DIN 17173-85 SEAMLESS CIRCULAR TUBES MADE FROM STEELS WITH LOW TEMPERATURE SERVICE

The subclauses marked with a single dot give specifications which are to be agreed upon at the time of ordering.
The subclauses marked with a two dots give specifications which optional and may be agreed upon at the time of ordering.

1. Field of application

1.1 This standard applies to seamless circular tubes made from carbon and alloy steels with low temperature toughness, as listed in table 1, for low temperature applications. These tubes are predominantly used in the construction of chemical plant vessels, pipework and for general mechanical engineering purposes.

Note. Seamless fine grain steel tubes (see DIN 17179) and seamless stainless austenitic steel tubes (see DIN 17458) are also used for low temperature applications.

1.2 If tubes complying with the requirements of this standard are intended for use in installations subject to regular inspection, the specifications in the relevant codes of practice shall be taken into consideration, e.g. the Technische Regeln Druckbehalter (Technical rules for pressure vessels). Merkblatter) (Instruction sheets of the pressure vessels Study Grop) (AD Instruction sheets).

The same applies for other fields of application for which additional specifications exist.

Grade	Mfg. Process	Chemical composition (%)								
		C	Si	Mn	P	S	Ni	Cr	Mo	Others
TSt35N	S	0.17Max	0.35Max	0.40Max	0.030Max	0.025Max	-	-	-	Al 0.020Min
TSt35V	S	0.17Max	0.35Max	0.50~0.80	0.030Max	0.025Max	-	-	-	Al 0.020Min
26CrMo4	S	0.22~0.29	0.35Max	0.70~1.50	0.030Max	0.025Max	-	0.90~1.20	-	-
11MnNi53	S	0.14Max	0.50Max	0.85~1.65	0.030Max	0.025Max	0.30~0.80	-	-	Al 0.020Min
13MnNi63	S	0.18Max	0.50Max	0.85~1.65	0.030Max	0.025Max	0.30~0.85	-	-	-
10Ni14	S	0.15Max	0.35Max	0.30~0.80	0.025Max	0.020Max	3.25~3.75	-	-	-
12Ni19	S	0.15Max	0.35Max	0.30~0.80	0.025Max	0.020Max	4.50~5.30	-	-	-
X8Ni19	S	0.10Max	0.35Max	0.30~0.80	0.025Max	0.025Max	8.00~10.00	-	-	-

Grade	Material number	Tensile Test MPa or N/mm^2		Remarks (Similar to JIS)
		Min Yield point	Tensile Strength	
TSt35N	1.0358	225	340~460	-
TSt35V	1.7219	t 25mmMax255 25mm<t 40mmMax 235	340~490	-

26CrMo4	26CrMo4	t 25mmMax440 25mm<t 40mmMax 420	560~740	-
11MnNi53	1.6212	t 25mmMax 285 13mm<t 25mmMax 275 25mm<t 40mmMax 265	410~530	-
13MnNi63	1.6217	t 13mmMax 355 13mm<t 25mmMax 345 25mm<t 40mmMax 335	490~610	-
10Ni14	1.5837	t 25mmMax 345 25mm<t 40mmMax 335	470~640	(STBL46)
12Ni19	1.5680	t 25mmMax 390 25mm<t 40mmMax 380	510~710	-
X8Ni19	1.5662	t 25mmMax 490 25mm<t 40mmMax 480	640~840	(STBL70)

JIS Number and Corresponding Foreign Standards

JIS			ASTM			BS			DIN			NF			ISO			Index Number
Standard Number	Grade	Type	Standard Number	Grade	Type	Standard Number	Grade	Type	Standard Number	Grade	Type	Standard Number	Grade	Type	Standard Number	Grade	Type	
G3464	STBL380	C	A334	Gr1	C	3603	HFS410LT50	C	17173	FONi14	Ni				2604/2	TS6	C	C014
	(STBL39)					"	CFS410LT50	C	17174	X8Ni9	Ni							
						"	ERW410LT50	C										
						"	CEW410LT50	C										
	STBL450	Ni	A334	Gr3	Ni	3603	HF503LT100	Ni				A49-230	TU10N14	Ni	2604/2	TS43	Ni	
	(STBL46)					"	CF503LT100	Ni				A49-213	TU10N14	Ni				
	STBL690	Ni	A334	Gr8	Ni	3603	HFS509LT196	Ni				A49-230	TUZ6N9	Ni	2604/2	TS45	Ni	
	(STBL70)					"	CFS509LT196	Ni				A49-215	TUZ6N9	Ni				

Table 1. Chemical composition (cast analysis) of steels with low temperature toughness for seamless tubes.

Steel grade		% by mass										
Symbol	Material number	C	Si max	Mn	P max	S max	Al min	Cr	Mo	Nb max	Ni	V max
TTSt 35N TTSt 35V	1.0358	max 0.17	0.35	min 0.40	0.030	0.025	0.020	-	-	-	-	-
26 CrMo 4	0.7219	0.22 to 0.29	0.35	0.50 to 0.80	0.030	0.025	-	0.90 to 1.20	0.15 to 0.30	-	-	-
11 MnNi 5 3	1.6212	max 0.14	0.50	0.70 to 1.50	0.030	0.025	0.020	-	-	0.05	0.30 1) to 0.80	0.05
13 MnNi 6 3	1.6217	max 0.18	0.50	0.85 to 1.65	0.030	0.025	0.020	-	-	0.05	0.30 1) to 0.85	0.05
10 Ni 14	1.5837	max 0.15	0.35	0.30 to 0.80	0.025	0.020	-	-	-	-	3.25 to 3.75	0.05
12 Ni 19	1.5580	max 0.15	0.35	0.30 to 0.80	0.025	0.020	-	-	-	-	4.50 to 5.30	0.05
X 8 Ni 9	1.5662	max 0.10	0.35	0.30 to 0.80	0.025	0.020	-	-	max 0.10	-	8.00 to 10.00	0.05
1) The lower fimit value for the nickel content may be reduced to not less than 0.15% by mass for tubes with wall thicknesses not exceeding 10mm												

Table 2. Permissible deviations between the results of the chemical composition determined by the product analysis and the limiting values for the cast analysis.

Element	Limiting values for the cast analysis as specified in table 1 % by mass	Permissible deviations between the results of product analysis and the limiting values for the cast analysis 1) % by mass
C	⩽ 0.29	0.02
Si	⩽ 0.35 > 0.35 ⩽ 0.50	0.03 0.05
Mn	⩽ 0.80 > 0.80 ⩽ 1.65	0.06 0.10
P	⩽ 0.030	0.005
S	⩽ 0.025	0.005
Al	⩽ 0.020	0.005
Cr	⩽ 1.20	0.10
Ni	⩽ 0.85 > 0.85 ⩽ 3.75	0.05 0.07

	> 3.75 ⩽ 5.30 ⩾ 8.00 ⩽ 10.00	0.10 0.15
Mo	⩽ 0.10 > 0.10 ⩽ 0.30	0.01 0.04
Nb	⩽ 0.05	0.01
V	⩽ 0.05	0.01
1) If several product analyses are carried out for a single cast and if these analyses show contents for a single element outside the range specified for the cast analysis, this for multiple annealing shall be 150 minutes. An attempt should be made to keep to the lower limit of the temperature range where the holding time exceeds 90 minutes.		

Table 3. Mechanical properties of the tubes in the as delivered condition 1)

Steel grade		Heat treatment condition 2)	Wall thickness s mm	Upper yield stress N/㎟ mm	Tensile strength N/㎟	Elongation after fracture (Lo = 5 do)	
Symbol	Material number					longitudinal	transverse
						% min	
TTSt 35N	1.0358	N	s ⩽ 10	225	340 to 360	25	23
TTSt 35V	1.0356	V	s ⩽ 25 25 <s ⩽ 40	255 235	360 to 490	23	21
28CrMo 4	1.7219	V	s ⩽ 25 25 < s ⩽ 40	440 420	560 to 740	18	16
11 MnNi 5 3	1.6212	N 3)	s ⩽ 13 13 < s ⩽ 25 25 < s ⩽ 40	285 275 265	410 to 530	24	22
13 MnNi 8 3	1.6217	N 3)	s ⩽ 13 13 < s ⩽ 25 25 < s ⩽ 40	355 345 335	490 to 610	22	20
10 Ni 14	1.5637	V 4)	s ⩽ 25 25 < s ⩽ 40	345 335	470 to 640	20	18
12 Ni 19	1.5680	V 4)	s ⩽ 25 25 < s ⩽ 40	390 380	510 to 710	19	17

X 8 Ni 9	1.5662	V	s ⩽ 25 25 < s ⩽ 40	490 480	640 to 840	18	16

1) The values for the mechanical properties of tubes with wall thicknesses greater than 40mm, with the exception of steels TTSt 35N and TTSt 35V, shall be agreed at the time of ordering.

2) N = normalized; V = quenched and tempered.

3) Tempering can, occasionally, be necessary after normalizing. In this case, the manufacturer shall inform the purchaser, and shall indicate to him the tempering temperature.

4) If this is permitted by the dimensions, normalizing (N), with additional tempering as necessary, may be carried out at the manufacturer's discretion instead of quenching and tempering (V). The purchaser shall be informed if this is the case.

Table 4. Requirements relating to the impact energy in the impact test on ISO V-notch test pieces 1), 2)

Steel grade		Wall thickness	Location of test	Minimum values of impact energy.									
Symbol	Material number	s mm	pieces relative to tube axis	-196	-120	-110	-100	-90	-60	-50	-40	-20	+20
TTSt 35 N	1.0356	s ⩽ 10	Longitudinal								40	45	55
TTSt 35 V	1.0356	s ⩽ 25	Longitudinal Transverse 5)							40 27	45 30	50 35	60 40
		25 <s ⩽ 40	Longitudinal Transverse 5)								40 27	45 30	55 35
26 CrMo 4	1.7219	s ⩽ 40	Longitudinal Transverse 5)						40 27	40 27	45 30	50 35	60 40
11 MnNi 5 3 13 MnNi 6 3	1.6212 1.6217	s ⩽ 40	Longitudinal Transverse 5)						40 27	45 30	50 35	55 40	70 45
10 Ni 14	1.5637	s ⩽ 25	Longitudinal Transverse 5)				40 27	45 30	50 35	55 35	55 40	60 45	65 45
		25 <s ⩽ 40	Longitudinal Transverse 5)					40 27	45 30	50 30	50 35	55 40	65 45

12 Ni 19	1.5680	s ⩽ 25	Longitudinal Transverse 5)		40 27	45 30	50 30	55 35	65 45	65 45	65 45	70 50	70 50
		25 < s ⩽ 40	Longitudinal Transverse 5)			40 27	45 30	50 30	65 40	65 45	65 45	65 45	70 50
X 8 Ni 9	1.5662	s ⩽ 40	Longitudinal Transverse 5)	40 27	50 35	50 35	60 40	60 40	70 50	70 50	70 50	70 50	70 50

1) The values for tubes with wall thicknesses exceeding 40mm, with the exception of steels TTSt 35N and TTSt 35V, shall be agreed at the time of ordering.

2) The impact energy values shall each determined for the lowest test temperature stated for the steel grade concerned; the values of impact energy at higher test temperatures shall be considered to have been demonstrated by the same determination.

3) Average value from three test pieces, only one individual value may fall short of the specified minimum value by a maximum of 30% (see also subclause 6.4.2).

4) The values given in subclause 6.5.2 shall apply for wall thicknesses less than 10mmmm.

5) To be determined only by agreement.

Table 5. Types of length and permissible deviations in length.

Type of length		Permissible deviations in length, in mm
Manufacturing length 1)		1)
Specified length		± 500
Exact lengths	up to 6m	+10 0
	over 6m up to 12m	+15 0
	over 12m	By agreement.

1) The products are supplied in the manufacturing lengths occurring in production.

The lengths differ according to the diameter. wall thickness and manufacturer's works and shall be agreed at the time of ordering.

Table 6. Permissible deviations in outside diameter.

Outside diameter da mm	Permissible deviation in diameter	
	Tube barrel and tube ends	At tube ends, subject to particular agreement 1)

da ⩽ 100	±1% da (values up to ± 0.5mm are permitted in all cases).	± 0.4mm
100 < da ⩽ 200	± % da	± 0.5% da
200 < da	± 1% da	± 0.6% da 2)
1) Over a length of about 100mm from the tube ends. 2) Subject to agreement at the time of ordering, the permissible deviation may also be referred to the inside diameter, in which case the permissible deviation in wall thickness is to be taken into account.		

Table 7. Permissible deviations in wall thickness

Permissible deviation in wall thickness for outside diameters da								
da ⩽ 130mm			130mm <da ⩽ 320mm and wall thicknesses s			320nn <da ⩽ 660mm		
⩽ 2*sn	2*sn < s⩽ 4*sn	> 4*sn	⩽ 0.05da	0.05da <s ⩽ 0.11da	> 0.11 da	⩽ 0.05da	0.05da< s da ⩽ 0.09da	> 0.09da
+15% -10%	+12.5% -10%	±9%	+17.5% -12.5%	± 12.5%	±110%	+22.5% -12.5%	+15% -12.5%	+12.5% -10%
Note. Sn is the standard wall thickness as specified in DIN 2448.								

Subject to agreement, the tubes may be supplied with the joint faces prepared. In this case, the form of joint faces shall be specified.

5.10.5. Masses per unit length and permissible deviations

The values of masses per unit length of tubes are specified in DIN 2448. The following deviations from these values are permitted:

$^{+12}_{-8}$ % for a single tube;

$^{+10}_{-5}$ % for a batch of tubes not less than 10t by mass.

JIS Number and Corresponding Foreign Standards

JIS			ASTM			BS			DIN			NF			ISO			Index Number
Standard Number	Grade	Type	Standard Number	Grade	Type	Standard Number	Grade	Type	Standard Number	Grade	Type	Standard Number	Grade	Type	Standard Number	Grade	Type	
G3464	STBL380	C	A334	Gr1	C	3603	HFS410LT50	C	17173	FONi14	Ni				2604/2	TS6	C	C014
	(STBL39)					"	CFS410LT50	C	17174	X8Ni9	Ni							
						"	ERW410LT50	C										
						"	CEW410LT50	C										
	STBL450	Ni	A334	Gr3	Ni	3603	HF503LT100	Ni				A49-230	TU10N14	Ni	2604/2	TS43	Ni	
	(STBL46)					"	CF503LT100	Ni				A49-213	TU10N14	Ni				
	STBL690	Ni	A334	Gr8	Ni	3603	HFS509LT196	Ni				A49-230	TUZ6N9	Ni	2604/2	TS45	Ni	
	(STBL70)					"	CFS509LT196	Ni				A49-215	TUZ6N9	Ni				