

DIN 17174-85 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 welded circular tubes made carbon and alloy steels with low temperature toughness, as listed in table1, for low temperature applications. These tubes are predominantly used in the construction of chemical plant, vessels, pipework and for general mechanical engineering purposes.

Note. Weded fine grain steel tubes (see DIN 1178) and welded stainless austenitic steel tubes (see DIN17457) 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 Druckbehälter (Technical rules for pressure vessels). Merkblätter) (Instruction sheets of the pressure vessels Study Grop) (AD Instruction sheets).

Technische Regeln für brennbare Flüssigkeiten (Technical rules on combustible liquids), Technische Regeln Druckgase Technical rules on pressure gases).

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

symbol or material number identifying the steel grade (see table 1).

Example:

A welded tube conforming to this standard, with an outside diameter of 168.3 mm and a wall thickness of 4.0 mm as specified in DIN 2458, made from TTSt 36 stell (material number 1.0356), in the quenched and tempered condition (V) shall be designated as follows:

Tube DIN 2458 - 168.3 X 4.0
 DIN 17174 - TTSt 35 V

or

Tube DIN 2458 - 168.3 X 4.0
 DIN 17174 - 1.0356 V

4.2 ● In addition to the standard designation as specified in subclause 4.1, the order shall always give the quantity required (e.g. total length to be supplied), the type of length (see table 5), the length of the individual tube in the case of specified lengths and exact lengths, the test class, the type of document on materials testing as specified in DIN 50 049 and the technical rule which may also be taken into consideration.

Example of an order:

1000m of tube DIN 2458 - 168.3 X 4.0
 DIN 17174 - TTSt 35 V

in exact lengths of 8 m, test class 1,

document DIN 50049 - 3.1 8

4.3 ●● In addition, further details such as are specified in the subclauses marked with two dots may be agreed at the time of ordering.

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

Steel grade		% by mass									
Symbol	Material number	C max	Si max	Mn	P max	S max	Al min	Mo max	Nb max	Ni	V max
TTSt35N TTSt35V	1.0356	0.17	0.35	min 0.40	0.030	0.025	0.020	-	-	-	-
11MnNi53	1.6212	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
13MnNi63	1.6217	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
10Ni14	1.5637	0.15	0.35	0.30 to 0.80	0.025	0.020	-	-	-	3.25 to 3.75	0.05
12Ni19	1.5680	0.15	0.35	0.30 to 0.80	0.025	0.020	-	-	-	4.50 to 5.30	0.05
X8Ni9	1.5662	0.10	0.35	0.30 to 0.80	0.025	0.020	-	0.10	-	8.00 to 10.00	0.05

1) The lower limit value for the nickel content may be reduced to not less than 0.15% by mass for tubes with wall thicknesses not exceeding 10 mm.

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		≤ 0.18 0.02
Si	≤ 0.35	≤ 0.35 0.03
	> 0.35	≤ 0.50 0.05
Mn	≤ 0.80	≤ 0.80 0.06
	> 0.80	≤ 1.65 0.10
P		≤ 0.030 0.005
S		≤ 0.025 0.005
Al		≥ 0.020 0.005
Ni	> 0.85	≤ 0.85 0.05
	> 3.75	≤ 3.75 0.07

	≥ 8.00	≤ 5.30 ≤ 10.00	0.10 0.15
Mo		≤ 0.10	0.01
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 content shall only either exceed the permissible maximum content or fall short of the permissible minimum content, but not both at the same time for one cast.

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 ² min	Tensile strength N/mm ²	Elongation after fracture (Lv = 5 do)	
Symbol	Material number					Longitudinal	Transverse
						% min	
TTSt35N	1.0356	N or NG	$s \leq 10$	225	340 to 460	25	23
TTSt35V	1.0356	V	$s \leq 25$ $25 < s \leq 40$	225 235	360 to 490	23	21
11MnNi53	1.6212	N 3) or NG	$s \leq 13$ $13 < s \leq 25$ $25 < s \leq 40$	285 275 265	410 to 530	24	22
13MnNi63	1.6217	N 3) or NG	$s \leq 13$ $13 < s \leq 25$ $25 < s \leq 40$	355 345 335	490 to 610	22	20
10Ni14	1.5637	V 4)	$s \leq 25$ $25 < s \leq 40$	345 335	470 to 640	20	18
12Ni19	1.5680	V 4)	$s \leq 25$ $25 < s \leq 40$	390 380	510 to 710	19	17
X8Ni9	1.5662	V	$s \leq 25$ $25 < s \leq 40$	490 480	640 to 840	18	16

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

2) N = normalized; V = quenched and tempered; NG = normalized starting product, weld only normalized (see subclause 5.2.1.1.1 b)).

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.

The chemical composition of the steels determined in the cast analysis 1) shall be as specified in table 1, Slight deviations from these values are permitted after consultation of, and agreement by the purchaser provided that the mechanical and technological properties of the tubes conform to this standard and weldability is not impaired.

Table4. Requirements relating to the impact energy in the impact test on ISO V-notch test pieces 1), 2)

Steel grade		Wall thickness s mm	Location of test pieces relative to tube axis	Minimum values of impact energy, in J 3), 4) at test temperature, in °C									
Symbol	Material number			-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	45	50	60
		25 < s ≤ 40	Longitudinal Transverse 5)							27	30	35	40
11 MnNi 5 3 13 MnNi 6 3	1.6212 1.6217	s ≤ 40	Longitudinal Transverse 5)						40	45	50	55	70
10 Ni 14	1.5637	s ≤ 25	Longitudinal Transverse 5)				40	45	50	55	55	60	65
		25 < s ≤ 40	Longitudinal Transverse 5)					27	30	35	40	40	45
12 Ni 19	1.5680	s ≤ 25	Longitudinal Transverse 5)		40	45	50	55	65	65	65	70	70
		25 < s ≤ 40	Longitudinal Transverse 5)		27	30	30	35	45	45	45	50	50
						40	45	50	60	65	65	65	70
						27	30	30	40	45	45	45	50

X 8 Ni 9	1.5662	s ≤ 40	Longitudinal	40	50	50	60	60	70	70	70	70	70
			Transverse 5)	27	35	35	40	40	50	50	50	50	50

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

2) The impact energy values shall each be 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 10 mm.

5) These values shall also apply when testing the impact energy in the center of the weld of fusion welded tubes with a wall thickness exceeding 10 mm.

●● To be determined on the parent metal only by agreement.

Table 5. Types of length and permissible deviations in length

Type of length		Permissible deviations in length, in mm, for outside diameters	
		up to 500	over 500
Manufacturing length 1)		1)	1)
Specified length		± 500	± 500
Exact lengths	up to 6 m	+ 10 0	+ 25 0
	over 6 m up to 12 m	+ 15 0	+ 50 0
	over 12 m	By agreement.	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.

Grade	Mfg. Process	Chemical composition (%)								
		C	Si	Mn	P	S	Ni	Cr	Mo	Others
TST35N	S	0.17Max	0.35Max	0.040Max	0.030Max	0.025Max	-	-	-	Al 0.020Max

TST35V	S	0.17Max	0.35Max	0.50~0.80	0.030Max	0.025Max	-	-	-	AI 0.020Max
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	-	-	AI 0.020Max
13MnNi63	S	0.18Max	0.50Max	0.85~1.65	0.30Max	0.025Max	0.30~0.80	-	-	-
10Ni14	S	0.15Max	0.35Max	0.30~0.80	0.25Max	0.020Max	3.25~3.75	-	-	-
12Ni19	S	0.15Max	0.35Max	0.30~0.80	0.25Max	0.020Max	4.50~5.30	-	-	-
X8Ni19	S	0.10Max	0.35Max	0.30~0.80	0.25Max	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	1.6212	t 25mmMax 255 25mm< t 40mmMax 235	340~460	-
26CrMo4	-	t 25mmMax 440 25mm< t 40mmMax 420	560~740	-
11MnNi53	1.6212	t 13mmMax 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	1.5637	t 25mmMax 345 25mm< t 40mmMax 335	470~640	(STBL46)
12Ni19	1.5680	t 25mmMax 390 25mm< t 40mmMax 380	510~710	-
X8Ni 9	1.5682	t 25mmMax 490 25mm< t 40mmMax 480	640~840	(STBL46)

JIS Number and Corresponding Foreign Standards

JIS			ASTM			BS			DIN			NF			ISO		
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
	(STBL39)					"	CFS410LT50	C	17174	X8Ni9	Ni						
						"	ERW410LT50	C									
						"	CEW410LT50	C									
	STBL450	Ni	A334	Gr3	Ni	3603	HFS03LT100	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			

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	HFS03LT100	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				