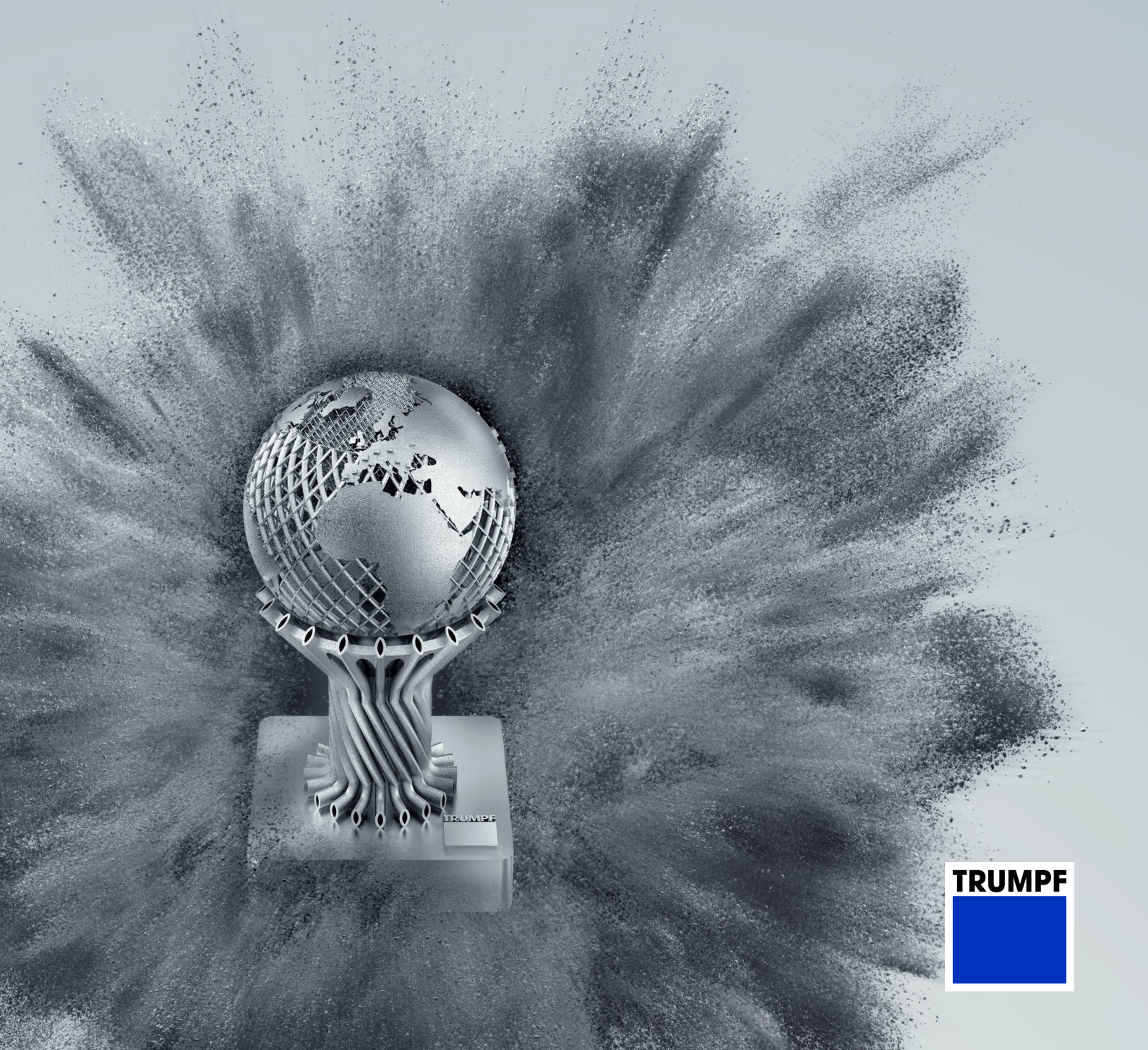
TruPrint 5000
Nickel



TRUMPF

Contents

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TRUMPF Laser- und Systemtechnik SE
Johann-Maus-Straße 2, 71254 Ditzingen
additive.manufacturing@de.trumpf.com
+49 (0) 7156 303-31620

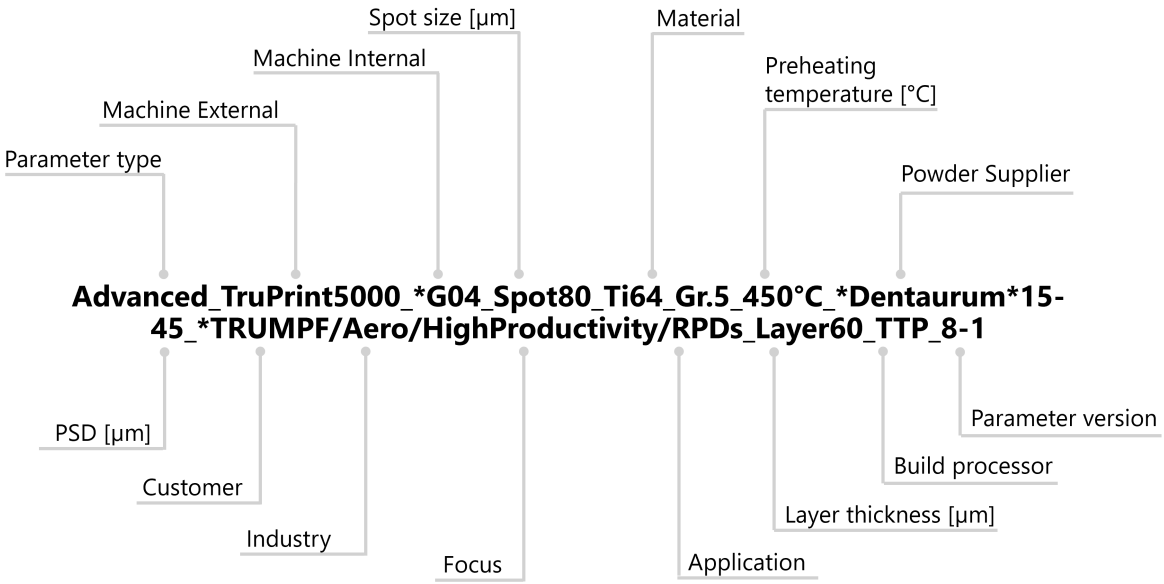
1. Introduction to parameters at TRUMPF AM

This document details the parameter set for processing Nickel using the TruPrint 5000. 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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Johann-Maus-Straße 2, 71254 Ditzingen
additive.manufacturing@de.trumpf.com
+49 (0) 7156 303-31620

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]
HastX	G04	Basic	100	200	0.03	Mat	35.6
HastX	G04	Basic	100	200	0.04	Mat	54.0
HastX	G04	Basic	100	200	0.06	Mat	81.0
In625	G04	Advanced	80	200	0.06	Mat	89.8
In625	G04	Basic	80	200	0.12	TTP	162.8
In625	G04	Basic	80	200	0.04	Mat	51.8
In625	G04	Basic	80	200	0.06	TTP	64.8
In625	G04	Basic	80	200	0.06	TTP	134.8
In625	G04	Basic	100	200	0.03	Mat	48.6
In718	G04	Advanced	80	200	0.06	TTP	90.7
In718	G04	Basic	80	200	0.04	TTP	51.8
In718	G04	Basic	80	200	0.06	TTP	64.8
In718	G04	Basic	80	200	0.06	TTP	134.8
In718	G04	Basic	100	200	0.03	Mat	39.9
In718	G04	Basic	100	200	0.06	Mat	77.8

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Johann-Maus-Straße 2, 71254 Ditzingen
additive.manufacturing@de.trumpf.com
+49 (0) 7156 303-31620

3. Powder Information

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

Material	Supplier	Powder name	PSD [µm]	Supplier ID
HastX	Oerlikon Metco	MetcoAdd HX-D	15-45	1301896.0
In625	Oerlikon Metco	MetcoAdd 625A	15-45	1093343.0
In718	Oerlikon Metco	MetcoAdd 718C	15-45	1096973.0
In718	Praxair	TruForm 718 Ni-202-35	15-45	915-036325-10KG
In718	VDM	VDM Powder 718	15-53	24668P0001

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Johann-Maus-Straße 2, 71254 Ditzingen
additive.manufacturing@de.trumpf.com
+49 (0) 7156 303-31620

4. Parameter details

4.1. Basic_TruPrint5000_Spot100_HastX_Layer30

Powder information		Material properties	
Material	HastX	**Build rate[4] [cm³/h]**	35.6
Supplier	Oerlikon Metco	**Relative density[5] [%]**	99.9
Powder name	MetcoAdd HX-D	**Average roughness[6] R_a [µm]**	—
Supplier ID	1301896.0	**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.

Physical properties	
Electrical conductivity [%IACS]	1.1 – 1.1
Thermal conductivity[14] [W/mK]	5.0

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Johann-Maus-Straße 2, 71254 Ditzingen
additive.manufacturing@de.trumpf.com
+49 (0) 7156 303-31620

4.2. Basic_TruPrint5000_Spot100_HastX_Layer40

Powder information		Material properties	
Material	HastX	**Build rate[4] [cm³/h]**	54.0
Supplier	Oerlikon Metco	**Relative density[5] [%]**	99.9
Powder name	MetcoAdd HX-D	**Average roughness[6] R_a [µm]**	—
Supplier ID	1301896.0	**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.

Physical properties	
Electrical conductivity [%IACS]	1.1 – 1.1
Thermal conductivity[14] [W/mK]	5.0

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Johann-Maus-Straße 2, 71254 Ditzingen
additive.manufacturing@de.trumpf.com
+49 (0) 7156 303-31620

4.3. Basic_TruPrint5000_Spot100_HastX_Layer60

Powder information		Material properties	
Material	HastX	**Build rate[4] [cm³/h]**	81.0
Supplier	Oerlikon Metco	**Relative density[5] [%]**	99.9
Powder name	MetcoAdd HX-D	**Average roughness[6] R_a [µm]**	—
Supplier ID	1301896.0	**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.

Physical properties	
Electrical conductivity [%IACS]	1.1 – 1.1
Thermal conductivity[14] [W/mK]	5.0

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Johann-Maus-Straße 2, 71254 Ditzingen
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+49 (0) 7156 303-31620

4.4. Advanced_TruPrint5000_Spot80_In625_Layer60

Powder information		Material properties	
Material	In625	**Build rate[4] [cm³/h]**	89.8
Supplier	Oerlikon Metco	**Relative density[5] [%]**	99.7
Powder name	MetcoAdd 625A	**Average roughness[6] R_a [µm]**	9.0
Supplier ID	1093343.0	**Average roughness[6] R_z [µm]**	49.0

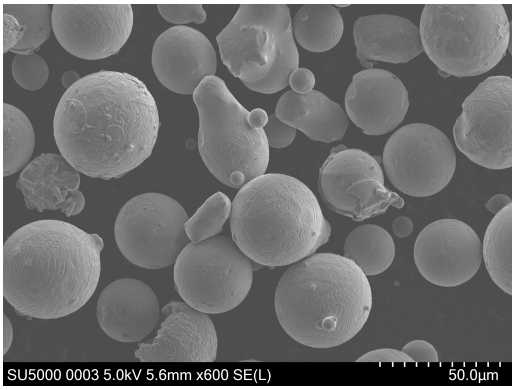

Figure 1: In625 powder by Oerlikon Metco. PSD: 15-45 µm. SEM magnification: 600x.

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]	—	485.0 – 575.0	—	**Samples**	—
Tensile strength [MPa]	—	805.0 – 925.0	—	**Build jobs**	—
Elong. at break [%]	—	31.0 – 43.0	—	**Machines**	—

Physical properties	
Electrical conductivity [%IACS]	0.8 – 0.8
Thermal conductivity[14] [W/mK]	3.6

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Johann-Maus-Straße 2, 71254 Ditzingen
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4.5. Basic_TruPrint5000_Spot80_In625_Layer120

Powder information		Material properties	
Material	In625	**Build rate[4] [cm³/h]**	162.8
Supplier	Oerlikon Metco	**Relative density[5] [%]**	99.7
Powder name	MetcoAdd 625A	**Average roughness[6] R_a [µm]**	—
Supplier ID	1093343.0	**Average roughness[6] R_z [µm]**	—

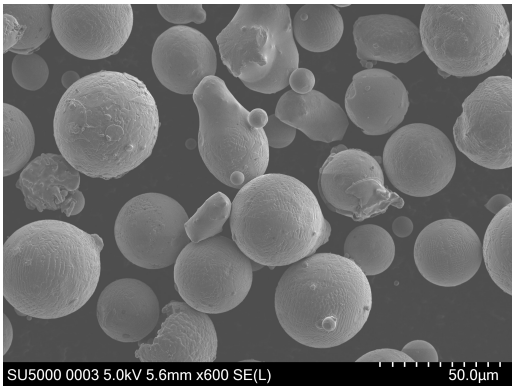

Figure 2: In625 powder by Oerlikon Metco. PSD: 15-45 µm. SEM magnification: 600x.

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.

Physical properties	
Electrical conductivity [%IACS]	0.8 – 0.8
Thermal conductivity[14] [W/mK]	3.6

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Johann-Maus-Straße 2, 71254 Ditzingen
additive.manufacturing@de.trumpf.com
+49 (0) 7156 303-31620

4.6. Basic_TruPrint5000_Spot80_In625_Layer40

Powder information		Material properties	
Material	In625	**Build rate[4] [cm³/h]**	51.8
Supplier	Oerlikon Metco	**Relative density[5] [%]**	99.7
Powder name	MetcoAdd 625A	**Average roughness[6] R_a [µm]**	—
Supplier ID	1093343.0	**Average roughness[6] R_z [µm]**	—

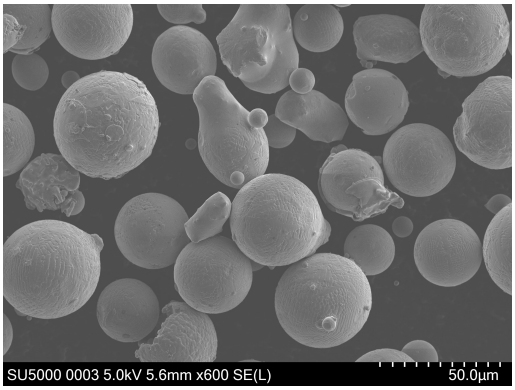

Figure 3: In625 powder by Oerlikon Metco. PSD: 15-45 µm. SEM magnification: 600x.

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.

Physical properties	
Electrical conductivity [%IACS]	0.8 – 0.8
Thermal conductivity[14] [W/mK]	3.6

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Johann-Maus-Straße 2, 71254 Ditzingen
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+49 (0) 7156 303-31620

4.7. Basic_TruPrint5000_Spot80_In625_high_density_Layer60

Powder information		Material properties	
Material	In625	**Build rate[4] [cm³/h]**	64.8
Supplier	Oerlikon Metco	**Relative density[5] [%]**	99.7
Powder name	MetcoAdd 625A	**Average roughness[6] R_a [µm]**	—
Supplier ID	1093343.0	**Average roughness[6] R_z [µm]**	—

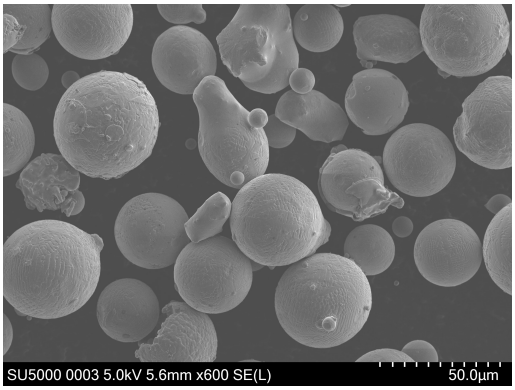

Figure 4: In625 powder by Oerlikon Metco. PSD: 15-45 µm. SEM magnification: 600x.

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.

Physical properties	
Electrical conductivity [%IACS]	0.8 – 0.8
Thermal conductivity[14] [W/mK]	3.6

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Johann-Maus-Straße 2, 71254 Ditzingen
additive.manufacturing@de.trumpf.com
+49 (0) 7156 303-31620

4.8. Basic_TruPrint5000_Spot80_In625_high_melting_rate_Layer60

Powder information		Material properties	
Material	In625	**Build rate[4] [cm³/h]**	134.8
Supplier	Oerlikon Metco	**Relative density[5] [%]**	99.7
Powder name	MetcoAdd 625A	**Average roughness[6] R_a [µm]**	—
Supplier ID	1093343.0	**Average roughness[6] R_z [µm]**	—

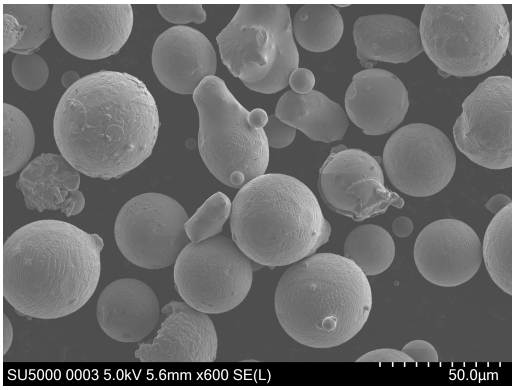

Figure 5: In625 powder by Oerlikon Metco. PSD: 15-45 µm. SEM magnification: 600x.

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.

Physical properties	
Electrical conductivity [%IACS]	0.8 – 0.8
Thermal conductivity[14] [W/mK]	3.6

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Johann-Maus-Straße 2, 71254 Ditzingen
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+49 (0) 7156 303-31620

4.9. Basic_TruPrint5000_Sopt100_In625_Layer30

Powder information		Material properties	
Material	In625	**Build rate[4] [cm³/h]**	48.6
Supplier	Oerlikon Metco	**Relative density[5] [%]**	99.7
Powder name	MetcoAdd 625A	**Average roughness[6] R_a [µm]**	—
Supplier ID	1093343.0	**Average roughness[6] R_z [µm]**	—

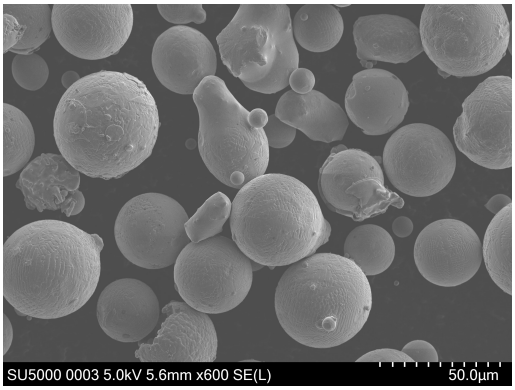

Figure 6: In625 powder by Oerlikon Metco. PSD: 15-45 µm. SEM magnification: 600x.

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.

Physical properties	
Electrical conductivity [%IACS]	0.8 – 0.8
Thermal conductivity[14] [W/mK]	3.6

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Johann-Maus-Straße 2, 71254 Ditzingen
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+49 (0) 7156 303-31620

4.10. Advanced_TruPrint5000_Spot80_IN718_Layer60

Powder information		Material properties	
Material	In718	**Build rate[4] [cm³/h]**	90.7
Supplier	Oerlikon Metco	**Relative density[5] [%]**	99.7
Powder name	MetcoAdd 718C	**Average roughness[6] R_a [µm]**	6.2
Supplier ID	1096973.0	**Average roughness[6] R_z [µm]**	36.0

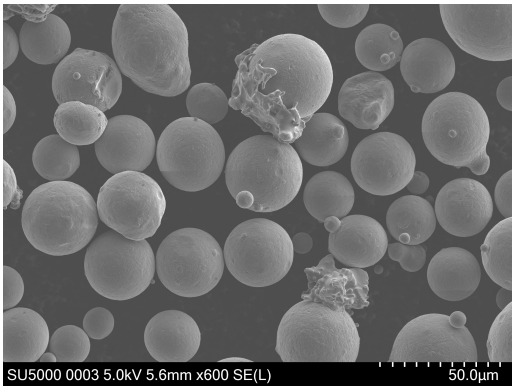

Figure 7: In718 powder by Oerlikon Metco. PSD: 15-45 µm. SEM magnification: 600x.

Other suitable In718 powders
For details see powder information page.

Supplier	Powder Name
Praxair	TruForm 718 Ni-202-35
VDM	VDM Powder 718

SEM images of other suitable In718 powders

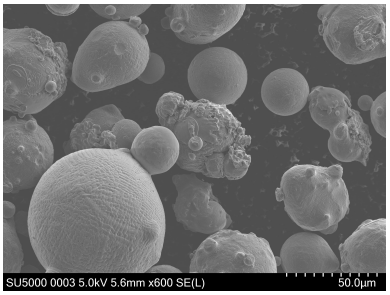

Figure 8: In718 powder by Praxair. PSD: 15-45 µm. SEM magnification: 600x.

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Johann-Maus-Straße 2, 71254 Ditzingen
additive.manufacturing@de.trumpf.com
+49 (0) 7156 303-31620

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]	696.0 – 786.0	579.0 – 669.0	501.6 – 862.8	**Samples**	20
Tensile strength [MPa]	1026.0 – 1116.0	972.0 – 1062.0	960.5 – 1127.3	**Build jobs**	1
Elong. at break [%]	26.0 – 32.0	30.0 – 36.0	25.3 – 36.7	**Machines**	1

Hardness[13]	
Vickers [HV]	279.0 – 309.0

Physical properties	
Electrical conductivity [%IACS]	0.4 – 1.0
Thermal conductivity[14] [W/mK]	2.9

In718: AMS5662

Process description[7]: 950°C/1h,Air;718°C/8h,Air;621°C/8h,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]	1138.0 – 1318.0	1106.0 – 1256.0	1109.2 – 1300.0	**Samples**	10
Tensile strength [MPa]	1507.0 – 1597.0	1452.0 – 1542.0	1438.2 – 1611.6	**Build jobs**	1
Elong. at break [%]	9.0 – 21.0	15.0 – 21.0	10.4 – 22.4	**Machines**	1

Hardness[13]	
Vickers [HV]	435.0 – 453.0

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Johann-Maus-Straße 2, 71254 Ditzingen
additive.manufacturing@de.trumpf.com
+49 (0) 7156 303-31620

4.11. Basic_TruPrint5000_Spot80_IN718_Layer40

Powder information		Material properties	
Material	In718	**Build rate[4] [cm³/h]**	51.8
Supplier	Oerlikon Metco	**Relative density[5] [%]**	99.7
Powder name	MetcoAdd 718C	**Average roughness[6] R_a [µm]**	—
Supplier ID	1096973.0	**Average roughness[6] R_z [µm]**	—

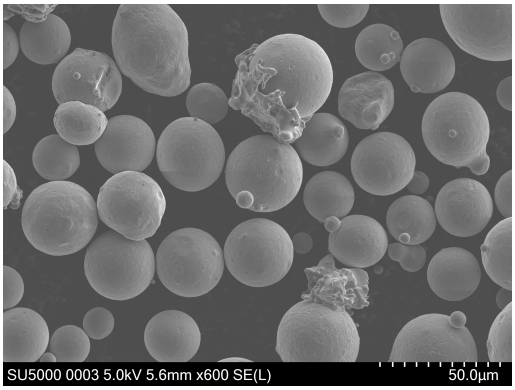

Figure 9: In718 powder by Oerlikon Metco. PSD: 15-45 µm. SEM magnification: 600x.

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.

Physical properties	
Electrical conductivity [%IACS]	0.4 – 1.0
Thermal conductivity[14] [W/mK]	2.9

TRUMPF Laser- und Systemtechnik SE
Johann-Maus-Straße 2, 71254 Ditzingen
additive.manufacturing@de.trumpf.com
+49 (0) 7156 303-31620

4.12. Basic_TruPrint5000_Spot80_IN718_high_density_Layer60

Powder information		Material properties	
Material	In718	**Build rate[4] [cm³/h]**	64.8
Supplier	Oerlikon Metco	**Relative density[5] [%]**	99.7
Powder name	MetcoAdd 718C	**Average roughness[6] R_a [µm]**	—
Supplier ID	1096973.0	**Average roughness[6] R_z [µm]**	—

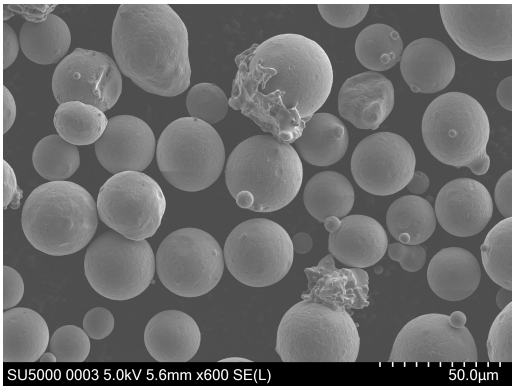

Figure 10: In718 powder by Oerlikon Metco. PSD: 15-45 µm. SEM magnification: 600x.

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.

Physical properties	
Electrical conductivity [%IACS]	0.4 – 1.0
Thermal conductivity[14] [W/mK]	2.9

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Johann-Maus-Straße 2, 71254 Ditzingen
additive.manufacturing@de.trumpf.com
+49 (0) 7156 303-31620

4.13. Basic_TruPrint5000_Spot80_IN718_high_melting_rate_500W_Layer60

Powder information		Material properties	
Material	In718	**Build rate[4] [cm³/h]**	134.8
Supplier	Oerlikon Metco	**Relative density[5] [%]**	99.7
Powder name	MetcoAdd 718C	**Average roughness[6] R_a [µm]**	—
Supplier ID	1096973.0	**Average roughness[6] R_z [µm]**	—

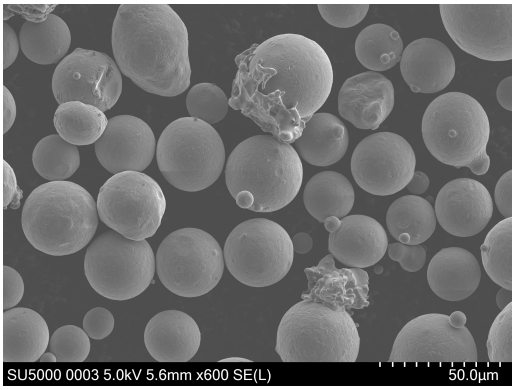

Figure 11: In718 powder by Oerlikon Metco. PSD: 15-45 µm. SEM magnification: 600x.

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.

Physical properties	
Electrical conductivity [%IACS]	0.4 – 1.0
Thermal conductivity[14] [W/mK]	2.9

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Johann-Maus-Straße 2, 71254 Ditzingen
additive.manufacturing@de.trumpf.com
+49 (0) 7156 303-31620

4.14. Basic_TruPrint5000_Spot100_In718_Layer30

Powder information		Material properties	
Material	In718	**Build rate[4] [cm³/h]**	39.9
Supplier	Oerlikon Metco	**Relative density[5] [%]**	99.7
Powder name	MetcoAdd 718C	**Average roughness[6] R_a [µm]**	—
Supplier ID	1096973.0	**Average roughness[6] R_z [µm]**	—

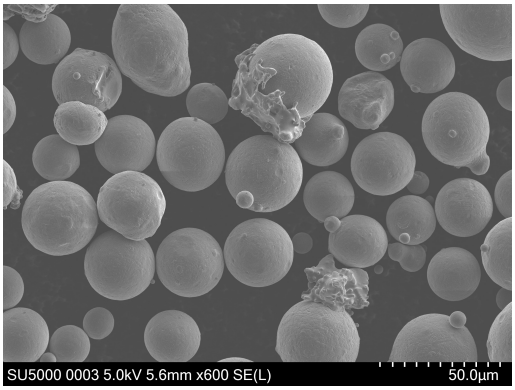

Figure 12: In718 powder by Oerlikon Metco. PSD: 15-45 µm. SEM magnification: 600x.

Other suitable In718 powders
For details see powder information page.

Supplier	Powder Name
Praxair	TruForm 718 Ni-202-35
VDM	VDM Powder 718

SEM images of other suitable In718 powders

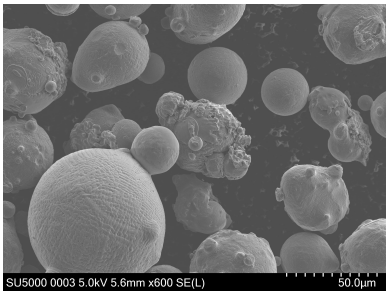

Figure 13: In718 powder by Praxair. PSD: 15-45 µm. SEM magnification: 600x.

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Johann-Maus-Straße 2, 71254 Ditzingen
additive.manufacturing@de.trumpf.com
+49 (0) 7156 303-31620

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]	0.4 – 1.0
Thermal conductivity[14] [W/mK]	2.9

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Johann-Maus-Straße 2, 71254 Ditzingen
additive.manufacturing@de.trumpf.com
+49 (0) 7156 303-31620

4.15. Basic_TruPrint5000_Spot100_In718_Layer60

Powder information		Material properties	
Material	In718	**Build rate[4] [cm³/h]**	77.8
Supplier	Oerlikon Metco	**Relative density[5] [%]**	99.7
Powder name	MetcoAdd 718C	**Average roughness[6] R_a [µm]**	—
Supplier ID	1096973.0	**Average roughness[6] R_z [µm]**	—

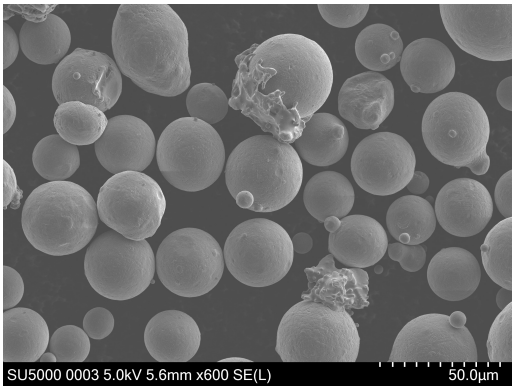

Figure 14: In718 powder by Oerlikon Metco. PSD: 15-45 µm. SEM magnification: 600x.

Other suitable In718 powders
For details see powder information page.

Supplier	Powder Name
Praxair	TruForm 718 Ni-202-35
VDM	VDM Powder 718

SEM images of other suitable In718 powders

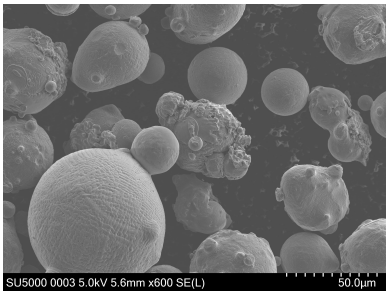

Figure 15: In718 powder by Praxair. PSD: 15-45 µm. SEM magnification: 600x.

TRUMPF Laser- und Systemtechnik SE
Johann-Maus-Straße 2, 71254 Ditzingen
additive.manufacturing@de.trumpf.com
+49 (0) 7156 303-31620

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]	0.4 – 1.0
Thermal conductivity[14] [W/mK]	2.9

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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].

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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+49 (0) 7156 303-31620