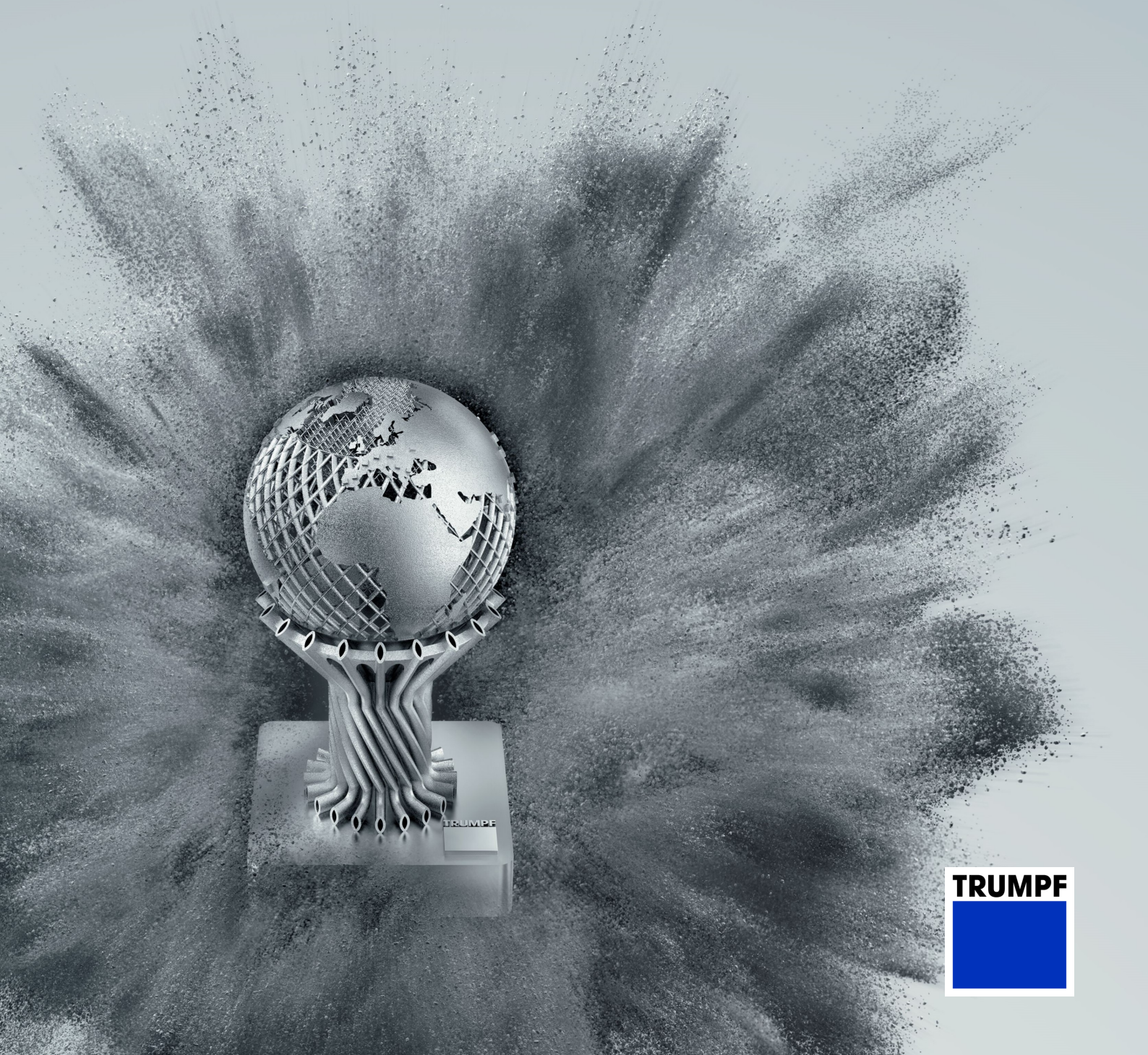
TruPrint 1000
Cobalt-Chrome



TRUMPF

Contents

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TRUMPF Laser- und Systemtechnik SE
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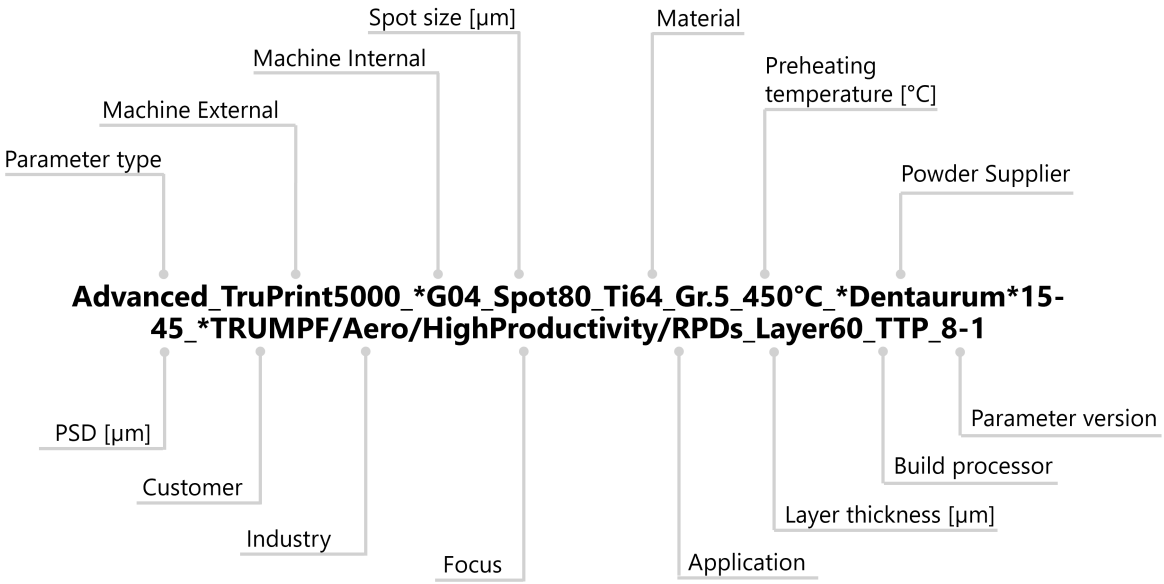
1. Introduction to parameters at TRUMPF AM

This document details the parameter set for processing Cobalt-Chrome using the TruPrint 1000. The set encompasses all materials within this material group, various layer thicknesses, and types of data preparation software. TRUMPF recommends using TruTops Print for data preparation. Each set may include basic and advanced parameters. Basic parameters are intended as a starting point for development. They are suitable for test geometries, but are generally not recommended for direct part production. Advanced parameters are refined settings suitable for actual component production.

Additionally, the document provides detailed information about the powders used to develop these parameters. Other powders, similar to those mentioned, are also suitable for production on our systems.

We are happy to assist you further in parameter development and optimization to meet your part requirements. Please reach out to us for support.

How do parameter names work at TRUMPF Additive Manufacturing?



***optional possibilities to differ the parameter portfolio**

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2. Available Parameters

Material	Machine	Parameter type[1]	Spot [µm]	Preheating temperature[2] [°C]	Layer thickness [mm]	Build processor[3]	Build rate[4] [cm³/h]
CoCrMo	G01	Advanced	55	23	0.02	TTP | Mat	12.7
CoCrMo	G06	Advanced	80	23	0.03	TTP | OQT	19.7
CoCrMo	G06	Advanced	80	23	0.03	TTP | OQT	24.3
CoCrMo	G01	Basic	67	23	0.02	TTP | OQT	10.4
CoCrW	G01	Advanced	55	23	0.02	TTP | OQT	10.4
CoCrW	G06	Advanced	80	23	0.03	TTP	24.3
CoCrW	G06	Advanced	80	23	0.06	TTP	45.4
CoCrW	G06	Advanced	80	23	0.06	TTP | OQT	45.4
CoCrW	G06	Advanced	80	23	0.03	TTP | OQT	21.2
CoCrW	G06	Advanced	80	23	0.03	TTP | OQT	21.2
CoCrW	G01	Basic	55	23	0.03	OQT	15.6
CoCrW	G01	Basic	55	23	0.02	TTP | OQT	10.4
CoCrW	G06	Basic	80	23	0.03	TTP	22.7
CoCrW	G06	Basic	80	23	0.03	TTP	24.3
CoCrWMo	G01	Advanced	55	23	0.02	TTP | Mat	10.4
CoCrWMo	G01	Advanced	55	23	0.04	TTP | Mat	11.5
CoCrWMo	G06	Advanced	80	23	0.03	TTP	24.3
CoCrWMo	G01	Basic	55	23	0.02	OQT	10.4
CoCrWMo	G01	Basic	55	23	0.04	OQT	11.5

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3. Powder Information

Please contact additive.manufacturing@de.trumpf.com for direct contact to powder manufacturers.

Material	Supplier	Powder name	PSD [µm]	Supplier ID
CoCrMo	Argen	SLM NP Partial	15-45	128512.0
CoCrMo	BCS	Nicrallium N7	15-45	130791545.0
CoCrMo	BEGO	Mediloy® RPD	10-45	50532.0
CoCrMo	Carpenter	CT PowderRange CCM F	15-45	CT PowderRange CCM F
CoCrW	ADOR	Adorbond BC	10-30	7630.0
CoCrW	Dentaurum	Remanium® star powder	10-30	REF 102-620-70
CoCrW	Eisenbacher	Kera-S Powder	10-45	1004000-PK
CoCrWMo	BEGO	Mediloy® S-Co	10-45	50551.0

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4. Parameter details

4.1. Advanced_TruPrint1000_Spot55_CoCrMo_Carpenter_Tech_Layer20

Powder information		Material properties	
Material	CoCrMo	**Build rate[4] [cm³/h]**	12.7
Supplier	Carpenter	**Relative density[5] [%]**	99.9
Powder name	CT PowderRange CCM F	**Average roughness[6] R_a [µm]**	11.0
Supplier ID	CT PowderRange CCM F	**Average roughness[6] R_z [µm]**	55.0

No Heat Treatment

All properties are reported using 3σ-intervals[8]. The values for 0° and 90° are derived from qualification reports, while the average values are calculated from additional measurements.

Mechanical properties[9] machined					
	0°	**90°**	**Average[12]**		
Yield strength [MPa]	685.0 – 799.0	541.0 – 595.0	—	**Samples**	—
Tensile strength [MPa]	1071.0 – 1203.0	754.0 – 1102.0	—	**Build jobs**	—
Elong. at break [%]	7.0 – 9.0	8.0 – 16.0	—	**Machines**	—

Hardness[13]	
Vickers [HV]	387.0 – 417.0

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4.2. Advanced_TruPrint1000_G06_Spot80_CoCrMo_Argen_RPDs_Layer30

Powder information		Material properties	
Material	CoCrMo	**Build rate[4] [cm³/h]**	19.7
Supplier	Argen	**Relative density[5] [%]**	99.9
Powder name	SLM NP Partial	**Average roughness[6] R_a [µm]**	6.5
Supplier ID	128512.0	**Average roughness[6] R_z [µm]**	36.6

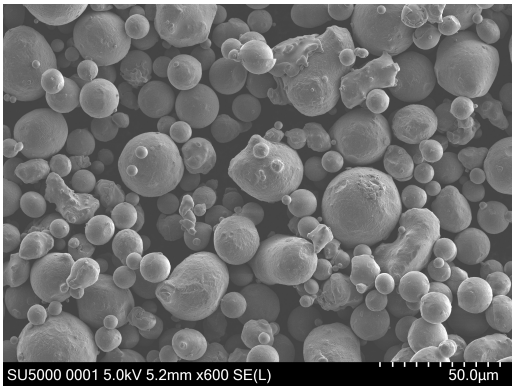

Figure 1: CoCrMo powder by Argen. PSD: 15-45 µm. SEM magnification: 600x.

No Heat Treatment

All properties are reported using 3σ-intervals[8]. The values for 0° and 90° are derived from qualification reports, while the average values are calculated from additional measurements.

Mechanical properties[10] machined					
	0°	**90°**	**Average[12]**		
Yield strength [MPa]	—	252.0 – 492.0	—	**Samples**	—
Tensile strength [MPa]	—	1180.0 – 1252.0	—	**Build jobs**	—
Elong. at break [%]	—	15.0 – 21.0	—	**Machines**	—

Hardness[13]	
Vickers [HV]	437.0 – 497.0

Roughness after blasting			
Type	**Corrund**	**Glas**	**Steel**
R_a [6] [µm]	2.93	3.24	—
R_z [6] [µm]	17.81	18.45	—

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CoCrW: AM_L

All properties are reported using 3σ-intervals[8]. The values for 0° and 90° are derived from qualification reports, while the average values are calculated from additional measurements.

Mechanical properties[10] machined					
	0°	90°	Average[12]		
Yield strength [MPa]	—	487.0 – 547.0	—	**Samples**	—
Tensile strength [MPa]	—	1002.0 – 1086.0	—	**Build jobs**	—
Elong. at break [%]	—	16.0 – 28.0	—	**Machines**	—

Hardness[13]	
Vickers [HV]	393.0 – 489.0

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4.3. Advanced_TruPrint1000_G06_Spot80_CoCrMo_Bego_RPDs_Layer30

Powder information		Material properties	
Material	CoCrMo	**Build rate[4] [cm³/h]**	24.3
Supplier	BEGO	**Relative density[5] [%]**	99.9
Powder name	Mediloy® RPD	**Average roughness[6] R_a [µm]**	5.5
Supplier ID	50532.0	**Average roughness[6] R_z [µm]**	—

No Heat Treatment

All properties are reported using 3σ-intervals[8]. The values for 0° and 90° are derived from qualification reports, while the average values are calculated from additional measurements.

Mechanical properties[10] machined					
	0°	**90°**	**Average[12]**		
Yield strength [MPa]	—	695.2 – 746.8	219.7 – 990.1	**Samples**	15
Tensile strength [MPa]	—	1187.3 – 1312.7	906.4 – 1416.4	**Build jobs**	1
Elong. at break [%]	—	12.5 – 16.1	-2.8 – 32.6	**Machines**	1

Roughness after blasting			
Type	**Corrund**	**Glas**	**Steel**
R_a [6] [µm]	2.2	—	—
R_z [6] [µm]	—	—	—

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CoCrMo: Bego_Mediloy_RPD_S

Process description[7]: 800°C/0,75h,Air

All properties are reported using 3σ-intervals[8]. The values for 0° and 90° are derived from qualification reports, while the average values are calculated from additional measurements.

Mechanical properties[10] machined					
	0°	**90°**	**Average[12]**		
Yield strength [MPa]	—	695.2 – 746.8	476.3 – 914.3	**Samples**	15
Tensile strength [MPa]	—	1187.3 – 1312.7	826.3 – 1589.5	**Build jobs**	1
Elong. at break [%]	—	12.5 – 16.1	9.7 – 40.3	**Machines**	1

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4.4. Basic_TruPrint1000_Spot55_CoCrMo_BCS_C&B_Layer20

Note for further use of the parameter [15]

Powder information		Material properties	
Material	CoCrMo	**Build rate[4] [cm³/h]**	10.4
Supplier	BCS	**Relative density[5] [%]**	99.7
Powder name	Nicrallium N7	**Average roughness[6] R_a [µm]**	7.8
Supplier ID	130791545.0	**Average roughness[6] R_z [µm]**	44.0

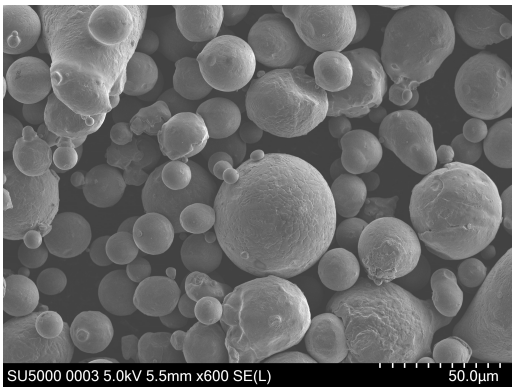

Figure 2: CoCrMo powder by BCS. PSD: 15-45 µm. SEM magnification: 600x.

No Heat Treatment

All properties are reported using 3σ-intervals[8]. The values for 0° and 90° are derived from qualification reports, while the average values are calculated from additional measurements.

Mechanical properties[9] machined					
	0°	**90°**	**Average[12]**		
Yield strength [MPa]	692.0 – 782.0	547.0 – 595.0	380.2 – 866.2	**Samples**	35
Tensile strength [MPa]	1001.0 – 1181.0	748.0 – 1132.0	772.6 – 1220.8	**Build jobs**	1
Elong. at break [%]	3.5 – 6.5	6.0 – 18.0	-3.2 – 23.2	**Machines**	1

Roughness after blasting			
Type	**Corrund**	**Glas**	**Steel**
R_a [6] [µm]	2.9	3.5	—
R_z [6] [µm]	19.0	20.0	—

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CoCrMo: BCS_Nicrallium_RPD_S_Air

Process description[7]: 800°C/0,25, Air

All properties are reported using 3σ-intervals[8]. The values for 0° and 90° are derived from qualification reports, while the average values are calculated from additional measurements.

Mechanical properties[9] machined					
	0°	90°	Average[12]		
Yield strength [MPa]	840.0 – 990.0	805.0 – 877.0	—	**Samples**	—
Tensile strength [MPa]	1320.0 – 1398.0	1056.0 – 1176.0	—	**Build jobs**	—
Elong. at break [%]	2.5 – 11.5	7.0 – 13.0	—	**Machines**	—

Hardness[13]	
Vickers [HV]	418.0 – 448.0

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4.5. Advanced_TruPrint1000_Spot55_CoCrW_Eisenbacher_C&B_RPDs_Layer20

Note for further use of the parameter [15]

Powder information		Material properties	
Material	CoCrW	**Build rate[4] [cm³/h]**	10.4
Supplier	Eisenbacher	**Relative density[5] [%]**	99.9
Powder name	KERA® S-Powder	**Average roughness[6] R_a [µm]**	7.8
Supplier ID	1004000-PK	**Average roughness[6] R_z [µm]**	42.6

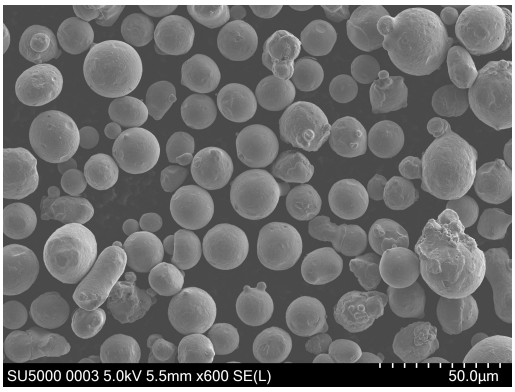

Figure 3: CoCrW powder by Eisenbacher. PSD: 10-45 µm. SEM magnification: 600x.

No Heat Treatment

All properties are reported using 3σ-intervals[8]. The values for 0° and 90° are derived from qualification reports, while the average values are calculated from additional measurements.

Mechanical properties[9] machined				
	0°	**90°**	**Average[12]**	
Yield strength [MPa]	674.0 – 698.0	515.0 – 593.0	—	**Samples** —
Tensile strength [MPa]	1118.0 – 1184.0	830.0 – 1184.0	—	**Build jobs** —
Elong. at break [%]	12.8 – 15.2	6.0 – 36.0	—	**Machines** —

Hardness[13]	
Vickers [HV]	368.0 – 440.0

Physical properties	
Electrical conductivity [%IACS]	0.6 – 1.8
Thermal conductivity[14] [W/mK]	5.0

Roughness after blasting			
Type	**Corrund**	**Glas**	**Steel**
R_a [6] [µm]	2.93	3.7	—
R_z [6] [µm]	17.81	20.33	—

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CoCrW: Eisenbacher_Kera-S_S_850

Process description[7]: 850°C/0,5h,Ar

All properties are reported using 3σ-intervals[8]. The values for 0° and 90° are derived from qualification reports, while the average values are calculated from additional measurements.

Mechanical properties[9] As Built					
	0°	**90°**	**Average[12]**		
Yield strength [MPa]	—	532.0 – 569.3	532.0 – 569.3	**Samples**	30
Tensile strength [MPa]	—	938.5 – 1057.9	938.5 – 1057.9	**Build jobs**	1
Elong. at break [%]	—	22.7 – 44.8	22.7 – 44.8	**Machines**	1

Mechanical properties[9] machined					
	0°	**90°**	**Average[12]**		
Yield strength [MPa]	—	738.0 – 834.0	505.1 – 631.7	**Samples**	64
Tensile strength [MPa]	—	956.0 – 1058.0	893.3 – 1091.9	**Build jobs**	1
Elong. at break [%]	—	11.0 – 17.0	6.1 – 48.1	**Machines**	1

Hardness[13]	
Vickers [HV]	265.0 – 367.0

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4.6. Advanced_TruPrint1000_G06_Spot80_CoCrW_Ador_RPDs_Layer30

Powder information		Material properties	
Material	CoCrW	**Build rate[4] [cm³/h]**	24.3
Supplier	ADOR	**Relative density[5] [%]**	99.9
Powder name	Adorbond BC	**Average roughness[6] R_a [µm]**	3.6
Supplier ID	7630.0	**Average roughness[6] R_z [µm]**	24.6

No Heat Treatment

All properties are reported using 3σ-intervals[8]. The values for 0° and 90° are derived from qualification reports, while the average values are calculated from additional measurements.

Mechanical properties[10] machined					
	0°	**90°**	**Average[12]**		
Yield strength [MPa]	—	459.0 – 639.0	459.2 – 638.6	**Samples**	15
Tensile strength [MPa]	—	965.0 – 1043.0	964.6 – 1043.2	**Build jobs**	1
Elong. at break [%]	—	14.3 – 29.9	14.3 – 29.9	**Machines**	1

Physical properties	
Electrical conductivity [%IACS]	0.6 – 1.8
Thermal conductivity[14] [W/mK]	5.0

Roughness after blasting			
Type	**Corrund**	**Glas**	**Steel**
R_a [6] [µm]	—	1.95	—
R_z [6] [µm]	—	11.1	—

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CoCrW: Adorbond_BC_L

Process description[7]: 1100°C/1h,Ar

All properties are reported using 3σ-intervals[8]. The values for 0° and 90° are derived from qualification reports, while the average values are calculated from additional measurements.

Mechanical properties[10] machined					
	0°	**90°**	**Average[12]**		
Yield strength [MPa]	—	478.0 – 646.0	526.1 – 626.9	**Samples**	14
Tensile strength [MPa]	—	949.0 – 1045.0	942.0 – 1036.2	**Build jobs**	1
Elong. at break [%]	—	12.8 – 35.6	15.3 – 37.5	**Machines**	1

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4.7. Advanced_TruPrint1000_G06_Spot80_CoCrW_Ador_RPDs_Layer60

Powder information		Material properties	
Material	CoCrW	**Build rate[4] [cm³/h]**	45.4
Supplier	ADOR	**Relative density[5] [%]**	99.9
Powder name	Adorbond BC	**Average roughness[6] R_a [µm]**	5.6
Supplier ID	7630.0	**Average roughness[6] R_z [µm]**	39.0

No Heat Treatment

All properties are reported using 3σ-intervals[8]. The values for 0° and 90° are derived from qualification reports, while the average values are calculated from additional measurements.

Mechanical properties[10] machined					
	0°	**90°**	**Average[12]**		
Yield strength [MPa]	—	450.0 – 558.0	450.1 – 558.1	**Samples**	15
Tensile strength [MPa]	—	985.0 – 1063.0	986.4 – 1061.4	**Build jobs**	1
Elong. at break [%]	—	13.8 – 22.2	13.8 – 22.2	**Machines**	1

Physical properties	
Electrical conductivity [%IACS]	0.6 – 1.8
Thermal conductivity[14] [W/mK]	5.0

Roughness after blasting			
Type	**Corrund**	**Glas**	**Steel**
R_a [6] [µm]	—	4.4	—
R_z [6] [µm]	—	25.0	—

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CoCrW: Adorbond_BC_L

Process description[7]: 1100°C/1h,Ar

All properties are reported using 3σ-intervals[8]. The values for 0° and 90° are derived from qualification reports, while the average values are calculated from additional measurements.

Mechanical properties[10] machined					
	0°	**90°**	**Average[12]**		
Yield strength [MPa]	—	534.0 – 600.0	—	**Samples**	—
Tensile strength [MPa]	—	986.0 – 1052.0	—	**Build jobs**	—
Elong. at break [%]	—	19.6 – 33.4	—	**Machines**	—

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4.8. Advanced_TruPrint1000_G06_Spot80_CoCrW_Dentaurum_RPDs_Layer60

Powder information		Material properties	
Material	CoCrW	**Build rate[4] [cm³/h]**	45.4
Supplier	Dentaurum	**Relative density[5] [%]**	99.9
Powder name	Remanium® star powder	**Average roughness[6] R_a [µm]**	9.1
Supplier ID	REF 102-620-70	**Average roughness[6] R_z [µm]**	38.4

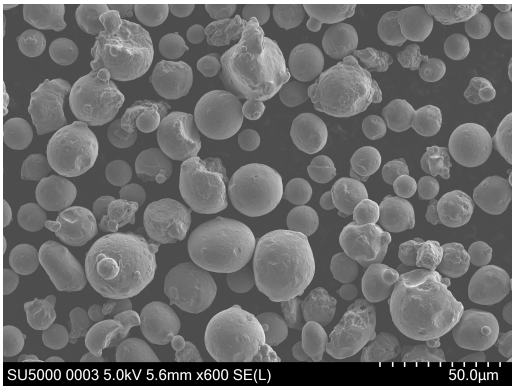

Figure 4: CoCrW powder by Dentaurum. PSD: 10-30 µm. SEM magnification: 600x.

No Heat Treatment

All properties are reported using 3σ-intervals[8]. The values for 0° and 90° are derived from qualification reports, while the average values are calculated from additional measurements.

Mechanical properties[10] machined					
	0°	**90°**	**Average[12]**		
Yield strength [MPa]	—	512.0 – 644.0	—	**Samples**	—
Tensile strength [MPa]	—	997.0 – 1063.0	—	**Build jobs**	—
Elong. at break [%]	—	9.0 – 15.0	—	**Machines**	—

Physical properties	
Electrical conductivity [%IACS]	0.6 – 1.8
Thermal conductivity[14] [W/mK]	5.0

Roughness after blasting			
Type	**Corrund**	**Glas**	**Steel**
R_a [6] [µm]	2.9	3.6	—
R_z [6] [µm]	18.8	20.52	—

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CoCrW: Dentaurum_Remanium_Star_L

Process description[7]: 1100°C/0,75h,Ar

All properties are reported using 3σ-intervals[8]. The values for 0° and 90° are derived from qualification reports, while the average values are calculated from additional measurements.

Mechanical properties[10] machined					
	0°	90°	Average[12]		
Yield strength [MPa]	—	678.0 – 750.0	—	**Samples**	—
Tensile strength [MPa]	—	1063.0 – 1111.0	—	**Build jobs**	—
Elong. at break [%]	—	9.0 – 15.0	—	**Machines**	—

Hardness[13]	
Vickers [HV]	386.0 – 410.0

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4.9. Advanced_TruPrint1000_G06_Spot80_CoCrW_Eisenbacher_C&B_Layer30

Note for further use of the parameter [15]

Powder information		Material properties	
Material	CoCrW	**Build rate[4] [cm³/h]**	21.2
Supplier	Eisenbacher	**Relative density[5] [%]**	99.9
Powder name	KERA® S-Powder	**Average roughness[6] R_a [µm]**	5.6
Supplier ID	1004000-PK	**Average roughness[6] R_z [µm]**	36.4

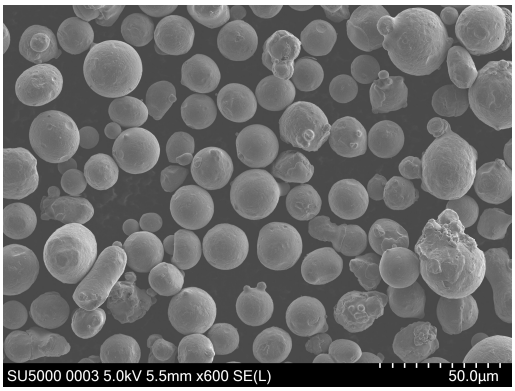

Figure 5: CoCrW powder by Eisenbacher. PSD: 10-45 µm. SEM magnification: 600x.

No Heat Treatment

All properties are reported using 3σ-intervals[8]. The values for 0° and 90° are derived from qualification reports, while the average values are calculated from additional measurements.

Mechanical properties[10] machined					
	0°	**90°**	**Average[12]**		
Yield strength [MPa]	—	495.0 – 591.0	—	**Samples**	—
Tensile strength [MPa]	—	1016.0 – 1088.0	—	**Build jobs**	—
Elong. at break [%]	—	14.5 – 32.5	—	**Machines**	—

Hardness[13]	
Vickers [HV]	347.0 – 383.0

Roughness after blasting			
Type	**Corrund**	**Glas**	**Steel**
R_a [6] [µm]	—	2.3	—
R_z [6] [µm]	—	15.33	—

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CoCrW: Eisenbacher_Kera-S_S_850

Process description[7]: 850°C/0,5h,Ar

All properties are reported using 3σ-intervals[8]. The values for 0° and 90° are derived from qualification reports, while the average values are calculated from additional measurements.

Mechanical properties[10] machined					
	0°	**90°**	**Average[12]**		
Yield strength [MPa]	—	730.0 – 820.0	—	**Samples**	—
Tensile strength [MPa]	—	996.0 – 1056.0	—	**Build jobs**	—
Elong. at break [%]	—	10.0 – 22.0	—	**Machines**	—

Hardness[13]	
Vickers [HV]	369.0 – 489.0

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4.10. Advanced_TruPrint1000_G06_Spot80_CoCrW_Eisenbacher_RPDs_Layer30

Powder information		Material properties	
Material	CoCrW	**Build rate[4] [cm³/h]**	21.2
Supplier	Eisenbacher	**Relative density[5] [%]**	99.8
Powder name	KERA® S-Powder	**Average roughness[6] R_a [µm]**	5.8
Supplier ID	1004000-PK	**Average roughness[6] R_z [µm]**	39.2

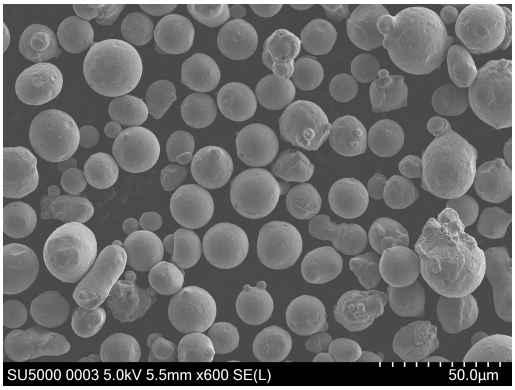

Figure 6: CoCrW powder by Eisenbacher. PSD: 10-45 µm. SEM magnification: 600x.

No Heat Treatment

All properties are reported using 3σ-intervals[8]. The values for 0° and 90° are derived from qualification reports, while the average values are calculated from additional measurements.

Mechanical properties[10] machined					
	0°	**90°**	**Average[12]**		
Yield strength [MPa]	—	499.0 – 619.0	—	**Samples**	—
Tensile strength [MPa]	—	888.0 – 1188.0	—	**Build jobs**	—
Elong. at break [%]	—	6.0 – 36.0	—	**Machines**	—

Hardness[13]	
Vickers [HV]	357.0 – 381.0

Physical properties	
Electrical conductivity [%IACS]	0.6 – 1.8
Thermal conductivity[14] [W/mK]	5.0

Roughness after blasting			
Type	**Corrund**	**Glas**	**Steel**
R_a [6] [µm]	—	2.7	—
R_z [6] [µm]	—	15.33	—

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CoCrW: Eisenbacher_Kera-S_S_850

Process description[7]: 850°C/0,5h,Ar

All properties are reported using 3σ-intervals[8]. The values for 0° and 90° are derived from qualification reports, while the average values are calculated from additional measurements.

Mechanical properties[10] machined					
	0°	90°	Average[12]		
Yield strength [MPa]	—	728.0 – 818.0	—	**Samples**	—
Tensile strength [MPa]	—	1028.0 – 1088.0	—	**Build jobs**	—
Elong. at break [%]	—	6.0 – 18.0	—	**Machines**	—

Hardness[13]	
Vickers [HV]	369.0 – 489.0

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4.11. Basic_TruPrint1000_Spot55_CoCrW_Dentaurum_C&B_Layer20

Note for further use of the parameter [15]

Powder information		Material properties	
Material	CoCrW	**Build rate[4] [cm³/h]**	15.6
Supplier	Dentaurum	**Relative density[5] [%]**	99.5
Powder name	Remanium® star powder	**Average roughness[6] R_a [µm]**	—
Supplier ID	REF 102-620-70	**Average roughness[6] R_z [µm]**	—

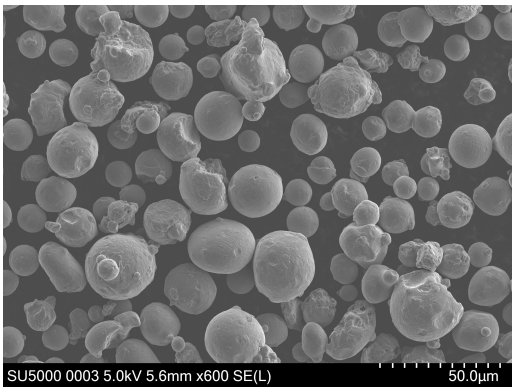

Figure 7: CoCrW powder by Dentaurum. PSD: 10-30 µm. SEM magnification: 600x.

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4.12. Basic_TruPrint1000_Spot55_CoCrW_Dentaurum_RPDs_Layer20

Powder information		Material properties	
Material	CoCrW	**Build rate[4] [cm³/h]**	10.4
Supplier	Dentaurum	**Relative density[5] [%]**	99.7
Powder name	Remanium® star powder	**Average roughness[6] R_a [µm]**	—
Supplier ID	REF 102-620-70	**Average roughness[6] R_z [µm]**	—

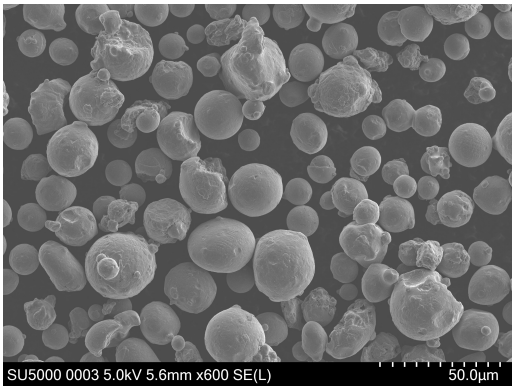

Figure 8: CoCrW powder by Dentaurum. PSD: 10-30 µm. SEM magnification: 600x.

No Heat Treatment

All properties are reported using 3σ-intervals[8]. The values for 0° and 90° are derived from qualification reports, while the average values are calculated from additional measurements.

Physical properties	
Electrical conductivity [%IACS]	0.6 – 1.8
Thermal conductivity[14] [W/mK]	5.0

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4.13. Basic_TruPrint1000_G06_Spot80_CoCrW_Dentaurum_C&B_Layer30

Note for further use of the parameter [15]

Powder information		Material properties	
Material	CoCrW	**Build rate[4] [cm³/h]**	22.7
Supplier	Dentaurum	**Relative density[5] [%]**	99.7
Powder name	Remanium® star powder	**Average roughness[6] R_a [µm]**	—
Supplier ID	REF 102-620-70	**Average roughness[6] R_z [µm]**	—

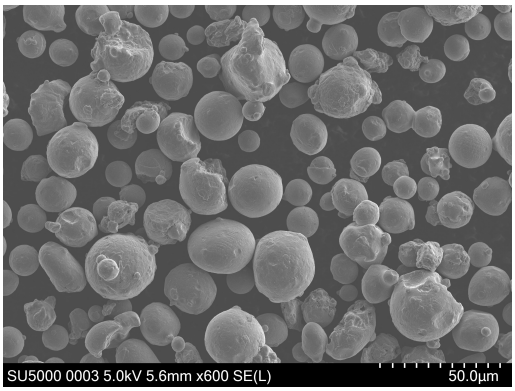

Figure 9: CoCrW powder by Dentaurum. PSD: 10-30 µm. SEM magnification: 600x.

No Heat Treatment

All properties are reported using 3σ-intervals[8]. The values for 0° and 90° are derived from qualification reports, while the average values are calculated from additional measurements.

Mechanical properties[9] machined					
	0°	**90°**	**Average[12]**		
Yield strength [MPa]	—	—	416.1 – 948.3	**Samples**	10
Tensile strength [MPa]	—	—	977.3 – 1258.7	**Build jobs**	1
Elong. at break [%]	—	—	5.9 – 23.9	**Machines**	1

Physical properties	
Electrical conductivity [%IACS]	0.6 – 1.8
Thermal conductivity[14] [W/mK]	5.0

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Exemplary Application parts

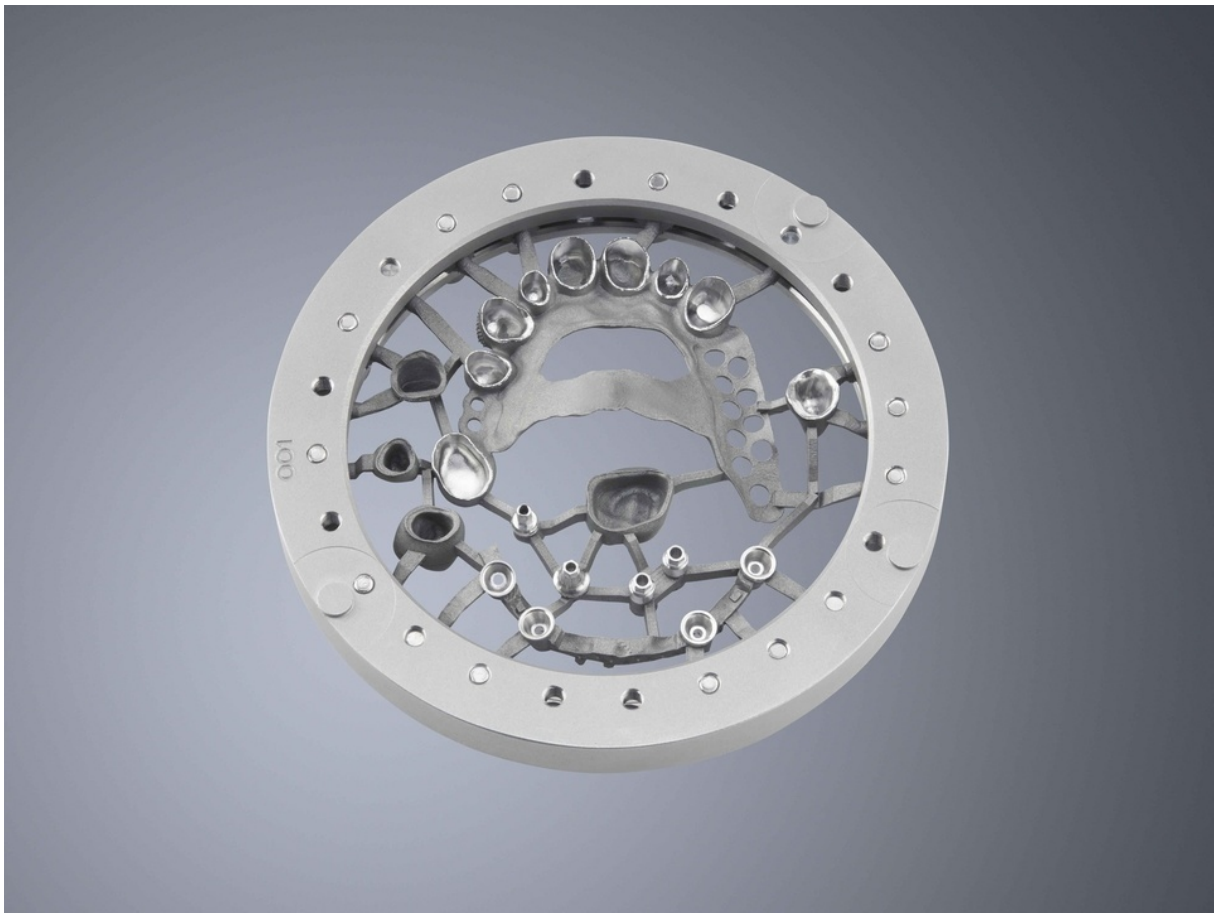

Figure 10: Hybrid manufactured dental parts

Figure 11: Preform option - Individual abutment with implant

Figure 12: Individual adapter + printed individual abutment

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Figure 13: Preform option individual abutments

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4.14. Basic_TruPrint1000_G06_Spot80_CoCrW_Dentaurum_RPDs_Layer30

Powder information		Material properties	
Material	CoCrW	**Build rate[4] [cm³/h]**	24.3
Supplier	Dentaurum	**Relative density[5] [%]**	99.7
Powder name	Remanium® star powder	**Average roughness[6] R_a [µm]**	—
Supplier ID	REF 102-620-70	**Average roughness[6] R_z [µm]**	—

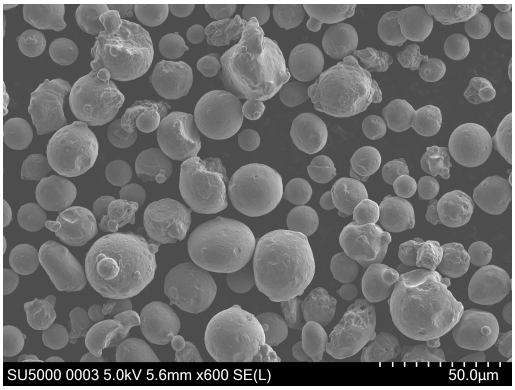

Figure 14: CoCrW powder by Dentaurum. PSD: 10-30 µm. SEM magnification: 600x.

No Heat Treatment

All properties are reported using 3σ-intervals[8]. The values for 0° and 90° are derived from qualification reports, while the average values are calculated from additional measurements.

Physical properties	
Electrical conductivity [%IACS]	0.6 – 1.8
Thermal conductivity[14] [W/mK]	5.0

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Exemplary Application parts

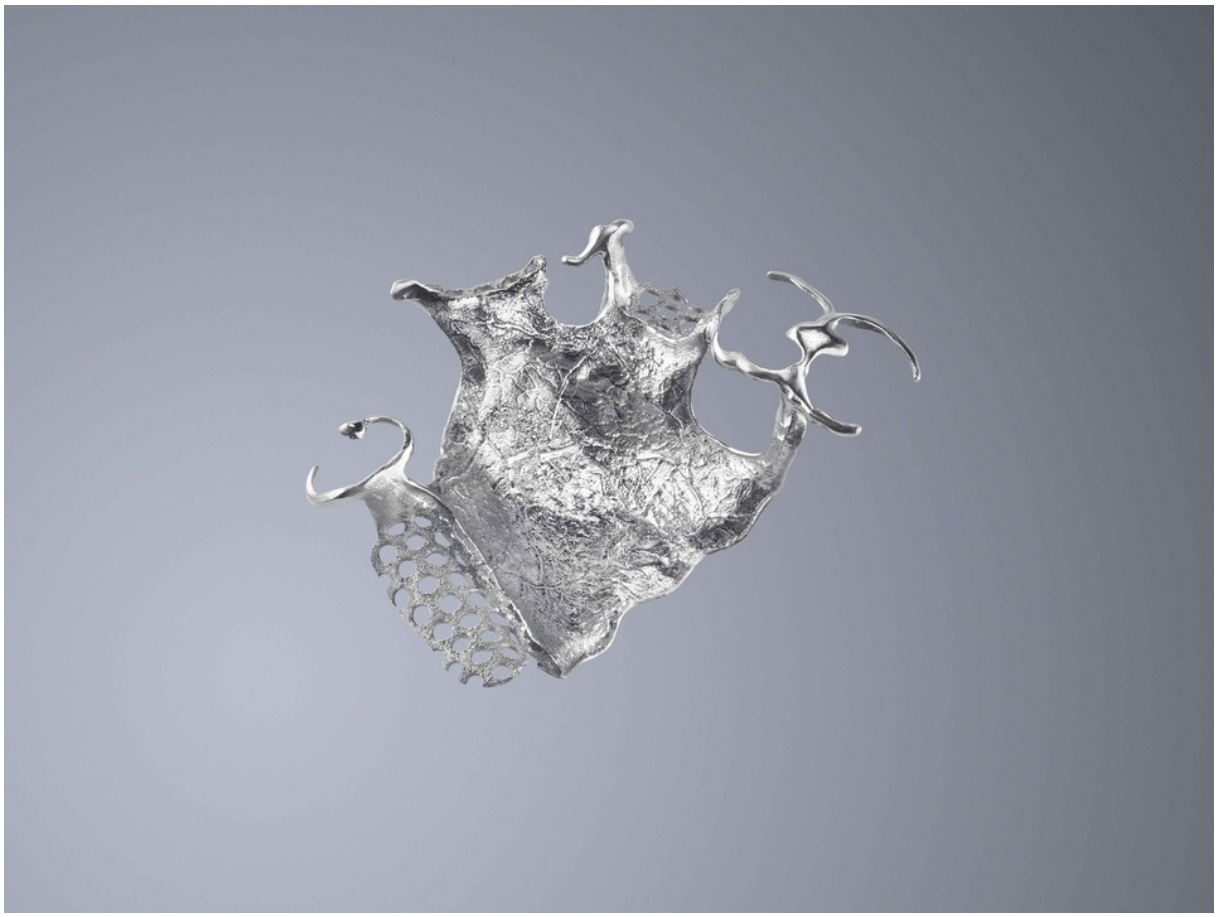

Figure 15: Finished manufactured/polished RPD

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Figure 16: Hybrid manufactured telescop crowns / Primary and secondary part

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4.15. Advanced_TruPrint1000_Spot55_CoCrWMo_Bego_C&B_Layer20

Note for further use of the parameter [15]

Powder information		Material properties	
Material	CoCrWMo	**Build rate[4] [cm³/h]**	10.4
Supplier	BEGO	**Relative density[5] [%]**	99.8
Powder name	Mediloy® S-Co	**Average roughness[6] R_a [µm]**	5.0
Supplier ID	50551.0	**Average roughness[6] R_z [µm]**	33.0

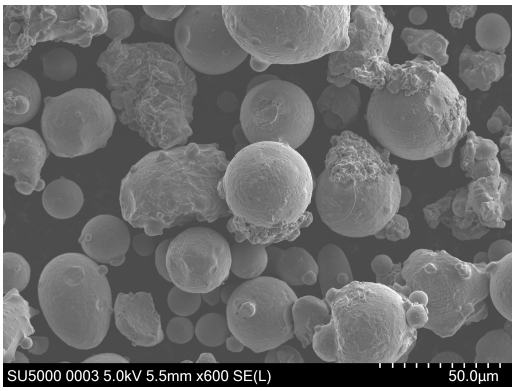

Figure 17: CoCrWMo powder by BEGO. PSD: 10-45 µm. SEM magnification: 600x.

No Heat Treatment

All properties are reported using 3σ-intervals[8]. The values for 0° and 90° are derived from qualification reports, while the average values are calculated from additional measurements.

Mechanical properties[9] machined					
	0°	**90°**	**Average[12]**		
Yield strength [MPa]	639.0 – 699.0	464.0 – 524.0	369.9 – 833.1	**Samples**	41
Tensile strength [MPa]	1080.0 – 1182.0	729.0 – 1119.0	756.6 – 1366.2	**Build jobs**	1
Elong. at break [%]	6.0 – 8.0	5.0 – 13.0	1.3 – 36.1	**Machines**	1

Hardness[13]	
Vickers [HV]	350.0 – 386.0

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4.16. Advanced_TruPrint1000_Spot55_CoCrWMo_Bego_C&B_Layer40

Note for further use of the parameter [15]

Powder information		Material properties	
Material	CoCrWMo	**Build rate[4] [cm³/h]**	11.5
Supplier	BEGO	**Relative density[5] [%]**	99.9
Powder name	Mediloy® S-Co	**Average roughness[6] R_a [µm]**	12.0
Supplier ID	50551.0	**Average roughness[6] R_z [µm]**	66.0

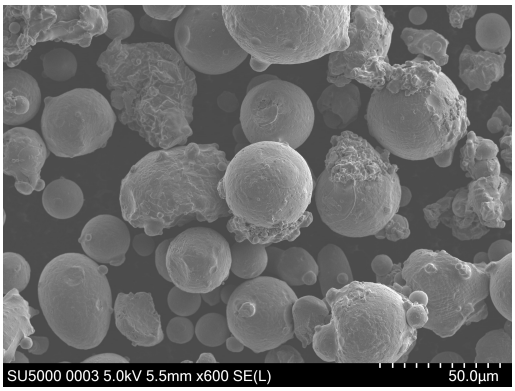

Figure 18: CoCrWMo powder by BEGO. PSD: 10-45 µm. SEM magnification: 600x.

No Heat Treatment

All properties are reported using 3σ-intervals[8]. The values for 0° and 90° are derived from qualification reports, while the average values are calculated from additional measurements.

Mechanical properties[9] machined					
	0°	**90°**	**Average[12]**		
Yield strength [MPa]	712.0 – 748.0	550.0 – 586.0	—	**Samples**	—
Tensile strength [MPa]	1082.0 – 1214.0	887.0 – 1001.0	—	**Build jobs**	—
Elong. at break [%]	5.2 – 17.2	8.0 – 17.0	—	**Machines**	—

Hardness[13]	
Vickers [HV]	225.0 – 519.0

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4.17. Advanced_TruPrint1000_G06_Spot80_CoCrWMo_Bego_C&B_Layer30

Note for further use of the parameter [15]

Powder information		Material properties	
Material	CoCrWMo	**Build rate[4] [cm³/h]**	24.3
Supplier	BEGO	**Relative density[5] [%]**	99.8
Powder name	Mediloy® S-Co	**Average roughness[6] R_a [µm]**	5.5
Supplier ID	50551.0	**Average roughness[6] R_z [µm]**	—

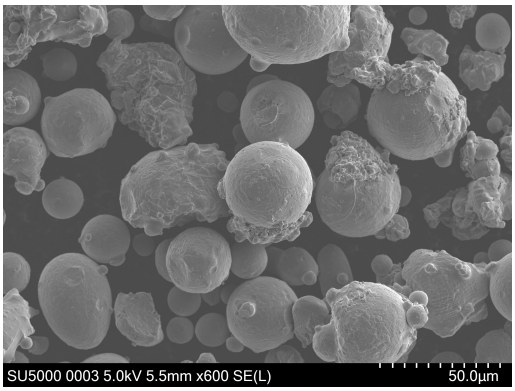

Figure 19: CoCrWMo powder by BEGO. PSD: 10-45 µm. SEM magnification: 600x.

No Heat Treatment

All properties are reported using 3σ-intervals[8]. The values for 0° and 90° are derived from qualification reports, while the average values are calculated from additional measurements.

Mechanical properties[9] machined				
	0°	**90°**	**Average[12]**	
Yield strength [MPa]	694.0 – 730.0	481.0 – 565.0	—	**Samples** —
Tensile strength [MPa]	1178.0 – 1208.0	1056.0 – 1098.0	—	**Build jobs** —
Elong. at break [%]	8.1 – 12.9	15.9 – 20.7	—	**Machines** —

Hardness[13]	
Vickers [HV]	380.0 – 464.0

Roughness after blasting			
Type	**Corrund**	**Glas**	**Steel**
R_a [6] [µm]	2.2	—	—
R_z [6] [µm]	—	—	—

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CoCrWMo: Bego_Mediloy_S-Co_S

Process description[7]: 800°C/0,25h,Air

All properties are reported using 3σ-intervals[8]. The values for 0° and 90° are derived from qualification reports, while the average values are calculated from additional measurements.

Mechanical properties[9] machined					
	0°	90°	Average[12]		
Yield strength [MPa]	1140.0 – 1158.0	888.0 – 936.0	—	**Samples**	—
Tensile strength [MPa]	1389.0 – 1407.0	1120.0 – 1162.0	—	**Build jobs**	—
Elong. at break [%]	4.5 – 7.5	8.0 – 14.0	—	**Machines**	—

Hardness[13]	
Vickers [HV]	480.0 – 540.0

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4.18. Basic_TruPrint1000_Spot55_CoCrWMo_Bego_C&B_Layer20

Note for further use of the parameter [15]

Powder information		Material properties	
Material	CoCrWMo	**Build rate[4] [cm³/h]**	10.4
Supplier	BEGO	**Relative density[5] [%]**	99.5
Powder name	Mediloy® S-Co	**Average roughness[6] R_a [µm]**	—
Supplier ID	50551.0	**Average roughness[6] R_z [µm]**	—

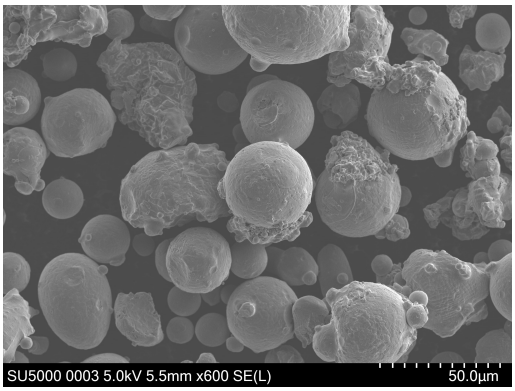

Figure 20: CoCrWMo powder by BEGO. PSD: 10-45 µm. SEM magnification: 600x.

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4.19. Basic_TruPrint1000_Spot55_CoCrWMo_Bego_C&B_Layer40

Note for further use of the parameter [15]

Powder information		Material properties	
Material	CoCrWMo	**Build rate[4] [cm³/h]**	11.5
Supplier	BEGO	**Relative density[5] [%]**	99.5
Powder name	Mediloy® S-Co	**Average roughness[6] R_a [µm]**	—
Supplier ID	50551.0	**Average roughness[6] R_z [µm]**	—

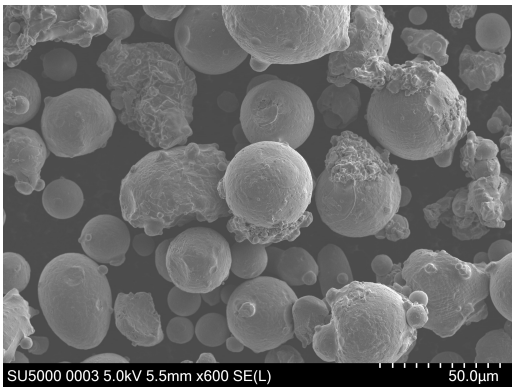

Figure 21: CoCrWMo powder by BEGO. PSD: 10-45 µm. SEM magnification: 600x.

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[1] Basic parameters: starting point for development, generally not recommended for direct part production. Advanced parameters: refined settings, suitable for actual component production.
[2] Describes the preheating temperature of the build plate. A generic value of 23°C is stated, if no active preheating was used. The actual value depends on the climatic conditions of the surrounding.
[3] TTP: TruTops Print, Mat: Materialise, Cam: Cambridge, Oqt: Oqton
[4] Calculated melting rate with maximum amount of lasers; effective melting rate may differ depending on the application.
[5] ASTM E 1245:2003. Measurement of the relative density was performed for specimens with cubic geometries. Values can differ for other geometries and sizes.
[6] Arcording to DIN EN ISO 21920-2-01:2022 with used measurement length of 4,8 mm
[7] The process description is read as follows: Example: 650°C/10min,850°C/10min,1010°C/30min,Air; 590°C/2h,Air; 590°C/2h,Air: 1. Heat treatment cycle: (1. temperature/1. holding time at temperature, 2. temperature/2. holding time, quenching medium); 2. heat treatment cycle (temperature/holding time, quenching medium); 3. heat treatment cycle (temperature/holding time, quenching medium). We recommend that titanium is heat treated under vacuum.
[8] Values are stated as intervals from 3σ to the left of the mean to 3σ to the right of the mean. This ensures that, statistically, 99.73% of the process output meets customer requirements. For sufficiently many data points, a full process capability analysis was performed and intervals are stated such that a CPK of 1.33 was achieved.
[9] DIN EN ISO 6892-1:2017, DIN 50125:2016
[10] DIN EN ISO 22674
[11] ASTM E8
[12] The average values could include a combination of different build jobs on the same machine type, different powder manufacturers and different inspection orientations.
[13] DIN EN ISO 6506-1:2015
[14] Calculated from electrical conductivity using Wiedemann Franz Law: $\kappa/\sigma = LT$, with thermal conductivity κ [W/mK], electrical conductivity σ [S/m], Lorenz number $L = 2.44 \cdot 10^{-8}$ WΩ/K², temperature T [K].
[15] C&B parameters are especially tested for the needs of dental Crowns & Bridges applications. Nonetheless, they are developed in a way that they can be considered for wider use, including other dental applications. In any case, the powder manufacturer's datasheet and instructions for use must be checked to ensure the right material is used for the intended application.

Further test procedure details are available on request.

The component properties obtained were exclusively derived from the combination of suitable powder, the TRUMPF TruPrint and the parameter sets, while observing the current operator's manual.

The data in this technical data sheet and other information are up to date. They alone do not provide a sufficient basis for designing components. The suitability of a component for a particular application cannot be guaranteed by this information. The details in this data sheet are intended exclusively for information purposes and do not constitute an agreement on certain qualities. The TRUMPF warranty only covers agreements specified in the delivery contracts.

The manufacturer of a component is responsible for determining the properties and suitability for any use of the component. They are also responsible for respecting any potential property rights and current legislation and regulations.

As a result of continuous improvement processes in place at TRUMPF, the information in this data sheet is subject to change without prior notice. Errors are excepted.

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