



## CHRONIFER® 455 KL martensitic Hardenable Stainless Steel

Material No.	DIN Abbreviation	AFNOR	AISI/SAE/ASTM	ISO	Euro Standard EN	Others
1.4543	X3CrNiCuTiNb12-9 (former X 3 CrNiCuTi 12.9)	Z 3 CNUTNb 12.9	AISI XM-16 ASTM F899		X3CrNiCuTiNb12-9	NF S 94-090

Distinctive feature & main attribute: a precipitation hardenable chromium-nickel-steel alloy, pre-viously refined by an electroslag remelting process (ESR), of favourable corrosion properties in normal air atmosphere or fresh water and slight risk of break-age after impact (notched impact strength). A single-step aging treatment develops exceptionally high yield strength with good ductility (after heat treatment) and toughness. A fine combination of strength, toughness and corrosion resistance.

Use & application range: this alloy is required for surgical instruments, hightech machines of the chemical and pharmaceutical industries such as cellulose, food and brewery branches.

REFERENCE ANALYSIS %	C	Si	Mn	P	S	Cr	Mo	Ni	Cu	Ti	Nb/TA	Fe
	max. 0.03	max. 0.50	max. 0.50	max. 0.015	max. 0.015	11.00 12.50	max. 0.50	7.50 9.50	1.50 2.50	0.90 1.40	0.10 0.50	balance

<b>EXECUTION DELIVERY FORM STANDARD SIZES AVAILABILITY</b>	<ul style="list-style-type: none"> <li>Execution in about 3 m round bars as well as in coils</li> <li>Standard size in stock: see <a href="#">Product range</a></li> <li>Other sizes on request</li> </ul>
--	--

<b>TOLERANCES</b>	<ul style="list-style-type: none"> <li>Ø 1.04 mm, coil: cold drawn; ISO <b>h8</b></li> <li>Ø 3.17 – 12.70 mm, bar: cold drawn, ground; ISO <b>h9</b></li> <li>Tighter tolerances on request</li> </ul>
-------------------	--

<b>MECHANICAL PROPERTIES</b>	At delivery status (in solution annealed condition): <ul style="list-style-type: none"> <li>Tensile strength (<math>R_m</math>): ~ <b>850 MPa</b>, size depending</li> </ul>
------------------------------	--

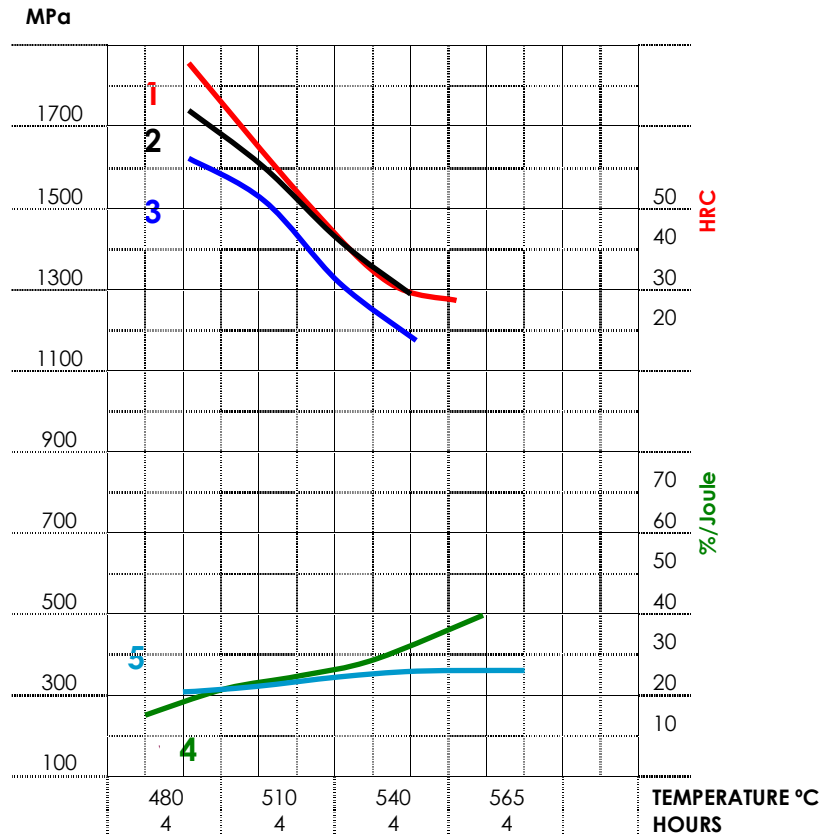
<b>HEAT TREATMENT</b>	Solution annealing (at delivery status) before the age-hardening process (see chart & spreadsheet)
-----------------------	--

<b>CUTTING RATES</b>	$v_c \sim 25 - 35 \text{ m/min}$ , value depending on the lubrication oil, cutting tools and shape of parts. <ul style="list-style-type: none"> <li>Cutting oil: e.g. INOX or ORTHO NFX of Motorex</li> </ul>
----------------------	---

Modifications will not be adjusted automatically

Last update 09/2011  
Volume no. 9  
Page 1/2

#### CHART FOR PRECIPITATION HARDENING



- 1: Hardness Rockwell HRC
- 2: Tensile strength  $R_m$  (MPa)
- 3: Yield strength  $R_{e 0.2}$  (MPa)
- 4: Ductile yield  $A \epsilon$  (%)
- 5: Impact ductility KCV (J/cm<sup>2</sup>)

The above curves indicate the results of determinate section of a curtain size. The result after heat treatment can be slightly different than shown on this curve, depending on the shape and size of the part.

#### SPREADSHEET

Standards	TTH	Rm (MPa)	Re 0,2 % (MPa)	A 4d %	Z %	HB	HRC	KCV (J/cm <sup>2</sup> )	Weldability	Corrosion
X3CrNiCuTiNb12.9	solution annealed	850				~ 255			good	***
	H900 (RV 480 °C)	1745	1670	10	45		49	9		
	H950 (RV 510 °C)	1600	1550	11.5	54		48	11		
	H1000 (RV 540 °C)	1410	1360	15	60		44	16		
	H1050 (RV 565 °C)	1300	1200	16	60		40	36		

Average value

Modifications will not be adjusted automatically