

<b>Quality</b>	<b>X 38CrMo16</b>	Supply conditions:
According to standards	<b>UNI EN ISO 4957: 2002</b>	Quenching and tempering
Number	<b>1.2316</b>	

## Chemical composition

C%	Si%	Mn%	P%	S%	Cr%	Mo%	Ni%	Deviations allowed for analysis product
	max	max	max	max			max	
0,33-0,45	1,00	1,50	0,030	0,030	15,50-17,50	0,80-1,30	1,00	
± 0.03	± 0.05	± 0.04	+ 0.005	+ 0.005	± 0.15	± 0.05	± 0.07	

Product deviations are allowed

On request, sulphur content can be increased and nickel content can be omitted

## Temperature °C

Hot-forming	Stress-relieving after machining and before quenching	Quenching <sup>1)</sup>	Tempering <sup>1)</sup>	Quenching <sup>2)</sup>	Tempering <sup>2)</sup>		
1050-850		1000-1050 oil or polymer s.b. (500-550)	550-650 calm air minimum 2 cycles	1000-1050 calm or forced air	170-210 calm air minimum 2 cycles		
Soft annealing	Stress-relieving	Spheroidizing	End quench hardenability test	Pre-heating welding	Stress-relieving after welding		
790-840 furnace cooling (HB max 240)	50° under the temperature of tempering			250-300	650 furnace cooling		
				<b>Ac1</b>	<b>Ac3</b>	<b>Ms</b>	<b>Mf</b>
				810	900	260	40

s.b. = salt bath

## Mechanical and physical properties

Table of tempering after quenching at 1040 °C in oil

<b>HB</b>	468	468	455	442	432	432	432	432	442	448	371	301
<b>HRC</b>	49	49	48	47	46	46	46	46	47	47,5	40	32
N/mm <sup>2</sup>	1700	1700	1640	1580	1520	1520	1520	1520	1580	1610	1250	1010
Tempering at °C	<b>50</b>	<b>100</b>	<b>150</b>	<b>200</b>	<b>250</b>	<b>300</b>	<b>350</b>	<b>400</b>	<b>450</b>	<b>500</b>	<b>550</b>	<b>600</b>

<b>Thermal expansion</b>	10 <sup>-6</sup> • K <sup>-1</sup>			10.7	11.7	11.7	11.7	11.8	11.9	12.4	12.9
<b>Modulus of elasticity</b>	longitudinal	GPa	223	218	212	205	197				
<b>Modulus of elasticity</b>	tangential	GPa	85	84	81	79	75				
Testing at °C			<b>20</b>	<b>100</b>	<b>200</b>	<b>300</b>	<b>400</b>	<b>500</b>	<b>600</b>	<b>700</b>	<b>800</b>

Specific heat capacity J/(Kg•K)	Density Kg/dm <sup>3</sup>	Thermal conductivity W/(m•K)	Specific electric resist. Ohm•mm <sup>2</sup> /m	Electrical conductivity Siemens•m/mm <sup>2</sup>
430	7.71	15	0.80	1.25

## Cold-work tool steels

- high alloyed martensitic steel grade
- particularly suitable for moulds for the plastic industry, especially if plastics have strong abrasive and corrosive powers
- very stable dimensionally during hardening; very limited deformations, even by cooling in polymer
- excellent machinability; after this operation, it is very suitable to polishing
- suitable for the construction of those mechanical components that have to deal with very hard substances, able to remove small quantities of base material
- applications: *moulds for corrosive plastic materials, moulds for the automotive industry (head lamp components), moulds for rubber pressing*