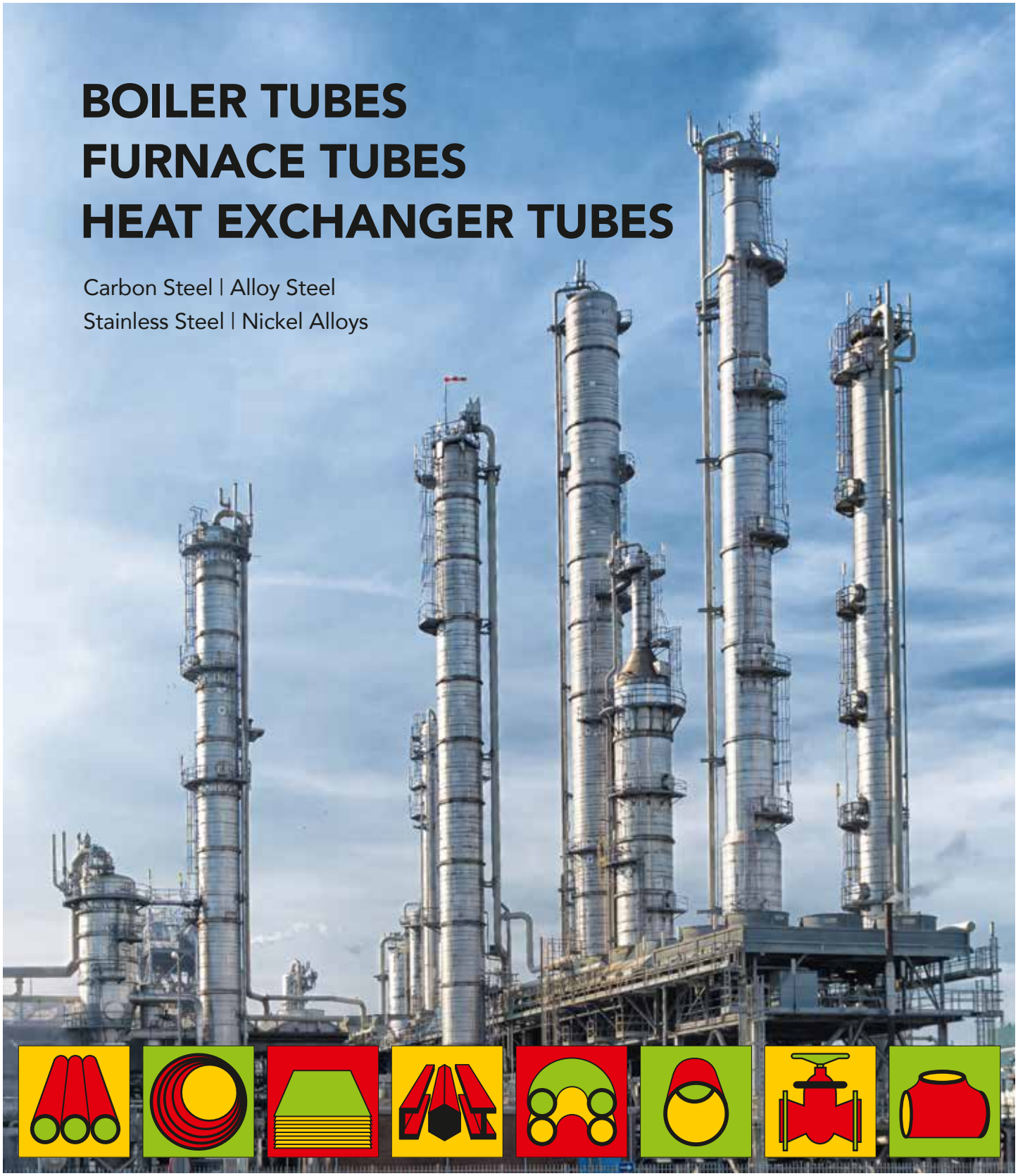
TPS TECHNITUBE®
RÖHRENWERKE GMBH

BOILER TUBES
FURNACE TUBES
HEAT EXCHANGER TUBES

Carbon Steel | Alloy Steel
Stainless Steel | Nickel Alloys



TPS-Technitube Röhrenwerke GmbH is a privately owned company operating most modern production mills and stocks for tubes and pipes in carbon steel, alloy steel, stainless steel, copper alloys, copper-nickel alloys, nickel alloys, titanium, oil- and gasfield tubular products, extended surfaces as well as accessories like fittings, flanges, plates and bars.

The production mills of TPS-Technitube Röhrenwerke GmbH, located on a total area of more than 100.000 m^2 in Daun/Germany in the centre of Europe have an outstanding worldwide reputation as a reliable and competent manufacturer and stockist.

From our central European location we have excellent access to the interconnecting roadways of the area, the north sea ports of Bremen, Hamburg, Rotterdam or Antwerp and the major continental airports. Wherever your location is, our quotations can be tailored to meet your emergency breakdown or planned maintainance requirements. Please tell us what you need and we make it possible.

TPS-Technitube Röhrenwerke GmbH, your partner for tubes, pipes and accessories for the oil- and gas industry, chemical and petrochemical industry, energy and offshore technology, paper, pharma, textile industry and automotive.

View our catalogues on your mobile device.

With this catalogue we like to introduce you our possibilities for:

Boiler Tubes / Furnace Tubes / Heat Exchanger Tubes:
- seamless and welded
- carbon steel / alloy steel / stainless steel / nickel alloys
- acc. to ASTM or ASME
- acc. to DIN or EN
- or any other international standards on request

Sizes:
- OD 5,00 - 610,00 mm
- WT 0,90 - 60,00 mm
- Minimum or average wall thickness
- Length of hot finished tubes up to 25 m
- Length of cold finished tubes up to 27 m
- Special tolerances on request

Our Service:
- mill production
- a well assorted stock
- just in time logistics

Technical Service:
- NDT testing facilities etc.
- qualified personal
- quality management system

CHEMICAL COMPOSITION AND MECHANICAL PROPERTIES

SEAMLESS CARBON STEEL TUBES

Material Grade	C	Mn	P (max)	S (max)	Si	TS min KSI (MPa)	YS min KSI (MPa)	El min. %
A/SA 179	0,06 - 0,18	0,27 - 0,63	0,035	0,035	-	47 (325)	26 (180)	35
A/SA 192	0,06 - 0,18	0,27 - 0,63	0,035	0,035	max. 0,25	47 (325)	26 (180)	35
A/SA 210 Gr. A-1	max. 0,27	max. 0,93	0,035	0,035	min. 0,10	60 (415)	37 (255)	30
A/SA 210 Gr. C	max. 0,35	0,29 - 1,06	0,035	0,035	min. 0,10	70 (485)	40 (275)	30

Hardness (max.): A 179 = 72 HRB
A 192 = 77 HRB / 137 HB
A 210 A1 = 79 HRB / 143 HB
A 210 C = 89 HRB / 179 HB

Tolerance: ASTM/ASME-A/SA 450
(ASTM A 161 is replaced by ASTM A 192, however we supply and certify still acc. to ASTM A 161 if required)

WELDED CARBON STEEL TUBES

Material Grade	C	Mn	P (max)	S (max)	Si	TS min KSI (MPa)	YS min KSI (MPa)	El min. %
A/SA 178 Gr. A	0,06 - 0,18	0,27 - 0,63	0,035	0,035	-	47 (325)	26 (180)	35
A/SA 178 Gr. C	max. 0,35	max. 0,80	0,035	0,035	-	60 (415)	37 (255)	30
A/SA 178 Gr. D	max. 0,27	1,00 - 1,50	0,030	0,015	min. 0,10	70 (485)	40 (275)	30
A/SA 214	max. 0,18	0,27 - 0,63	0,035	0,035	-	-	-	-

Hardness (max.): A 214 = 72 HRB

Tolerance: ASTM/ASME-A/SA 450
(ASTM A 226 is replaced by ASTM A 178 Gr. A, however we supply and certify still acc. to ASTM A 226 if required)

SEAMLESS ALLOY STEEL TUBES

Material Grade	C	Mn	P (max)	S (max)	Si	Mo	TS min KSI (MPa)	YS min KSI (MPa)	El min. %
A/SA 209 T1	0,10 - 0,20	0,30 - 0,80	0,025	0,025	0,10 - 0,50	0,44 - 0,65	55 (380)	30 (205)	30
A/SA 209 T1a	0,15 - 0,25	0,30 - 0,80	0,025	0,025	0,10 - 0,50	0,44 - 0,65	53 (365)	28 (195)	30
A/SA 209 T1b	max. 0,14	0,30 - 0,80	0,025	0,025	0,10 - 0,50	0,44 - 0,65	60 (415)	32 (220)	30

Hardness (max.): A209 T1 = 80 HRB / 146 HBW
A209 T1a = 81 HRB / 153 HBW
A209 T1b = 77 HRB / 137 HBW

Tolerance: ASTM/ASME-A/SA 1016

All mechanical properties at room temperature.
Not mentioned grades on request.

CHEMICAL COMPOSITION AND MECHANICAL PROPERTIES

Material Grade	C	Mn	P (max)	S (max)	Si	Ni	Cr	Mo
T2	0,10 - 0,20	0,30 - 0,61	0,025	0,025	0,10 - 0,30	-	0,50 - 0,81	0,44 - 0,65
T5	max. 0,15	0,30 - 0,60	0,025	0,025	max. 0,5	-	4,00 - 6,00	0,45 - 0,65
T5b	max. 0,15	0,30 - 0,60	0,025	0,025	1,00 - 2,00	-	4,00 - 6,00	0,45 - 0,65
T5c	max. 0,12	0,30 - 0,60	0,025	0,025	max. 0,5	-	4,00 - 6,00	0,45 - 0,65
T9	max. 0,15	0,30 - 0,60	0,025	0,025	0,25 - 1,00	-	8,00 - 10,00	0,90 - 1,10
T11	0,05 - 0,15	0,30 - 0,60	0,025	0,025	0,50 - 1,00	-	1,00 - 1,50	0,44 - 0,65
T12	0,05 - 0,15	0,30 - 0,61	0,025	0,025	max. 0,5	-	0,80 - 1,25	0,44 - 0,65
T17	0,15 - 0,25	0,30 - 0,61	0,025	0,025	0,15 - 0,35	-	0,80 - 1,25	-
T21	0,05 - 0,15	0,30 - 0,60	0,025	0,025	0,50 - 1,00	-	2,65 - 3,35	0,80 - 1,06
T22	0,05 - 0,15	0,30 - 0,60	0,025	0,025	max. 0,5	-	1,90 - 2,60	0,87 - 1,13
T23	0,04 - 0,10	0,10 - 0,60	0,030	0,010	max. 0,5	max. 0,4	1,90 - 2,60	0,05 - 0,30
T24	0,05 - 0,10	0,30 - 0,70	0,020	0,010	0,15 - 0,45	-	2,20 - 2,60	0,90 - 1,10
T36	0,10 - 0,17	0,80 - 1,20	0,030	0,025	0,25 - 0,50	1,00 - 1,30	max. 0,3	0,25 - 0,50
T91	0,07 - 0,14	0,30 - 0,60	0,020	0,010	0,20 - 0,50	max. 0,4	8,00 - 9,50	0,85 - 1,05
T92	0,07 - 0,13	0,30 - 0,60	0,020	0,010	max. 0,5	max. 0,4	8,50 - 9,50	0,30 - 0,60
T122	0,07 - 0,14	max. 0,7	0,020	0,010	max. 0,5	max. 0,5	10,00 - 11,50	0,25 - 0,60
T911	0,09 - 0,13	0,30 - 0,60	0,020	0,010	0,10 - 0,50	max. 0,4	8,50 - 9,50	0,90 - 1,10

Material Grade	Tensile Strength min. KSI (MPa)	Yield Strength min. KSI (MPa)	Elongation min. %	Hardness max.	
				Brinell/Vickers	Rockwell
T2	60 (415)	30 (205)	30	163 HB / 170 HV	85 HRB
T5	60 (415)	30 (205)	30	163 HB / 170 HV	85 HRB
T5b	60 (415)	30 (205)	30	179 HBW / 190 HV	89 HRB
T5c	60 (415)	30 (205)	30	163 HB / 170 HV	85 HRB
T9	60 (415)	30 (205)	30	179 HBW / 190 HV	89 HRB
T11	60 (415)	30 (205)	30	163 HB / 170 HV	85 HRB
T12	60 (415)	32 (220)	30	163 HBW / 170 HV	85 HRB
T17	60 (415)	30 (205)	30	163 HB / 170 HV	85 HRB
T21	60 (415)	30 (205)	30	163 HB / 170 HV	85 HRB
T22	60 (415)	30 (205)	30	163 HB / 170 HV	85 HRB
T23	74 (510)	58 (400)	20	220 HBW / 230 HV	97 HRB
T24	85 (585)	60 (415)	20	250 HBW / 265 HV	25 HRC
T36 Class 1	90 (620)	64 (440)	15	250 HBW / 265 HV	25 HRC
T36 Class 2	95,5 (660)	66,5 (460)	15	250 HBW / 265 HV	25 HRC
T91	85 (585)	60 (415)	20	190 - 250 HBW / 196 - 265 HV	90 HRB - 25 HRC
T92	90 (620)	64 (440)	20	250 HBW / 265 HV	25 HRC
T122	90 (620)	58 (400)	20	250 HBW / 265 HV	25 HRC
T911	90 (620)	64 (440)	20	250 HBW / 265 HV	25 HRC

Tolerance: ASTM / ASME-A / SA 1016
(ASTM A 199 and A 200 are replaced by ASTM A 213, however we supply and certify still acc. to ASTM A 199 and A 200 if required)

	V	B	Nb	N	Al	W	Other
	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
	-	-	-	-	-	-	Ti = 4xC - 0,70
	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
	max. 0,15	-	-	-	-	-	-
	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
	0,20 - 0,30	0,0010 - 0,006	0,02 - 0,08	max. 0,015	max. 0,03	1,45 - 1,75	Ti = 0,005 - 0,060 / Ti/N ≥ 3,5C
	0,20 - 0,30	0,0015 - 0,007	-	max. 0,012	max. 0,02	-	Ti = 0,06 - 0,10
	max. 0,02	-	0,015 - 0,045	max. 0,02	max. 0,05	-	Cu = 0,50 - 0,80
	0,18 - 0,25	-	0,06 - 0,10	0,030 - 0,070	max. 0,02	-	Ti ≤ 0,01 / Zr ≤ 0,01
	0,15 - 0,25	0,001 - 0,006	0,04 - 0,09	0,030 - 0,070	max. 0,02	1,50 - 2,00	Ti ≤ 0,01 / Zr ≤ 0,01
	0,15 - 0,30	0,0005 - 0,005	0,04 - 0,10	0,040 - 0,100	max. 0,02	1,50 - 2,50	Cu = 0,30 - 1,70 / Ti ≤ 0,01 / Zr ≤ 0,01
	0,18 - 0,25	0,0003 - 0,006	0,06 - 0,10	0,040 - 0,090	max. 0,02	0,90 - 1,10	Ti ≤ 0,01 / Zr ≤ 0,01

	Heat Treatments
	full or isothermal annealed / normalized and tempered / subcritical annealed
	full or isothermal annealed / normalized and tempered
	full or isothermal annealed / normalized and tempered
	subcritical annealed
	full or isothermal annealed / normalized and tempered
	full or isothermal annealed / normalized and tempered
	full or isothermal annealed / normalized and tempered / subcritical annealed
	full or isothermal annealed / normalized and tempered
	full or isothermal annealed / normalized and tempered
	full or isothermal annealed / normalized and tempered
	normalized and tempered
	normalized and tempered
	normalized and tempered
	normalized and tempered
	normalized and tempered
	normalized and tempered
	normalized and tempered
	normalized and tempered

RIFLED TUBES

Seamless cold drawn rifled tubes for boiler are available upon request.
We can manufacture ribbed tubes according to your drawings with rib count and tooling details!

All mechanical properties at room temperature

Not mentioned grades on request.

CHEMICAL COMPOSITION AND MECHANICAL PROPERTIES

Steel Grade	Material-Number	C	Si	Mn	P max.	S max.	Cr	Mo
P195GH	1.0348	≤ 0,13	≤ 0,35	≤ 0,70	0,025	0,010	≤ 0,30	≤ 0,08
P235GH	1.0345	≤ 0,16	≤ 0,35	≤ 1,20	0,025	0,010	≤ 0,30	≤ 0,08
P265GH	1.0425	≤ 0,20	≤ 0,40	≤ 1,40	0,025	0,010	≤ 0,30	≤ 0,08
20MnNb6	1.0471	≤ 0,22	0,15 - 0,35	1,00 - 1,50	0,025	0,010	-	-
16Mo3	1.5415	0,12 - 0,20	≤ 0,35	0,40 - 0,90	0,025	0,010	≤ 0,30	0,25 - 0,35
8MoB5-4	1.5450	0,06 - 0,10	0,10 - 0,35	0,60 - 0,80	0,025	0,010	≤ 0,20	0,40 - 0,50
14MoV6-3	1.7715	0,10 - 0,15	0,15 - 0,35	0,40 - 0,70	0,025	0,010	0,30 - 0,60	0,50 - 0,70
10CrMo5-5	1.7338	≤ 0,15	0,50 - 1,00	0,30 - 0,60	0,025	0,010	1,00 - 1,50	0,45 - 0,65
13CrMo4-5	1.7335	0,10 - 0,17	≤ 0,35	0,40 - 0,70	0,025	0,010	0,70 - 1,15	0,40 - 0,60
10CrMo9-10	1.7380	0,08 - 0,14	≤ 0,50	0,30 - 0,70	0,020	0,010	2,00 - 2,50	0,90 - 1,10
11CrMo9-10	1.7383	0,08 - 0,15	≤ 0,50	0,40 - 0,80	0,025	0,010	2,00 - 2,50	0,90 - 1,10
25CrMo4	1.7218	0,22 - 0,29	≤ 0,40	0,60 - 0,90	0,025	0,010	0,90 - 1,20	0,15 - 0,30
20CrMoV13-5-5	1.7779	0,17 - 0,23	0,15 - 0,35	0,30 - 0,50	0,025	0,010	3,00 - 3,30	0,50 - 0,60
15NiCuMoNb5-6-4	1.6368	≤ 0,17	0,25 - 0,50	0,80 - 1,20	0,025	0,010	≤ 0,30	0,25 - 0,50
7CrWVMoNb9-6	1.8201	0,04 - 0,10	≤ 0,50	0,10 - 0,60	0,030	0,010	1,90 - 2,60	0,05 - 0,30
7CrMoVTiB10-10	1.7378	0,05 - 0,10	0,15 - 0,45	0,30 - 0,70	0,020	0,010	2,20 - 2,60	0,90 - 1,10
X11CrMo5+I/NT1/NT2	1.7362+I/NT1/NT2	0,08 - 0,15	0,15 - 0,50	0,30 - 0,60	0,025	0,010	4,00 - 6,00	0,45 - 0,65
X11CrMo9-1+I/NT	1.7386+I/NT	0,08 - 0,15	0,25 - 1,00	0,30 - 0,60	0,025	0,010	8,00 - 10,00	0,90 - 1,10
X10CrMoVNb9-1	1.4903	0,08 - 0,12	0,20 - 0,50	0,30 - 0,60	0,020	0,005	8,00 - 9,50	0,85 - 1,05
X10CrWMoVNb9-2	1.4901	0,07 - 0,13	≤ 0,50	0,30 - 0,60	0,020	0,010	8,50 - 9,50	0,30 - 0,60
X11CrMoWVNb9-1-1	1.4905	0,09 - 0,13	0,10 - 0,50	0,30 - 0,60	0,020	0,010	8,50 - 9,50	0,90 - 1,10
X20CrMoV11-1	1.4922	0,17 - 0,23	0,15 - 0,50	≤ 1,00	0,025	0,010	10,00 - 12,50	0,80 - 1,20

(TC1 and TC2 are available)

Steel Grade	Material Number	Upper Yield Strength in MPa min. ReH or Rp0,2 for wall thickness T in mm				Tensile Strength Rm MPa	Elongation min. %	
		T ≤ 16	16 < T ≤ 40	40 < T ≤ 60	60 < T ≤ 100		longitud.	transve
P195GH	1.0348	195	-	-	-	320 - 440	27	25
P235GH	1.0345	235	225	215	-	360 - 500	25	23
P265GH	1.0425	265	255	245	-	410 - 570	23	21
20MnNb6	1.0471	355	345	335	-	500 - 650	22	20
16Mo3	1.5415	280	270	260	-	450 - 600	22	20
8MoB5-4	1.5450	400	-	-	-	540 - 690	19	17
14MoV6-3	1.7715	320	320	310	-	460 - 610	20	18
10CrMo5-5	1.7338	275	275	265	-	410 - 560	22	20
13CrMo4-5	1.7335	290	290	280	-	440 - 590	22	20
10CrMo9-10	1.7380	280	280	270	-	480 - 630	22	20
11CrMo9-10	1.7383	355	355	355	-	540 - 680	20	18
25CrMo4	1.7218	345	345	345	-	540 - 690	18	15
20CrMoV13-5-5	1.7779	590	590	590	-	740 - 880	16	14
15NiCuMoNb5-6-4	1.6368	440	440	440	440	610 - 780	19	17
7CrWVMoNb9-6	1.8201	400	400	400	-	510 - 740	20	18
7CrMoVTiB10-10	1.7378	450	430	430	-	565 - 840	17	15
X11CrMo5+I	1.7362+I	175	175	175	175	430 - 580	22	20
X11CrMo5+NT1	1.7362+NT1	280	280	280	280	480 - 640	20	18
X11CrMo5+NT2	1.7362+NT2	390	390	390	390	570 - 740	18	16
X11CrMo9-1+I	1.7386+I	210	210	210	-	460 - 640	20	18
X11CrMo9-1+NT	1.7386+NT	390	390	390	-	590 - 740	18	16
X10CrMoVNb9-1	1.4903	450	450	450	450	630 - 830	19	17
X10CrWMoVNb9-2	1.4901	440	440	440	440	620 - 850	19	17
X11CrMoWVNb9-1-1	1.4905	450	450	450	450	620 - 850	19	17
X20CrMoV11-1	1.4922	490	490	490	490	690 - 840	17	14

(TC1 and TC2 are available)
(DIN 17175 is replaced by EN 10216-2, however we supply and certify still acc. to DIN 17175 if required)

	Ni	Al	Cu	Nb	Ti max.	V	Cr+Cu+Mo+Ni	Others
	≤ 0,30	≥ 0,020	≤ 0,30	≤ 0,010	0,040	≤ 0,02	≤ 0,70	-
	≤ 0,30	≥ 0,020	≤ 0,30	≤ 0,020	0,040	≤ 0,02	≤ 0,70	-
	≤ 0,30	≥ 0,020	≤ 0,30	≤ 0,020	0,040	≤ 0,02	≤ 0,70	-
	-	≤ 0,060	≤ 0,30	0,015 - 0,10	-	-	-	-
	≤ 0,30	≤ 0,040	≤ 0,30	-	-	-	-	-
	-	≤ 0,060	≤ 0,30	-	0,060	-	-	B = 0,002 - 0,006
	≤ 0,30	≤ 0,040	≤ 0,30	-	-	0,22 - 0,28	-	-
	≤ 0,30	≤ 0,040	≤ 0,30	-	-	-	-	-
	≤ 0,30	≤ 0,040	≤ 0,30	-	-	-	-	-
	≤ 0,30	≤ 0,040	≤ 0,30	-	-	-	-	-
	≤ 0,30	≤ 0,040	≤ 0,30	-	-	-	-	-
	≤ 0,30	≤ 0,040	≤ 0,30	-	-	-	-	-
	≤ 0,30	≤ 0,040	≤ 0,30	-	-	0,45 - 0,55	-	-
	1,00 - 1,30	≤ 0,050	0,50 - 0,80	0,015 - 0,045	-	-	-	-
	-	≤ 0,030	-	0,02 - 0,08	0,005 - 0,060	0,20 - 0,30	-	N ≤ 0,015 / B = 0,0010 - 0,0060 / W = 1,45 - 1,75 / Ti/N ≥ 3,50
	-	≤ 0,020	-	-	0,05 - 0,10	0,20 - 0,30	-	N ≤ 0,010 / B = 0,0015 - 0,0070
	-	≤ 0,040	≤ 0,30	-	-	-	-	-
	-	≤ 0,040	≤ 0,30	-	-	-	-	-
	≤ 0,40	≤ 0,020	≤ 0,30	0,06 - 0,10	0,010	0,18 - 0,25	-	N = 0,030 - 0,070 / Zr ≤ max. 0,01
	≤ 0,40	≤ 0,020	-	0,04 - 0,09	0,010	0,15 - 0,25	-	N = 0,030 - 0,070 / B = 0,001 - 0,006 / W = 1,50 - 2,00 / Zr ≤ max. 0,01
	0,10 - 0,40	≤ 0,020	-	0,06 - 0,10	0,010	0,18 - 0,25	-	N = 0,050 - 0,090 / B = 0,0005 - 0,005 / W = 0,90 - 1,10 / Zr ≤ max. 0,01
	0,30 - 0,80	≤ 0,040	≤ 0,30	-	-	0,25 - 0,35	-	-

	Heat Treatments
rse	
	normalized
	normalized
	normalized
	normalized
	normalized
	normalized
	normalized and tempered
	normalized and tempered
	normalized and tempered
	normalized and tempered
	quenched and tempered
	quenched and tempered
	quenched and tempered
	normalized and tempered
	normalized and tempered
	normalized and tempered
	isothermal annealed
	normalized and tempered
	normalized and tempered
	isothermal annealed
	normalized and tempered
	normalized and tempered
	normalized and tempered
	normalized and tempered
	normalized and tempered

All mechanical properties at room temperature

Not mentioned grades on request.

CHEMICAL COMPOSITION AND MECHANICAL PROPERTIES

SEAMLESS CARBON STEEL & ALLOY STEEL TUBES ACC. TO ASTM/ASME-A/SA 334

Steel Grade	C (max)	Mn	P (max)	S (max)	Si	Ni	Cu	Cr
Gr. 1	0,30	0,40 - 1,06	0,025	0,025	-	-	-	-
Gr. 3	0,19	0,31 - 0,64	0,025	0,025	0,18 - 0,37	3,18 - 3,82	-	-
Gr. 6	0,30	0,29 - 1,06	0,025	0,025	min. 0,10	-	-	-
Gr. 7	0,19	max. 0,90	0,025	0,025	0,13 - 0,32	2,03 - 2,57	-	-
Gr. 8	0,13	max. 0,90	0,025	0,025	0,13 - 0,32	8,40 - 9,60	-	-
Gr. 9	0,20	0,40 - 1,06	0,025	0,025	-	1,60 - 2,24	0,75 - 1,25	-
Gr. 11	0,10	max. 0,60	0,025	0,025	max. 0,35	35,00 - 37,00	-	max. 0,50

Tolerance: ASTM / ASME-A / SA 1016

SEAMLESS CARBON STEEL & ALLOY STEEL TUBES ACC. TO EN 10216-4

Steel Grade	Material Number	C	Si	Mn	P max.	S max.	Cr
P215NL	1.0451	≤ 0,15	≤ 0,35	0,40 - 1,20	0,025	0,010	≤ 0,30
P255QL	1.0452	≤ 0,17	≤ 0,35	0,40 - 1,20	0,025	0,010	≤ 0,30
P265NL	1.0453	≤ 0,20	≤ 0,40	0,60 - 1,40	0,025	0,010	≤ 0,30
26CrMo4-2	1.7219	0,22 - 0,29	≤ 0,35	0,50 - 0,80	0,025	0,010	0,90 - 1,20
11MnNi5-3	1.6212	≤ 0,14	≤ 0,50	0,70 - 1,50	0,025	0,010	-
13MnNi6-3	1.6217	≤ 0,16	≤ 0,50	0,85 - 1,70	0,025	0,010	-
12Ni14	1.5637	≤ 0,15	0,15 - 0,35	0,30 - 0,80	0,025	0,005	-
X12Ni5	1.5680	≤ 0,15	≤ 0,35	0,30 - 0,80	0,020	0,005	-
X10Ni9	1.5682	≤ 0,13	0,15 - 0,35	0,30 - 0,80	0,020	0,005	-

(TC1 and TC2 are available)

Steel Grade	Material Number	Upper Yield Stength in MPa min.	Tensile Strength Rm MPa	Elongation min. %	
				longitud.	transverse
P215NL	1.0451	215	360 - 480	25	23
P255QL	1.0452	255	360 - 490	23	21
P265NL	1.0453	265	410 - 570	24	22
26CrMo4-2	1.7219	440	560 - 740	18	16
11MnNi5-3	1.6212	285	410 - 530	24	22
13MnNi6-3	1.6217	355	490 - 610	22	20
12Ni14	1.5637	345	440 - 620	22	20
X12Ni5	1.5680	390	510 - 710	21	19
X10Ni9	1.5682	510	690 - 840	20	18

(TC1 and TC2 are available)
(DIN 17173 is replaced by EN 10216-4, however we supply and certify still acc. to DIN 17173 if required)

	Co	Mo	TS min KSI (MPa)	YS min KSI (MPa)	El. min, %	Hardness max.		Heat Treatments
						Brinell	Rockwell	
	-	-	55 (380)	30 (205)	35	163	B85	normalized
	-	-	65 (450)	35 (240)	30	190	B90	normalized
	-	-	60 (415)	35 (240)	30	190	B90	normalized
	-	-	65 (450)	35 (240)	30	190	B90	normalized
	-	-	100 (690)	75 (520)	22	-	-	quenched and tempered
	-	-	63 (435)	46 (315)	28	-	-	normalized
	max. 0,50	max. 0,50	65 (450)	35 (240)	18	190	B90	-

	Ni	Mo	Al	Cu	Nb	Ti max.	V
	≤ 0,30	≤ 0,08	≥ 0,020	≤ 0,30	≤ 0,010	0,040	≤ 0,02
	≤ 0,30	≤ 0,08	≥ 0,020	≤ 0,30	≤ 0,010	0,040	≤ 0,02
	≤ 0,30	≤ 0,08	≥ 0,020	≤ 0,30	≤ 0,010	0,040	≤ 0,02
	-	0,15 - 0,30	-	≤ 0,30	-	-	-
	0,30 - 0,80	-	≥ 0,020	≤ 0,30	≤ 0,050	-	≤ 0,05
	0,30 - 0,85	-	≥ 0,020	≤ 0,30	≤ 0,050	-	≤ 0,05
	3,25 - 3,75	-	-	≤ 0,30	-	-	≤ 0,05
	4,50 - 5,30	-	-	≤ 0,30	-	-	≤ 0,05
	8,50 - 9,50	≤ 0,10	-	≤ 0,30	-	-	≤ 0,05

	Heat Treatments
	normalized
	quenched and tempered
	normalized
	quenched and tempered
	normalized
	normalized
	normalized and tempered / quenched and tempered
	normalized and tempered / quenched and tempered
	normalized / normalized and tempered / quenched and tempered

All mechanical properties at room temperature

Not mentioned grades on request.

CHEMICAL COMPOSITION AND MECHANICAL PROPERTIES

AUSTENITIC STAINLESS STEEL

Material Standard: Tubes and Pipes: ASTM A 213 Tolerance: ASTM / ASME-A / SA 1016 (ASTM A 271 is replaced by ASTM A213)

Grade	UNS No	C	Si max.	Mn max.	P max.	S max.
TP 304	S30400	0.08 max	1,00	2.00	0.045	0.030
TP 304 H	S30409	0.04-0.10	1,00	2.00	0.045	0.030
TP 304 N	S30451	0.08 max	1,00	2.00	0.045	0.030
TP 304 LN	S30453	0.035 max	1,00	2.00	0.045	0.030
TP 304 L	S30403	0.035 max	1,00	2.00	0.045	0.030
TP 309 S	S30908	0.08 max	1,00	2.00	0.045	0.030
TP 310 S	S31008	0.08 max	1,00	2.00	0.045	0.030
TP 316	S31600	0.08 max	1,00	2.00	0.045	0.030
TP 316 H	S31609	0.04-0.10	1,00	2.00	0.045	0.030
TP 316 L	S31603	0.035 max	1,00	2.00	0.045	0.030
TP 316 N	S31651	0.08 max	1,00	2.00	0.045	0.030
TP 316 LN	S31653	0.035 max	1,00	2.00	0.045	0.030
TP 317	S31700	0.08 max	1,00	2.00	0.045	0.030
TP 317 L	S31703	0.035 max	1,00	2.00	0.045	0.030
TP 321	S32100	0.08 max	1,00	2.00	0.045	0.030
TP 321 H	S32109	0.04-0.10	1,00	2.00	0.045	0.030
TP 347	S34700	0.08 max	1,00	2.00	0.045	0.030
TP 347 H	S34709	0.04-0.10	1,00	2.00	0.045	0.030
TP 904 L	N08904	0.02 max	1.00	2.00	0.040	0.030

FERRITIC AND MARTENSITIC STAINLESS STEEL

Material Standard: Tubes and Pipes: ASTM A 268, Tolerance: ASTM / ASME-A / SA 1016

Grade	UNS No	C max.	Si max.	Mn max.	P max.	S max.
TP 405	S40500	0.08	1.00	1.00	0.040	0.030
TP 410	S41000	0.15	1.00	1.00	0.040	0.030
TP 429	S42900	0.12	1.00	1.00	0.040	0.030
TP 430	S43000	0.12	1.00	1.00	0.040	0.030
TP 446-1	S44600	0.20	1.00	1.50	0.040	0.030
TP 446-2	S44600	0.12	1.00	1.50	0.040	0.030
TP 409	S40900	0.08	1.00	1.00	0.045	0.030
TP 430 TI	S43036	0.10	1.00	1.00	0.040	0.030

FERRITIC AND MARTENSITIC STAINLESS STEEL

Material Standard Tubes and Pipes: ASTM A 789, Tolerance: ASTM / ASME-A / SA 1016

UNS No	C max.	Si	Mn	P max.	S max.	Ni	Cr	Mo
S31803	0.030	1.00 max	2.00 max	0.030	0.020	4.50-6.50	21.0-23.0	2.50-3.50
S31500	0.030	1.40-2.00	1.20-2.00	0.030	0.030	4.30-5.20	18.0-19.0	2.50-3.00
S32550	0,040	1.00 max	1.50 max	0.040	0.030	4.50-6.50	24.0-27.0	2.90-3.90
S31200	0.030	1.00 max	2.00 max	0.045	0.030	5.50-6.50	24.0-26.0	1.20-2.00
S31260	0.030	0.75 max	1.00 max	0.030	0.030	5.50-7.50	24.0-26.0	2.50-3.50
S32304	0.030	1.00 max	2.50 max	0.040	0.040	3.0-5.5	21.5-24.5	0.05-0.60
OD 1 in (25mm) and Under								
OD over 1 in. (25 mm)								
S32750	0.030	0.80 max	1.20 max	0.035	0.020	6.0-8.0	24.0-26.0	3.0-5.0
S32760	0.030	1.00 max	1.00 max	0.030	0.010	6.00-8.00	24.0-26.0	3.00-4.00

Not mentioned grades on request.

	Ni	Cr	Mo	Others	YS min KSI (MPa)	TS min KSI (MPa)	El. min. %
	8.00-11.00	18.00-20.00	...		30 (205)	75 (515)	35
	8.00-11.00	18.00-20.00	...		30 (205)	75 (515)	35
	8.00-11.00	18.00-20.00	...	N 0.10 - 0.16	35 (240)	80 (550)	35
	8.00-11.00	18.00-20.00	...	N 0.10 - 0.16	30 (205)	75 (515)	35
	8.00-12.00	18.00-20.00	...		25 (170)	70 (485)	35
	12.00 -15.00	22.00-24.00	...		30 (205)	75 (515)	35
	19.00-22.00	24.00-26.00			30 (205)	75 (515)	35
	10.00-14.00	16.00-18.00	2.00-3.00		30 (205)	75 (515)	35
	11.00-14.00	16.00-18.00	2.00-3.00		30 (205)	75 (515)	35
	10.00-14.00	16.00-18.00	2.00-3.00		25 (170)	70 (485)	35
	10.00-13.00	16.00-18.00	2.00-3.00	N 0.10 - 0.16	35 (240)	80 (550)	35
	10.00-13.00	16.00-18.00	2.00-3.00	N 0.10 - 0.16	30 (205)	75 (515)	35
	11.00-15.00	18.00-20.00	3.00-4.00		30 (205)	75 (515)	34
	11.00-15.00	18.00-20.00	3.00-4.00		30 (205)	75 (515)	35
	9.00-12.00	17.00-19.00	...	Ti 5x(C+N), max 0.70%	30 (205)	75 (515)	35
	9.00-12.00	17.00-19.00	...	Ti 4x(C+N), max 0.70%	30 (205)	75 (515)	35
	9.00-13.00	17.00-20.00	...	Nb 10xC, max 1.10%	30 (205)	75 (515)	35
	9.00-13.00	17.00-19.00	...	Nb 8xC, max 1.10%	30 (205)	75 (515)	35
	23.00-28.00	19.00-23.00	4.00-5.00	N max. 0,10; Cu 1.00-2.00	31 (215)	71 (490)	35

	Ni max.	Cr	Mo	Others	YS min KSI (MPa)	TS min KSI (MPa)	El. min. %
	0.50	11.50-14.50	...	Al 0.10 - 0.30	30 (205)	60 (415)	20
		11.50-13.50	...		30 (215)	60 (415)	20
		14.00-16.00	...		35 (240)	60 (415)	20
		16.00-18.00	...		35 (240)	60 (415)	20
	0.75	23.00-27.00	...	N 0.25 max.	40 (275)	70 (485)	18
	0.50	23.00-27.00	...	N 0.25 max.	40 (275)	65 (450)	20
	0.50	10.50-11.70	...	Ti 6xC min; 0.75 max	25 (170)	55 (380)	20
	0.75	16.00-19.50	...	Ti 5xC min; 0.75 max	35 (240)	60 (415)	20

	N	Cu	Others	YS KSI (MPa)	TS KSI (MPa)	El. min. %	Brinell max	Rockwell max
	0.08-0.20	...	...	65 (450)	90 (620)	25	290	30
	0.05-0.10	...	...	64 (440)	92 (630)	30	290	30
	0.10-0.25	1.50-2.50	...	80 (550)	110 (760)	15	297	31
	0.14-0.20	...	...	65 (450)	100 (690)	25	280	...
	0.10-0.30	0.20-0.80	W 0.10-0.50	65 (450)	100 (690)	25	290	30
	0.05-0.20	0.05-0.60						
				65 (450)	100 (690)	25	...	...
				58 (400)	87 (600)	25	290	30
	0.24-0.32	0.50 max	...	80 (550)	116 (800)	15	300	32
	0.20-0.30	0.50-1.00	W 0.50-1.00	80 (550)	109 (750)	25	300	...

All mechanical properties at room temperature

CHEMICAL COMPOSITION AND MECHANICAL PROPERTIES

Material Grade	Tube / Pipe Standard	Material No.	C max.	Si max.	Mn max.	P max.	S max.	Cr	Ni	Mo
UNSN02200	ASTM B 161 ASTM B 725 ASTM B 730	2.4066	0,150	0,35	0,35	-	0,010	-	99,0 min	-
UNSN02201	ASTM B 161 ASTM B 725 ASTM B 730	2.4063	0,020	0,35	0,35	-	0,010	-	99,0 min	-
UNSN04400	ASTM B 165 ASTM B 725 ASTM B 730	2.4360	0,300	0,50	2,00	-	0,024	-	63,0 min	-
UNSN06600	ASTM B 167 ASTM B 516 ASTM B 517	2.4816	0,150	0,50	1,00	-	0,015	14,0-17,0	72,0 min	-
UNSN06601	ASTM B 167 ASTM B 829 ASTM B 775	2.4851	0,100	0,50	1,00	-	0,015	21,0-25,0	58,0-63,0	-
UNSN06625	ASTM B 444 ASTM B 704 ASTM B 705	2.4856	0,100	0,50	0,50	0,015	0,015	20,0-23,0	58,0 min	8,0-10
UNSN08800	ASTM B 407 ASTM B 514 ASTM B 515	1.4876	0,100	1,00	1,50	-	0,015	19,0-23,0	30,0-35,0	-
UNSN08810	ASTM B 407 ASTM B 514 ASTM B 515	1.4876	0,050- 0,100	1,00	1,50	-	0,015	19,0-23,0	30,0-35,0	-
UNSN08811	ASTM B 407 ASTM B 829	1.4876	0,060- 0,100	1,00	1,50	-	0,015	19,0-23,0	30,0-35,0	-
UNSN08825	ASTM B 423 ASTM B 704 ASTM B 705	2.4858	0,050	0,50	1,00	-	0,030	19,5-23,5	38,0-46,0	2,5-3
UNSN08020	ASTM B 464 ASTM B 729	2.4660	0,070	1,00	2,00	0,045	0,035	19,0-21,0	32,0-38,0	2,0-3
UNSN10276	ASTM B 622 ASTM B 619 ASTM B 626	2.4819	0,010	0,08	1,00	0,040	0,030	14,5-16,5	rem.	15,0-1
UNSN06022	ASTM B 622 ASTM B 626	2.4602	0,015	0,08	0,500	0,020	0,020	20,0-22,5	rem.	12,5-1

Not mentioned grades on request.

			MECHANICAL PROPERTIES		
	Ti	Others	TS min. KSI (MPa)	YS min. KSI (MPa)	El. min. %
	-	Cu 0,25 max, Fe 0,40 max	55 (379)	15 (103)	40
	-	Cu 0,25 max, Fe 0,40 max	50 (345)	12 (83)	40
	-	Cu 28,0-34,0;Fe 2,5 max.	70 (483)	28 (193)	35
	-	Cu 0,5 max; Fe 6,0-10,0	80 (552)	35 (241)	30
	-	Cu 1,0 max, Al 1,0 - 1,70; Fe rem.	80 (552)	30 (207)	30
,0	0,40 max.	CB + Ta 3,15 - 4,15, Fe max 5,0; Al max 0,40	120 (827)	60 (414)	30
	0,15-0,60	Cu 0,75 max; Al 0,15-0,6:Fe 39,5 min	75 (517)	30 (207)	30
	0,15-0,60	Cu 0,75 max;Al 0,15-0,6:Fe 39,5 min	65 (448)	25 (172)	30
	0,15-0,60	Cu 0,75 max;Al 0,15-0,6:Fe 39,5 min	65 (448)	25 (172)	30
,5	0,60-1,20	Cu 1,5-3,0; Al 0,2 max, Fe min 22,0	85 (586)	35 (241)	30
,0	-	Cu 3,00-4,00; NB+Ta 8xC max. 1,0; Fe rem.	80 (551)	35 (241)	30
7,0	-	W 3,0 - 4,5, Fe 4,0 - 7,0, Co 2,5 max, V 0,35 max	100 (690)	41 (283)	40
4,5	-	W 2,5-3,5, Fe 2,0 - 6,0, V 0,35 max Co 2,5 max,	100 (690)	45 (310)	45

a. m. values are for annealed condition and for indication only (values may change depending on size required)

Outside Diameter

Seamless hot finished Tubes

OD (in mm)	Tolerance (in mm)
101,60 and under	- 0,80 / + 0,40
101,60 to 190,50, incl.	- 1,20 / + 0,40
190,50 to 228,60, incl.	- 1,60 / + 0,40

Welded and cold finished Tubes

OD (in mm)	Tolerance (in mm)
under 25,40	- 0,10 / + 0,10
25,40 to 38,10 incl.	- 0,15 / + 0,15
over 38,10 to 50,80 excl.	- 0,20 / + 0,20
50,80 to 63,50 excl.	- 0,25 / + 0,25
63,50 to 76,20 excl.	- 0,30 / + 0,30
76,20 to 101,60 incl.	- 0,38 / + 0,38
over 101,60 to 190,50 incl.	- 0,64 / + 0,38
over 190,50 to 228,60 incl.	- 1,14 / + 0,38

Minimum Wall Thickness

Seamless hot finished Tubes

OD (in mm)	Minimum Wall Thickness (in mm)			
	2,40 and under	2,40 to 3,80 incl.	3,80 to 4,60 incl.	over 4,60
101,60 and under	- 0 / + 40 %	- 0 / + 35 %	- 0 / + 33 %	- 0 / + 28 %
over 101,60	-	- 0 / + 35 %	- 0 / + 33 %	- 0 / + 28 %

Seamless cold finished Tubes

OD (in mm)	Wall Thickness (in %)
38,10 and under	- 0 / + 20
Over 38,10	- 0 / + 22

Welded Tubes

OD (in mm)	Wall Thickness (in %)
All sizes	- 0 / + 18

Fix Length

Method of Manufacture	OD (in mm)	Cut Length (in mm)
Seamless, hot finished	All sizes	- 0 / + 5
Seamless, cold finished	under 50,80 mm	- 0 / + 3
	50,80 and over	- 0 / + 5
Welded	under 50,80 mm	- 0 / + 3
	50,80 and over	- 0 / + 5

They apply to cut length up to and including 7,30 m. For lengths greater than 7,30 m the tolerance is to be agreed.

Outside Diameter and Average Wall Thickness

Hot finished Tubes

Outside Diameter D mm	Tolerance on D	Tolerances on T for a T/D ratio			
		≤ 0,025	> 0,025 - 0,050	> 0,050 - 0,10	> 0,10
D ≤ 219,10	± 1 % or ± 0,5 mm, whichever is the greater	± 12,5 % or ± 0,4 mm whichever is the greater			
D > 219,10		± 20 %	± 15 %	± 12,5 %	± 10 %

Outside Diameter and Minimum Wall Thickness

Hot finished Tubes

Outside Diameter D mm	Tolerance on D	Tolerances on T for a T/D ratio			
		≤ 0,02	> 0,02 - 0,04	> 0,04 - 0,09	> 0,09
D ≤ 219,10	± 1 % or ± 0,5 mm, whichever is the greater	-0/+28 % or -0/+0,8 mm whichever is the greater			
D > 219,10		-0/+50 %	-0/+35 %	-0/+28 %	-0/+22 %

Outside Diameter and Average Wall Thickness

Cold finished Tubes

Tolerances on D	Tolerances on T
± 0,5 % or ± 0,3 mm whichever is the greater	± 10 % or ± 0,2 mm whichever is the greater

Fix Length (in mm)

Length L	Tolerances for Fix Length
L ≤ 6000	- 0 / + 10
6000 < L ≤ 12000	- 0 / + 15
L > 12000	- 0 / + to be agreed

CARBON AND ALLOY STEEL GRADES

ASTM A ASME SA	Steel Grade	EN 10216-2	Material Number	DIN
		P195GH	1.0348	17175
179	low carbon steel	P235GH	1.0345	ST35.8
192	carbon steel			
210	A-1	P265GH	1.0425	17175 ST45.8
210	C			17175: 17Mn4
209	T1, T1A, T1B			
213	T2			
213	T5, T5B**, T5C**	X11CrMo5 + I	1.7362	17176: 12CrMo19-5
		X11CrMo5 + NT1		
		X11CrMo5 + NT2		
213	T9	X11CrMo9-1 + I	1.7386	17176: X12CrMo9-1
		X11CrMo9-1 + NT		
213	T11	10CrMo5-5	1.7338	
213	T12	13CrMo4-5	1.7335	17175, 17176 13CrMo44
213	T17			
213	T21			17176 12CrMo1210
213	T22	10CrMo9-10	1.7380	17175: 10CrMo910
213	T23	7CrWVMoNb9-6	1.8201	
213	T24	7CrMoVTiB10-10	1.7378	
213	T91	X10CrMoVNb9-1	1.4903	17175 VdTÜV 511: X10CrMoVNb91
213	T92	X10CrWMoVNb9-2	1.4901	
213	T122			
213	T911	X11CrMoWVNb9-1-1	1.4905	
		16Mo3	1.5415	17175: 15Mo3
		20MnNb6	1.0471	17175: 15Mo3
		8MoN5-4	1.5450	
		11CrMo9-10	1.7383	
		25CrMo4	1.7218	17176: 25CrMo4
		20CrMoNb5-6-4	1.7779	
213	T36	15NiCuMoNb5-6-4	1.6368	
		X20CrMoV11-1	1.4922	17175: X20CrMoV-12 1

ASTM A ASME SA	Steel Grade	EN 10216-4	Material Number	DIN
334	1	P215NL	1.0451	17173: TTSt35N
334	3	12Ni14	1.5637	17173: 10Ni14
334	6	P265NL	1.0453	
334	7			
334	8			
334	9			
334	11			
		P255QL	1.0452	17173: TTSt35V
		26CrMo4-2	1.7219	
		11MnNi5-3	1.6212	
		13MnNi6-3	1.6217	
		X12Ni5	1.5680	
		X10Ni9		

As a replacement for EN 10216-2				JIS	GOST
	BS	NFA	UNI		
	3059-1, -2: Steel 320, 360	49-213, TU37C	663: Fe35-2	G 3461: STB 340	550:10
		49-215, TU37C			
	3602-1: Steel 360	49-219, TU37F	5462: C14		TU 14-3-190:10
		49-211,TUE220B			
	3602-1: Steel 430	49-213, TU42C	663: Fe45-2	G 3461: STB 410	TU 14-3-460:20
		49-215, TU42C			
		49-219, TU42F	5462: C18		TU 14-3-190:20
		49-211, TUE250B			
	3059-2: Steel 440	49-213, TU48C			
			5462. 16Mo5	G 3458: STBA 12	
		49-213, -215: TU15CD2-05		G 3458: STBA 20	
	3604, 3606: Steel 625	49-213, -215: TUZ10CD505 TUZ12CD505		G 3458: STBA 25	550/5632: 15CH 5M
	3604: Steel 629	49-213 TUZ10CD9		G 3458: STBA 26	
	3604: Steel 621	49-213, -215, -219 TU10CD505		G 3462: STBA 23	
	3059-2 , 3604, 3606 Steel 620-460	49-213, -215, -219: TU13CD404	5462: 14CrMo3	G 3462: STBA 22	TU 14-3-460: 15 ChM
	3059-2,3604, 3606: Steel 622-490	49-213, -215, -219: TU10CD910	5462: 12CrMo910	G 3462: STBA 24	
	3059-2, 3604: Steel 91	49-213, TUZ10CDVNb09-01			
	3059-2: 3606, Steel 243	49-213, -215, -219: TU15D3			
	3602: Steel 500 Nb				
	3606: Steel 261				
	3604: Steel 591				
	3059-2, 3604: steel 762				

As a replacement for EN 10216-4				JIS	GOST
	BS	NFA	UNI		
				G 3464: STBL 380	
	3603: Steel 503 LT	49-230, -330: TU10N9		G 3464: STBL 450	
	3603: Steel 430 LT	49-230, -330: TU42BT			
		49-230: TU10N9			
		49-230, -330: TU17N2			

STAINLESS STEEL GRADES

AISI.	DIN.	Material Number	UNS.	AFNOR.	BS.	JIS	SS.	GOST
403(410S)	X6Cr13	1.4000	S 41008	Z6C13	403 S17	SUS 403	2301	08Ch13
	(X7Cr13)							
405	X6CrAl13	1.4002	S40500	Z6CAl13	405 S17	SUS 405		08Ch11NYU
	(X7CrAl13)							
410	X10Cr13	1.4006	S 41000	Z12C13	410 S21	SUS 410	2302	12Ch13
430	X6Cr17	1.4016	S43000	Z8C17	430 S15	SUS 430	2320	12Ch17
430	(X8Cr17]		S17					
420	X20Cr13	1.4021	S42000	Z20C13	420 S29	SUS 420J1	2303	20Ch13
420			S37	SUS	420J2			
420			S45					
410	X15Cr13	1.4024	S 41000	...	420 S29	SUS 410J1	...	...
410			S21					
420	X30Cr13	1.4028	S 42000	Z30C13	420 S45	SUS 420J2	2304	30Ch13
420	X38Cr13	1.4031	S 42000	Z40C14	...	SUS 420J2	2304	40Ch13
	(X40Cr13)							
420	X46Cr13	1.4034	S42000	Z40C14	420 S45	...	...	40Ch13
	Z38C13M							
431	X20CrNi172	1.4057	S43100	Z15CN 16-02	431 S29	SUS 431	2321	20Ch17N2
	(X22CrNi17)							
XM8	X6CrTi17	1.4510	...	Z8CT17	...	SUS 430LX	...	08Ch17T
430Ti	(X8CrTi17)							
409	X6CrTi12	1.4512	S 40900	Z6CT12	409 S19	SUH 409	...	...
					409 S17			
304/304H	X5CrNi1810	1.4301	S 30400	Z6CN 18-09	304 S31	SUS 304	2332	03Ch18N10
	(X5CrNi189)							
303	X10CrNiS189	1.4305	S 30300	Z10CNF 18-09	303 S21	SUS 303	2346	...
	(X12CrNiS188)							
304L	X2CrNi1911	1.4306	S 30403	Z2CN18-10	304 S12	SCS 19	2352	03Ch18N11
	(X2CrNi 189)			Z3CN19-10M	304 C12	SUS 304L	2333	
	(G-X2Cr189)			Z2CN 18-09	304 S11			
301	X12CrNi177	1.4310	S 30100	Z12CN17-07	301 S21	SUS 301	...	...
				Z12Cn18-07				
304LN	X2CrNiN 1810	1.4311	S 30453	Z2CN18-10Az	304 S62	SUS304LN	2371	...
316	X5CrNiMo17122	1.4401	S 31600	Z6CND17-11	316 S16	SUS 316	2347	...

AISI.	DIN.	Material Number	UNS.	AFNOR.	BS.	JIS	SS.	GOST
316L	X2CrNiMo17132	1.4404	S 31603	Z2CND 18-13	316 S14	SUS 316L	2348	...
	(X2CrNiMo1810)			Z2CND 17-12				
	G-X2CrNiMo1810)							
316LN	X2CrNiMoN17133	1.4429	S31653	Z2CND 17-13	...	SUS 316LN	2375	...
	(X2CrNiMoN1813)							
316L	X2CrNiMo18143	1.4435	S 31603	Z2CND 17-13	316 S11	SCS 16	2353	03Ch17N14M2
	(X2CrNiMo1812)				316 S12	SUS 316L		
					316 S13			
316L	X5CrNiMo17133	1.4436	S 31600	Z6CND 17-12	316 S16	SUS 316	2343	...
	(X5CrNiMo1812)				316 S33			
317L	X2CrNiMo18164	1.4438	S 31703	Z2CND 19-15	317 S12	SUS 317L	2367	...
	(X2CrNiMo1816)							
317LNM	X2CrNiMoN17135	1.4439	S 31726	Z2CND 19-15	317 S16	...	...	...
317	X5CrNiMo 1713	1.4449	...	...	317 S16	SUS 317	...	...
...	X1CrNiMoN25252	1.4465	N 08310	...	...	...	...	...
...		1.4505	...	...	...	...	...	07Ch17N20M2D2T
440	X2CrMoTi182	1.4521	S 44400	...	...	...	2326	...
...	X1N iCrM-oCuN25206	1.4529	N 08925	...	...	...	...	...
904L		1.4539	N 08904	Z1NCDU25-2004	...	...	2562	...
321	X6CrNiTi1810	1.4541	S 32100	Z6CNT18-10	321 S12	SUS 321	2337	1Ch18N12T
	(XlOCrNiTi189)				321 S20			
					(321 531)			
347	X6CrNiNb1810	1.4550	S 34700	Z6CNNb 18-10	347 S17	SUS 347	2338	08Ch 18N12B
	(X10CrNiNb189)				347 S31			
...	X2NiCrAlTi3220	1.4558	N 08800	...	...	...		...
...	NiCrMoCuN31274	1.4563	N 08028	Z1NCDU31273Az	...	...	...	
316Ti	X6CrNiMoTi17122	1.4571	S 31635	Z6CNDT 17-12	320 S31	...	2350	10Ch17N13M2T
	(X10CrNiMo Ti1810)				320 S17			
316 Cb	X6CrNi-MoNb17122	1.4580	...	Z6CNDNb17-12	...	...	...	08Ch16N13M2B
	(X10CrNiMoNb 1810)			Z6CNDNb19-13				
318	X10CrNi-MoNb1812	1.4583	...	...	...	...	...	...
...	X5CrMo-CuNb2218	1.4586	...	...	...	...	...	...

STAINLESS STEEL GRADES

AISI.	DIN.	Material Number	UNS.	AFNOR.	BS.	JIS	SS.	GOST
310LC	X1CrNi2521	1.4335	...	Z2CN25-20	...	...	...	...
...	X10CrAl7	1.4713	...	Z8CA7	...	...	...	...
HNV3	X45Cr5i93	1.4718	...	Z45C59	401 S45	SUH 1	...	...
(405)	X10CrAl13	1.4724	...	Z10C13	403 S17	...	...	...
(430)	X10CrAl18	1.4742	...	Z10CAS18	430 S15	SUS 430	...	...
						SUH 21		
446 -1	X18CrN 28	1.4749	...	...	...	...	...	Ch25
(446)	X10CrAl24	1.4762	...	Z10CAS24	...	...	...	...
327	X20CrNi5i254	1.4821	...	Z20CN525-04	...	...	...	...
309	X15CrNi5i2012	1.4828	S 30900	Z15CNS20_12	309 S24	SUH 309	...	Ch24N12S1
309S	X7CrNi2314	1.4833	S 30908	Z15CN24 -13	...	S 309	...	...
314/310	X15CrNiSi2520	1.4841	...	Z12CN525-20	...	SUH 310	...	20Ch25N2052
310S	X12CrNi2521	1.4845	N 31008	Z12CN25-20	310 S24	SUH 310	2361	10Ch23N18
						SUS 310S		
...	(G-X4 0CrNi5i2520)	1.4848	...	310 C40	SCH 21	...	...	...
330	X12NiCr5i3616	1.4864	N 08330	Z12NC53 7-18	Na 17	SUH 330	...	...
				Z12NC535-16				
				Z12NC37-18				
EV8	X53CrMnNiN219	1.4871	...	Z52CMN21-09	349 S54	SUH 35	...	...
						SUH 36		
	X10NiCrAlTi3320	1.4876	N 08800	Z8NC32-21	NA 15(H)	NCF 8000	...	...
	X10CrNiAiti3320	1.4876	N 08810	Z8NC32-21	NA 15	...	...	...
321H	X12CrNiTi189	1.4878	...	Z6CNT18-12 (B)	321 S20	SUS 321	2337	...
					(321 S12)			
...	...	1.4893	S 30815	...	...	...	2368	...
...	...	1.4410	S 32750	...	...	...	...	...
...	...	1.4362	S 32304	...	...	...	...	...
...	...	1.4417	S 31500	...	...	...	...	...
329	X4CrNiMo2751	1.4460	S 32900	...	...	SUS 329J1	2324	...
	(X8CrNiMo275)					SCH 11		
						SCS 11		
...	X2CrNiMoN2253	1.4462	S 31803	Z2CND22-05Az	...	...	...	...
...	...	...	S 31200	...	...	...	...	...
...	...	...	S 31260	...	...	...	...	...
...	...	1.4507	S 32550	...	...	...	...	...
...	...	...	S 32950	...	...	...	...	...

Heat Treatment (optional)
If requested, the U-bent area can be stress relieved.

Dye penetrant test (optional)
Dye penetrant testing of bending area can be agreed indicating the corresponding radii.

Free passage (optional)
If requested, the free passage can be proved by a ball passage test. The diameter of the ball is as follows:

Inside diameter - flattening - 2 mm

Tightness test (optional)
As final operation tightness test by cold water pressure testing with demineralized water can be performed according to specification or to be agreed upon.

Tube end protection
Tube end protection can be performed by plastic plugs

Dimensional inspection
Radius and total length are inspected on each U-bend tube. Usually one sample of smallest radius of each thickness is inspected with regard to minimum wallthickness on bend area and flattening.

Cleanliness
The cleanliness of the inside and outside surface is inspected on each U-tube.

Marking
If not agreed otherwise, the first layer of each radius of each pallet or case is marked with label as follows:

Row No. • Radius (mm) • Quantity of tubes

Packing list will be attached to each packing unit.

Documentation
If not agreed otherwise, inspection certificate 3.1., according to EN10204 is executed. If required, test certificate 3.2, by third party inspection can be provided.

TESTING AND DOCUMENTATION

Material testing:
- acc. to DIN / EN
- acc. to ASME / ASTM
- other international standards or customer specifications on request

Material documentation:
- acc. to EN 10204/3.1 or EN 10204/3.2

Third Party Inspection:
Material inspection through any independent inspection company like
- TÜV
- Lloyd's Register EMEA
- Germanischer Lloyd
- Bureau Veritas
- SGS Germany

and other customer specified National and International Inspection Authorities

RUST PROTECTION AND PACKING SERVICES

Rust protection: (surface protection for carbon steel and alloy steel)
- dipped in oil
- dipped in dewatering-fluid
- outside varnished

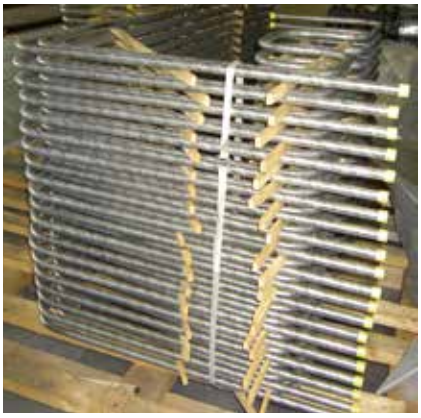
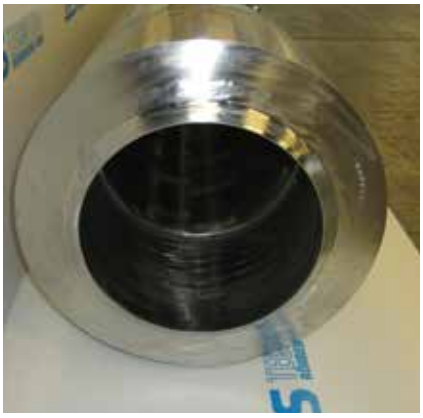
Packing:
- bundled
- wrapped in foil
- ends with plugs or caps on request
- crates
- wooden cases (all wood is ISPM 15 treated)

PIPE ASSEMBLY/SEMI ASSEMBLIES LIKE

- Headers
- Pigtails
- Flanged Pipes
- Longitudinal finned Pipes and Tubes
- Finned Tubes
- Special Forgings
- Special designed parts acc. to drawing
- Welding together possible

IN ALL KIND OF MATERIAL AND COMBINATIONS POSSIBLE:

- Carbon Steel
- Alloy Steel
- Stainless Steel
- Duplex and Superduplex
- Nickel and Nickel Alloys
- Titanium
- Copper Nickel
- Admiralty Brass
- Aluminium Brass





Headquarter


Project Office


Mill 1


Mill 2

Head Office:
TPS-Technitube Röhrenwerke GmbH
Julius-Saxler-Str. 7 | 54550 Daun/Germany
Postfach 1509 | 54541 Daun/Germany
Tel.: +49 65 92 71 20 | Fax: +49 65 92 1305
E-Mail: service@tpsd.de

Project Office:
TPS-Technitube Röhrenwerke GmbH
Dreischeibenhaus 1 | 40211 Düsseldorf/Germany
Tel.: +49 211 136 502 5390
Fax: +49 211 136 502 5379
E-Mail: projects@tpsd.de

www.tpsd.de

TPS TECHNITUBE® RÖHRENWERKE GMBH

TPS-Technitube Röhrenwerke GmbH is a company of the LEPPER Stiftung (Foundation).