

**Non-alloy steel tube for pressure purposes****Material Data Sheet**

Steel Designation:

**Name****Standard****Grade A  
(P235TR1/2)****ASTM/ASME A53  
(1.0254/1.255)****Grade B  
(P265TR1/2)****ASTM/ASME A53  
(1.0258/1.0259)****Scope**

This data sheet applies for seamless and welded tubes of non-alloy steel with specified elevated temperature properties.

**Application**

This tubes are used for pipe lines beyond the DGRL (TR1) and pipe lines of class I to III (TR2). Their application is usual up to 300 °C. The permitted pressure should not exceed 160 bar.

**Chemical composition** (Heat analysis in %)

Name	C max.	Si min.	Mn max.	P max.	S max.	Cr <sup>b</sup> max.	Cu <sup>b</sup> max.	Mo <sup>b</sup> max.	Ni <sup>b</sup> max.	V <sup>b</sup> max.
Grade A	0,25	-	0,95	0,05	0,045	0,40	0,40	0,15	0,40	0,08
P235TR1*	0,16	0,35	1,20	0,025	0,020	0,30	0,30	0,08	0,30	0,02
P235TR2 <sup>a</sup>	0,16	0,35	1,20	0,025	0,020	0,30	0,30	0,08	0,30	0,02
Grade B	0,30	-	1,20	0,05	0,045	0,40	0,40	0,15	0,40	0,08
P265TR1*	0,20	0,40	1,40	0,025	0,020	0,30	0,30	0,08	0,30	0,02
P265TR2 <sup>a</sup>	0,20	0,40	1,40	0,025	0,020	0,30	0,30	0,08	0,30	0,02

\*  $Cr+Cu+Mo+Ni \leq 0,70$

<sup>a</sup> Al<sub>min.</sub> 0,02 - This requirement is not applicable provided the steel contains sufficient amount of other nitrogen binding elements, which should be reported.

<sup>b</sup> For the materials Grade A and B the total composition for this five elements shall not exceed 1 %.

### Mechanical properties at room temperature

Name	Product thickness mm	Yield/ proof strength $R_{eH}$ N/mm <sup>2</sup> min.	Tensile strength $R_m$ N/mm <sup>2</sup>	Elongation min.		Minimum average impact energy KV J At a temperature in °C of		
				longitudinal	transverse	longitudinal		transverse
						0	-10	0
Grade A*	-	205	min. 330	-	-	-	-	-
P235TR1* <sup>a</sup> P235TR2* <sup>a</sup>	$T \leq 16$	235	360 - 500	25	23	40 <sup>b</sup>	28 <sup>b</sup>	27 <sup>b</sup>
	$16 < T \leq 40$	225						
	$40 < T \leq 60$	215						
Grade B*	-	240	min. 415	-	-	-	-	-
P265TR1* <sup>a</sup> P265TR2* <sup>a</sup>	$T \leq 16$	265	410 - 570	21	19	40 <sup>b</sup>	28 <sup>b</sup>	27 <sup>b</sup>
	$16 < T \leq 40$	255						
	$40 < T \leq 60$	245						

\* Delivery condition N = normalizing incl. normalizing forming

<sup>a</sup> For wall thicknesses larger than 60 mm the mechanical properties have to be agreed.

<sup>b</sup> applies only for testing class TR2

### Reference data for some physical properties

Density at 20 °C Kg/dm <sup>3</sup>	Modulus of elasticity kN/mm <sup>2</sup> at				Thermal conductivity bei 20 °C W/m K	spec. thermal capacity at 20 °C J/kg K	spec. electrical resistivity at 20 °C $\Omega$ mm <sup>2</sup> /m
	20 °C	300 °C	400 °C	450 °C			
7,85	210	192	184	179	51	461	0,20

Linear coefficient  $10^{-6} K^{-1}$  of thermal expansion between 20 °C and

100 °C	200 °C	300 °C	400 °C	450 °C
12,5	13,0	13,6	14,1	14,3

### Hot forming / Heat treatment

Hot forming		Heat treatment		
Temperature °C	Type of cooling	Normalizing <sup>1)</sup>	Stress relieving anneal <sup>2)</sup>	Type of cooling
1100 - 950	Air	890 - 950 °C	600 - 650 °C	Air

<sup>1)</sup> Normalizing: Holding time 1 minute per mm plate thickness, minimum 30 minutes

<sup>2)</sup> Stress relieving anneal: Holding time 1-2 minutes per mm plate thickness, minimum 30 minutes

### Processing / Welding

Standard welding processes for these steel grades are:

TIG-welding

Arc welding (E)

MAG-welding massive wire

Submerged arc welding (SAW)

MAG- welding cored wire

Depending on the welding position and the plate thickness, maybe other filler metals have to be applied, which can be asked inquired at the manufacturer in case of need.

For these steel grades as filler metal the following electrodes and welding wires are recommended:

Process	Filler metal	
<b>WIG</b>	Union I 52	
<b>MAG massive wire</b>	Union K 52 Union K 56	
<b>MAG cored wire</b>	Union MV 70 Union BA 70 (Union RV 71)	
<b>Arc welding (E)</b>	Phoenix 120K Phoenix Special D	
<b>SAW</b>	Wire	Powder
	Union S2 (Union S2)	UV 400 (UV 306)

These steels can be welded within all thickness ranges according to the afore mentioned welding processes considering the general rules of technology by hand and automatically welding.

The mentioned filler metals apply for highest demands. The details in brackets are for lower demands.

Burning, preheating, welding and stress relieving annealing should occur under consideration of Stahl-Eisen-Material bulletin 088.

Specifications and standards concerning stress relieving anneal have to be observed.

#### Remark

The material is magnetizable.

#### Editor

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#### References

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#### Important Hint

Information given in this data sheet about property or applicability of materials respective products are no assurance of characteristics but serve for description.

Information, with which we like to advise you, relate to the experience of the producers and our own. Warranty for the results of the treatment and application of the products cannot be granted.