



HYDRAULIC **CYLINDERS**

Product Specification Sheet

TOPCOAT® CCR+

300µm 2-layer Ni based superalloy / Chromium-carbide

Coating construction and composition (2-layer coating system)

Intermediate coating	HP-HVOF	TOPCOAT® 177 (Ni-superalloy)	≥ 150µm (max. 3000µm)
Topcoat	HP-HVOF	Cr ₂ C ₃ - NiCr	≥ 100µm (typically 150µm, max. 250µm)

Key coating information

Description	International standard	Minimum value	Griekspoor Standard
Tensile Adhesive Strength	ISO 14916	≥ 50 N/mm ²	≥ 80 N/mm ²
Corrosion test	NOV/DNV-C2	No corrosion visible after 500h	>1000h
	Endurance test acc. NBD10300	No permeability after 1000h (ECP-test > -350mV)	>1000h (ECP-test > -150mV)
Corrosion resistance	ISO 9227 AASS ASTM G85	No corrosion after 1000h	>1000h
Porosity		<1%	<0.7%
Chemical Resistance 1. H ₂ SO ₄ (acid) 2. HCL (acid) 3. NaOH (base)			1. Good 2. Fair 3. Excellent
Impact toughness test	NOV/DNV-M1 (0.8kpm)	No cracking outside the impact area, min. energy 0.8kpm (8J)	No cracking outside the impact area, min. energy 0.8kpm (8J)
Rockwell indentation test	NOV/DNV-M2	No or negligible break-out or cracking	No break-out or cracking
Dynamic bending test 500 x / σ 300 N/mm ²	NOV/DNV-M3	No cracks after a minimum of 500 bending cycles	No cracks after a minimum of 500 bending cycles
Micro hardness	HV0,3	950HV (NOV/DNV>600)	1150HV
Macro hardness	HR15N	>75	>90
Operating temp.	---	-40°C ≤ T ≤ 120°C	-40°C ≤ T ≤ 870°C
Wear testing	ASTM G065		Approx. 50% better than galvanic chromium
Surface finish	NEN-EN ISO4287	Ra < 0.2µm Rz < 4.0µm Rpk < 0.1µm	Ra < 0.2µm Rz < 2.5µm Rpk < 0.1µm
Seal advice		1. Excellent sealing properties. 2. Surface roughness and structure/texture can be adjusted for optimum seal life time. 3. Free choice of sealing constructions.	
Possibility of integrated Linear Positioning Measuring (LPM-system)		Yes, over full capacity Length 23 meters, Diameter approx. 1 meter, Weight 20 tons.	
Elasticity			Fair

General information

The bond/intermediate coating is a Griekspoor developed nickel based superalloy, designed to withstand the most severe environments in (chemical) corrosion.

The top coating is a chromium carbide coating in a nickel/chromium matrix as a binder for the carbides. TOPCOAT® CCR+ has excellent corrosion and oxidation resistance. This coating is almost an economic optimum combining wear resistance and corrosion resistance.

This coating is a greatly improved alternative for galvanic chromium considering corrosion resistance and wear resistance. No construction changes are necessary when switching from galvanic chromium to TOPCOAT® CCR+.

Because of the high density (porosity <0.7%) finishing can be very smooth. Average roughness (Ra) can be as low as 0.03µm. Griekspoor can "adjust" the roughness between 0.03 and 0.6µm depending on the optimum roughness required for the chosen seals (translation as well as rotation). This combination leads to maximum seal life time and optimal sealing properties: no leakage, no stick-slip, low friction etc.

This coating is designed to withstand severe chemical and maritime environments.

Typical uses and applications are hydraulic rods, engine valve spindles, liners/bushes, ball valves etc.