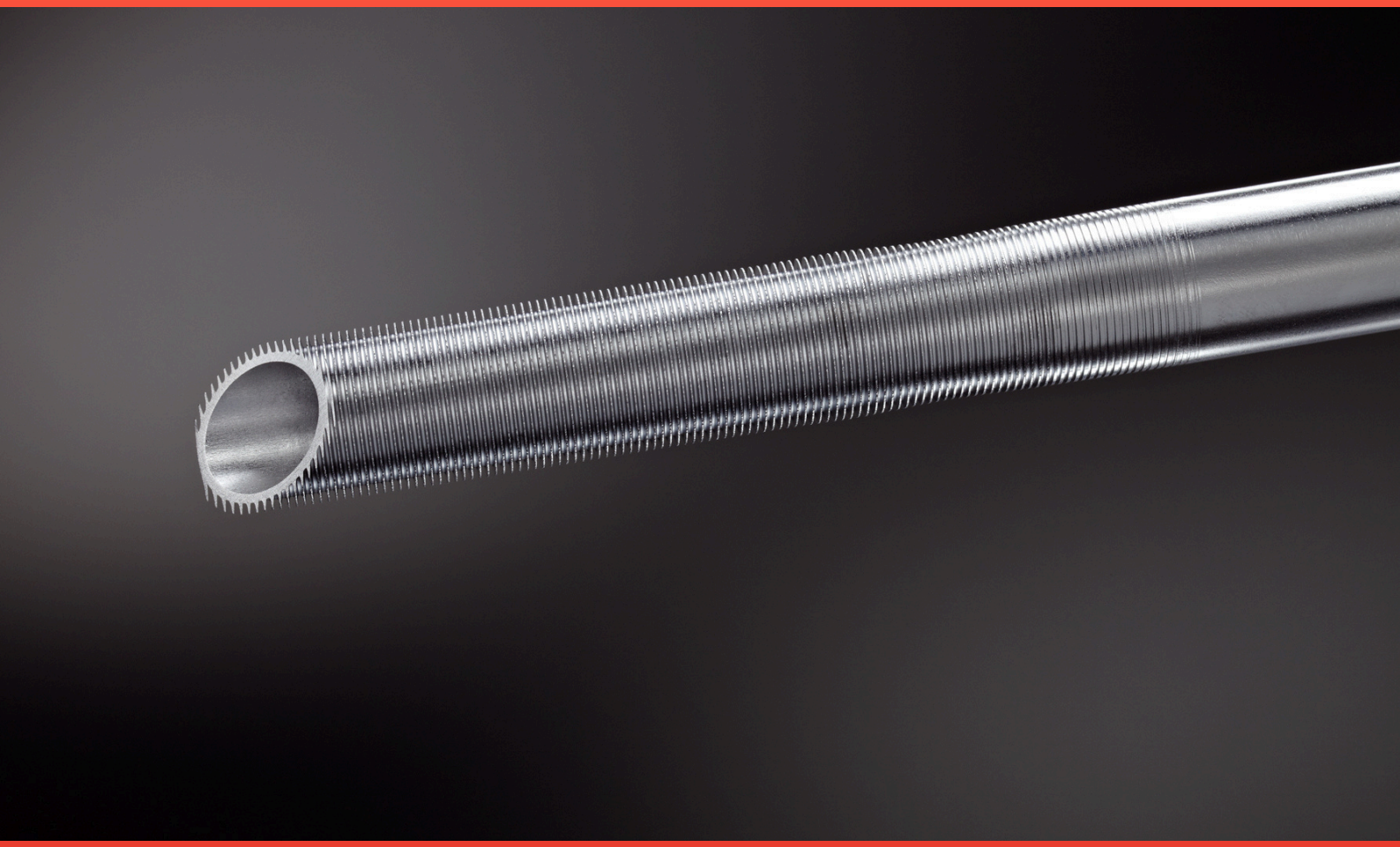
SCHMOELE



Trufin Finned Tubes S/T and S/TT (Turbo-Chil)

from non-ferrous metal, steel, stainless steel, and titanium

- High thermal conductivity, the fins being rolled from the tube wall
- High heat transfer efficience as a result of optimal conical fin profile
- Good bending properties due to the stiffening effect of the fins
- Soft annealed unfinned tube ends suitable for expansion into tube plates
- Increased corrosion resistance by the use of optional bimetallic tubes
- Installation in tube bundle heat exchangers occurs when the fin outer diameter is less than the outer diameter.
- S/TT /Turbo-Chil) = high performance design produces increased flow turbulence from additional inside ridges

Trufin finned tubes S/T and S/TT (Turbo-Chil)

Application

Trufin Finned Tubes S/T and High Performance Finned Tubes Trufin S/TT (Turbo-Chil) manufactured by Schmöle are used in many branches of the industry. They are suitable for cooling and heating of liquides and gases as well as for condensing and evaporating refrigerants.

Long-term experience in the application of Trufin Finned Tubes S/TT and S/T has shown that their use considerably improves the price - performance ratio of heat exchanges.

The following table shows some examples of typical applications:

Refrigeration industry	Tube bundle condensers* Tube bundle evaporators (flooded) Coaxial condensers
Heating industry	Calorifiers
Chemical and petrochemical industry	Condensers Product coolers Product heaters Oil coolers Oil heaters Gas coolers
Power plants	Steam reheaters Flue gas coolers Flue gas heaters
General and automobile engineering	Water cooled oil coolers Compressed air coolers

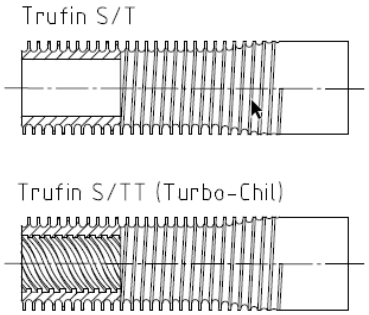
Description

High Performance Finned Tubes Trufin S/TT (Turbo-Chil) are produced by a rolling process from seamless or longitudinally welded tubes.

During the finning operation the inside diameter of the base tubes is reduced and simultaneously helical fins are rolled out of the tube wall. Therefore the outside diameter of the fins becomes smaller or at least not larger than the permissible outside diameter of the unfinned tube sections.

It is an advantage of this finning procedure that the finning operation can be interrupted at any point of the tube. The unfinned tube sections make it possible to support and fit these finned tubes in shell-and-tube heat exchangers in the same way as plain tubes.

In comparison to Trufin S/T Finned Tubes, Trufin S/TT (Turbo-Chil) High Performance Finned Tubes have in addition helical inside ridges which provoke an increase of the flow turbulence on the inside fluid resultig in a considerable performance.



Testing

The inspection of the Trufin Finned Tubes S/T in copper and copper alloys is carried out according to DIN 17679. The verification of the mechanical properties in the unfinned tube sections is made a tensile test on the tubes before finning. Leak testing, preferably the eddy current test to DKI 801 or ASTM/ASME standards, is used. Also an inside air pressure test at 20 bar under water is carried out on request.

If the application requires other test conditions, there should be agreed when placing an order.

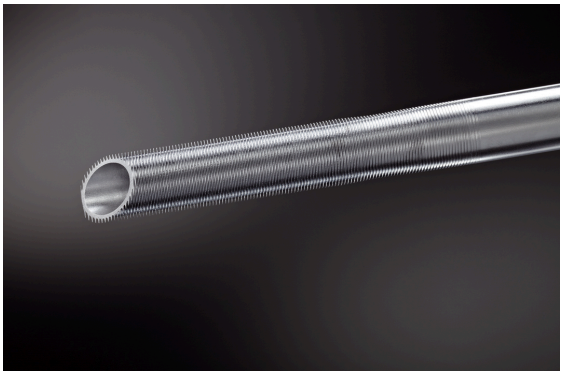
The inspection and tests of High Performance Finned Tubes Trufin S/TT (Turbo-Chil) and of finned tubes of other materials are effected with references to DIN 17679 or to the VdTÜV Material Specifications indicated in the following.

Trufin finned tubes S/T and S/TT (Turbo-Chil)

Approvals

The manufacturing of finned tubes intended for pressure vessels has been verified and authorized in accordance with AD-Merkblatt WO/TRD 100.

Schmöle provides and evaluates Trufin finned tubes S/T in accordance with the following material specifications:



- Trufin finned tubes ST, constructed from copper and copper alloys in accordance with VdTÜV material sheet 420/1 (for the condition of the finned tube component, refer to the table on page 3).

- Trufin finned tubes ST are constructed from St 35.8/1 and III in accordance with VdTÜV material sheet 457 (the condition of the finned tube component adheres to this specification and is heat treated).

Materials

Trufin finned tubes S/T and high-performance finned tubes Trufin S/TT (Turbo-Chil) are primarily constructed from the materials specified in the table below. The strength characteristics of the unfinned tube sections are detailed in the applicable standards.

Other materials, along with those conforming to various international and national standards such as ISO, EN, ASME, BS, AFNOR, etc., are available upon request.

When choosing the type and materials of the pipe, it is essential to consider the operating conditions of the specific application.

Material designation DIN		Materialnumber DIN	Material or product standard		Comparable US materials				Condition of the finned pipe section[5]	Schmöle Werkstoff-kennzahl	Weight-ratio G/G Cu
			welded	seamless	Alloy/Grade	UNS-No.	ASTM standard				
							welded	seamless			
Copper and copper alloys											
Cu-DHP	F 22	2.0090.19	-	DIN 1787 [2]	122	C 12200	-	B 359	bh	01	1,00
CuZn28Sn1	F 32	2.0470.19	-	DIN 17660 [2]	443	C 44300 [1]	-	B 359	wb	26	0,96
CuZn20Al2	F 34	2.0460.19	-	DIN 17660 [2]	687	C 68700	-	B 359	wb	30	0,93
CuNi10Fe1Mn	F 29	2.0872.19	-	DIN 17664 [2]	706	C 70600	-	B 359	bh	53	1,00
CuNi30Mn1Fe	F 37	2.0882.19	-	DIN 17664 [2]	715	C 71500	-	B 359	bh	51	1,00
Carbon steels											
St 35.8/I u. III		1.0305	-	DIN 17175	Gr. A	-	A 214 [3]	A 179	bh/wb	60	0,88
TT St. 35 N		1.0356	-	DIN 17173	Gr. 1	-	A 334 [3]	A 334	bh/wb	60	0,88
Austenitic chromium-nickel steels											
X 5 CrNi 18 10		1.4301	DIN 17457	DIN 17458	304	S 30400	A 249 [3]	A 213 [3]	bh/wb [6]	70	0,88
X 2 CrNi 19 11		1.4306	DIN 17457	DIN 17458	304 L	S 30403	A 249 [3]	A 213 [3]	bh/wb [6]	70	0,88
X 5 CrNiMo 17 122		1.4401	DIN 17457	DIN 17458	316	S 31600	A 249 [3]	A 213 [3]	bh/wb [6]	70	0,89
X 2 CrNiMo 17 122		1.4404	DIN 17457	DIN 17458	316 L	S 31603	A 249 [3]	A 213 [3]	bh/wb [6]	70	0,89
X 2 CrNiMo 18 143		1.4435	DIN 17457	DIN 17458	316 L	S 31603	A 249 [3]	A 213 [3]	bh/wb [6]	70	0,89
X 5 CrNiMo 17 133		1.4436	DIN 17457	DIN 17458	316	S 31600	A 249 [3]	A 213 [3]	bh/wb [6]	70	0,89
X 2 CrNiMoN 17 135		1.4439	DIN 17457	DIN 17458	317 LN	S 31726	A 249 [3]	A 213 [3]	bh/wb [6]	70	0,90
X 6 CrNiTi 18 10		1.4541	DIN 17457	DIN 17458	321	S 32100	A 249 [3]	A 213 [3]	bh/wb [6]	70	0,88
X 6 CrNiMoTi 17 122		1.4571	DIN 17457	DIN 17458	316 Ti	S 31635	-	-	bh/wb [6]	70	0,89
X 1 NiCrMoCuN 25 20 5		1.4539	SEW 400	VdTÜV 421	904 L	N 08904	B 674	B 677	bh/wb [6]	70	0,91
X 1 NiCrMoCuN 31 27 4		1.4563	SEW 400	VdTÜV 421	28	N 08028	B 709	B 668	bh/wb [6]	70	0,91
Ferritic steel											
X 6 CrTi 17		1.4510	DIN 17455	DIN 17456	430 Ti	S 43036	A 268 [3]	A 268 [3]	bh/wb [6]	70	0,87
Nickel alloys											
NiCr 21 Mo 14 W		2.4602	-	-	22	N 06022	B 622	B 626	bh/wb [6]	70	0,07
NiCr 22 Mo 7 Cu		2.4619	DIN 17750	DIN 17751	G-3	N 06985	B 622	B 626	bh/wb [6]	70	0,94
NiMo 16 Cr 15 W		2.4819	DIN 17750	DIN 17751	C-276	N 10276	B 622	B 626	bh/wb [6]	70	1,03
NiCr 22 Mo 9 Nb		2.4856	DIN 17750	DIN 17751	625	N 06625	B 444	B 704	bh/wb [6]	70	0,97
NiCr 21 Mo		2.4858	DIN 17750	DIN 17751	825	N 08825	B 163	B 704	bh/wb [6]	70	0,92
Titan											
Ti 1		3.7025	DIN 17866 [4]	DIN 17861 [4]	Gr. 1	-	B 338	B 338	bh	14	0,50
Ti 2		3.7035	DIN 17866 [4]	DIN 17861 [4]	Gr. 2	-	B 338	B 338	bh	14	0,50

Other materials on request

1) Alloy composition not completely congruent
2) Finned tube guide for 19 and 26 ribs/inch according to DIN 17679
3) Finned tube design according to ASTM A 4gB
4) Composition according to DIN 17850
5) bh = ribbed hard wb = heat-treated
6) If heat treatment after finning is not expressly required, the finned is not expressly requested, the finned tubes are supplied in a hard-finned condition.

Trufin finned tubes S/T and high-performance finned tubes Trufin S/TT (Turbo-Chil) are preferably manufactured from seamless tubes. Trufin finned tubes can also be supplied in welded tubes (e.g. titanium) if batch sizes are economical and the appropriate quality is available.

Trufin finned tubes S/T with 19, 26 and 40 fins/inch

Fin thickness $\delta_R \approx 0{,}3$ mm

Schmöle Code-No.	Schmöle material index							unfinned tube section		finned tube section							ungef. Gewicht
	01	26	30	51	53	60	70	Outside-ø d mm	Wall-thickness s mm	Inner-ø d mm	Core tube outside-ø d mm	Fintube outside ø d mm	Wall thinkness s mm	Inside cross cut q cm²	Outside surface A m²/m	Area ratio A/A -	G kg/m
Fin pitch m = 1.34 mm, corresponds to 19 fins/inch																**Fin height h = 1,5 mm**	
15-19 09 080	●							12,7	1,15	7,9	9,5	12,5	0,80	0,49	0,10	4,0	0,32
15-19 09 090	●	●	●	●	●	●		12,7	1,25	7,7	9,5	12,5	0,90	0,47	0,10	4,1	0,34
15-19 09 100	●	●	●	●	●	●	●	12,7	1,35	7,5	9,5	12,5	1,00	0,44	0,10	4,2	0,37
15-19 09 125	●	●	●	●	●	●	●	12,7	1,60	7,0	9,5	12,5	1,25	0,38	0,10	4,5	0,42
15-19 12 080	●							15,90	1,20	11,1	12,7	15,7	0,80	0,97	0,12	3,6	0,44
15-19 12 090	●							15,90	1,30	10,9	12,7	15,7	0,90	0,93	0,12	3,7	0,47
15-19 12 100	●	●	●	●	●	●	●	15,90	1,40	10,7	12,7	15,7	1,00	0,90	0,12	3,8	0,51
15-19 12 125	●	●	●	●	●	●	●	15,90	1,60	10,2	12,7	15,7	1,25	0,82	0,12	4,0	0,57
15-19 15 080	●							19,0	1,25	14,2	15,8	18,8	0,80	1,58	0,15	3,4	0,59
15-19 15 090	●							19,0	1,30	14,0	15,8	18,8	0,90	1,54	0,15	3,5	0,61
15-19 15 100	●	●	●	●	●	●		19,0	1,45	13,8	15,8	18,8	1,00	1,50	0,15	3,6	0,63
15-19 15 125	●	●	●	●	●	●	●	19,0	1,60	13,3	15,8	18,8	1,25	1,39	0,15	3,7	0,71
15-19 15 150	●	●	●	●	●	●	●	19,0	1,80	12,8	15,8	18,8	1,50	1,29	0,15	3,8	0,77
15-19 15 165	●	●	●	●	●	●	●	19,0	1,95	12,5	15,8	18,8	1,65	1,23	0,15	3,9	0,83
15-19 15 210	●	●	●	●	●	●	●	19,0	2,30	11,6	15,8	18,8	2,10	1,06	0,15	4,2	0,98
15-19 19 100	●			●	●			22,2	1,45	17,0	19,0	22,0	1,00	2,26	0,18	3,4	0,80
15-19 19 125	●	●	●	●	●	●		22,2	1,65	16,5	19,0	22,0	1,25	2,14	0,18	3,5	0,89
15-19 19 150	●	●	●	●	●	●	●	22,2	1,85	16,0	19,0	22,0	1,50	2,01	0,18	3,6	0,99
15-19 19 165	●	●	●	●	●	●	●	22,2	1,95	15,7	19,0	22,0	1,65	1,95	0,18	3,7	1,03
15-19 19 210	●	●	●	●	●	●	●	22,2	2,35	14,8	19,0	22,0	2,10	1,72	0,18	3,9	1,25
15-19 22 100	●							25,4	1,45	20,2	22,2	25,2	1,00	3,20	0,21	3,3	0,93
15-19 22 125	●	●	●	●	●			25,4	1,65	19,7	22,2	25,2	1,25	3,05	0,21	3,4	1,04
15-19 22 150	●	●	●	●	●	●		25,4	1,85	19,2	22,2	25,2	1,5	2,90	0,21	3,5	1,15
15-19 22 165	●	●	●	●	●	●	●	25,4	2,00	18,9	22,2	25,2	1,65	2,81	0,21	3,6	1,21
15-19 22 210	●	●	●	●	●	●	●	25,4	2,35	18,0	22,2	25,2	2,10	2,54	0,21	3,7	1,45
Fin pitch m = 0,89 mm, correspondens 26 fins/inch																**Fin height h = 1,5 mm**	
15-26 09 80	●							12,7	1,25	7,9	9,5	12,5	0,80	0,49	0,12	5,0	0,34
15-26 09 100	●	●	●	●	●	●		12,7	1,45	7,5	9,5	12,5	1,00	0,44	0,12	5,3	0,39
15-26 09 125	●	●	●	●	●	●		12,7	1,65	7,0	9,5	12,5	1,25	0,38	0,12	5,8	0,46
15-26 12 080	●							15,90	1,30	11,1	12,7	15,7	0,80	0,97	0,16	4,6	0,46
15-26 12 100	●	●	●	●	●	●		15,90	1,40	10,7	12,7	15,7	1,00	0,90	0,16	4,8	0,53
15-26 12 125	●	●	●	●	●	●		15,90	1,65	10,2	12,7	15,7	1,25	0,82	0,16	5,0	0,60
15-26 15 080	●							19,0	1,30	14,2	15,8	18,8	0,80	1,58	0,20	4,4	0,60
15-26 15 090	●							19,0	1,35	14,0	15,8	18,8	0,90	1,54	0,20	4,5	0,64
15-26 15 100	●	●	●	●	●			19,0	1,45	13,8	15,8	18,8	1,00	1,50	0,20	4,6	0,66
15-26 15 125	●	●	●	●	●	●		19,0	1,65	13,3	15,8	18,8	1,25	1,39	0,20	4,8	0,74
15-26 19 100	●							22,2	1,45	17,0	19,0	22,0	1,00	2,26	0,23	4,4	0,83
15-26 19 125	●	●	●	●	●			22,2	1,65	16,5	19,0	22,0	1,25	2,14	0,23	4,5	0,93
15-26 19 150	●	●	●	●	●	●		22,2	1,90	16,0	19,0	22,0	1,50	2,01	0,23	4,7	1,03
15-26 22 100	●							25,4	1,50	20,2	22,2	25,2	1,00	3,20	0,27	4,3	0,97
15-26 22 125	●	●	●	●	●			25,4	1,70	19,7	22,2	25,2	1,25	3,05	0,27	4,4	1,08
15-26 22 150	●	●	●	●	●			25,4	1,90	19,2	22,2	25,2	1,50	2,90	0,27	4,5	1,19
15-26 22 165	●	●	●	●	●	●		25,4	2,05	18,9	22,2	25,2	1,65	2,81	0,27	4,6	1,24
15-26 22 210	●	●	●	●	●	●		25,4	2,40	18	22,2	25,2	2,10	2,54	0,27	4,8	1,48
Fin pitch m = 0,64 mm, correspondens to 40 fins/inch																**Fin height h = 0,9 mm**	
09-40 17 070	●				●			19,0	1,10	15,4	17,0	18,8	0,70	1,94	0,20	4,1	0,55
09-40 17 090	●				●			19,0	1,30	15,2	17,0	18,8	0,90	1,84	0,20	4,2	0,63
09-40 17 100	●			●	●			19,0	1,45	15,0	17,0	18,8	1,00	1,79	0,20	4,3	0,67
09-40 17 125	●			●	●			19,0	1,65	14,5	17,0	18,8	1,25	1,67	0,20	4,4	0,72
09-40 17 165	●			●	●			19,0	2,10	13,7	17,0	18,8	1,65	1,50	0,20	4,7	0,94

The specified wall thicknesses s apply to copper tubes.
Deviations are possible for tubes made of other materials

Other materials and dimensions on request

Trufin-Finned tubes S/TT (Turbo-Chil) with 19, 26 and 40 fins/inch

Fin thinkness $\delta_R \approx$ 0,3 mm
Inernal fin height ≈ 0,35 mm
Quantity internal fins = 10

Schmöle Code-No.	Schmöle Material code			Unfinned tube sections		Finned tube sections								Approx. weight
				outside-ø	Wall thick-ness	inside-ø	hydrau-lic ø	Core outside-ø	Fin outside-ø	Wall thick-ness	Inside sectional area	Outside surface area	Surface area ratio	
	01	51	53	d_1 mm	s_1 mm	d_3 mm	d_h mm	d_4 mm	d_5 mm	s_2 mm	q_i cm_2	A_a m_2 /m	A_a/A -	G_{Cu} kg/m
Fin pitch m = 1,34 mm, corresponding to 19 fins per inch														**Fin height h = 1,5 mm**
15 - 19 12 070 13	●	●	●	15,9	1,25	11,3	9,96	12,7	15,7	0,70	0,97	0,12	3,0	0,46
15 - 19 12 080 13	●	●	●	15,9	1,35	11,1	9,76	12,7	15,7	0,80	0,93	0,12	3,1	0,50
15 - 19 12 090 13	●	●	●	15,9	1,45	10,9	9,55	12,7	15,7	0,90	0,90	0,12	3,2	0,53
15 - 19 12 100 13	●	●	●	15,9	1,55	10,7	9,35	12,7	15,7	1,00	0,86	0,12	3,3	0,56
15 - 19 12 125 13	●	●	●	15,9	1,80	10,2	8,84	12,7	15,7	1,25	0,78	0,12	3,5	0,64
15 - 19 150 070 13	●	●	●	19,0	1,30	14,4	13,11	15,8	18,8	0,70	1,59	0,15	3,0	0,56
15 - 19 150 080 13	●	●	●	19,0	1,35	14,2	12,91	15,8	18,8	0,80	1,54	0,15	3,1	0,60
15 - 19 150 090 13	●	●	●	19,0	1,45	14,0	12,71	15,8	18,8	0,90	1,50	0,15	3,2	0,64
15 - 19 150 100 13	●	●	●	19,0	1,60	13,8	12,50	15,8	18,8	1,00	1,46	0,15	3,3	0,70
15 - 19 150 125 13	●	●	●	19,0	1,80	13,3	12,00	15,8	18,8	1,25	1,35	0,15	3,4	0,78
15 - 19 19 090 13	●	●	●	22,2	1,45	17,2	15,94	19,0	22,0	0,90	2,29	0,18	3,1	0,76
15 - 19 19 100 13	●	●	●	22,2	1,6	17,0	15,74	19,0	22,0	1,00	2,23	0,18	3,2	0,83
15 - 19 19 125 13	●	●	●	22,2	1,9	16,5	15,24	19,0	22,0	1,25	2,10	0,18	3,3	0,97
15 - 19 19 150 13	●	●	●	22,2	2,1	16,0	14,73	19,0	22,0	1,50	1,98	0,18	3,4	1,06
15 - 19 22 090 13	●	●	●	25,4	1,45	20,4	19,17	22,2	25,2	0,90	3,23	0,21	3,0	0,88
15 - 19 22 100 13	●	●	●	25,4	1,65	20,2	18,97	22,2	25,2	1,00	3,17	0,21	3,1	0,99
15 - 19 22 125 13	●	●	●	25,4	1,85	19,7	18,47	22,2	25,2	1,25	3,01	0,21	3,2	1,10
15 - 19 22 150 13	●	●	●	25,4	2,05	19,2	17,53	22,2	25,2	1,50	2,86	0,21	3,3	1,21
Fin pitch m = 0,98 mm, corresponding to 26 fins per inch														**Fin height h = 1,5 mm**
*15 26 09 070 03	●	●	●	12,7	1,30	8,1	7,66	9,5	12,5	0,70	0,49	0,12	4,2	0,35
*15 26 09 080 03	●	●	●	12,7	1,40	7,9	7,52	9,5	12,5	0,80	0,47	0,12	4,3	0,37
*15 26 09 090 03	●	●	●	12,7	1,50	7,7	7,21	9,5	12,5	0,90	0,44	0,12	4,4	0,40
*15 26 09 100 03	●	●	●	12,7	1,60	7,5	7,06	9,5	12,5	1,00	0,42	0,12	4,5	0,42
15 - 26 12 070 13	●	●	●	15,9	1,30	11,3	9,96	12,7	15,7	0,70	0,97	0,16	4,1	0,48
15 - 26 12 080 13	●	●	●	15,9	1,40	11,1	9,76	12,7	15,7	0,80	0,93	0,16	4,2	0,51
15 - 26 12 090 13	●	●	●	15,9	1,50	10,9	9,55	12,7	15,7	0,90	0,90	0,16	4,3	0,54
15 - 26 12 100 13	●	●	●	15,9	1,60	10,7	9,35	12,7	15,7	1,00	0,86	0,16	4,4	0,58
15 - 26 12 125 13	●	●	●	15,9	1,80	10,2	8,84	12,7	15,7	1,25	0,78	0,16	4,6	0,64
15 - 26 15 070 13	●	●	●	19,0	1,30	14,4	13,11	15,8	18,8	0,70	1,59	0,20	4,1	0,58
15 - 26 15 080 13	●	●	●	19,0	1,40	14,2	12,91	15,8	18,8	0,80	1,54	0,20	4,2	0,62
15 - 26 15 090 13	●	●	●	19,0	1,50	14,0	12,71	15,8	18,8	0,90	1,50	0,20	4,3	0,66
15 - 26 15 100 13	●	●	●	19,0	1,60	13,8	12,50	15,8	18,8	1,00	1,46	0,20	4,4	0,72
15 - 26 15 125 13	●	●	●	19,0	1,85	13,3	12,00	15,8	18,8	1,25	1,35	0,20	4,5	0,89
15 - 26 19 090 13	●	●	●	22,2	1,50	17,2	15,94	19,0	22,0	0,90	2,29	0,23	4,0	0,78
15 - 26 19 100 13	●	●	●	22,2	1,65	17,0	15,74	19,0	22,0	1,00	2,22	0,23	4,1	0,86
15 - 26 19 125 13	●	●	●	22,2	1,90	16,5	15,24	19,0	22,0	1,25	2,10	0,23	4,3	0,97
15 - 26 22 090 13	●	●	●	25,4	1,50	20,4	19,17	22,2	25,2	0,90	3,23	0,27	4,0	0,90
15 - 26 22 100 13	●	●	●	25,4	1,70	20,2	18,97	22,2	25,2	1,00	3,17	0,27	4,1	1,02
15 - 26 22 125 13	●	●	●	25,4	1,90	19,7	18,47	22,2	25,2	1,25	3,01	0,27	4,2	1,13
Fin pitch m = 0,64 mm, corresponding to 40 fins per inch														**Fin height h = 0,9 mm**
09 - 40 17 070 13	●	●	●	19,0	1,20	15,4	14,03	17,0	18,8	0,70	1,82	0,20	3,8	0,62
09 - 40 17 090 13	●	●	●	19,0	1,35	15,2	13,81	17,0	18,8	0,90	1,77	0,20	3,9	0,67
09 - 40 17 100 13	●	●	●	19,0	1,45	15,0	13,67	17,0	18,8	1,00	1,73	0,20	4,0	0,73

Other materials and dimensions on request.

* Number of internal ribs = 6

The wall thicknesses s_1 indicated are valid for copper tubes.
For other tube materials small deviations are possible.

d_3 = Inside-ø am Fuß at the foot of the inner piers
d_h = hydraulic diameter ($d_h = \frac{4 q_i}{U}$)
U = Extent of the inner profile

Trufin-Finned Tubes S/T with 30 fins per inch

Trufin Finned Tubes S/T from stainless steel, nickel-base alloys and titanium

Within the context of increased enviromental protection measures, such as prevention of water pollution and flue gas cleaning in power plants, more and more corrision-resistant materials are required. Schmöle have taken this trend into account and by means of selective further development of the finning procedures have extended their Trufin Finned Tube programme to include difficult-to-fin corrosion-resistant materials, such as chromium-nickel grades of steel, nickelbase alloys and titanium. See material table on page 3.

With a fin pitch of 30 f. p. i., a fin height of 0,8 mm and an economical residual wall thickness of 0,7 mm, for a base tube outside diameter of 19 mm, a surface area ratio (inside surface area; outside surface area) of 2,8 can be achieved. See following dimension table:

Schmöle Code-No.	Schmöle Material code		Unfinned tube sections		Finned tube sections						Approx. weight
			Outside-ø	Wall thickness	Inside-ø	Core outside-ø	Core outside-ø	Wall thickness	Inside sectional area	Outside surface area	Sureface area ratio	
	14	70	d_1 mm	s_1 mm	d_3 mm	d_4 mm	d_5 mm	s mm	q cm^2	A_a m^2/m	A_a/A -	G_{Cu} kg/m
Fin pitch m = 0,85 mm, corresponding to 30 fins/inch											Fin height h = 0,8 mm, Fin thickness ≈ 0,3 mm	
08 - 30 17 070	●	●	19,0	1,35	15,8	17,2	18,8	0,70	1,96	0,14	2,8	0,58
08 - 30 17 100	●	●	19,0	1,65	15,2	17,2	18,8	1,00	1,81	0,14	2,9	0,60
08 - 30 17 125	●	●	19,0	1,75	14,70	17,2	18,8	1,25	1,69	0,14	3,0	0,76
												δ_R
08 - 30 23 100	●	●	25,4	1,65	21,60	23,6	25,2	1,00	3,66	0,19	2,8	0,91
08 - 30 23 125	●	●	25,4	1,90	21,1	23,6	25,2	1,25	3,49	0,19	2,9	1,06
08 - 30 23 150	●	●	25,4	2,00	20,6	23,6	25,2	1,50	3,33	0,19	2,9	1,18
08 - 30 30 100	●	●	32,0	1,65	28,2	30,2	31,8	1,00	6,24	0,25	2,8	1,16
08 - 30 30 125	●	●	32,0	1,90	27,7	30,2	31,8	1,25	6,02	0,25	2,9	1,36
08 - 30 30 150	●	●	32,0	2,00	27,2	30,2	31,8	1,50	5,81	0,25	2,9	1,51

Preferred dimensions! **Other materials and dimensions on request.**

* Conversation factors see page 3!

The wall thickness s_1 indicated may deviate, depending on the material grade.

Tube codification

Schmöle-Code-No. W/HT 45 - 11 12 080 12 - 01

- Tube type
- Fin height 4,5 mm
- Fin pitch 11 f. p. i.
- Core o.d. 12 mm
- Wall thickness under fin 0,80 mm
- 10 inside riside, approx. 0,35 mm height
- Schmöle Material code for Cu-DHP

Ordering information

Please let us have the following information in enquiries and orders:

- No. of tubes
- Material (see table on page 3)
- Condition (see table on page 3)
- Outside-ø of the unfinned tube section
- Wall thickness of the unfinned tube sections

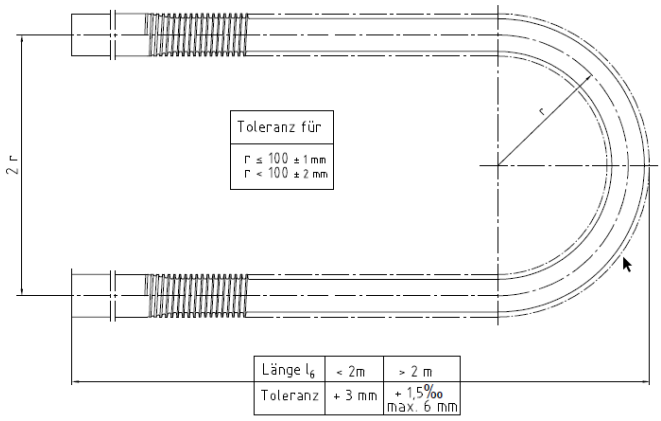
} or corresponding Schmöle No. to be indicated

- Fin outside diameter
- Wall thickness of the unfinned tube sections
- Fin height
- Fin pitch
- Total tube lenght
- Length of the unfinned tube ends, if required
- Position and length of the unfinned intermediate sections, if required
- Execution with one expanded tube end
- Reference to the corresponding standard
- Special test conditions

Trufin Finned Tubes S/T and S/ZT (Turbo-Chil) bent to hair pins (U-bends)

Schmöle production facilities permit the manufacture of U-bent tubes with various bending radii.

In case of small bending radii we recommend bending Trufin Finned Tubes only in unfinned tube sections, as the bigger inside sectional area may compensate for eventual sectional contraction due to bending and the wall thickness is larger than that under the fins. Therefore reduction below the permissible minimum wall can be avoided.



In order to avoid too great a contraction of the inside cross section, the minimum bending radii indicated in the following table should be used:

Bending section	Ratio diameter / wall thickness	Minimum mean bending radius r mm
unfinned	$d_1 / s_1 < 10$	$1,5 \cdot d_1$
unfinned	$d_1 / s_1 > 10$	$2,0 \cdot d_1$
finned	$d_4 / s_2 < 10$	$2,0 \cdot d_4$
finned	$d_4 / s_2 > 10$	$3,0 \cdot d_4$

This product description takes into account our own investigations and the relevant literature. It has been compiled with due care.

Regardless, the suitability of the product should be verified under actual operating conditions. This is especially true for the suitability of the chosen material for the intended application.

The relevant standards and regulations for the operation of heat exchangers must be observed.

We are happy to provide you with consulting support.

Schmöle GmbH

Trufin Finned Tubes S/T and S/TT (Turbo-Chil) with one expanded tube end

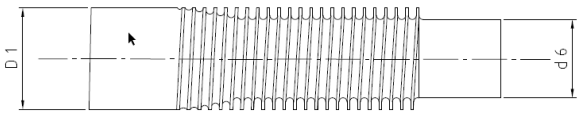
Whilst for the standard finned tubes the base tube outside diameter corresponds to the unfinned sections of the finished finned tubes, the tube uses a smaller base tube outside diameter. During the finning operation the inside diameter is less reduced and the fins are rolled over the outside diameter of the base tube to the same dimensions as for the standard finned tubes.

By the expansion of one tube ende the same outside diameter as for the standard finned tubes is obtained.

The outside diameters of the tube ends are indicated in the following table:

Outside diameter og the expanded tube end d_1 mm	Outside diameter of the base tube d_6 mm
12,7	11,5
15,9	14,5
19,0	17,5
22,2	20,5
25,4	24,0

By alternating the expanded ends in the tube bundle it is possible to maximise the material available for the rolling-in process between the different bore diameters in the tube plates.



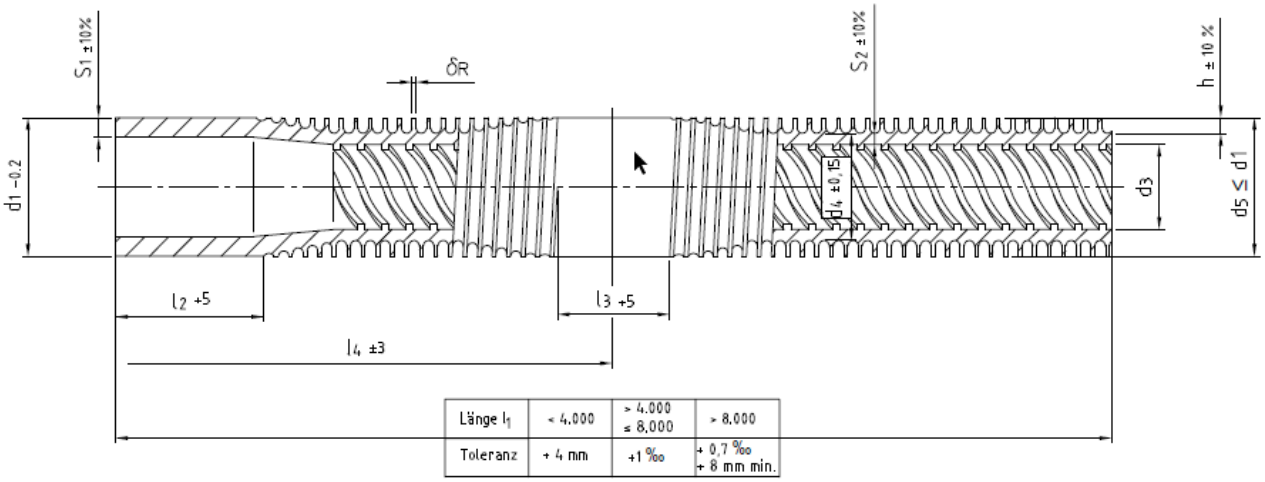
Forms of supply

- in straight lengths up to 20 m
- entirely finned
- with unfinned tube ends
- with unfinned intermediate sections
- with definned tube ends
- with one expanded tube end
- bent to hair pins (U-bends) or bent to tube coils
- with electro-tinned outside surface uo to a tube length of 4,8 m
- in bimetallic construction, if necessary outer tube turned off at the ends (Material example: outer tube from carbon steel, suitable for ammonia and inner tube from CuNi10Fe1Mn, suitable for sea water)

Trufin-Finned Tubes S/T and S/TT (Turbe-Chil)

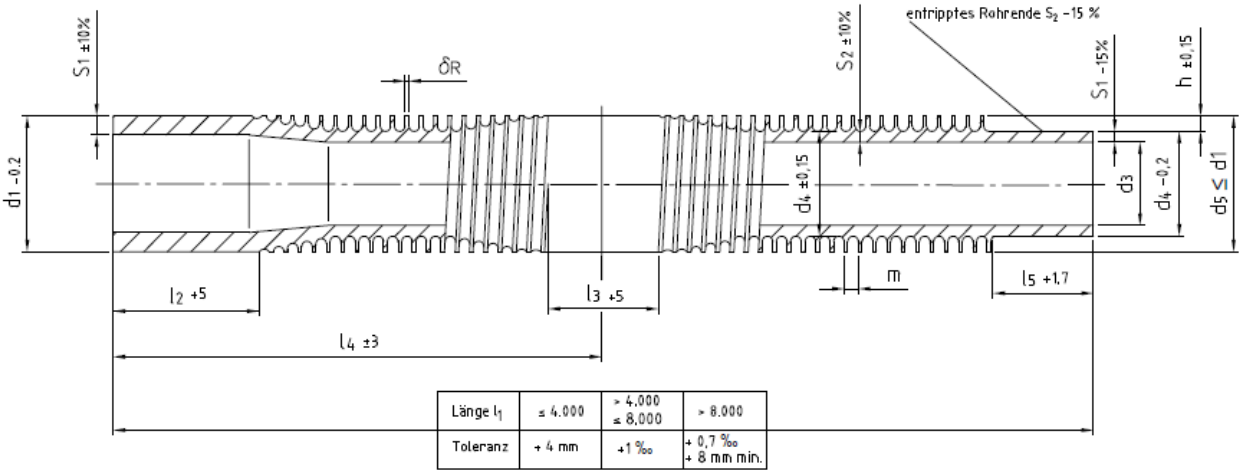
Tolerances

Trufin S/TT



Länge l_1	< 4.000	> 4.000 ≤ 8.000	> 8.000
Toleranz	+ 4 mm	+1 ‰	+ 0,7 ‰ + 8 mm min.

Trufin S/T



Länge l_1	≤ 4.000	> 4.000 ≤ 8.000	> 8.000
Toleranz	+ 4 mm	+1 ‰	+ 0,7 ‰ + 8 mm min.

1 6

Please, ask for the following leaflets:

- Finned Tubes (programme survey) No. 820 e
- High Performance Finned Tubes Trufin S/T-K for Refrigerant Condensers No. 836 e
- Trufin Finned Tubes W/H and W/HT (Turbo-Chil) from Cu, CuNi, Al, Steel and Stainless Steal No. 837 e

Outside diameter of unfinned tube sections d and d mm	**Tolerance incl. out-of-roundness - mm**
6 - 26	+ 0 / -0,20
< 26 - 35	+ 0 / -0,30

Fin pitch m 1/Zoll	**Tolerance - 1/inch**
19	+ / -1
26, 30 and 40	+ / -2

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