

# MATERIAL DATA SHEET

## STEEL GRADE

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OVAKO

### 32CrMoV12-10\* All

#### General Information

Ovako 398Q is an ingot cast high tensile quench and tempering steel with high hardenability. The grade has high strength and toughness. The strong carbide and nitride formers makes it very well suited for nitriding. The grade is produced with the quality class IQ (isotropic quality). This ensures a very low number of elongated sulphide inclusions which will give more isotropic properties.

*\* Designation followed by "" is not an official EN standard grade but named according to the rules in EN 10027.*

#### IQ-Steel®

IQ-Steel® is an isotropic quality ultra clean steel optimized for high fatigue strength under multi axial loading.

#### Similar designations

AMS 6481, 1.7765

#### Chemical composition

Variant	Cast	Weldability		C %	Si %	Mn %	P %	S %	Cr %	Ni %	Mo %	V %
398Q	IC	CEV 1.48 <sub>max</sub>	Min	0.30	0.20	0.40	-	-	2.80	-	0.80	0.250
		Pcm 0.71 <sub>max</sub>	Max	0.35	0.35	0.60	0.015	0.001	3.30	0.30	1.20	0.350

### Mechanical Properties

Variant	Condition <sup>i</sup>	Format	Dimension [mm]	Yield strength min [MPa]	Tensile strength [MPa]	Elongation A <sub>5</sub> [%]	Reduction of area Z <sub>min</sub> [%]	Hardness	Impact (ISO-V) strength <sub>min</sub>
398Q	+QT	Tube, wall	0 typical	800*	940 typical	19	70	300 HB typical	20 °C 200 J (long) 20 °C 130 J (transv)

*Rp0.2 \* Reh, \*\* Rel*

### Transformation temperatures

	Temperature °C
MS	357
AC1	773
AC3	884

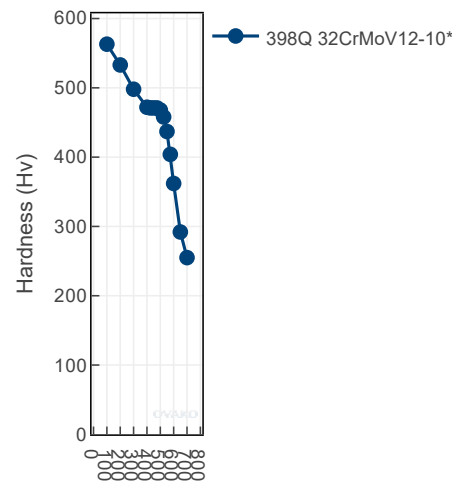
### Heat treatment recommendations

Treatment	Condition <sup>i</sup>	Temperature cycle	Cooling/quenching
Hot forging	+AR	850-1150°C	In air
Normalizing	+N	900-980°C	In air
Annealing	+A	650-730°C	In air
Hardening	+QT	900-940°C	In oil
Tempering	+QT	570-700°C See tempering response diagram	In air

### Heat Treatment Guide generated Graphs

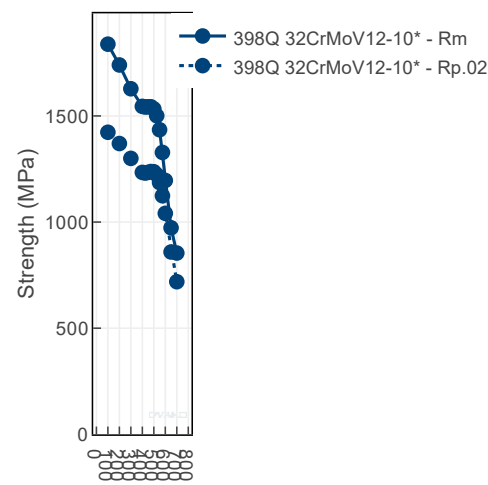
The following graphs are generated from a theoretical model. For further info see the Heat treatment guide module. Select a specific grade version for individual display.

Tempering Diagram (hardness)



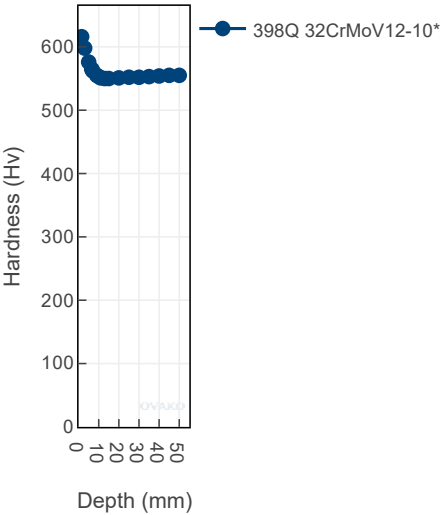
Tempering temperature (°C)

Tempering Diagram (strength)



Tempering temperature (°C)

Jominy

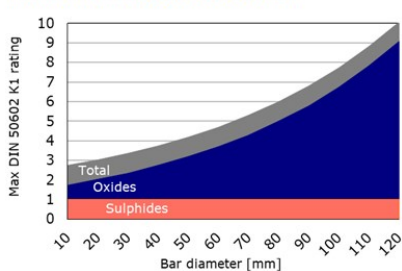


## Steel cleanliness

Micro inclusions - IQ		Macro inclusions - IQ	
Applied standard	DIN 50602 K1	Applied standard	10 M Hz UST (Ovako internal standard)
Sampling	Six random samples from final product dimension	Sampling	Statistical testing on billets
Limits	The limit is dimension dependent. The average rating of six samples should not exceed the limits given in the graph	Limits	< 10 defects/dm <sup>3</sup> > 0,2 mm FBH

## IQ

Inclusion limits IQ-processed steel



## SUSTAINABILITY-ENVIRONMENTAL IMPACT DATA

At Ovako sustainability and reduction of our environmental impact is a major focus in everything we do.

Further information is found [here](#).

Steel works	Hofors	Smedjebacken	Imatra
CO <sub>2</sub> e/kg	120	62	76

To get the full picture of our products environmental impact we have to look at all of our CO<sub>2</sub> emission sources.

Not only the steel work Scope 1-2 itself, but all operations downstream in our production, heating and heat treatment furnaces etc (full scope 1-2) as well as all the emission from input material, eg. alloys, scope 3.

Steel Grade	Format	Condition ⓘ	Scope 1-3 (CO <sub>2</sub> e kg /1000 kg steel)	Climate compensated Net emission = Scope 3 (CO <sub>2</sub> e kg /1000 kg steel) Scope 1 - 2 = 0 (compensated)
398Q	Round bar	+AR	725	326
398Q	Round bar	+QT	731	330

All above data are to be seen as typical values for the specified format and condition. Detailed information about your specific product please contact your sales contact.

## Other properties (typical values)

Youngs module (GPa)	Poisson's ratio (-)	Shear module (GPa)	Density (kg/m <sup>3</sup> )
210	0.3	80	7800
Average CTE 20-300°C (µm/m°C)	Specific heat capacity 50/100°C (J/kg°C)	Thermal conductivity Ambient temperature (W/m°C)	Electrical resistivity Ambient temperature (µΩm)
12	460 - 480	40 - 45	0.20 - 0.25

## Contact us

Would you like to know more about our offers? Don't hesitate to contact us:

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Via telephone: +46 8 622 1300

For more detailed information please visit <http://www.ovako.com/en/Contact-Ovako/>

## Disclaimer

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