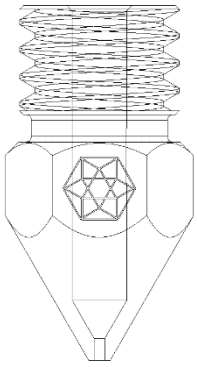
ZODIAC M200 CRB

High performance extruder nozzle for 3D printing

Features

- Extreme hardness
- Extraordinary wear resistance
- Limited abrasion and clogging
- Spherical cross section of the filament
- High operation temperature
- Perfect print results

Parameter	Value	Units
Material (body)	Hardened tool steel	
Material (coating)	ZODIAC® bi-Layer	
Winding	M6	
Wrench size	8.08 ± 0.10	mm
Internal bore	2.00 ± 0.10	mm
Nozzle diameter	0.40 ± 0.01	mm

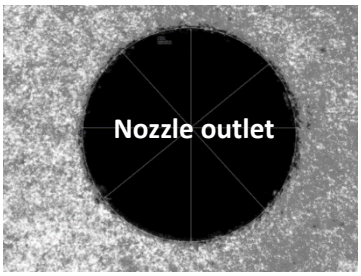


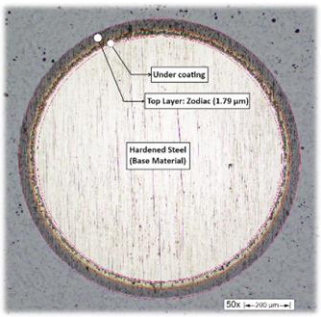
*All specifications according to the GUM Standard

Properties

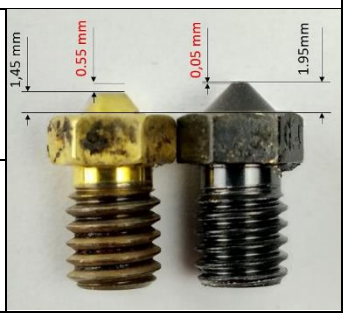
- Hardened steel body with micro polish finishing of the internal bore
- Coating tested after Calotest (DIN EN ISO 1071-2, VDI 3198)
- Under coating for high adhesive strength (PECVD)
- Top layer coating for high abrasion and wear resistance

Parameter	Value	Units
Hardened tool steel	~ 62	HRC
Coating hardness	~3500	HV
Coating thickness (FTIR)	1.79	µm
Coefficient of friction (coating)	0.08-0.1	
Surface roughness (coating)	0.02	µm
Deviation of inner circularity (coated)	± 2.5	µm
Thermal conductivity (coating)	3.5	$W \times m^{-1} K^{-1}$
Thermal resistance	>450	°C





Abrasion testing

Test parameter	Value	Units	
Printing Mass	1000 g (Carbon-fiber PLA)		Abuse testing of two nozzles was carried out according to the test parameters. The results showed decisive shortening of the competitor nozzle compared to the ZODIAC nozzle
Printing duration	1d 2h 34 min		
Filament	1.75 35%CRB		
Nozzle temperature	245	°C	
Bed temperature	80	°C	
Result (shortening of the nozzle tip due to abrasion)			
Brass nozzle without ZODIAC coating	0.55 mm		
Brass nozzle coated with ZODIAC coating	0.05 mm		

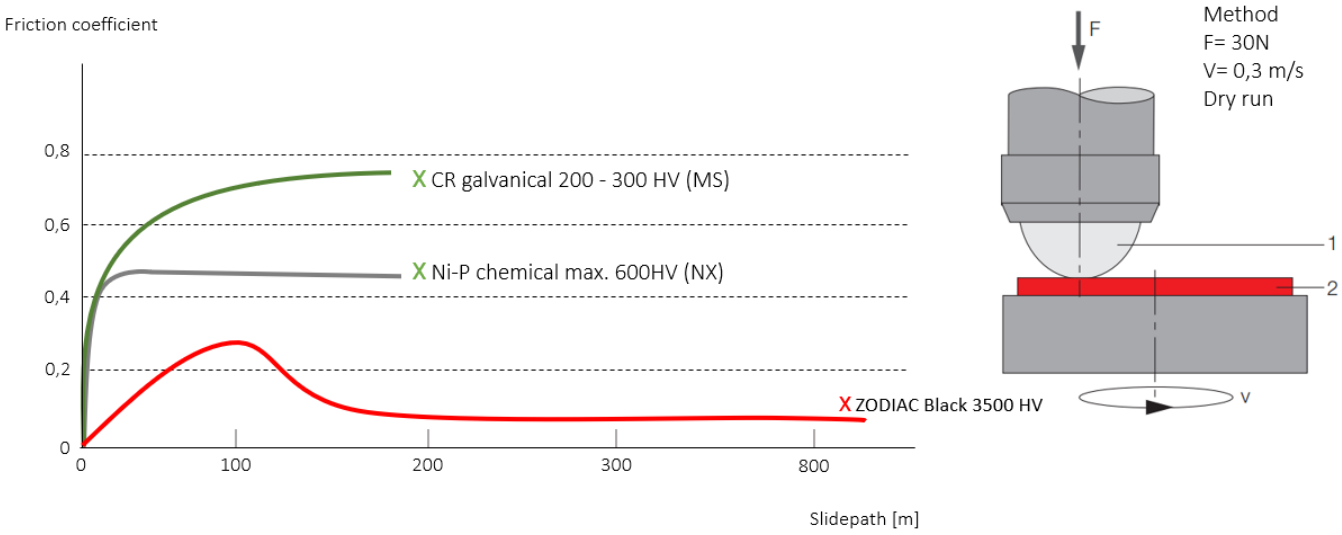
Printing Parameters

Settings	Value	Units
Retraction	0.8	mm
Lift Z	0.6	mm
Retraction speed	35	mm/s
Print speed	60	mm/s

Temperatures

	PLA	ABS	PETG	PC	PP	CPE	TPU	NYLON	VINYL
Nozzle	225°C	260°C	240°C	275°C	245°C	265°C	240°C	255°C	235°C
Bed	60°C	100°C	60°C	100°C	100°C	80°C	60°C	80°C	80°C

Sliding wear testing



In this comparison test we see the sliding wear of different nozzle suppliers. The diamond specimen (fig.1) is pressed with a contact pressure of 30N with a speed of 0.3mm/s onto the coated specimen (fig.2).

X= The Specimen gray and green show high wear already after 190m (End of the experiment)

Due to the low friction values, ZODIAC coated nozzles show no wear even after 1000m.

- Extreme hardness of the top layer coating stabilizes the bulk body and prevents shortening of the nozzle tip
- Extraordinary wear resistance lead to almost no clogging
- Hardened steel body allows printing of almost all materials while limiting abrasion 5x than comparable nozzles
- Micro polishing of the steel body lowers inner roughness of the nozzle and gives optimal layer construction
- High operation temperature of up to 450 °C/ 662 °F and higher