

# 13CrMo4-5

## Heat-resistant pressure-vessel steels

Material no.	1.7335
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%	0,18%
Si		0,35%
Mn	0,40%	1,00%
P		0,025%
S		0,010%
N		0,012%
Cu		0,30% <sup>3)</sup>
Cr	0,70%	1,15%
Mo	0,40%	0,60%

1) Heat analysis

2) The Al-content of the melting is to determine and to indicate in the certification.

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

### Welding

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

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

Nom. thick. e	Yield strength R <sub>eH</sub>
≤ 16 mm	≥ 300 MPa
> 16 mm	≥ 290 MPa

Nom. thick. e	Tensile strength R <sub>m</sub>
≤ 25 mm	450 – 600 MPa

Nom. thick. e	Total elongation A <sub>5</sub>
3 < e ≤ 25 mm	≥ 19 %

1) Transverse samples, normalised

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

Temperature	Notch impact energy
+20°C	≥ 31J
0°C <sup>2)</sup>	–
-20°C <sup>2)</sup>	–

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.

2) A value can be agreed on in the request and order.

### 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. The steel grade 13CrMo4-5 is delivered in the as-rolled condition; the test is carried out on simulating heat-treated samples (normalised and tempered).

### Yield point at elevated temperature

Test temperature	Yield point at elev. temp. R <sub>p0,2</sub>	
	e ≤ 16 mm	e > 16 mm
50°C	≥ 294 MPa	≥ 285 MPa
100°C	≥ 285 MPa	≥ 275 MPa
150°C	≥ 269 MPa	≥ 260 MPa
200°C	≥ 252 MPa	≥ 243 MPa
250°C	≥ 234 MPa	≥ 226 MPa
300°C	≥ 216 MPa	≥ 209 MPa
350°C	≥ 200 MPa	≥ 194 MPa
400°C	≥ 186 MPa	≥ 180 MPa
450°C	≥ 175 MPa	≥ 169 MPa
500°C	≥ 164 MPa	≥ 159 MPa

### 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