

DIN 17102 WELDABLE NORMALIZED FINE GRAIN STRUCTURAL STEELS

1. Field of application

1.1 This standard applies to hot rolled products in the form of flats (plate, strip, wide flats), sections and bars of weldable fine grain structural steels exhibiting, in the as delivered condition as specified in subclause 7.2.1. minimum yield strengths of 255 to 500 n/mm referred to the lowest thickness range as specified in table3.

If the products of steels covered by this standard are made or used for plants subject to regular inspection, the relevant codes of practice, e.g. Technische Regeln Druck. behälter (TAB) (Technical rules on pressure vessels),

Technische Regeln für Dampfkessel (TRD) (Technical rules on steam boilers), Merkblätter für Arbeitsgemeinschaft Druckbehälter (AD-Merkblätter) (Instruction sheets of the pressure vessel study group), Technische Regeln für brennbare Flüssigkeiten (TRbF) (Technical rules on flammable liquids), Technische Regeln für Druckgase (TRGI) (Technical rules on high pressure gas pipelines) shall be observed. The same applies to other fields of application for which additional specifications exist.

1.2 This standard does not apply to hot rolled fine grain steels for cold forming as covered by Stah (EisenWerkstoffblatt (Iron and steel material sheet)092, nor to hollow sections, tubes and forgings of weldable fine grain structural steels.

1.3 In addition to the specifications of this standard, the general technical delivery conditions for steel contained in DIN 17010 shall apply except where stated to the contrary below.

Chemical composition

Steel grade		Percentage by mass														
Symbol	Material number	C Max	Si	Mn	P Max	S Max	N Max	Al Min	Cr Max	Cu Max	Mo Max	Ni Max	Nb Max	Ti Max	V Max	Nb+Ti+V Max
StE255	1.0461	0.18	0.40Max	0.50 to 1.30			0.020	0.020	0.30	0.20	0.08					0.05
WStE255	1.0462	0.18														
TStE255	1.0463	0.16														
ESTe255	1.1103	0.16														
StE285	1.0486	0.18	0.60 to 1.40								0.30	0.03				
WStE285	1.0487	0.18														
TStE285	1.0488	0.16														
ESTe285	1.1104	0.16														
StE315	1.0505	0.18	0.45Max	0.70 to 1.50												
WStE315	1.0506	0.18														
TStE315	1.0508	0.16														
ESTe315	1.1105	0.16														

StE355	1.0562	0.20	0.10 to 0.50	0.90 to 1.65							0.30			0.10	0.12
WStE355	1.0565	0.20													
TStE355	1.0566	0.18													
EstE355	1.1106	0.18													
StE380	1.8900	0.20	0.10 to 0.60	1.00 to 0.60			0.30		1.00	0.05		0.20	0.22		
WStE380	1.8930														
TStE380	1.8910														
EstE380	1.8911														
StE420	1.8902														
WStE420	1.8932														
TStE420	1.8912														
EstE420	1.8913														
StE460	1.8905														
WStE460	1.8935														
TStE460	1.8915														
EstE460	1.8918														
StE500	1.8907	0.21										0.22			
WStE500	1.8937														
TStE500	1.8917														
EstE500	1.8919														

Table 1. Chemical composition by cast analysis

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1) If nitrogen is additionally controlled by niobium, titanium or vanadium, the specification minimum aluminum content is dropped.

2) The sum of the mass contents of the three elements chromium, copper and molybdenum shall not amount to more than 0.45%.

- 3) If copper is added as an alloying element, the maximum content may be 0.70%.
- 4) If nickel is added as an alloying element, the maximum content may be 0.85%.
- 5) If titanium is added as an alloying element, the maximum content may be 0.20%.

Table 2. Permissible deviations of the chemical composition determined by the product analysis from the limiting values to be stated by the manufacturer for the cast analysis (see subclause 7.3.2).

Element	Permissible mass content by cast analysis %	Permissible deviations of results of product analysis from the upper or lower limiting values for the cast analysis 1) Percentage by mass
C	≤ 0.21	0.02
Si	≤ 0.60	0.05
Mn	≤ 13.00	0.06
	>1.00 ≤ 1.70	0.10
P	≤ 0.035	0.005
S	≤ 0.030	0.005
Cr	≤ 0.30	0.04
Cu	≤ 0.70	0.07
Mo	≤ 0.10	0.03
Ni	≤ 1.00	0.05
Nb	≤ 0.05	0.01
Ti	≤ 0.20	0.02
V	≤ 0.22	0.02
1) If, from one and the same cast, several product analyses are carried out and if it is found in these analyses that the contents of a particular element are outside the range of chemical composition permitted by the cast analysis, then, only values exceeding the permitted maximum value or only values falling short of the permitted minimum value shall be allowed, but not both together for one and the same cast.		

Table 3. Grade classification and requirements to be met by the properties of the steels at room temperature in the tensile test and bend test 1)

Steel grade	Mechanical and technological properties
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Basic series		High temperature series		Low temperature series		Special low temperature series		Tensile strength Rm for product thicknesses s, in mm					Upper yield stress ReH 2) for product thicknesses s, in mm								Elongation after fracture 3) (Lo= 5do) %	Mandrel diameter for bend test 4), 5)		
								s ≤ 70	70 < s ≤ 85	85 < s ≤ 100	100 < s ≤ 125	125 < s ≤ 150	s ≤ 16	16 < s ≤ 35	35 < s ≤ 50	50 < s ≤ 60	60 < s ≤ 70	70 < s ≤ 85	85 < s ≤ 100	100 < s ≤ 125				125 < s ≤ 150
								N/mm²					N/mm² min.											
Symbol	Material number	Symbol	Material number	Symbol	Material number	Symbol	Material number														min.	Longitudinal	Transverse 6)	
StE 265	1.0461	WStE 255	1.0462	TStE 255	1.0463	EstE 255	1.1103	360 to 480	350 to 470	340 to 460	330 to 450	330 to 450	255	245	235		225	215	205	195	25	1a	1a	
StE 285	1.0486	WStE 285	1.0487	TStE 285	1.0488	EstE 285	1.1104	390 to 510	380 to 500	370 to 490	360 to 480	350 to 480	285	276	265		255	245	235	225	24	1.5a	2a	
StE 315	1.0505	WStE 315	1.0506	TStE 315	1.0508	EstE 315	1.1105	440 to 560	430 to 550	420 to 540	410 to 530	400 to 520	315	305	295		285	275	265	255	23	2a	2.5a	
StE 355	1.0562	WStE 355	1.0565	TStE 355	1.0566	EstE 355	1.1106	490 to 630	480 to 620	470 to 610	460 to 600	450 to 590	355	345	335		325	315	305	295	22	2a	3a	
StE 380	1.8900	WStE 380	1.8930	TStE 380	1.8910	EstE 380	1.8911	500 to 650	490 to 640	480 to 630	470 to 620	460 to 610	380	375	365	355	345	335	325	315	305	20	2.5a	3.5a
StE 420	1.8902	WStE 420	1.8932	TStE 420	1.8912	EstE 420	1.8913	530 to 680	520 to 670	510 to 660	500 to 650	490 to 640	420	410	400	390	385	375	365	355	345	19	2.5a	3.5a
StE 460	1.8905	WStE 460	1.8935	TStE 460	1.8915	EstE 460	1.8918	560 to 730	550 to 720	540 to 710	530 to 700	520 to 690	460	450	440	430	420	410	400	390	380	17	3a	4a
StE	1.8907	WStE	1.8937	TStE	1.8917	EstE	1.8919	610	600	590	580	570	500	480	470	460	450	440	430	420	410	18	3a	4a

[illegible]

Table 4. Requirements regarding 0.2% proof stress at elevated temperatures 1), 2)

Steel grade		Minimum values of 0.2% proof stress for product thicknesses s, in mm																						
		s≤	35<s	70<s	85<s	100<s	125<s	s≤	35<s	70<s	85<s	100<s	125<s	s≤	70<s	85<s	100<s	125<s	s≤	70<s	85<s	100<s	125<s	
		35	≤70	≤85	≤100	≤125	150	35	≤70	≤85	≤100	≤125	150	70	≤85	≤100	≤125	150	70	≤85	≤100	≤125	150	
Symbol	Material number	at																						
		100°C						150°C						200°C						250°C				
		N/mm²																						
WStE 255	1.0462	226	216	206	196	186	177	206	196	186	177	167	157	186	177	167	157	147	167	157	147	137	127	
WStE 285	1.0487	255	245	235	226	216	206	235	226	216	206	196	186	206	196	186	177	167	186	177	167	157	147	
WStE 315	1.0506	275	265	255	245	235	226	255	245	235	226	216	206	226	216	206	196	186	206	196	186	177	167	
WStE 355	1.0565	304	294	284	275	265	255	284	275	265	255	245	235	255	245	235	226	216	235	226	216	206	196	
WStE 380	1.8930	333	324	314	304	294	284	314	304	294	284	275	265	284	275	265	255	245	265	255	245	235	226	
WStE 420	1.8935	363	353	343	333	324	314	343	333	324	314	304	294	314	304	294	284	275	284	275	265	255	245	
WStE 460	1.8935	402	392	382	373	363	353	373	363	353	343	333	324	343	333	3214	314	304	314	304	294	284	275	
WStE 500	1.8937	422	412	402	392	382	372	392	382	373	363	353	343	363	353	343	333	324	333	324	314	304	294	

1) The yield strength values given in table 3 for room temperature are valued up to 50°C as characteristic values to be used for calculation. For temperatures between 50 and

2) For thicknesses exceeding 150 mm, the values shall be agreed.

Table 4. (continued)

Steel grade	Minimum values of 0.2% proof stress for product thicknesses s, in mm
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		s ≤ 70	70 < s ≤ 85	85 < s ≤ 100	100 < s ≤ 125	125 < s ≤ 150	s ≤ 70	70 < s ≤ 85	85 < s ≤ 100	100 < s ≤ 125	125 < s ≤ 150	s ≤ 70	70 < s ≤ 85	85 < s ≤ 100	100 < s ≤ 125	125 < s ≤ 150
Symbol	Material number	at														
		300 °C						350 °C						400 °C		
		N/mm²														
WStE 255	1.0462	137	127	118	108	98	118	108	98	88	78	108	98	88	78	69
WStE 285	1.0487	157	147	137	127	118	137	127	118	108	98	118	108	98	88	78
WStE 315	1.0506	177	167	157	147	137	157	147	137	127	118	137	127	118	108	98
WStE 355	1.0565	216	206	196	186	177	196	186	177	186	157	167	157	147	137	127
WStE 380	1.8930	245	235	226	216	206	216	206	196	186	177	186	177	167	157	147
WStE 420	1.8935	265	265	245	235	226	235	226	216	206	196	206	196	186	177	167
WStE 460	1.8935	294	284	275	265	255	265	255	245	235	226	235	226	216	206	196
WStE 500	1.8937	314	304	294	284	275	284	275	265	255	245	255	245	235	226	226
216For 1) and 2) see above.																

Table 5. Requirements regarding impact energy for impact tests on ISO V-notch test pieces

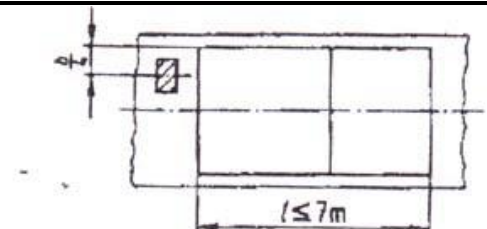
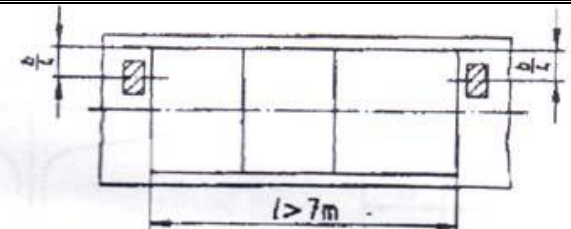
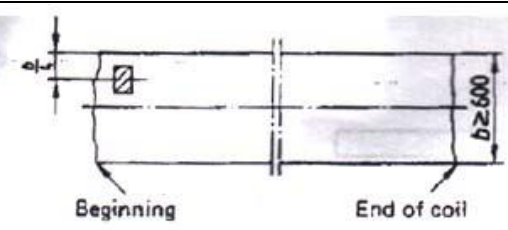
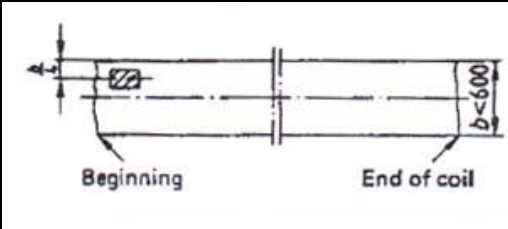
Steel grades of the flowing series	Test piece direction	Minimum values of impact energy Av for product thicknesses 10 ≤ s ≤ 150 mm 1), 2), 3)								
Basic series and high temperature	Longitudinal	-	-	-	-	39	43	47	51	55
	Transverse 4)	-	-	-	-	21	24	31	31	31
Low temperature series	Longitudinal	-	27	31	39	47	561	55	59	63
	Transverse 4)	-	16	20	24	27	31	31	35	39
Special low temperature series	Longitudinal	25	30	40	50	65	80	90	95	100
	Transverse 4)	20	27	30	35	45	60	70	75	80

1) For thicknesses exceeding 150 mm, the values shall be agreed.

2) The mean of three tests shall be deemed to be the test result. Only one individual value is allowed to be below the minimum mean value, and by not more than 30%.

3) For product thicknesses under 10 mm, the data of subclause 7.4.1.5.2. shall apply.

4) Only for plate and strip in rolling widths equal to or exceeding 600 mm; for wide flats and sections, see subclause 7.4.1.5.1.

Product	Taking of samples	
	From each test unit there shall be taken, for the preparation of the test pieces described in subclause 8.3	
	for	one sample from the positions marked by
plate	supply in product lengths, per as rolled plate $l \leq 7\text{m}$	
	supply in product lengths, per as rolled plate $l > 7\text{m}$	
strip Supplied as coil	product widths b $b \geq 600\text{mm}$	
	$b < 600\text{mm}$	

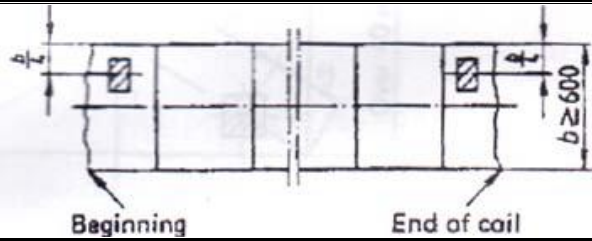
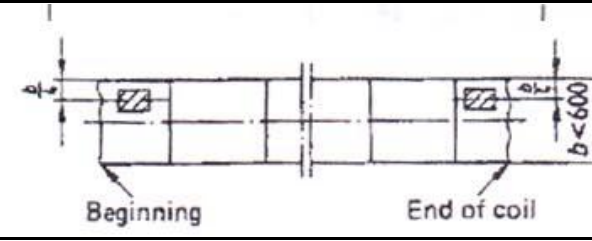
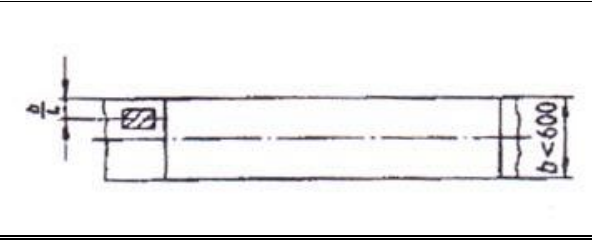
strip Supplied as plate	$b \geq 600\text{mm}$	
	$b < 600\text{mm}$	
Wide flats	product widths b $b \geq 600\text{mm}$	
	$b < 600\text{mm}$	
1) Longitudinal test pieces for the impact test (see subclause 7.4.1.5.1)		

Figure 1. Synopsis of positions of test pieces to be taken from plate, strip and wide flats.

