

## P295GH

### Heat-resistant pressure-vessel steels

Material no.	1.0481
according to	DIN EN 10028-2
Tensile strength class	B

#### Usage

These steel grades are characterised by a good weldability. They are used above all for manufacturing boilers, pressure vessels and pipes transporting hot liquids.

The user of these steel grades must make sure that his calculation, design and processing methods are appropriate for the material. The grades of this series offer good cold and hot-forming properties.

#### Chemical composition <sup>1) 2)</sup>

(in percent by weight)

	min.	max.
C	0,08%	0,20%
Si		0,40%
Mn	0,90%	1,50% <sup>3)</sup>
P		0,025%
S		0,015%
N		0,012% <sup>4)</sup>
Al	0,020%	
Cu		0,30% <sup>5)</sup>
Cr		0,30%
Ni		0,30%
Nb		0,020%
V		0,020%
Ti		0,03%
Mo		0,08%

1) Heat analysis

2)  $(Cr + Cu + Mo + Ni) \leq 0,70\%$

3) For thicknesses < 6.0 mm, a minimum content for Mn that is 0.20 % smaller than specified is permitted.

4)  $Al/N \geq 2$

5) A lower Cu-content and a maximum tin content may be agreed in the order, e. g. with respect to formability.

#### Notch impact energy <sup>1)</sup>

Temperature	Notch impact energy
+20°C	≥ 40 J
0°C	≥ 34 J
-20°C	≥ 27 J

1) Average values of 3 samples; one individual value may fall short of the required minimum value by not more than 30 %. The sample width shall equal the product thickness if the latter is between 6 and 10 mm. The tests are performed by using samples similar to Charpy-V samples. The values specified in the table above are to be reduced proportionally to the sample width.

#### Yield point at elevated temperature

Test temperature	Yield point at elev. temp. $R_{p0,2}$	
	e ≤ 16 mm	e > 16 mm
50°C	≥ 285 MPa	≥ 280 MPa
100°C	≥ 268 MPa	≥ 264 MPa
150°C	≥ 249 MPa	≥ 244 MPa
200°C	≥ 228 MPa	≥ 225 MPa
250°C	≥ 209 MPa	≥ 206 MPa
300°C	≥ 192 MPa	≥ 189 MPa
350°C	≥ 178 MPa	≥ 175 MPa
400°C	≥ 167 MPa	≥ 165 MPa

#### Mechanical properties <sup>1)</sup>

Nom. thick. e	Yield strength $R_{eH}$
< 16 mm	≥ 295 MPa
≥ 16 mm	≥ 290 MPa

Nom. thick. e	Tensile strength $R_m$
< 25 mm	460 – 580 MPa

Nom. thick. e	Total elongation $A_5$
3 < e < 25 mm	≥ 21 %

1) Transverse samples, normalised

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#### Available dimensions

Hot-rolled coils unpickled, mill edge

Thickness in mm	Width in mm
2,00 – 2,24	900 – 1400
2,25 – 2,49	900 – 1450
2,50 – 2,99	900 – 1500
3,00 – 3,99	900 – 1680
4,00 – 12,70	900 – 1750

Widths < 900 mm and thicknesses > 12.70 mm on request

Hot-rolled slit strip

Thickness in mm	Width in mm
2,00 – 2,24	100 – 690
2,25 – 2,49	100 – 715
2,50 – 2,99	100 – 740
3,00 – 4,60	100 – 800
4,61 – 6,00	116 – 800
6,01 – 7,00	175 – 800
7,01 – 8,00	233 – 800

Widths < 100 mm on request

#### Welding

The steel grades of this series may be welded by means of the usual welding techniques.

#### Condition of delivery, scope of testing and certificate

The provisions of EN 10028-2, chapters 8.2 and 9 shall apply for delivery and inspection. Steel grades P235GH– P355GH are delivered normalised rolled (delivery condition N).