

**DIN 17172-78 STEEL PIPES FOR PIPE LINES FOR THE TRANSPORT OF COMBUSTIBLE FLUIDS AND GASES**

For connection with the International Draft Standards 3183 and 3845 published by the International Organization for Standardization (ISO) as well as with the Draft for spiral-welded pipes at present in preparation, see Explanations.

1. Scope

These conditions of delivery apply to seamless and to welded pipes made from the unalloyed and low alloy steels specified in Table 1 for the construction of long distance pipelines (see Section3) 1),2).

Grade	Mfg. Process	Chemical composition (%)								
		C	Si	Mn	P	S	Ni	Cr	Mo	Others
As Rolled or Normalized Steel										
StE210.7	S, E, A	0.17Max	0.45Max	0.35Min	0.040Max	0.035Max	-	-	-	-
StE240.7	S, E, A	0.17Max	0.45Max	0.40Min	0.040Max	0.035Max	-	-	-	-
StE290.7	S, E, A	0.22Max	0.45Max	0.50~1.10	0.040Max	0.035Max	-	-	-	-
StE320.7	S, E, A	0.22Max	0.45Max	0.70~1.30	0.040Max	0.035Max	-	-	-	-
StE360.7	S, E, A	0.22Max	0.55Max	0.90~1.50	0.040Max	0.035Max	-	-	-	-
StE385.7	S, E, A	0.23Max	0.55Max	1.00~1.50	0.040Max	0.035Max	-	-	-	-
StE415.7	S, E, A	0.23Max	0.55Max	1.00~1.50	0.040Max	0.035Max	-	-	-	-
Thermo Mechanical Treated Steel										
StE290.7TM	S, E, A	0.04~0.12	0.40Max	1.00~1.50	0.035Max	0.025Max	-	-	-	-
StE207.7TM	S, E, A	0.04~0.12	0.40Max	0.70~1.50	0.035Max	0.025Max	-	-	-	-
StE360.7TM	S, E, A	0.04~0.12	0.45Max	0.90~1.50	0.035Max	0.025Max	-	-	-	-
StE385.7TM	S, E, A	0.04~0.14	0.45Max	1.00~1.60	0.035Max	0.025Max	-	-	-	-
StE415.7TM	S, E, A	0.04~0.14	0.45Max	1.00~1.60	0.035Max	0.025Max	-	-	-	-
StE445.7TM	S, E, A	0.04~0.16	0.55Max	1.00~1.60	0.035Max	0.035Max	-	-	-	-
StE480.7TM	S, E, A	0.04~0.16	0.55Max	1.10~1.70	0.035Max	0.035Max	-	-	-	-

Grade	Material number	Tensile Test MPa or N/mm <sup>2</sup>		Remarks (Similar to JIS)
		Min Yield point	Tensile Strength	

StE210.7	1.0307	205	325-440	(STPG370)
StE240.7	1.0457	235	370-490	-
StE290.7	1.0484	275	420-540	-
StE320.7	1.0409	325	460-580	-
StE360.7	1.0582	360	510-630	-
StE385.7	1.8970	380	530-680	-
StE415.7	1.8972	410	550-770	-
StE290.7TM	1.0429	295	420-540	-
StE207.7TM	1.0430	325	460-580	-
StE360.7TM	1.0578	360	510-630	-
StE385.7TM	1.8971	380	530-680	-
StE415.7TM	1.8973	380	550-700	-
StE445.7TM	1.8975	440	560-710	-
StE480.7TM	1.8977	480	600-750	-

Table 1. Chemical composition of steels (ladle analysis) 1)

Steel grade		Kind of deoxidation 2)	Chemical composition in %by wt.					Others
Code number	Material number		C 3)	Si	Mn 3), 4)	P	S	
			maximum			maximum		
Untreated (see Section 6.2.1.1.a) or normalized steels								
StE 210.7	1.0307	R 5)	0.17	0.45	≥ 0.35	0.040	0.035	
StE 240.7	1.0457	R 5)	0.17	0.45	≥ 0.40	0.040	0.035	
StE 290.7	1.0484	RR 6)	0.22	0.45	0.50 to 1.10	0.040	0.035	
StE 320.7	1.0409	RR 6)	0.22	0.45	0.70 to 1.30	0.040	0.035	
StE 360.7	1.0582	RR 6)	0.22	0.55	0.90 to 1.50	0.040	0.035	
StE 385.7	1.8970	RR 6)	0.23	0.55	1.00 to 1.50	0.040	0.035	
StE 415.7	1.8972	RR 6)	0.23	0.55	1.00 to 1.50	0.040	0.035	

7)

Thermo-mechanically treated steels							
StE 290.7	1.0429	RR 7)	0.40	0.40	0.50 to 1.50	0.035	0.025
StE 320.7	1.0430		0.40	0.40	0.70 to 1.50	0.035	0.025
StE 360.7	1.0578		0.45	0.45	0.90 to 1.50	0.035	0.025
StE 385.7	1.8971		0.45	0.45	1.00 to 1.60	0.035	0.025
StE 415.7	1.8973		0.45	0.45	1.00 to 1.60	0.035	0.025
StE 445.7	1.8975		0.55	0.55	1.00 to 1.60	0.035	0.025
StE 480.7	1.8977		0.55	0.55	1.10 to 1.70	0.035	0.025

7)

1) Elements not featured in this Table may not be intentionally added to the steel without purchaser's consent, other than for the purpose of finish-treatment of the melt. All suitable precautions shall be taken avoid the introduction of any such elements from the scrap or from any other substances used during manufacture, because such elements may adversely affect the mechanical properties and the usability.

2) R = killed (semi-killed steel is not included herein), RR = specially killed.

3) For every reduction of the maximum C content by 0.01% , a corresponding increase of the maximum manganese content by 0.05% is permissible, but only up to 1.9% Mn maximum.

4) In the case of wall thicknesses > 15 mm, the specified manganese content may be exceeded by 0.10% in the case of thermo-mechanically treated steels.

5) These steels can also be supplied specially killed by agreement; in this event the steel grades shall be designated RRSIE 210.7 (material number 1.0319) resp. RRSIE 240.7 (material number 1.0459).

6) The steels contain an adequate aluminum content to achieve the necessary fineness of grain, i.e. as a general rule  $\geq 0.020\%$  Al met.

7) In order to attain the mechanical properties and a fine-grained structure, steels StE 360.7 StE 385.7 as well as StE 415.7 may. and all thermo-mechanically treated steels must contain adequate of e.g. vanadium and niobium, in addition to aluminum. These materials may in part only be present in trace form. The sum total of these additives, in the case of wall thicknesses  $\leq 15$  mm, shall not exceed 0.15% in the case of steels StE 360.7, StE 385.7 as well as StE415.7, 0.16% in the case of steels StE 290.7 TM, StE 320.7 TM as well as StE 360.7 TM, and 0.20% in the case of the remaining thermo-mechanically treated steels; in the case of wall thicknesses > 15mm, the sum total of these additives shall not exceed 0.17% in the case of steel StE 360.7, 0.18% in the of steels StE 285.7 and StE 415.7, 0.17% in the case of steels StE 290.7 TM, StE 302.7 TM as well as StE360.7 TM, and 0.20% in the case of the remaining thermo-mechanically treated steels. The vanadium content shall be  $\leq 0.12$  in every case.

8) The C content shall not be less than 0.04%.

Table 2. Permissible variations of product analysis from the limiting values applicable to the ladle analysis

Element	Permissible variation of product analysis from the limiting values of the ladle analysis 1)
C	+0.02
	-0.01

Si	+0.03 0
Mn	±0.06
P	+0.005 0
S	+0.005 0
1) For a melt, the variation of an element, in the event of several product analyses, may only be situated either below the minimum value or only above the maximum value of the range specified for the ladle analysis, but not both simultaneously.	

6.2.1.1 Seamless pipes:

- a) Untreated, after a hot forming operation by rolling, pressing or drawing, on condition that said hot forming operation achieves an irreproachable structure condition with adequate uniformity without any further treatment;
- b) Normalized Cold rolled or cold drawn pipes must be normalized in every case.

6.2.1.2. Welded pipes:

- a) Pipes welded from normalized 6) and subsequently cold curved plate or strip no further heat-treatment;
- b) Pipes welded from normalized 6) and subsequently hot curved plate or strip under controlled temperature command, no further heat-treatment;
- c) Pipes welded from hot or cold curved plate or strip and normalized;
- d) In the case of electrically pressure welded pipes which are not normalized around the entire periphery, an annealing of the weld must be carried out in order to achieve as uniform as possible a distribution of the strength properties.

Table3. Mechanical properties in the "as-delivered" condition 1)

Steel grade Untreated (see Section 6.2.1.1. a) or normalized steels		Steel grade Thermo-mechanically treated steels		Yield point 2), 3), 4) N/mm <sup>2</sup> min	Tensile strength 3), 5) N/mm <sup>2</sup>	Permissible yield point ratio	Elongation 6) (l <sub>0</sub> = 5d <sub>0</sub> ) %	Absorbed energy	Diameter of bending mandrel for the folding test on fusion welded pipes 7)	Flattening test on pressure welded and seamless pipes	C		
Code number	Material number	Code number	Material number								5L	5LX	5LS
StE 210.7	1.0307	-	-	210	320 to 440	≤ 0.85	26	see Table 4	2s	see Section 7.5.4	A	-	A
StE 240.7	1.0457	-	-	240	370 to 490		24		2s		B	-	B
StE 290.7	1.0484	StE 290.7 TM	1.0429	290	420 to 540		23		3s		-	X42	X42

StE 320.7	1.0409	StE 320.7 TM	1.0430	320	460 to 580		21		4s		-	X46	X46
StE 360.7	1.0582	StE 360.7 TM	1.0578	360	510 to 630		20		4s		-	X52	X52
StE 385.7	1.8970	StE 385.7 TM	1.8971	385	530 to 680		19		5s		-	X56	X56
StE 415.7	1.8972	StE 415.7 TM	1.8973	415	550 to 700	$\leq 0.85$ 8)	18		5s		-	X60	X60
-	-	StE 445.7 TM	1.8975	445	560 to 710	$\leq 0.85$	18		6s		-	X65	X65
-	-	StE 480.7 TM	1.8977	480	600 to 750	$\leq 0.90$ 3)	18		6s		-	X70	X70

- 1) Make sure by competent further processing of the pipes that the specified limiting values are neither exceeded nor fallen short of.
- 2) In the case of a clearly defined yield point, the upper yield point shall apply, in the other case the yield limit for 0.5% total elongation (Rt 0.5).
- 3) If the value determined for the yield point for steel StE 415.7 TM is slighter than 520N/mm<sup>2</sup> or higher than 555N/mm<sup>2</sup> for steel StE 445.7TM, or higher than 600 N/mm<sup>2</sup> for steel StE 480.7 TM, then the yield point ratio must be  $\leq 0.85$  (see also Foot note 5) (see also Explanations).
- 5) Exceeding the upper limiting value by 30 N/mm<sup>2</sup> may not be objected. This applies to untreated or normalized steels StE 210.7 to StE 320.7 inclusive, but only on condition that the ratio of yield point to tensile strength does not exceed the value of 0.80.
- 6) These values apply to transverse specimens taken from the parent meta, Where longitudinal specimens are tested (see Fig.1), the values of elongation to be achieved
- 7) s = wall thickness of pipe, bending angle = 180° (see Section 7.4.2.3).
- 8) This value applies to steel grade StE 415.7 (see also Footnote 5).

Table 4. Minimum values of absorbed energy (ISO -V specimens) at 0°C

Nominal outside diameter da mm	Type of pipe	Location from which specimen is cut	Position of specimen	Absorbed energy at 0°C	
				Mean value J 1), 2) min	Individual value J 2) min
Up to 500 3)	Seamless Pressure welded Fusion welded	Parent metal	Longitudinal to pipe axis (see Fig. 1)	47	39
over 500	Seamless Pressure welded Fusion welded	Parent metal	Transverse to pipe axis (see Fig. 1)	27 4)	22 4)
over 500	Welded	Weld	Transverse to weld axis	27	22

			(see Fig. 1)		
<p>1) Mean value from 3 tests</p> <p>2) See Section 7.5.3.</p> <p>3) In special cases where pipes with outside diameters of 300 to 500 mm and wall thicknesses of 6.3 mm and over are concerned, the verification of the absorbed energy may be agreed in the circumferential direction when ordering. In this event, the values of absorbed energy must also be agreed.</p> <p>4) In the case of steel grades StE 385.7 (1.8970), StE 385.7 TM (1.8971), StE 415.7 (1.8972), StE 415.7 TM (1.8973), StE 445.7 TM (1.8975) and StE 480.7 TM (1.8977), the minimum values shall be 31 J for the mean value and 24 J for the individual value.</p>					