the materials of the finned tube coil: Copper = Cu; Cupronickel = CuNi

Dimensions and nominal capacities

Design type S LOK tube coil heat exchanger

Heat exchanger Type LOK	Nominal capacity Q [kW]	Throughput		Dimensions														Approx. weight G _{ges} [kg]
		Oil V _o [l/min]	Water V _w [l/h]	b	c	d ₁	d ₂	e	g	h	k	l	m	n	o	p	s	
		[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	

Shell outer diameter a = 70 mm

S 9-00.11-1	3,1	70	350	45	55	G 3/4	G 3/8	64	30	102	140	290	75	100	11	40	85	4,0
S 9-00.12-1	5,9	70	350	45	55	G 3/4	G 3/8	64	30	102	240	420	75	100	11	40	85	5,5
S 9-00.13-1	7,4	70	350	45	55	G 3/4	G 3/8	64	30	102	450	680	75	100	11	40	85	6,5
S 9-00.14-1	10,9	70	350	45	55	G 3/4	G 3/8	64	30	102	450	680	75	100	11	40	85	8,0

Shell outer diameter a = 108 mm

S 9-01.13-2	8,0	180	700	70	77	G 1	G 1/2	66	31	84	325	479	110	140	13	70	130	9,0
S 9-01.14-1	11,8	180	350	70	77	G 1	G 1/2	66	31	84	325	479	110	140	13	70	130	10,0
S 9-01.14-2	11,8	180	700	70	77	G 1	G 1/2	66	31	84	325	479	110	140	13	70	130	10,0
S 9-01.21-2	16,0	180	700	70	77	G 1	G 1/2	66	31	84	325	479	110	140	13	70	130	12,0
S 9-01.23-2	28,4	180	700	70	77	G 1	G 1/2	66	31	84	550	699	110	140	13	70	130	16,5

Shell outer diameter a = 127 mm

S 9-02.22-1	19,3	220	630	80	85	G 1 1/4	G 1/2	72	31	85	400	539	125	150	13	90	150	15,5
S 9-02.22-2	19,4	220	1250	80	85	G 1 1/4	G 1/2	72	31	85	400	539	125	150	13	90	150	15,5
S 9-02.23-2	24,6	220	1250	80	85	G 1 1/4	G 1/2	72	31	85	400	539	125	150	13	90	150	17,5
S 9-02.32-2	41,2	220	1250	80	85	G 1 1/4	G 1/2	72	31	85	600	789	125	150	13	90	150	25,0

Shell outer diameter a = 152,4 mm

S 9-03.31-1	29,9	290	890	95	97	G 1 1/4	G 3/4	80	39	131	450	661	140	170	13	110	180	27,0
S 9-03.31-2	29,4	290	1770	95	97	G 1 1/4	G 3/4	80	39	131	450	661	140	170	13	110	180	27,0
S 9-03.32-2	35,8	290	1770	95	97	G 1 1/4	G 3/4	80	39	131	450	661	140	170	13	110	180	30,0
S 9-03.42-2	60,3	290	1770	95	97	G 1 1/4	G 3/4	80	39	160	650	961	140	170	13	110	180	42,0

Shell outer diameter a = 193,7 mm

S 9-04.41-1	41,9	370	1530	130	125	G 1 1/2	G1	92	45	155	450	775	180	210	13	130	230	48,0
S 9-04.41-2	42,6	370	3060	130	125	G 1 1/2	G1	92	45	155	450	775	180	210	13	130	230	48,0
S 9-04.42-3	56,6	370	4590	130	125	G 1 1/2	G1	92	45	155	450	775	180	210	13	130	230	54,0
S 9-04.51-3	72,3	370	4590	130	131	G 2	G1	100	45	194	650	1045	180	210	13	130	230	64,0
S 9-04.52-3	83,7	370	4590	130	131	G 2	G1	100	45	194	650	1045	180	210	13	130	230	68,0
S 9-04.53-3	111,3	370	4590	130	131	G 2	G1	100	45	300	750	1305	180	210	13	130	230	83,0

Dimensions and nominal capacities

Design type M LOK tube coil heat exchanger

Heat exchanger Type LOK	Nominal capacity \dot{Q} [kW]	Throughput		Dimensions														Approx. weight G_{ges} [kg]
		Oil \dot{V}_o [l/min]	Water \dot{V}_w [l/h]	b	c	d ₁	d ₂	e	g	l	m	n	o	p	s	t	u	
		[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	

Shell outer diameter a = 70 mm

M 9-00.12-1	5,9	70	350	46	55	G 3/4	G 3/8	39	30	415	68	90	8,5	40	85	312	20	5,5
M 9-00.14-1	10,9	70	350	46	55	G 3/4	G 3/8	39	30	675	68	90	8,5	40	85	562	20	8,0

Shell outer diameter a = 108 mm

M 9-01.13-2	8,0	180	700	67	77	G 1	G 1/2	65	31	455	110	128	8,5	70	130	312	25	9,0
M 9-01.14-1	11,8	180	350	67	77	G 1	G 1/2	65	31	455	110	128	8,5	70	130	312	25	10,0
M 9-01.14-2	11,8	180	700	67	77	G 1	G 1/2	65	31	455	110	128	8,5	70	130	312	25	10,0
M 9-01.21-2	16,0	180	700	67	77	G 1	G 1/2	65	31	455	110	128	8,5	70	130	312	25	12,0
M 9-01.22-2	22,2	180	700	67	77	G 1	G 1/2	39	31	680	110	128	8,5	70	130	562	25	15,5
M 9-01.23-2	28,4	180	700	67	77	G 1	G 1/2	39	31	680	110	128	8,5	70	130	562	25	16,5

Shell outer diameter a = 127 mm

M 9-02.22-2	19,4	220	1250	78	89	G 1 1/2	G 1/2	55	31	685	118	140	11	90	150	536	30	18,0
M 9-02.31-2	32,9	220	1250	78	89	G 1 1/2	G 1/2	55	31	685	118	140	11	90	150	536	30	21,6

Shell outer diameter a = 152,4 mm

M 9-03.31-2	29,4	290	1770	95	92	G 1 1/2	G 3/4	53	39	976	140	170	13	110	180	847	30	33,8
M 9-03.41-2	46,3	290	1770	95	92	G 1 1/2	G 3/4	53	39	976	140	170	13	110	180	847	30	38,7
M 9-03.42-2	60,3	290	1770	95	92	G 1 1/2	G 3/4	53	39	976	140	170	13	110	180	847	30	42,8

Shell outer diameter a = 193,7 mm

M 9-04.51-3	72,3	370	4590	130	131	G2	G1	60	45	1292	180	220	13	130	230	1110	30	70,0
M 9-04.52-3	83,7	370	4590	130	131	G2	G1	60	45	1292	180	220	13	130	230	1110	30	74,0
M 9-04.53-3	111,3	370	4590	130	131	G2	G1	60	45	1292	180	220	13	130	230	1110	30	83,0

Dimensions and nominal capacities

Design type T LOK tube coil heat exchanger

Heat exchanger Type LOK	Nominal capacity \dot{Q} [kW]	Throughput		Dimensions										Approx. weight G_{ges} [kg]
		Oil \dot{V}_o [l/min]	Water \dot{V}_w [l/h]	c	d ₁	d ₂	e	f	g	l	n	o	p	

Shell outer diameter a = 108 mm

T 9-01.12-1	5,4	180	350	160	G 3/4	G 1/2	140	30	33	150	10	9	70	5,5
T 9-01.13-1	8,7	180	350	160	G 3/4	G 1/2	140	30	33	210	10	9	70	6,0
T 9-01.14-1	11,8	180	350	160	G 3/4	G 1/2	140	30	33	260	10	9	70	7,0
T 9-01.14-2	11,8	180	700	160	G 3/4	G 1/2	140	30	33	350	10	9	70	7,5
T 9-01.21-2	16,0	180	700	160	G 3/4	G 1/2	140	30	33	430	10	9	70	10,0
T 9-01.22-2	22,2	180	700	160	G 3/4	G 1/2	140	30	33	540	10	9	70	12,0
T 9-01.23-2	28,4	180	700	160	G 3/4	G 1/2	140	30	33	650	10	9	70	13,0

Shell outer diameter a = 127 mm

T 9-02.21-1	13,8	220	630	190	G 1	G 1/2	170	26	33	290	10	9	90	10,0
T 9-02.22-1	19,3	220	630	190	G 1	G 1/2	170	26	33	390	10	9	90	13,5
T 9-02.22-2	19,4	220	1250	190	G 1	G 1/2	170	26	33	390	10	9	90	13,5
T 9-02.23-2	24,6	220	1250	190	G 1	G 1/2	170	26	33	480	10	9	90	16,0
T 9-02.31-2	32,6	220	1250	190	G 1	G 1/2	170	26	33	610	10	9	90	20,0

Shell outer diameter a = 152,4 mm

T 9-03.23-1	22,9	290	890	235	G 1 1/2	G 3/4	210	24	40	380	12	9	110	18,5
T 9-03.31-1*	29,9	290	890	235	G 1 1/2	G 3/4	210	24	40	480	12	9	110	22,0
T 9-03.31-2*	29,4	290	1770	235	G 1 1/2	G 3/4	210	24	40	520	12	9	110	22,5
T 9-03.32-2*	35,8	290	1770	235	G 1 1/2	G 3/4	210	24	40	610	12	9	110	25,5
T 9-03.41-2*	46,3	290	1770	235	G 1 1/2	G 3/4	210	24	40	750	12	9	110	32,5
T 9-03.42-2*	60,3	290	1770	235	G 1 1/2	G 3/4	210	24	40	920	12	9	110	39,0

Shell outer diameter a = 193,7 mm

T 9-04.42-3*	56,6	370	4590	265	G 2	G 1	240	40	45	735	16	14	130	44,5
T 9-04.51-3*	72,3	370	4590	265	G 2	G 1	240	40	45	835	16	14	130	50,0
T 9-04.52-3*	83,7	370	4590	265	G 2	G 1	240	40	45	1005	16	14	130	66,0

*These heat exchangers are only supplied with cupronickel finned tube coils



Inspections and Testing

In order to verify the quality of our finned tubes, the following inspection and test methods are used:

Non-destructive Testing

- Eddy current test acc. to DKI¹⁾ 801
ASTM B 359 / ASME SB 359
ASTM E 309 / ASME SE 309
ASTM E 426 / ASME SE 426
- Pneumatic pressure test under water
- Hydraulic pressure test

Destructive Testing

The following mechanical and structural properties are determined:

- Tensile strength
- Yield strength
- Elongation
- Grain size

¹⁾DKI = German Copper Institute, Düsseldorf



The Company

Schmöle GmbH is considered to be one of the leading manufacturers in the fields of finned tubes and heat exchangers.

Our clients expect both our involvement in solving their application-specific problems as well as a constantly being improved products and processes.

With 160 years of experience and a continued commitment to intensive research and development and modern manufacturing procedures, supported by a certified quality system, we shall continue to meet these challenges.

Schmöle GmbH has two product divisions:

Product Division 1: Finned tubes
Heat exchangers

Product Division 2: Ceiling cooling batteries
Surface heat exchanger

Quality Management

Manufacturing at Schmöle is accompanied by tests laid down in a Quality Assurance plan which is established for the individual product, containing all operations and examinations.

Schmöle, since 1993, is known for a certified Quality Management System according to DIN EN ISO 9001 as well as approval according to PED 97/23/EC.

By consistent development of the Quality Management System, Schmöle is familiar to its customers as a reliable business partners and manufacturer of high quality products.

We are happy to advise you.

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