

## S320IHU

### Steels for hydroforming

Material no.	–
according to	<b>SZFG Werkstoffblatt</b>
Tensile strength class	<b>A</b>

#### Usage

The mechanical properties of special grade S320IHU are between those of steel grades S275JRC and S355JRC according to EN 10025-2. They feature outstanding flow properties and particular suitability for high-frequency welding. This steel was specially developed for hydroforming and, due to its excellent forming properties, enables the production of high-strength components.

#### Hydroforming

The hot strip is split into bands, which are then bent lengthways to form a tube and welded via high-frequency welding. The tube is then split into sections and, if necessary, pre-bent. These workpieces are inserted into a mold consisting of two parts. The mold is closed and the ends of the tubes are sealed with two axial stamps. The stamps are hollow and have a borehole for filling the tube with an emulsion of water and oil; the necessary internal pressure is built up. During forming, the two axial stamps press against the ends of the tubes with high force whilst, at the

same time, the emulsion (with up to 4.000 bar) presses the wall of the tube against the tool mold. Hydroforming technology is used to produce highly accurate components with extremely precise repeat accuracy. By optimizing component design in accordance with the stresses applied and using strain-hardening, weight reductions are possible. The reduction in the number of parts, as well as the lack of welding seams, also offers cost and manufacturing benefits.

#### Chemical composition (in percent by weight)

	min.	max.
C		0.180 %
Si		0.200 %
Mn		1.250 %
P		0.020 %
S		0.010 %
N		0.009 % <sup>1)</sup>
Al	0.015 %	
C <sub>E</sub> <sup>2)</sup>		0.42 %

1) The maximum nitrogen content shall not apply if the total aluminium content of the steel is at least 0,020 % or if it contains enough other nitrogenfixing elements.

2) Maximum carbon equivalent value:  
 $C_E = C + Mn / 6 + (Cr + Mo + V) / 5 + (Cu + Ni) / 15$

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

Nom. thick. e	Yield strength R <sub>eH</sub>
≤ 16 mm	280 – 360 MPa

Nom. thick. e	Tensile strength R <sub>m</sub> <sup>2)</sup>
< 3 mm	400 – 480 MPa
≥ 3 mm	400 – 480 MPa

Nom. thick. e	Total elongation A <sup>3)</sup>
< 3 mm	≥ 27 %
3 ≤ e < 25 mm	≥ 32 %

1) The given values apply to longitudinal samples.

2) The tensile test values given in the table apply to longitudinal samples (l); in case of strip and sheet steel of widths of ≥ 600 mm they apply to transverse samples (t).

3) It shall apply for nominal thickness e:  
 e < 3 mm: A<sub>80</sub>  
 e ≥ 3 mm: A<sub>5</sub>

#### Min. notch impact energy<sup>1)</sup>

Temperature	Minimum notch impact energy
-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 5 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.

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#### Available dimensions

Hot-rolled coils unpickled, mill edge

Thickness in mm	Width in mm
1.50 – 1.79	900 – 1250
1.80 – 1.99	900 – 1390
2.00 – 2.24	900 – 1540
2.25 – 2.49	900 – 1700
2.50 – 2.99	900 – 1880
3.00 – 3.99	900 – 1880
4.00 – 6.00	900 – 1880
6.01 – 7.00	900 – 1880

Hot-rolled slit strip

Thickness in mm	Width in mm
1.50 – 1.79	100 – 515
1.80 – 1.99	100 – 635
2.00 – 2.24	100 – 760
2.25 – 7.00	100 – 800

<100 mm on request

#### Melting form

S320IHU is melted in the oxygen-blowing process as fine-grained steel.

#### Condition of delivery

The steel is produced as hot strip in nominal thicknesses of 2.0 to 5.0 mm and in widths according to the Salzgitter Flachstahl delivery program.