



Energietechnik Essen
GmbH · seit 1811



Cronidur[®] 30

Maximum Demand by
Corrosive Stress Wear





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The Profile - Cronidur[®] 30 features

- superior corrosion resistance
- excellent machinability
- high dimensional stability after heat treatment
- excellent grinding and polishing ability to obtain optimal surface quality
- high durability by maximum hardness under static and dynamic demands
- good wear resistance
- high temper resistance up to 500 °C



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Chemical Composition

Cronidur® 30	C	Cr	Mo	Mn	Ni	N
Min.	0.25	14.00	0.85			0.30
Max.	0.35	16.00	1.10	1.00	0.50	0.50

Typical Hardness: 54 – 61 HRc



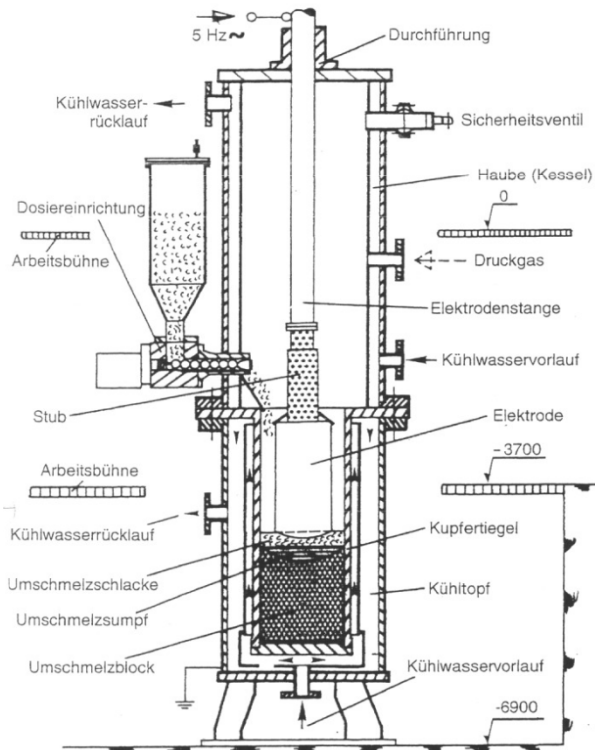
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Cronidur® 30 offers

- an extreme high cleanliness by using the PESR production process (Pressurized Electro Slag Remelting)
- optimized and homogenous structure by customized forging
- a microdisperse formation of mainly chromium-carbonitrides, typical carbide size 6-10 μm (max. 40 μm depending on material size/diameter)
- excellent machinability, grindability and polishing



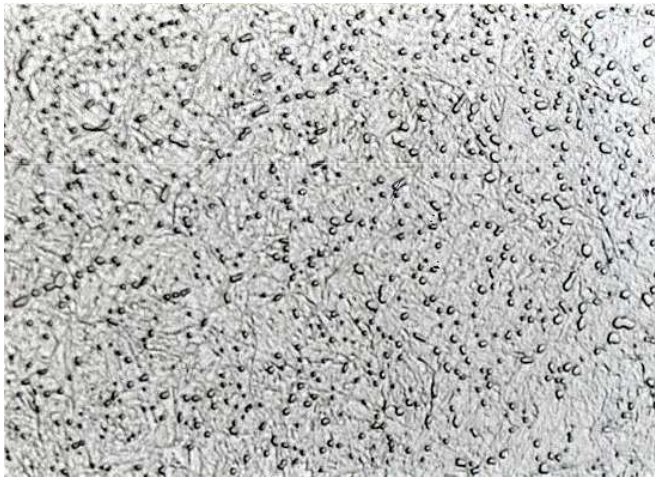
Cronidur® 30 Production Process – The DESU-Facility



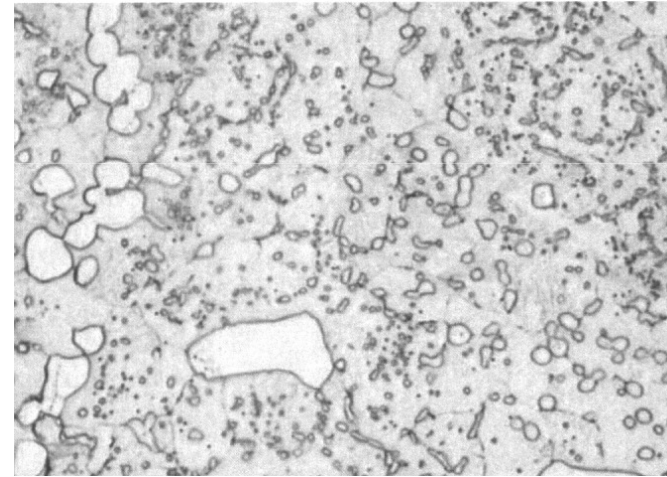


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PESR- and Conventional Structure in Comparison



Cronidur® 30 ,
Magnification 1000x

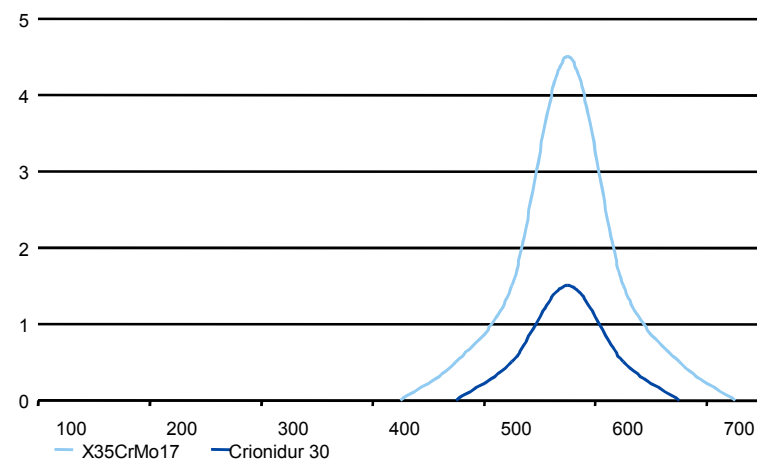
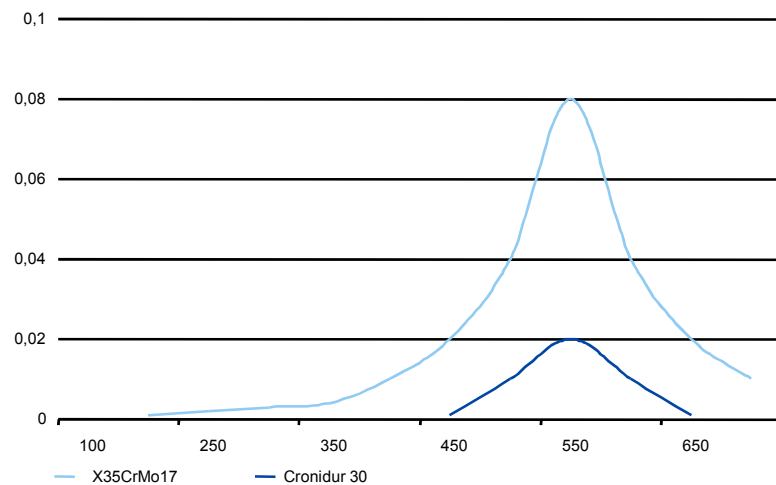


1.4112,
Magnification 1000x



Typical Applications

- exhibits higher corrosion resistance than 1.2083, 1.4112, 1.4301, 1.4571
- offers higher wear resistance to 1.4034, 1.2363 or 1.4528
- tougher and secondary hardening alternative to all corrosion resistant PM-steels

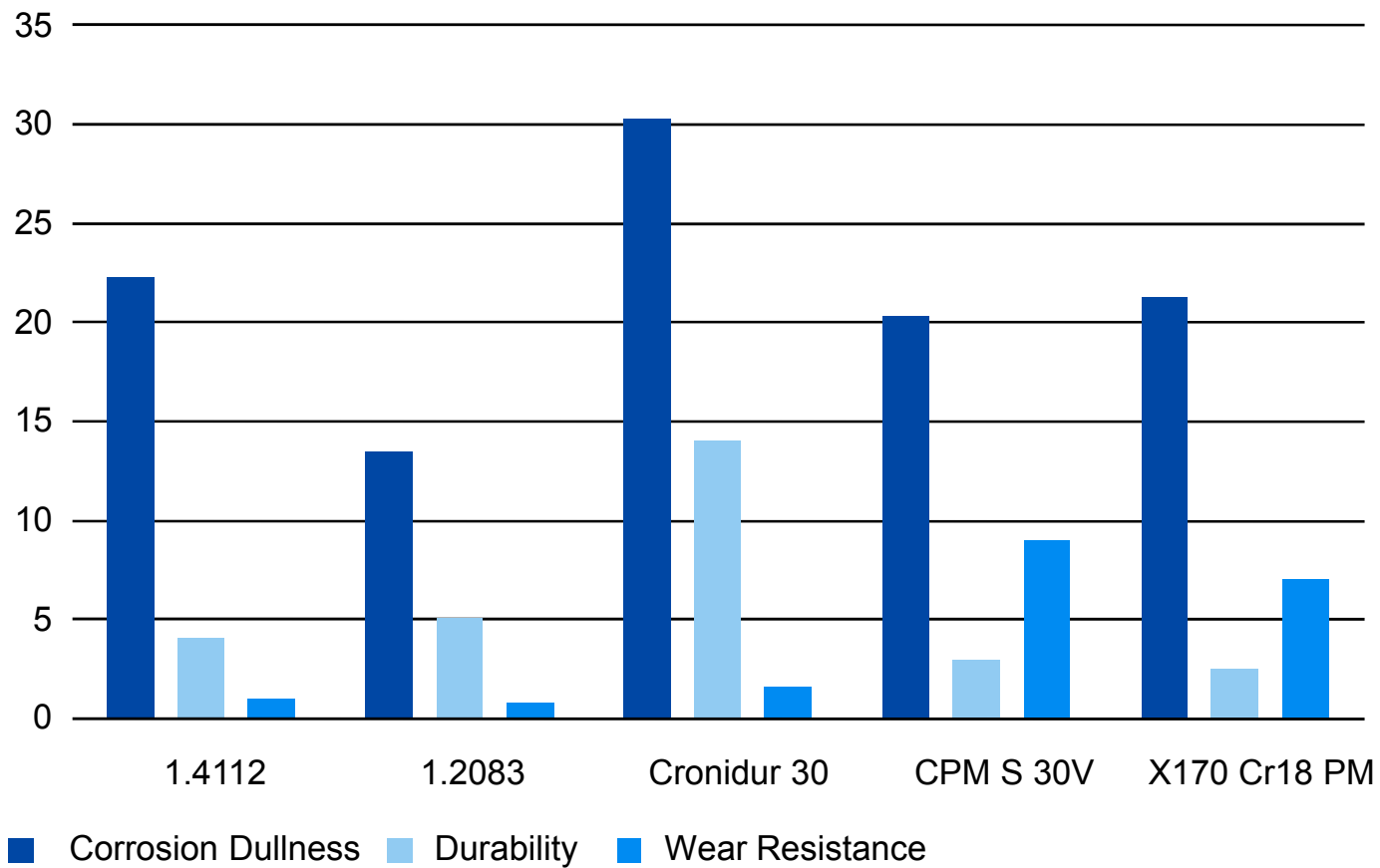


Dimension loss in 5% NaCl-dissolution and 0,2% acetic acid dissolution against tempering temperature.



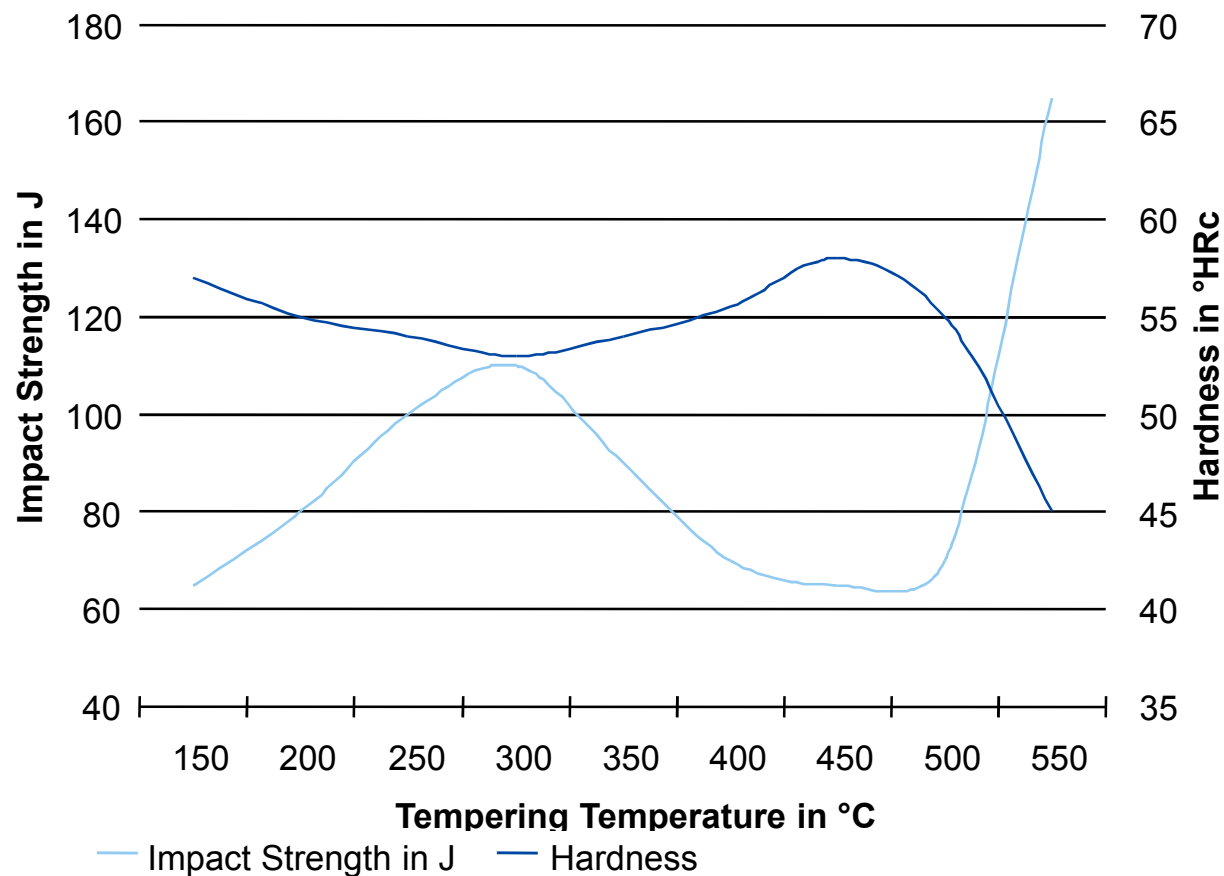
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Cronidur® 30 Tool Steel Comparagraph





Impact Strength and Hardness

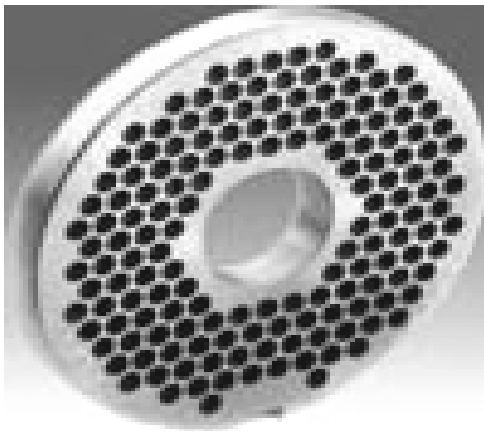




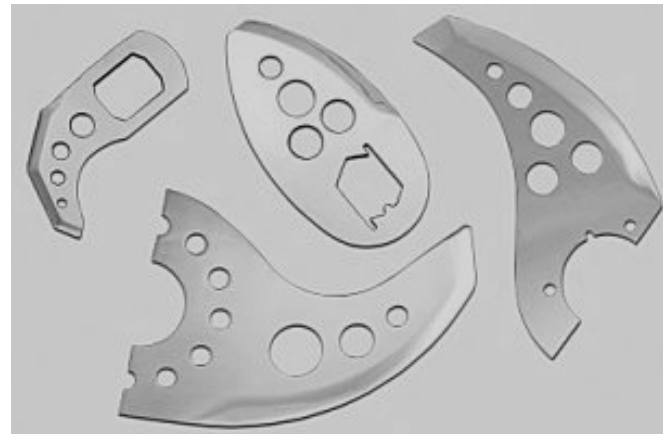
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High Corrosive Claimed Cutter, Portioner- and Filling-Units in the Food Industry

- Because of the constant structural condition and homogeneous allocation of nitride and carbonitrides you will reach a superior cutting ability and edge holdingability at high durability.



Perforation Equipment



Butcher's Knife (Cutter)



Comparison of Corrosion Test Results in different Mediums

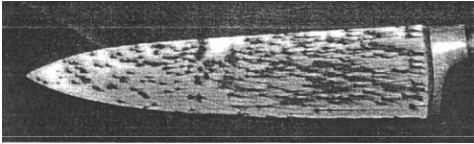
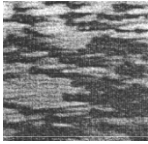
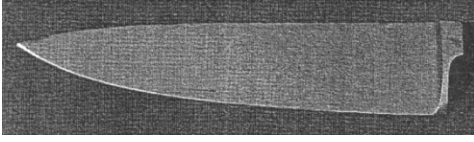
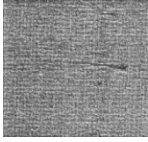
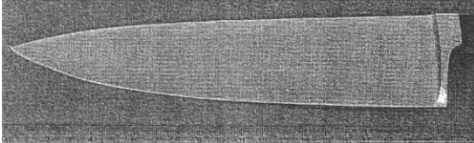
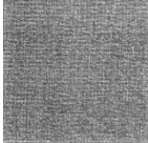
Brand Name Material-No.		100Cr6 1.3505	Cronidur 30	X46Cr13 1.4043	X90Cr MoV18 1.4112	X102Cr Mo17 1.4125	440 c
Ability to Bearing Steel		++	++	-	+	+	+
Medium 20 °C	Conz. in %						
Saltwater	4.0	--	++	0	++	-	-
Salt Acid HCl	0.1	--	++	--	-	--	--
Sulphuric Acid H ₂ SO ₄	10.0	--	--	--	--	--	--
Nitric Acid HNO ₃	5.0	--	++	++	++	--	--
Phosphoric Acid H ₃ PO ₄	10.0	--	++	-	+	+	+
Citric Acid C ₆ H ₈ O ₇	25.0	--	++	-	+	--	--
Sulphurous Acid H ₂ SO ₃	1.0	--	++	--	-	--	--

++ constant / + temperate constant / - barely applicable / -- unstable / 0 not tested



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Professional Cutlery and Table Holloware with Superior Corrosion-Resistance and Cutting-Performance

Material	Knife blade after cyclic submerge	Cut-out 1 cm x 1 cm
X46Cr13		
X50CrMoV		
Cronidur 30		

Cyclic Submerge acc. to DIN EN ISO 8442-1

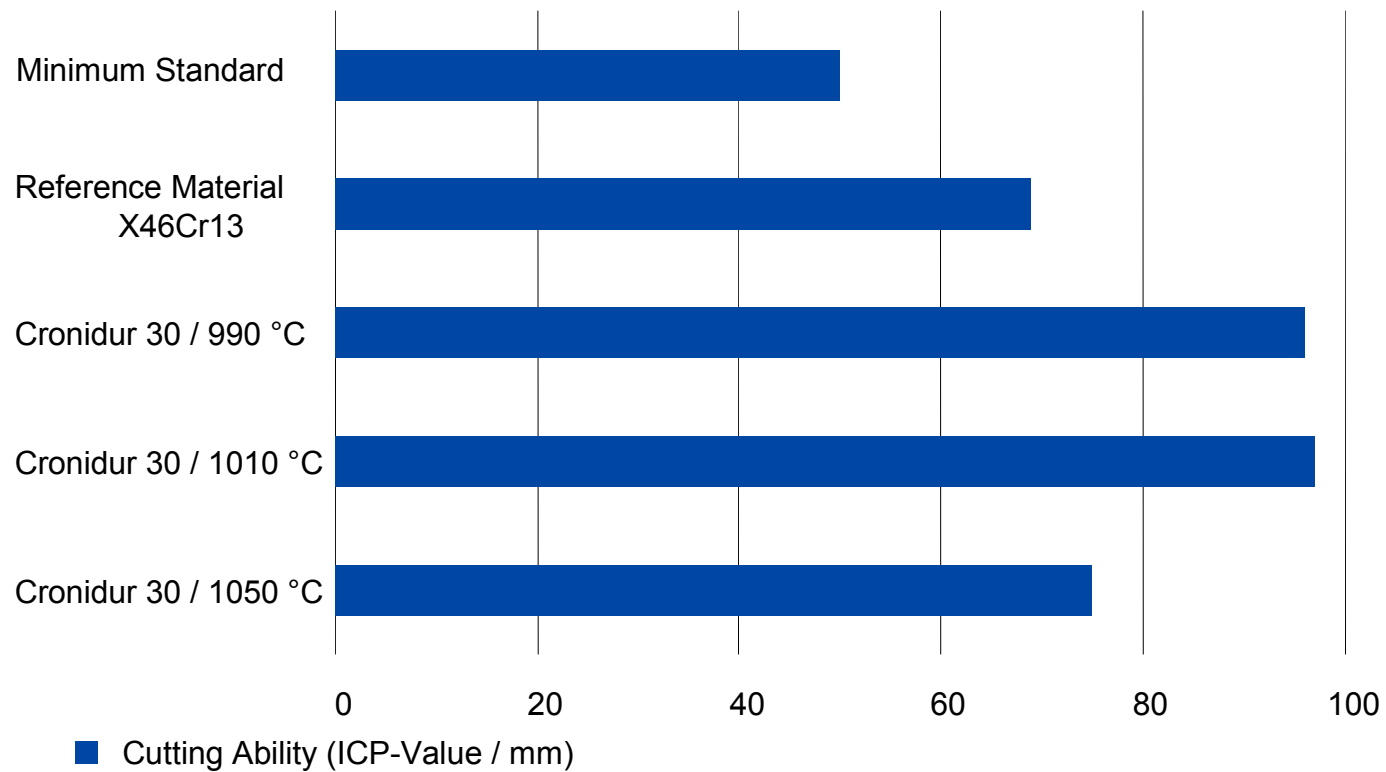


Cronidur® 30 Beats all Specifications of DIN 8442-1

Cronidur 30	Less than 5 Pittings $\varnothing < 0.1$ mm and Less than 50 Pittings $\varnothing < 0.05$ mm
	Less than 5 Pittings $\varnothing < 0.1$ mm or Less than 50 Pittings $\varnothing < 0.05$ mm
X50CrMoV15	No Pittings $\varnothing > 0.1$ mm
X46Cr13	No Pittings $\varnothing > 0.4$ mm per blade (Minimum standards of RAL RG 604)
	At most three Pittings $\varnothing < 0.4$ mm per 20 cm ² no Pittings $\varnothing > 0.75$ mm No cracks and no overlapping (Minimum standards of DIN EN ISO 8442-1)

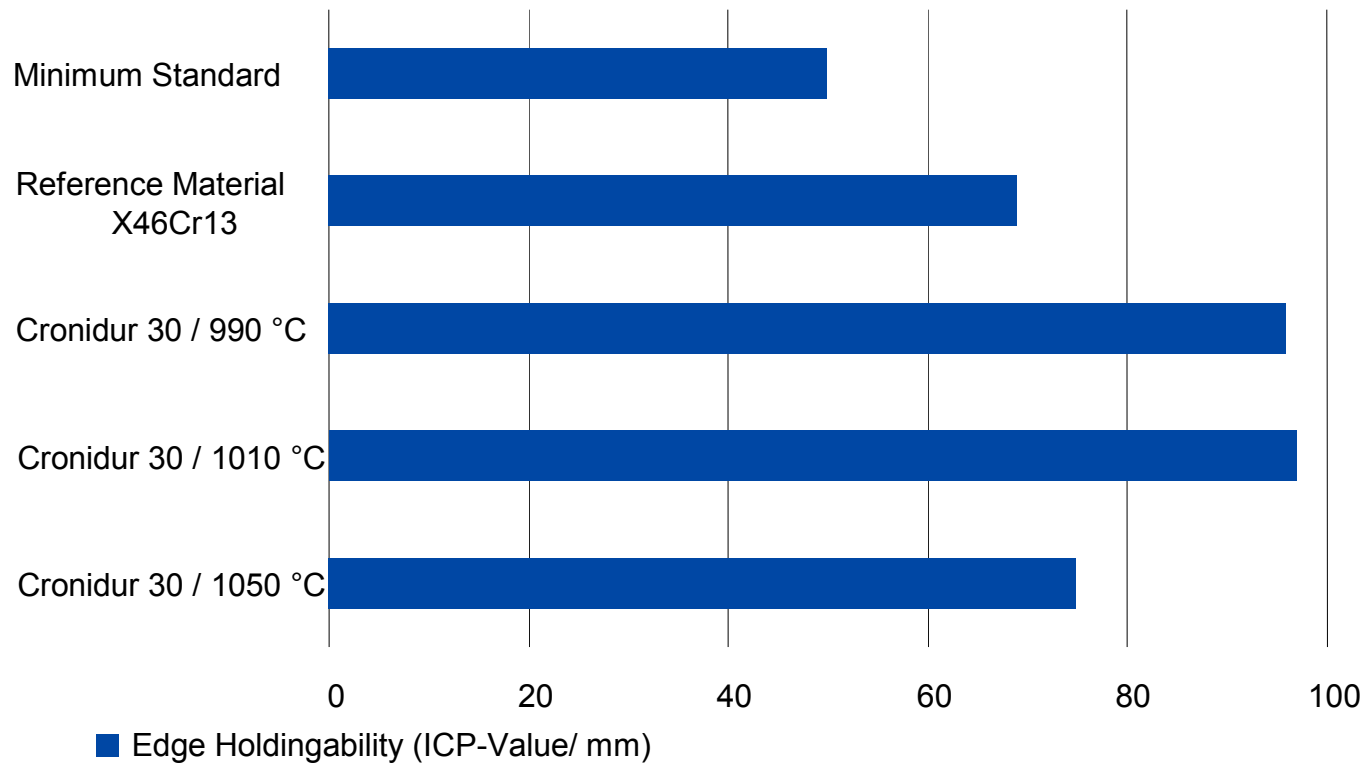


Cutting Ability of Knife Baldes (ICP-Value)





Edge Holdingability of Knife Blades (TCP-Value)





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Vanes, Spindles, Extrusion- und Portioner-Units in the Chemical- and Pharmaceutical Industry

- Outstanding tribological properties under boundary lubrication also by additional corrosion demands or artificial indentations.



Highly stressed machine components in aggressive media.



Superior Tribological Properties for critical Circumstances

Lubrication/ Test Conditions	Contact Stress P_c in MPa	Results	Cronidur 30
Full Lubrication[EHD]	3,800	100Cr 6: L10 = 16h M50: L10 = 160h	L10 > 260h
Full Lubrication [EHD]	2,800	100Cr 6: L10 = 800h M50: L10 = 600h	L10 > 3,900h
Boundary Lubrication	2,500	100Cr 6: L10 = 55h 440C:L10 = 10h	L10 > 1,050h
Boundary Lubrication and Corros. Cyclic Test (Salt Spray)	2,800	440C: L10 = 10h	L10 > 240h
Boundary Lubrication and Artificial Indentations	2,500	100Cr 6:L10 = 35h	L10: 500h
HFA Hydr. Fluid	2,500	100Cr 6: L10 = 57h 440C: L10 = 370h	L10: 570h
HFC Hydr. Fluid	2,500	440C. L10 = 370h	L10 > 4,000h



Persuasive Mechanical Properties under Static and Dynamical Pressure

	AISI 440 C	M 50	Cronidur 30
Durability [HRc]	> 58	> 60	> 58
Yield Strength [MPa]	1,900	2,200	1,850
Tensile Strength [MPa]	2,050	2,480	2,150
Elongation [%]	0.2	1.5	3
Fatigue Test under Reversed Bending Stresses (Rotating Fatigue Test) [MPa]	-	810	> 1,200
Toughness [MPa sqr m]	> 15	> 20	> 20



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Typical Applications – Chemical- and Pharmaceutical Industry

Compression Tools

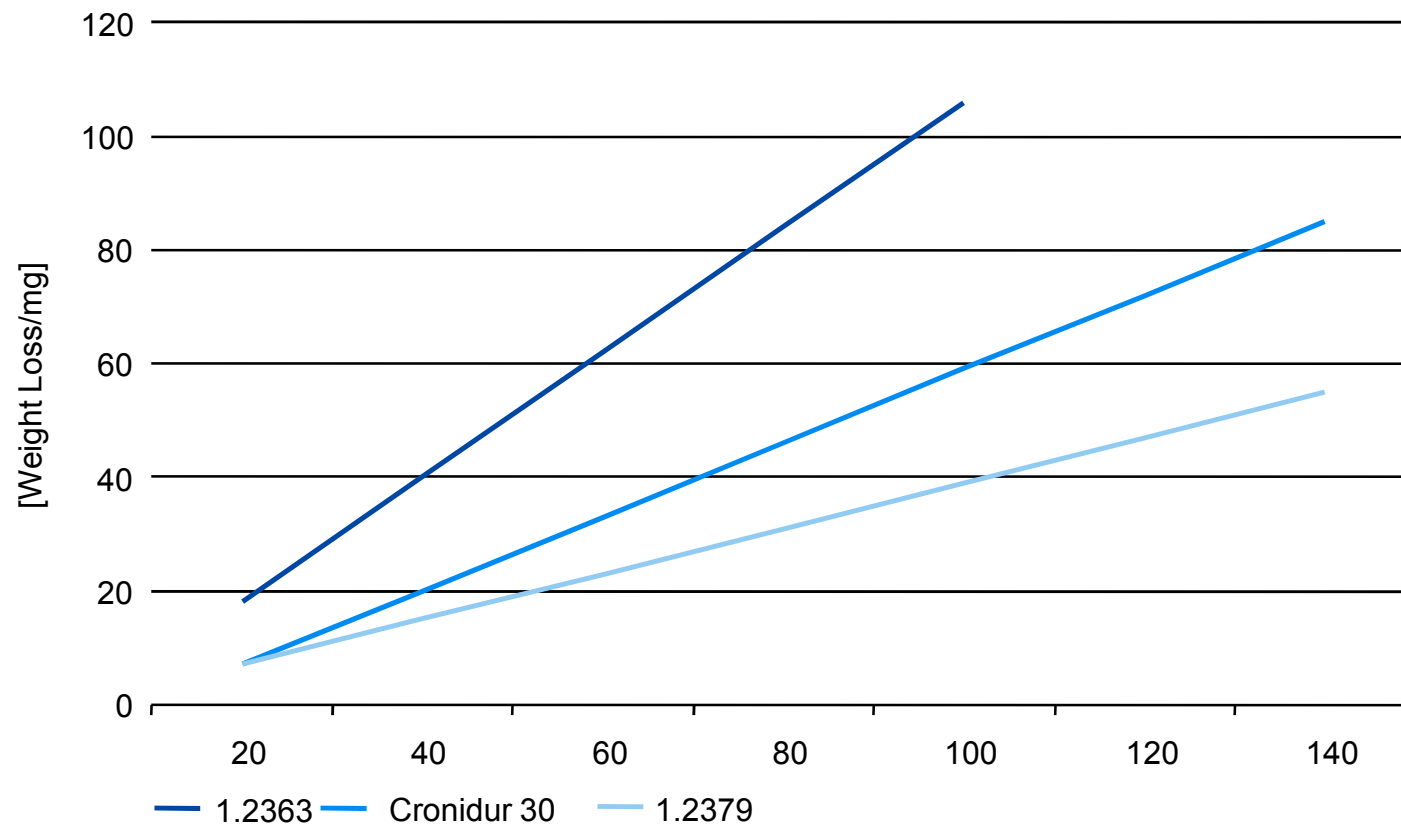
- superior toughness compared to 1.2363 also at filigree geometries
- good broaching under hardened condition
- excellent grinding- and polish properties
- high corrosion resistance especially for CIP-applications





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Abrasive Wear Resistance



Pin on Disc Test F = 50 N Pin: Dia = 6 mm

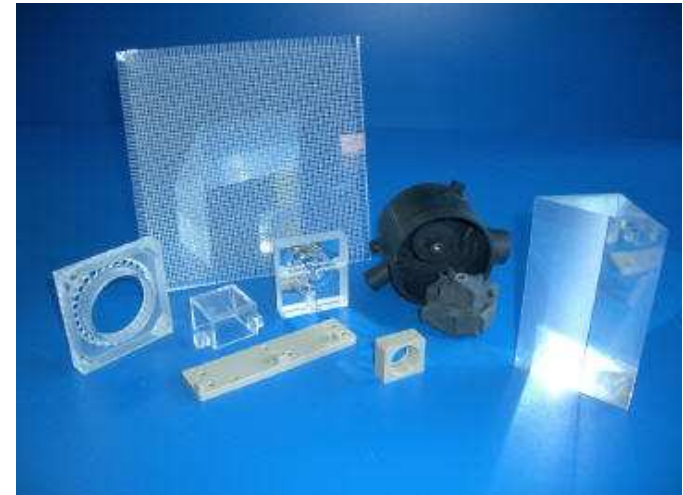


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Typical Applications – Plastics Industry

High-Glance Polished Cavities in the Plastics Industry

- outstanding machinability also in hardened condition
- high dimensional stability after heat treatment
- optimal surfaces with outstanding polish ability through homogeneous structural conditions and fine distributed hard phases
- high reliability against hydrochlorid solutions and hotgas- corrosion (for example PVC-assimilation)





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Typical Applications – Recycling Industry

Shredderknives und Granulatingrotors in the Recycling Industry

- high toughness and corrosion resistance against different mediums at moderate wear resistance





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Typical Applications – Bearing Industry

Ball Screw Bearings and Nuts for Aerospace and Industrial Applications

- high hardness and corrosion resistance under different surroundings and temperatures





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Summary

Cronidur® 30 is the ideal solution

- For tools and machine parts which need high toughness under static and dynamic stresses
- For tools and machine parts which are in contact with very corrosive fluids or gases even under bad abrasive conditions
- Compared to the commonly used tool steels 1.2316, 1.4112 and 1.4125 if higher corrosion resistance is requested
- And/or if there are higher requirements concerning grindability and polishability to achieve better surface conditions