CENTRAVIS

Proudly engineered in Ukraine

Heat-Exchanger Tubes

Product catalogue

Quality Management


TÜV NORD

CERTIFICATE

CENTRAVIS PRODUCTION UKRAINE PJSC
Trubnikov Avenue 56
53201 Nikopol, Dnepropetrovsker Bezirk
UKRAINE

material manufacturer acc. to AD 2000-Merkblatt W 0


CERTIFICATE

TÜV AUSTRIA

CENTRAVIS

CENTRAVIS PRODUCTION UKRAINE PRIVATE JOINT-STOCK COMPANY (CENTRAVIS PRODUCTION UKRAINE PJSC)

Design, manufacturing and supply of hot and cold formed seamless tubes in stainless steels and nickel alloys


CERTIFICATE

TÜV AUSTRIA

CENTRAVIS


CERTIFICATE

The Certification Body of TÜV SÜD Management Service GmbH certifies that

CENTRAVIS
PRIVATE JOINT-STOCK COMPANY
«CENTRAVIS PRODUCTION UKRAINE»
Trubnikov Ave., 56
53201 Nikopol
Ukraine

has established and applies an Occupational Health and Safety Management System for

Design, manufacturing and supply of hot and cold formed seamless tubes in stainless steels and nickel alloys.

An audit was performed, Order No. 707047705.
Proof has been furnished that the requirements according to

ISO 45001:2018

are fulfilled.
The certificate is valid from 2020-09-16 until 2021-08-12.
Certificate Registration No.: 12 117 50495 TMS.

Product Compliance Management
Munich, 2020-09-16


CERTIFICATE

The Certification Body of TÜV SÜD Management Service GmbH certifies that

CENTRAVIS
PRIVATE JOINT-STOCK COMPANY
«CENTRAVIS PRODUCTION UKRAINE»
Trubnikov Ave., 56
53201 Nikopol
Ukraine

has established and applies an Environmental Management System for

Design, manufacturing and supply of hot and cold formed seamless tubes in stainless steels and nickel alloys.

An audit was performed, Report No. 707047705.
Proof has been furnished that the requirements according to

ISO 14001:2015

are fulfilled.
The certificate is valid from 2018-08-13 until 2021-08-12.
Certificate Registration No.: 12 104 50495 TMS.

Product Compliance Management
Munich, 2018-08-17


CERTIFICATE

The Certification Body of TÜV SÜD Management Service GmbH certifies that

CENTRAVIS
PRIVATE JOINT-STOCK COMPANY
«CENTRAVIS PRODUCTION UKRAINE»
Trubnikov Ave., 56
53201 Nikopol
Ukraine

has established and applies an Occupational Health and Safety Management System for

Design, manufacturing and supply of hot and cold formed seamless tubes in stainless steels and nickel alloys.

An audit was performed, Report No. 707047705.
Proof has been furnished that the requirements according to

OHSAS 18001:2007

are fulfilled.
The certificate is valid from 2018-08-13 until 2021-03-11.
Certificate Registration No.: 12 116 50495 TMS.

Product Compliance Management
Munich, 2018-08-17


NATIONAL ACCREDITATION AGENCY OF UKRAINE

ACCREDITATION CERTIFICATE

«Central plant laboratory of «CENTRAVIS PRODUCTION UKRAINE» PRIVATE JOINT-STOCK COMPANY


TÜVNORD

CERTIFICATE

Management system as per
ISO 9001 : 2015

CENTRAVIS PRODUCTION UKRAINE PJSC
56, Trubnikov Avenue
53201 Nikopol, Dnipropetrovsk Region
Ukraine

CENTRAVIS

Design, manufacturing and supply of hot and cold formed seamless tubes in stainless steels and nickel alloys


TÜV NORD

CERTIFICATE

Management system as per
IATF 16949:2016
(1st edition, 2016-10-01)

CENTRAVIS PRODUCTION UKRAINE PJSC
Trubnikov Avenue 56
53201 Nikopol
Ukraine

Scope

manufacturing of cold formed seamless tubes from stainless steels and nickel alloys

without product design responsibility (according to section 8.3)

with the remote locations according to appendix

Essen, 2021-04-21

TÜV NORD CERT GmbH

Quality Management

Focusing on a unique combination of process and service quality

Focusing on Customer needs

In the current competitive market, we understand that we can work and develop only together with customers and for the customers. Therefore, implementation of customers' current requirements and striving to exceed their expectations is our primary mission.

CENTRAVIS has created conditions where by customer satisfaction is our priority target and purpose in daily activities. In this work, the Company follows the principles and require¬-ments of international quality standards. The processes of consumers are regarded as a continuation of our processes, both in terms of quality and products added value increases, and in terms of reducing all types of losses.

Investing in quality

Considering the quality of products and processes as a key priority, CENTRAVIS invests heavily in production equipment.

Among them - a new SMS MEER press line and rolling mill, LOI bright annealing furnace, Koerner etching baths and finishing equipment. In addition, advanced instrumentation systems have been introduced - non-destructive testing equipment of MAC, GE, Foerster production, chemical analyzer SpectroLab F, etc.

A modernization process, introduction of new operating procedures is continual and allows CENTRAVIS to meet the requirements and expectations of customers, provide top quality products and strive for greater production efficiency.

The quality management system of CENTRAVIS has been approved by the following certificates:

ISO 9001
ISO 14001
ISO/TS 16949
OHSAS18001
2014/68/EU
ISO/IEC 17025
AD2000MerkblattW0

Control - at each stage of production

In CENTRAVIS a multilevel system of products and quality control processes is applied, which guarantees high level of produced pipes and serves as a guarantee of customer satisfaction. Quality systems include pipe quality planning at the time of order signing, 100% initial quality control of billets, operational control of manufacturing processes and acceptance control of finished product, including geometrical parameter control, visual inspection of pipe inner and outer surface, nondestructive and laboratory testing.

Customer Benefits

The quality Management System is approved by most key customers in the market and proved by results of international audits and certificates.

CENTRAVIS products conform to customer standards and specifications and satisfy the reliability requirements required by the world's leading end-users and engineering compa¬nies operating in oil & gas, chemical, aerospace, automobile, nuclear and other power generating industries. The CENTRAVIS team has extensive technical experience and a deep understanding of the industry, allowing us to provide appropriate solutions for specific customer requirements.

Our business partners can verily actual Quality Certificates online on the company official website www.centravis.com.

Key customers accept CENTRAVIS

Over the past few years CENTRAVIS has paid special attention to the customers' needs operating in various industries. Our company was successfully certified by: SHELL, NAM, REPSOL, BAYER, BASF, PETROFAC, EXXONMOBIL, WEBCO, SABIC, FOSTER WHEELER, TECHNIP, PETROBRAS, ARAMCO OVERSEAS COMPANY, McJUNKIN RED MAN CORPORATION and other well-known companies.

Moreover, the process of obtaining official certification continues and in the near future CENTRAVIS expects to receive certification from the majority of key companies from different industries, proving the Company's ability to meet the highest standards of customer requirements from all over the world.

Classification of steels

Austenitic steels

The main advantage of steels of the austenitic class are their high performance characteristics (strength, plasticity, and corrosion resistance in most environments) and good processability. Hence, austenitic corrosion resistant steels are widely applied as a construction material in various mechanical engineering industries.

Ferritic steels

These steels are used in the manufacture of products for application in an oxidizing environment (e.g. in nitric acid solutions), for household devices, in food and consumer goods industries, and for the heat-exchange equipment in power-plant engineering. Ferritic chromium steels keep high corrosion resistance in nitric acid, ammonia water, ammonia nitrate, mixture of nitric, phosphorus and hydrofluoric acids, and in other aggressive environments as well.

Martensitic-ferritic steels

Martensitic-ferritic steels keep high corrosion resistance in atmosphere conditions and mildly aggressive environments (diluted salt/acid solutions), and high mechanical properties. Generally these steels are used for products such as cutting tools, particularly cutters, and for springing elements and constructions in contact with mildly aggressive environments in food and chemical industries.

Nickel and Iron-nickel based alloys

When manufacturing chemical apparatus, particularly for use in sulphuric and hydrochloric acid, steels maintaining corrosion resistance higher than austenitic steels such as iron-nickel, nickel-molybdenum, chrome-nickel and chrome-nickel-molybdenum based alloys shall be used.

Duplex and super duplex steels

Corrosion resistant steels keeping fine-grain mixed microstructure of ferrite and austenite and containing approximately 26% Cr and 6.5 % Ni. Corrosion resistance of duplex stainless steels is similar to austenitic stainless steels. However, duplex stainless steels keep higher strength, tensile yield strength and better resistance to stress corrosion cracking than the austenitic equivalents.

Steel grades correlation in different standards

		A1S1 (USA)	UNS (USA)	B.S. (UK)	Steel number	AFNOR NF (France)	Steel name	SS (Sweden)	JIS (Japan)	CB/PR (China)	KS (Korea)
General service and wet corrosion	Austenitic	TP304	S30400	304531/ 304515	1.4301	Z7CN18-09/ Z6CN18-09	X5CrNi1810 19-11	2333	SUS 304TP	0Cr18Ni9	STS 304
		TP304L	S30403	304511	1.4306	Z2CN18-10	X2CrNi	2352	SUS 304LTP	00Cr19Ni 10	STS 304L
					1.4307	Z3CN18-10	X2CrNi18-9				
		TP304LN	530453	304561	1.4311	Z3CN18-10Az	X2CrNi18-10	2371	-	00Cr18Ni 10N	STS 304LN
		TP316	S31600	316531	1.4401	Z7CND17-11-02	X5CrNio17-12-2	2347	SUS 316TP	0Cr17Ni 12Mo2	STS 316
				316533/ 316531	1.4436	Z7CND18-12- 03	X3CrNiMo 17-13-3	2343			
		TP316L	S31603	316511/ 316514	1.4404	Z3CND17-11-02/ Z3CND18-12-02	X2CrNiMo 17-12-2	2348	SUS 316LTP	00Cr17Ni 14Mo2	STS 316L
				316513/ 316511	1.4435	Z3CND18-14-03	X2CrNiMo 18-14-3	2353			
		TP316Ti	S31635	320531	1.4571	Z6CNDT17-12-02	X6CrNiMo-Ti17-12-2	2350	SUS 316TiTP	0Cr18Ni 12Mo2Ti	STS 316Ti
		TP316H	S31609	316552	1.4919	Z6CND17-12-02	X6CrNiMo B17-12-21712	-	-	-	-
		TP321	532100	321531	1.4541	Z6CNT18-10	X6CrNiTi18-10	2337	SUS 321TP	1Cr18Ni-9Ti	STS 321
		TP317	531700	317516	1.4449	-	X3CrNiMo 18-12-3	-	SUS 317TP	-	-
		TP317L	S3170B	317512	1.4438	Z3CND19-15-04	X2CrNi-Mo18-15-4	2367	SUS 317LTP	00Cr19Ni 13Mo3	STS 317L
		TP347	534700	347531	1.4550	Z6CNNb18-10	X6CrNiNb18-10	2338	SUS 347TP	OCr18Ni 11Nb	STS 347
		-	N08904	904513	1.4539	Z2NCDU25-20	X1NiCrMo-Cu25-20-5	2562	-	-	STS 317J5L+
	Duplex	-	S31803	-	1.4462	Z2CND22-05Az	X2CrNi-MoN22-5-3	2377	-	-	-
		-	S32205	318S13	1.4462	Z3CND22-05Az	X2CrNi-MoN22-5-3	2377	-	OOCr22N-15Mo3N	STS 329J3L
	Ferritic	TP405	S40500	405517	1.4002	Z6CAl13	X6CrAl13	-	SUS 405TP		
		TP410	S41000	410521	1.4006	Z12C13	X12Cr13	2302	SUS 410TP	1Cr12	STS 410
	Super	-	S32750	-	1.4410	-	X2CrNi-MoN25-7-4	-	-	-	-
		-	S32760	-	-	-	-	-	-	-	-
Heat resistant	Austenitic	TP304H	S30409	304551	1.4948	Z6CN18-09	X6CrNi18-10	2333	SUS 304HTP	1Cr18Ni9	STS 304
		TP321H	S32109	321551	1.4878	Z6CNT18-10	X8CrNiTi18-10	2337	SUS 321HTP	-	-
		TP347H	S34709	347551	1.4912	-	X7CrNiNb18-10	2347	SUS 347HTP	-	-
		TP310S	S31008	310516/ 310524	14845	Z8CN25-20/ Z12CN25-20	X3CrNi25-21	2361	SUS 3105TP	0Cr25Ni20	STS 310S
		TP310H	S31009	-	1.4845	-	X8CrNi25-21	-	-	-	-
		TP314	S31400	-	1.4841	Z15CMS25-20	X15CrNiSi25-21	-	-	-	-
		-	S31254	-	1.4547	-	X1CrNiMo-CuN20-18-7	-	-	-	-
		-	N08825	-	-	-	-	-	-	-	-
		-	N06625	-	-	-	-	-	-	-	-

Chemical composition

Steel grade	Tube standard	Chemical composition, %.				
		C	Mn	P	S	Si
Austenitic stainless steels						
TP 304	A213	<0.08	<2.00	<0.045	<0.030	<1.00
TP 304L	A213	<0.035	<2.00	<0.045	<0.030	<1.00
TP304H	A213	0.04-0.10	<2.00	<0.045	<0.030	<1.00
TP304N	A213	<0.08	<2.00	<0.045	<0.030	<1.00
TP304LN	A213	<0.035	<2.00	<0.045	<0.030	<1.00
TP 310S	A213	<0.08	<2.00	<0.045	<0.030	<1.00
TP310H	A213	0.04-0.10	<2.00	<0.045	<0.030	<1.00
TP 316	A213	<0.08	<2.00	<0.045	<0.030	<1.00
TP316L	A213	<0.035	<2.00	<0.045	<0.030	<1.00
TP 316H	A213	0.04-0.10	<2.00	<0.045	<0.030	<1.00
TP 316Ti	A213	<0.08	<2.00	<0.045	<0.030	<0.75
TP 317	A213	<0.08	<2.00	<0.045	<0.030	<1.00
TP 317L	A213	<0.035	<2.00	<0.045	<0.030	<1.00
TP 321	A213	<0.08	<2.00	<0.045	<0.030	<1.00
TP321H	A213	0.04-0.10	<2.00	<0.045	<0.030	<1.00
TP 347	A213	<0.08	<2.00	<0.045	<0.030	<1.00
TP 347H	A213	0.04-0.10	<2.00	<0.045	<0.030	<1.00
N08904	A213	<0.02	<2.00	<0.040	<0.030	<1.00
1.4301	EN 10216-5	<0.07	<2.00	<0.040	<0.015	<1.00
1.4306	EN 10216-5	<0.03	<2.00	<0.040	<0.015	<1.00
1.4307	EN 10216-5	<0.03	<2.00	<0.040	<0.015	<1.00
1.4311	EN 10216-5	<0.03	<2.00	<0.040	<0.015	<1.00
1.4401	EN 10216-5	<0.07	<2.00	<0.040	<0.015	<1.00
1.4404	EN 10216-5	<0.03	<2.00	<0.040	<0.015	<1.00
1.4435	EN 10216-5	<0.03	<2.00	<0.040	<0.015	<1.00
1.4429	EN 10216-5	<0.03	<2.00	<0.040	<0.015	<1.00
1.4436	EN 10216-5	<0.05	<2.00	<0.040	<0.015	<1.00
1,4541	EN 10216-5	<0.08	<2.00	<0.040	<0.015	<1.00
1.4571	EN 10216-5	<0.08	<2.00	<0.040	<0.015	<1.00
TU Z 6 CN 18 9	NF A 49-117, NF A 49-217	<0.09	<2.04	<0.045	<0.035	<1.05
TU Z 2 CN 18 10	NF A 49-117, NF A 49-217	<0.03	<2.04	<0.045	<0.035	<1.05
TU Z 12 CN 25 20	NF A 49-117	<0.16	<2.04	<0.045	<0.035	<1.05
TU Z 6 CNT 18 10	NF A 49-117	<0.09	<2.04	<0.045	<0.035	<1.05
TU Z 6 CNDT 17 12	NF A 49-117	<0.09	<2.04	<0.045	<0.035	<1.05
TU Z 2 CND 17 12	NF A 49-117, NF A 49-217	<0.03	<2.04	<0.045	<0.035	<1.05
TU Z 6 CND 17 11	NF A 49-117, NF A 49-217	<0.08	<2.04	<0.045	<0.035	<1.05
TU Z 2 CND 18 14	NF A 49-217	<0.03	<2.04	<0.025	<0.020	<1.05
1.4466		0.020	≤2.00	0.025	0.010	0.020
Ferritic stainless steels						
TP 405	A268	<0.08	<1.00	<0.040	<0.030	<1.00
TP 410	A268	<0.15	<1.00	<0.040	<0.030	<1.00
1.4002	DIN EN 10297-2	<0.08	<1.00	<0.040	<0.015	<1.00
1.4006	DIN EN 10297-2	0.08-0.15	<1.50	<0.040	<0.015	<1.00
1.4016	DIN EN 10297-2	<0.08	<1.00	<0.040	<0.015	<1.00
1.4510	DIN EN 10297-2	<0.05	<1.00	<0.040	<0.015	<1.00
TU Z 12 C 13	NF A 49-217	<0.16	<1.05	<0.045	<0.035	<1.05
TU Z 10 C 17	NF A 49-217	<0.13	<1.05	<0.045	<0.035	<1.05
S41008		0.08	1.00	0.040	0.030	1.00
Duplex stainless steels						
S31803	A789	<0.03	<2.00	<0.030	<0.020	<1.00
S32205	A789	<0.03	<2.00	<0.030	<0.020	<1.00
1.4462	EN 10216-5	<0.03	<2.00	<0.035	<0.015	<1.00
TU Z 2 CND 22 05 03	NF A 49-217	<0.03	<2.04	<0.035	<0.025	<1.05
S31254		0.020	1.00	0.030	0.010	0.80
Super duplex stainless steels						
S32750	A789	<0.03	<1.20	<0.035	<0.020	<0.80
S32760	A789	<0.03	<1.00	<0.030	<0.010	<1.00
1.4410		0.030	≤2.00	0.035	0.015	≤1.00
1.4501		0.030	≤1.00	0.035	0.015	≤1.00
S31254		0.020	1.00	0.030	0.010	0.80
Nickel-based alloys						
N08825		0.05	1.0	-	0.03	0.5
N06625		0.10 max	0.50max	0.015 max	0.015 max	0.50 max

Chemical composition, %.						
Cr	Ni	Mo	N	Nb	Ti	Others
Austenitic stainless steels						
18.0-20.0	8.0-11.0	-	-	-	-	-
18.0-20.0	8.0-12.0	-	-	-	-	-
18.0-20.0	8.0-11.0	-	-	-	-	-
18.0-20.0	8.0-11.0	-	0.10-0.16	-	-	-
18.0-20.0	8.0-11.0	-	0.10-0.16	-	-	-
24.0-26.0	19.0-22.0	-	-	-	-	-
24.0-26.0	19.0-22.0	-	-	-	-	-
16.0-18.0	11.0-14.0	2.00-3.00	-	-	-	-
16.0-18.0	10.0-14.0	2.00-3.00	-	-	-	-
16.0-18.0	11.0-14.0	2.00-3.00	-	-	-	-
16.0-18.0	10.0-14.0	2.00-3.00	<0.10	-	5*(C+N)-0.70	-
18.0-20.0	11.0-14.0	3.00-4.00	-	-	-	-
18.0-20.0	11.0-15.0	3.00-4.00	-	-	-	-
17.0-19.0	9.0-12.0	-	<0.10	-	5*C-0.70	-
17.0-19.0	9.0-12.0	-	-	-	4*C-0.60	-
17.0-19.0	9.0-13.0	-	-	10*C-1.00	-	-
17.0-19.0	9.0-13.0	-	-	8*C-1.00	-	-
19.0-23.0	23.0-28.0	4.0-5.0	<0.10	-	-	Cu 1.00-2.00
17.0-19.5	8.0-10.5	-	<0.10	-	-	-
18.0-20.0	10.0-12.0	-	<0.10	-	-	-
17.5-19.5	8.0-10.0	-	<0.10	-	-	-
17.0-19.5	8.5-11.5	-	0.12-0.22	-	-	-
16.5-18.5	10.0-13.0	2.0-2.5	<0.10	-	-	-
16.5-18.5	10.0-13.0	2.0-2.5	<0.10	-	-	-
17.0-19.0	12.5-15.0	2.5-3.0	<0.10	-	-	-
16.5-18.5	11.0-14.0	2.5-3.0	0.12-0.22	-	-	-
16.5-18.5	10.5-13.0	2.5-3.0	<0.10	-	-	-
17.0-19.0	9.0-12.0	-	-	-	5*C-0.70	-
16.5-18.5	10.5-13.5	2.0-2.5	-	-	5*C-0.70	-
17.0-20.2	8.00-11.10	-	-	-	-	Cu≤1.0-Bmax 15ppm-
17.0-20.2	9.00-12.15	-	-	-	-	-
24.0-26.2	19.00-22.15	-	-	-	-	-
17.0-20.2	9.00-12.15	-	-	-	5*C-0.65	-
16.0-18.2	10.50-13.15	1.9-2.5	-	-	5*C-0.65	-
16.0-18.2	10.50-13.15	2.0-2.5	-	-	-	-
16.0-18.2	10.00-12.65	2.0-2.5	-	-	-	-
17.0-18.7	13.00-16.15	2.2-3.1	-	-	-	-
1.4466		0.020	≤2.00	0.025	0.010	0.020
Ferritic stainless steels						
11.5-14.5	<0.50	-	-	-	-	Al 0.10-0.30
11.5-13.5	-	-	-	-	-	-
12.0-14.0	-	-	-	-	-	Al 0.10-0.30
11.5-13.5	<0.75	-	-	-	-	-
16.0-18.0	-	-	-	-	-	-
16.0-18.0	-		-	-	(4(C+N)+0.15) – 0.80	-
11.5-13.7	<0.55	-	-	-	-	-
16.0-18.2	<0.55	-	-	-	-	-
-	-	-	-	-	-	-
Duplex stainless steels						
21.0-23.0	4.5-6.5	2.5-3.5	0.08-0.20	-	-	-
22.0-23.0	4.5-6.5	3.0-3.5	0.14-0.20	-	-	-
21.0-23.0	4.5-6.5	2.5-3.5	0.10-0.22	-	-	-
21.0-23.2	4.50-6.65	2.5-3.6	0.07-0.21	-	-	-
-	-	-	-	-	-	-
Super duplex stainless steels						
24.0-26.0	6.0-8.0	3.0-5.0	0.24-0.32	-	-	Cu <0.50
24.0-26.0	6.0-8.0	3.0-4.0	0.20-0.30	-	-	W 0.50-1.00; Cu 0.50-1.00
24.0-26.0	6.0-8.0	3.00-4.5	0.20-0.35	-	-	-
24.0-26.0	6.0-8.0	3.00-4.0	0.20-0.30	-	-	W 0.50-1.00
-	-	-	-	-	-	-
Nickel-based alloys						
19.5-23.5	38.0-46.0	2.5-3.5	-	10	0.6-1.2	Fe 22.0 minB; Cu 1.5-3.0; Al 0.2
20.0 min; 23.0 max	58.0 min	8.0 min 10.0 max	-	-	0.40 max	Cb+Ta 3.15min 4.15max; Co 1.0 max; Fe 5.0max; Al 0.40 max

Heat-exchanger tubes

Description:

Heat-exchanger equipment, pipelines and pipeline components

Application:

Nuclear Industry
Chemical Industry
Petrochemical industry
HVAC (Heating Ventilation Air Conditioning), refrigeration
Food and Beverages
Power Generation

Shell & Tube Heat Exchangers

Shell and Tube Heat Exchangers are defined as heat exchangers that can transfer hot fluid to a cooler fluid. Fluid passes through a set of tubes while another fluid passes through the shell that encloses the tubes. Shell and Tube Heat Exchangers are used in applications in processes involving high temperature and pressure, and in cases where the fluid contains particles.

There are two main types of Shell &Tube Heat Exchangers used in industrial application: U-tube and Straight Tube Heat Exchangers.

U-Tube Heat Exchangers

U-Tube heat exchangers comprise a U-shaped tube fixed by flow baffles or tube supports and placed in a shell to control the fluid present in the exterior of the tube assembly. The fluid is guided into the tubes by a head assembly which is fixed to the shell by bolts.

Straight Tube Heat Exchangers

Straight tube heat exchangers are used in applications where the fluids have high fouling properties. They are also used in applications with high occurrence of temperature cross.
The straight tube structure facilitates easy cleaning of the tubes. However, owing to the design, straight tube heat exchangers are not effective where the temperature difference between the fluids is high.

• Standards: ASTM A213/A213M; ASME SA-213/SA-213M

Steel grades: TP 304, TP 304L, TP 316, TP 316L, TP 317, TP 317L, TP 321, TP347H, TP310H

Basic product range of heat-exchanger tubing

Outside diameter			Wall thickness																
inch	mm	mm	0.71	0.89-0.91	1	1.2	1.4-1.5	1.6	1.83-1.9	2.0-2.03	2.11	2.2-2.3	2.4-2.5	2.6-2.64	2.7	3.0-3.05	3.18-3.2	3.5-3.6	4.0
		12																	
½	12.70	12.7																	
		13																	
		13.5																	
		14-14.3																	
		15																	
⅝		15.88																	
		16																	
		17.2-17.5																	
		18																	
		19.0-19.05																	
		20																	
		20.6-21.34																	
		22																	
		22.23																	
		23.81																	
		25																	
1	25.40	25.4																	
		26.7																	
		26.9																	
		28																	
		30																	
1¼	31.75	31.75																	
		32																	
		33.4																	
		33.7																	
		35																	
		36																	
1½	38.10	38.10																	
		40																	
		42.0-42.4																	
1 ¾	44.45	44.45																	
		48.0-48.3																	
2	50.80	50.8																	

Mechanical properties

Steel grade	Tensile strength, N/mm², min	Yield strength, N/mm², min	Elongation, %, min
	not less than		
TP304	515	205	35
TP304L	485	170	35
TP316	515	205	35
TP316L	485	170	35
TP317	515	205	34
TP317L	515	205	35
TP321	515	205	35
TP316Ti	515	205	35
TP347	515	205	35
TP310S	515	205	35
N08904	490	215	35

Dimensional tolerances (ASTM A450, ASTM A1016)

Outside diameter, mm	Wall thickness, mm	Tolerance limits of		
		outside diameter	wall thickness MW	wall thickness AW
<25.4	0.4-4.5	+0.10 mm, -0.10 mm	+20%, 0%	±10%
25.40-38.10	1.0-6.0	+0.10 mm, -0.15 mm	+20%, 0%	±10%
38.20-50.80	1.2-7.0	+0.20 mm, -0.20 mm	+22%, 0%	±11%

• Standard: EN 10216-5

Steel grades:

Steel number	Steel name
1.4301	X5CrNi18 10
1.4306	X2CrNi 19 11
1.4541	X6CrNiTi 18 10
1.4401	X5CrNiMo 17 12 2
1.4404	X2CrNiMo 17 12 2
1.4436	X3CrNiMo 17 13 3
1.4435	X2CrNiMo 18 14 3
1.4571	X6CrNiMoTi l7 12 2
1.4462	X2CrNiMoN 22 53
1.4410	X2CrNiMoN25-7-4
1.4466	X1CrNiMoN25-22-2

Steel number	Steel name
“+DIN EN 10297-2”	
1.4006	X12Cr13
1.4016	X6Cr17
1.4510	X3CrTi 17
“+SEW470”	
1.4878	X12CrNiTi 18 9
1.4845	X12CrNi 25 21
1.4828	X15CrNiSi 2012
1.4841	X15CrNiSi 25 20
1.4501	X2CrNiMoCuWN25-7-4

Basic product range of heat-exchanger tubing

Outside diameter	Wall thickness											
mm	0.8	1.0	1.2	1.6	2.0	2.3	2.6	2.8	2.9	3.2	3.6	4.0
12												
13.5												
14												
16												
17.2												
18												
19												
19.1												
20												
21.3												
22												
25												
25.4												
26.9												
30												
31.8												
32												
33.7												
35												
38												
40												
42												
42.4												
44.5												
48.3												
51												

Type of delivery and surface condition:
CFD – cold finished heat treated, descaled, surface metallicaly clean.
CFA – cold finished heat treated, bright annealed, surface metallicaly bright.
CFG – cold finished heat treated, ground, surface metallicaly bright. Degree of roughness shall be agreed upon.
CFP – cold finished heat treated, polished, surface metallicaly bright. Degree of roughness shall be agreed upon.
Both mechanical and electric polishing are available

Mechanical properties

Steel Grade	Tensile strength, N/mm*	Yield strength, 0.2%	Yield strength, 1.0%	Elongation, %
	not less than/range			
1.4301 (XSCrNi 1810)	500-700	195	230	40
1.4306 (X2CrNi 1911)	460-680	180	215	40
1.4541 (XeCrNiTi 1810)	500-730	200	235	35
1.4401(X5CrNiMo1712 2)	510-710	205	240	40
1.4571 (XeCrNiMoTi 1712 2)	500-730	210	245	35
l,4404(X2CrNiMo1712 2)	490-690	190	225	40
1.4435(X2CrNiMo1814 3)	490-690	190	225	40
1.4436(X3CrNiMo1713 3)	510-710	205	240	40
1 4462 (X2CrNiMoN 22 5 3)	640-880	450	-	22
1.4006 (X12Cr 13)	650	450	460	18
1.4016 (X6Cr 17)	430	240	250	20
1.4510 (X3CrTi 17)	420	230	240	23
1.4878(X12CrNiTil8 9)	500-750	210	-	40
1.4845 (X12CrNi 25 21)	500-750	210	-	35
1,4828 (XlSCrNiSi 2012)	500-750	230	-	30
1.4410 (X2CrNiMoN25-7-4)	800-1000	550	-	20
1.4501 (X2CrNiMoCuWN25-7-4)	800-1000	550	-	20
1.4466 (X1CrNiMoN25-22-2)	540-740	260	295	40

Dimensional tolerances (ISO 1127, DIN 2462)

Tolerance class	Outside diameter tolerances
D3	±0.75% with min ±0.30 mm
D4	±0.50% with min ±0.10 mm
Tolerance class	**Wall thickness tolerances**
T3	±10.0% with min ±0.20 mm
T4	±7.5% with min ±0.15 mm
Tolerance class	**Length L tolerances**
L≤6000	+5; 0
6000<L≤12000	+10; 0
L>12000	+ by agreement; 0

Note: D4, T4 – upon agreement

• Standards: ASTM A268/A268M, ASME SA-268/SA-268M

Steel grades: TP405, TP410

Basic product range of heat-exchanger tubing

Outside diameter		Wall thickness											
inch	mm	1.2-1.24	1.4-1.5	1.6-1.65	1.83	2.0-2.03	2.11	2.2-2.3	2.4-2.5	2.7-2.8	3.0-3.05	3.5-3.68	4.0
	19.0-19.05												
	20.0												
	20.6-21.34												
7/8	22.23												
15/16	23.81												
	25.0												
1	25.4												
1 1/4	31.75												
	33.4												
1 1/2	38.1												
	40.0												
	42.0-42.4												
1 3/4	44.45												
	48.0-48.3												
2	50.8												

Mechanical properties

Steel grade	Tensile strength min, N/mm²	Yield strength, N/mm²	Elongation, %
	not less than		
TP405	415	205	20
TP410	415	205	20

Dimensional tolerances

Outside diameter, inch (mm)	Admissible outside diameter tolerance, inch (mm)	Admissible wall thickness tolerance, %	Length tolerance, inch (mm)		Thin-wall tubes
			more	less	
Up to ½ (D<12.7, exl)	±0.005 (±0.13)	±15	1/8 (3)	0	–
½ up to 1½ excl. (D<38.1)	±0.005 (±0.13)	±10	1/8 (3)	0	under 0.065" (1.6 mm) nominal
1½ - 3½ excl. (38.1<D<88.9)	±0.010 (±0.25)	±10	3/16 (5)	0	under 0.095" (2.4 mm) nominal

• Standards: ASTM A789/A789M, ASME SA-789/SA-789M

Steel grades: S31803, S32205, S32750, S32760

Basic product range of heat-exchanger tubing

Outside diameter		Wall thickness															
inch	mm	0.89-0.91	1	1.2-1.24	1.4-1.5	1.6-1.65	1.83-1.9	2.0-2.03	2.11	2.2-2.3	2.4-2.5	2.6-2.64	2.8	3.0-3.05	3.18-3.2	3.5-3.6	4.0
5/8	15.88																
11/16	17.46																
3/4	19.05																
13/16	20.64																
7/8	22.23																
15/16	23.81																
1	25.40																
1 1/4	31.75																
1 1/2	38.10																
1 3/4	44.45																
2	50.80																

Mechanical properties

UNS designation	Tensile strength, N/mm²	Yield strength, min, N/mm²	Elongation in 2" or 50 mm, min, %	Hardness, max	
				Brinnel	Rockwell
S31803	620	450	25	290	30
S32205	655	485	25	290	30
S 32750	800	550	15	300	32
S 32760	750	550	25	310	32

Dimensional tolerances

Group	Size, Outside Diameter, in. [mm]	Permissible Variations in Outside Diameter, in. [mm]	Average Wall[D] Permissible Variations in Wall Thickness,[A] %	Minimum Wall[E] Permissible Variations Wall Thickness,[A] %		Permissible Variations in Cut Length, in.[B] [mm]		Thin Walled Tubes[C]
				Over	Under	Over	Under	
1	Up to ½[12.7], excl	±0.005 [0.13]	±15	30	0	1/8 [3]	0	...
2	½ to1½[12.7 to 38.1], excl	±0.005 [0.13]	±10	20	0	1/8 [3]	0	less than 0.065 in. [1.6 mm] specified
3	1½ to 3½ [38.1 to 88.9], excl	±0.010[0.25]	±10	20	0	3/16 [3]	0	less than 0.095 in. [2.4 mm] specified

• Standards: ASTM B407, ASTM B729, ASTM B668, ASTM B423, ASTM B163, ASTM B444

Alloy grades: N08800, N08825, N08904, N08811, N08020, N06625

Basic product range for heat exchanger tubing

Outside diameter			Nominal wall thickness, mm									
			Sch 5S		Sch 10S		Sch 30S		Sch 40S		Sch 80S	
NPS	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
⅛	0.405	10.29			0.049	1.24	0.057	1.45	0.068	1.73	0.095	2.41
¼	0.540	13.72			0.065	1.65	0.073	1.85	0.088	2.24	0.119	3.02
⅜	0.675	17.15			0.065	1.65	0.073	1.85	0.091	2.31	0.126	3.20
½	0.840	21.34	0.065	1.65	0.083	2.11	0.095	2.41	0.109	2.77	0.147	3.73
¾	1.050	26.67	0.065	1.65	0.083	2.11	0.095	2.41	0.113	2.87	0.154	3.91
1	1.315	33.40	0.065	1.65	0.109	2.77	0.114	2.90	0.133	3.38	0.179	4.55
1 ¼	1.660	42.16	0.065	1.65	0.109	2.77	0.117	2.97				
1 ½	1.900	48.26	0.065	1.65	0.109	2.77	0.125	3.18				
2	2.375	60.33	0.065	1.65	0.109	2.77	0.125	3.18				

Mechanical properties

Steel grade	Tensile strength, min, N/mm2	Yield strength, min, N/mm2	Elongation in 2" or 50 mm, min,%
N08800	520	207	30
N08811	448	172	30
N08020	550	240	30
N08825	586	241	30
N06625	827	414	30

Dimensional tolerances

Outside diameter, inch (mm)	Permitted variations in OD, inch (mm)		Permitted variations in wall thickness, % (AW)	
	over	under	over	under
Over 0.400 (10) to ⅝ (16) excl	0.005 (±0.127)	0.005 (0.13)	12.5	12.5
⅝ (16) to 1 ½ (38) incl.	0.0075 (0.19)	0.0075 (0.19)	10	10
Over 1 ½ (38) to 3 (76) incl.	0.010 (0.25)	0.010 (0.25)	10	10

• Additional requirements (acc. to DIN 28180)

Steel grades:

Steel code	Designation
1.4301	X5CrNi 18 10
1.4401	X5CrNiMo 17 12 2
1.4541	X6CrNiTi 18 10
1.4571	X6CrNiMoTi 17 12 2

Outside diameter,mm	Wall thickness,mm				
16	1.2	1.6	2	-	-
20	-	1.6	2	2.6	3.2
25	-	1.6	2	2.6	3.2
30	-	1.6	2	2.6	3.2
38	-	-	2	2.6	3.2

Tolerances:

Outside diameter tolerances tubes from austenitic stainless steel

Outside diameter, mm	Tolerance class 1, mm	Tolerance class 2, mm
16	± 0.10	± 0.30
20		
25	± 0.12	
30	± 0.15	
38	± 0.20	± 0.40

Wall thickness tolerances

Outside diameter	Wall thickness tolerances:	
	Up to 2	More than 2
Tolerance class 1 and 2	± 0.20	±10% from wall thickness
Tolerance class 3	± 0.20	+ 15% - 10% from wall thickness

Length tolerances

Length	Tolerances
≤ 5 000	+5 0
> 5 000 ≤ 10 000	+ 10 0
> 10 000	Upon agreement

• U-bent tubes

Steel grades

Ferrite	Austenite	Duplex	Superduplex	Ni – alloys*
TP410	TP 304/304L	UNS S31803	UNS S32750	
	TP 316/316L	UNS S32205	UNS S32760	
	TP 316Ti	1.4462(X2CrNiMoN 22 5 3)		UNS N00880
	TP 317/317L	1.4410(X2CrNiMoN 25 7 4)		UNS N08825
	TP 321			
	TP 347			
	1.4301 (X5CrNi 18 10)			
	1.4401 (X5CrNiMo 17 12 2)			
	1.4541 (X6CrNi 18 10)			
	1.4571 (X5CrNiMoTi 17 12 2)			

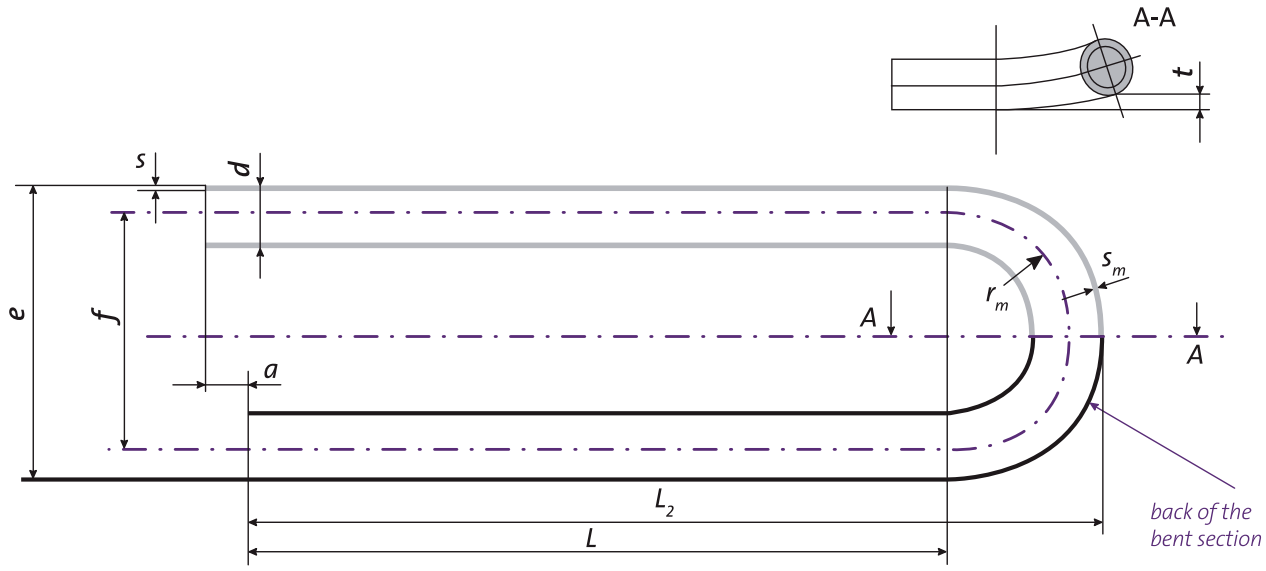
* – Tubes of other alloys and steel grades can be produced in trial lots.

Technical requirements

Straight tubes for bending (ASTM/ASME A/SA 213; ASTM A269; ASTM B163; ASTM B729; ASTM B407; ASTM B423; ASTM A789; DIN 28180; EN 10216-5)

U-BENT TUBES:

TEMA RCB 2.31 – Standards of the Tubular Exchanger Manufacturers Association (9th edition).
ASTM A688 – Standard Specification for Seamless and Welded Austenitic Stainless Steel Feedwater Heater Tubes.
ASTM B163 – Standard technical requirements for tubes of nickel and nickel alloy for condensers and heat exchangers.
DIN 28179 – Steel U-tubes for tubular heat exchangers - Technical delivery conditions.
Customer specifications.



Available range:

OD	Wall thickness, mm																		
mm	0.89	0.91	1.20	1.25	1.40	1.50	1.60	1.65	1.80	2.00	2.11	2.20	2.40	2.60	2.77	2.80	3.00	3.20	3.40
12.70																			
13.72																			
14.00																			
15.88																			
15.90																			
16.00																			
17.20																			
19.05																			
20.00																			
21.30																			
25.00																			
25.40																			
26.90																			
30.00																			
31.80																			
38.10																			

The bending radius (R):

• minimum bending radius - 1.5 outer diameter of the pipe;
• the maximum technological bending radius - 1250 mm;
• pipe with R <2 outer diameter of the pipe - a deviation from the nominal outside diameter in the area of bending ± 15%;
• pipe with R ≥ 2 outer diameter of the pipe - a deviation from the nominal outside diameter in the area of bending ± 10%;
• pipes of duplex and super duplex steel with R <2 outer pipe diameters and a wall thickness of 1.65 mm or less - as agreed;
• pipes with R <1,5 Outer diameter of the pipe - as agreed;
• pipes with R <2 outer pipe diameter and wall thickness of 1.2 mm or less - as agreed.

Length:

• for bending radii of less than 90 mm, if required hydraulic test, the minimum length of the straight section - 3000 mm;
• for bending radii of less than 90 mm, if hydraulic testing is not required, the minimum length of the straight section - 1500 mm;
• for bending radii of more than 90 mm the minimum length of the straight section - 1500 mm;
• maximum straight length of pipe - 25000 mm.
The maximum wall thickness of U-bent tubes 25,0-38,1 mm outer diameter shall not exceed 3.4 mm, within a tolerance.

Heat Treatment:

Heat treatment is carried out by resistometric method on a curved part of the tube and on straight parts 300 mm in length by heating the tube to the required temperature (see table below), and then soaking and rapid cooling of the tube to the temperature 370 C & below. Nitrogen blow-off tubes used before and during the process of heat treatment to protect the inner surface from oxidation.

Marking - before bending by marking machine all over the tube length (bent section after heat treatment without marking). Marking is also possible after bending on the straight parts of U-bent tube.
Packaging - closed wooden boxes of corresponding dimensions for each tube length, radius, diameter, according to PO requirements or in bundles wrapped in polyethylene film with plastic clamping spacers on each tube. Transportation - a truck with capacity of 20 tones, body length 13.6 m, width 2.46 m.

Nuclear segment: TU 14-3-197-2006:

OD Maximum Deviations

Outside Diameter, mm	OD Maximum Deviations with Production Accuracy		
	Normal accuracy		Improved accuracy
	Hot-formed	Cold-formed	
6 to 16	-	±0.2 mm	±0.2mm
16 to 31	-	±0.3 mm	±0.2 5 mm
31 to 51	±1.25%	±0.45 mm	±0.4mm
51 to 70	±1.25%	± 1%	±0.8%

WT Maximum Deviations

Wall Thickness, mm	WT Maximum Deviations with Production Accuracy		
	Normal accuracy		Improved
	Hot-formed	Cold-formed	
1 to 2	-	±15%	±15%
2 to 5 inch for diameters up to 50 inch	±12.5 %	±12.5/40%	±10%
2 to 5 inch for diameters over 50	±12.5 %	±10%	±0.4mm
Over 5	±12.5 %	±12.5 %	±0.8%

Size Range of Cold-Formed Tubes

OD, mm	Maximum tube specified length, m, with wall thickness, mm																							
	1,0	1,2	1,4	1,5	1,8	2,0	2,2	2,5	2,8	3,0	3,2	3,5	4,0	4,5	5,0	5,5	6,0	6,5	7,0	7,5	8,0	8,5	9,0	9,5	10
6	7	7	7	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	7	7	7	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	7	7	7	7	7	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	7	7	7	7	7	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	7	7	7	7	7	7	7	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	7	7	7	7	7	7	7	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	7	7	7	7	7	7	7	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	7	7	7	7	7	7	7	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	7	7	7	7	7	7	7	7	7	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	7	7	7	7	7	7	7	7	7	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	7	7	7	7	7	7	7	7	7	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	7	7	7	7	7	7	7	7	7	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	7	7	7	7	7	7	7	7	7	7	7	7	-	-	-	-	-	-	-	-	-	-	-	-	-
19	7	7	7	7	7	7	7	7	7	7	7	7	-	-	-	-	-	-	-	-	-	-	-	-	-
20	7	7	7	7	7	7	7	7	7	7	7	7	7	-	-	-	-	-	-	-	-	-	-	-	-
21	7	7	7	7	7	7	7	7	7	7	7	7	7	-	-	-	-	-	-	-	-	-	-	-	-
22	7	7	7	7	7	7	7	7	7	7	7	7	7	-	-	-	-	-	-	-	-	-	-	-	-
23	7	7	7	7	7	7	7	7	7	7	7	7	7	-	-	-	-	-	-	-	-	-	-	-	-
24	7	7	7	7	7	7	7	7	7	7	7	7	7	-	-	-	-	-	-	-	-	-	-	-	-
25	7	7	7	7	7	7	7	7	7	7	7	7	7	7	-	-	-	-	-	-	-	-	-	-	-
27	7	7	7	7	7	7	7	7	7	7	7	7	7	7	-	-	-	-	-	-	-	-	-	-	-
28	7	7	7	7	7	7	7	7	7	7	7	7	7	7	-	-	-	-	-	-	-	-	-	-	-
30	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	-	-	-	-	-	-	-	-	-
32	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	-	-	-	-	-	-	-	-	-
34	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	-	-	-	-	-	-	-	-	-
35	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	-	-	-	-	-	-	-	-	-
36	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	-	-	-	-	-	-	-	-	-
38	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	-	-	-	-	-	-	-	-
40	-	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	-	-	-	-	-	-	-	-
42	-	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	-	-	-	-	-	-	-	-
45	-	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	-	-	-	-	-	-	-	-
48	-	-	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	-	-	-	-
50	-	-	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	-	-	-	-
51	-	-	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	-	-	-	-
53	-	-	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	-	-	-	-
54	-	-	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	-	-	-	-
56	-	-	-	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	-	-	-
57	-	-	-	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	-	-	-
60	-	-	-	-	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	-	-

Chemical composition

Steel grade	Elements content, %								
	Carbon	Silicium	Manga-nese	Chrome	Nickel	Titanum	Sulphur	Phosphor	Nitrogen
	No more						No more		
08X18H10T	0.08	0.8	1.5	17.0-19.0	10.0-11.0	5C-0.6	0.020	0.035	0.05
08X18H12T	0.08	0.8	1.5	17.0-19.0	11.0-13.0	5C-0.6	0.020	0.035	0.05

Notes:
1 Content of residual elements shall comply with GOST 5632.
2 Deviation in nickel content shall be no more than +0.5%, carbon - +0.01%.
3 Deviation in elements content is allowed according to GOST 5632 if tube billets are supplied under TU 14-134-323-93.

Mechanical properties

Tube dimensions, mm	Mechanical properties			
	As received			After austenization
	Ultimate strength at tem-perature 20°C,	Relative elongation at temperature	Yield point at temperature 350°C, $\sigma_{0.2}$, N/mm2(kgf/mm2)	Yield point at temperature 350°C, $\sigma_{0.2}$, N/mm2 (kgf/mm2)
	No less			
Diameter up to 17 and including	549 (56)	35	196-343 (20-35)	176-323 (18-33)
Diameter over 17 to 76 and including	549 (56)	37	196-343 (20-35)	176-323 (18-33)

Note:
Tubes are supplied without testing at temperaUire 350°C or with testing at less number of samples as agreed between Producer and Customer.

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