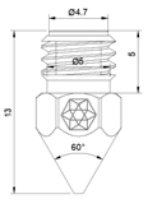
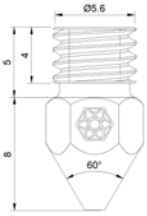
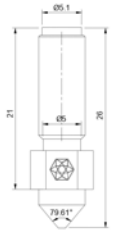
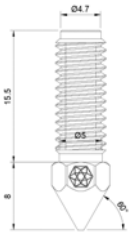
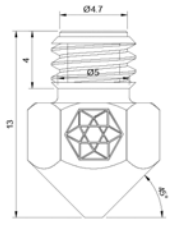
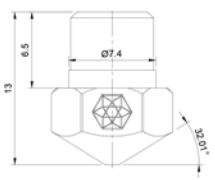
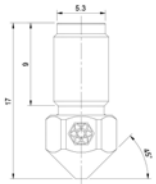
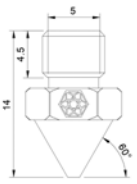
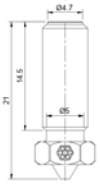
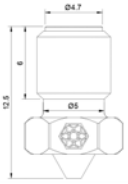
PRODUCT SPECIFICATIONS

PARAMETER	VALUE	UNITS
Material (body)	Hardened Steel Tool	
Material (coating)	ZODIAC bi-layer	
Winding	M6	
Wrench Size	8.08	mm
Internal Bore	2.00	mm
Nozzle Diameter	0.40	mm

All specification is according to GUM Standard*

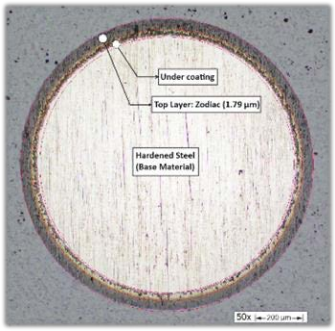
OUR NOZZLES

BP1	M200	CRB Flow	BP1 Volcano	MK8
				
				

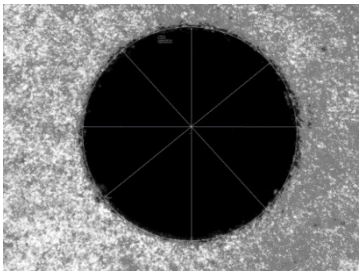
MK10	UM-BB	V3	V6 VOLCANO	V6
				
				

TECHNICAL PARAMETERS

PARAMETER	VALUE	UNITS
Hardened Tool Steel	~65	HRC
Coating Hardness	~3900	HV
Coating Thickness (FTIR)	1.79	µm
Coefficient of Friction (coating)	0.08	
Surface Roughness (coating)	0.01-0.02	µm
Deviation of Inner Circularity (coated)	± 2.5	µm
Thermal Conductivity (coating)	3.5	$W \times m^{-1}K^{-1}$
Thermal Resistance	>600	°C



NOZZLE OUTLET



PROPERTIES AND FEATURES

- Hardened tooling steel body with micro polish finishing of the internal bore
- Coating tested after Calott test (DIN EN ISO 1071-2, VDI 3198)
- Under coating for high adhesive strength (PECVD)
- Top layer coating for high abrasion and wear resistance
- Extreme hardness with extraordinary wear resistance
- Limited abrasion and clogging
- Spherical cross section of the filament
- High operation temperature

PRINTING PARAMETERS

PARAMETER	VALUE	UNITS
Retraction	0.8	mm
Lift Z	0.6	mm
Retraction Speed	35	mm/s
Printing Speed	60	mm/s
Part Cooling CF	Off	
Part Cooling GF		

THERMAL CONDUCTIVITY TEST OF TOOL STEEL

Thermal Conductivity (W/mK)	25.3	26.3	27.2
Temperature (°C)	20	200	350

ABRASION TESTING

PARAMETER	**VALUE**	**UNITS**	
Printing Mass	1000 g (PA-GF)		Abuse testing of two nozzle types was carried out according to the test parameters. The results showed decisive shortening of the competitor nozzle compared to the **Zodiac nozzle**.
Printing Duration	22 hours 19 mins		
Filament	1.75 15% GF		
Nozzle Temperature	270	°C	
Bed Temperature	60	°C	
Result (shortening if the nozzle tip due to abrasion)			
ZODIAC (PRO) Nozzle	0.006	mm	
Brass Nozzle	0.309	mm	

TEMPERATURE

	PA-GF	**PA-CF**	**PETG**	**CPE-CF**	**PP 2320**	**VINYL 303**	**TPU**	**NYLON FX256**
NOZZLE	270°C	270°C	237°C	270°C	240°C	227°C	240°C	255°C
BED	60°C	60°C	60°C	80°C	100°C	80°C	60°C	95°C

SLIDING WEAR TESTING

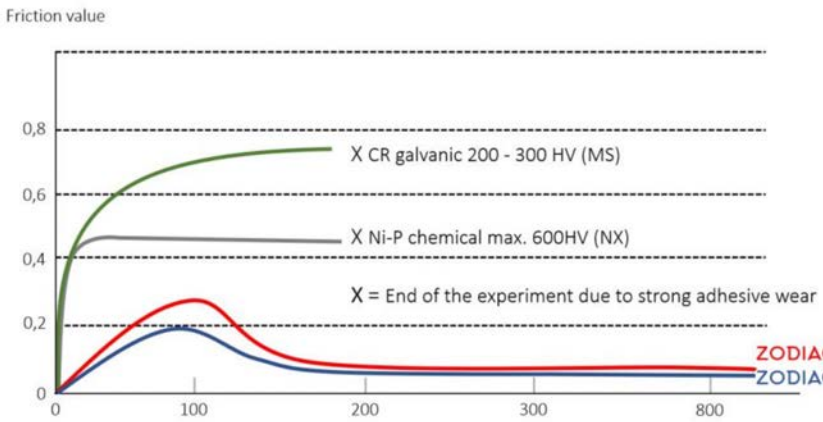


FIGURE 1

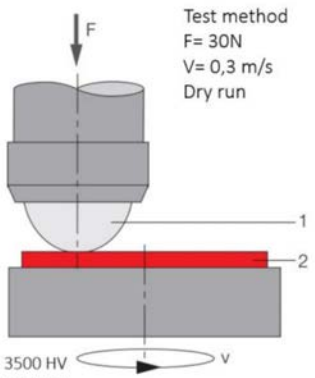


FIGURE 2

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

X= The specimen ***GRAY*** (Chrome coated) and ***GREEN*** (Nickel coated) show high wear already after 190m (end of the experiment)

Due to the low friction values, ZODIAC CRB coated nozzles show no wear even after 1000m and ZODAIC PRO shows improved friction values.

- 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
- Micro polishing of the steel body lowers inner roughness of the nozzle and gives optimal layer construction
- High operation temperature of up to 350°C/ 662°F and higher