



## TZM rod (fully worked)

## PS-IHR 101

Prepared: P. Abenthung, IHR / Released: C. Bichler, IQM

Date of issue: 2011-03-16

Scope: PLANSEE SE

Controlled document acc. to QR-04; this does not apply to hard copies

### 1. Dimensions and tolerances

#### 1.1 Diameter and guaranteed production tolerances

Diameter [mm]	Diameter tolerance [mm]	Cylindrical tolerance [mm]
	ground	
0.50 - 0.99	± 0.007	Values within defined Ø-tolerance
1.00 - 1.99	± 0.010	
2.00 - 2.99	± 0.015	
3.00 - 15.90	± 0.020	
16.00 - 24.90	± 0.030	
25.00 - 34.90	± 0.050	
35.00 - 39.90	± 0.060	
≥ 40.00	± 0.20	
	cleaned	Values within defined Ø-tolerance
0.50 - 14.90	upon request	
15.00 - 29.90	± 0.30	
30.00 - 69.90	± 0.40	
70.00 - 119.90	± 1.00	
120.00 - 160.00	± 1.80	
	turned	Values within defined Ø-tolerance
30.00 - 49.90	± 0.30	
50.00 - 165.00	± 0.40	

#### 1.2 Production lengths and straightness

Diameter [mm]	Production length min. [mm]	Straightness/meter [mm]	
		cleaned	ground / turned
0.50 - 0.99	500	< 2.5	< 2.5
1.00 - 9.90	500	< 2.0	< 1.5
10.00 - 165.00	500	< 1.5	< 1.0

#### 1.3 Guaranteed length tolerances

Diameter 0.50 – 30.0 mm						
Nominal length [mm]	≥ 6 - 30	> 30 - 120	> 120 - 400	> 400 - 1000	> 1000 - 2000	> 2000
Length tolerance [mm]	± 0.2	± 0.3	± 0.5	± 0.8	± 1.2	± 2.0
Diameter > 30.0 mm						
Nominal length [mm]	≥ 6 - 30	> 30 - 120	> 120 - 400	> 400 - 1000	> 1000 - 2000	> 2000
Length tolerance [mm]	± 1.0	± 1.5	± 2.5	± 4.0	± 6.0	± 8.0



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## 2. Physical and mechanical product properties

### 2.1 Physical properties

<b>Density:</b>	0.50 - 40,00 mm = min. 10,15 g/cm <sup>3</sup>		
	41.00 - 80,00 mm = min. 10,10 g/cm <sup>3</sup>		
	81.00 - 120,00 mm = min. 10,00 g/cm <sup>3</sup>		
	121.00 - 165,00 mm = min. 9,90 g/cm <sup>3</sup>		
<b>Non destructive test:</b>	For diameters > 15.00 mm: 100 % ultrasonic testing (all types) For diameters of 0.50 – 50.00 mm: Eddy current tests on ground rods		
<b>Surface:</b>	<b>Pickled<sup>a</sup></b>	<b>Ground<sup>b</sup></b>	<b>Turned</b>
	Ø 0.50 - 165.00 mm	Ø 0.50 – 50.00 mm	Ø > 30.00 mm
<b>Roughness:</b>	<b>Diameter</b>	<b>R<sub>a</sub></b>	<b>R<sub>a</sub></b>
	[mm]	ground [µm]	turned [µm]
	≤ 2.50	≤ 0.80	–
	> 2.50 – 50.00	≤ 1.00	–
> 30.00	–	max. 3.2	

<sup>a</sup> Clean, dull surface

<sup>b</sup> The rods can also be offered with a centerless circular ground surface

### 2.2 Mechanical properties

Diameter [mm]	Tensile strength min. [MPa]	Yield strength min. [MPa]	Elongation min. [%]	Hardness [HV 10]
0.50 – 4.76	---	---	---	---
> 4.76 – 22.20	790	690	18	260 – 320
> 22.20 – 28.60	760	655	15	250 – 310
> 28.60 – 47.60	690	585	10	245 – 300
> 47.60 – 73.00	620	550	10	240 – 290
> 73.00 – 88.90	585	515	5	235 – 285
90.00 – 120.90	585	515	5	235 – 285
121.00 – 165.00	585	515	5	220 – 280



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### 3. Chemical composition

Main and minor components	PLANSEE		Standard / EU-Directive	
	Min. content [%]		ASTM B387/364	RoHS <sup>a</sup>
Mo Ti Zr	Balance 0.40 – 0.55 0.06 – 0.12		Balance 0.40 – 0.55 % 0.06 – 0.12 %	--- --- ---
Impurities	Max. values [µg/g]		Max. values [µg/g]	Max. values [µg/g]
	Typical	Guaranteed		
Al	1	10	---	---
Cr	3	20	---	---
Cu	2	20	---	---
Fe	5	20	100	---
K	6	20	---	---
Ni	1	10	50	---
Si	2	20	50	---
W	169	300	---	---

C	---	100 - 400	100 - 400	---
H	0	10	---	---
N	5	10	20	---
O	130	500	300	---

Cd	1	5	---	100
Hg *	0	1	---	1000
Pb	0	5	---	1000
Cr (VI)	The presence of Cr (VI) and organic impurities can be excluded definitely because of the production process (multiple heat treatment at temperatures above 1000 °C in H <sub>2</sub> -atmosphere).		---	1000
Organic impurities (e.g. PBB, PBDE, PFOS, PFOA)			---	1000

<sup>a</sup> EU-directives 2002/95/EC, 2000/53/EC and 2006/122/EC.

\* First-up

The chemical composition is continuously checked by means of random sampling. The sampling inspection plan, analysis and evaluation methods are determined in the internal instruction QA-QR-06-01. The application of the measured values for the chemical analysis is defined in QA-TA041.



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### 4. Packaging, labelling, storage and certification

#### 4.1 Packaging, labelling and storage

**Standard individual packing:** rods up to 6 mm diameter will be delivered in bundles, larger sizes will be packed individually.

**Special packing:** extra costs will be invoiced.

**Each package will be provided with a label with the following information:**

Producer's name:	<b>PLANSEE</b>
Plansee order number:	
Lot number:	
Material number:	
Material:	<b>TZM</b>
Dimension:	<b>Rod diameter and length</b>
Surface:	
Quantity:	<b>Total quantity in m or kg</b>
Date:	

**The TZM rods must be kept in a dry place and protected from mechanical damage.** It is best to keep the rods in their original packing until used.

**Special packing** should be used if the rods are stored under unusual conditions (aggressive atmosphere, sea air. ...).

#### 4.2 Certification

Following certificates will be supplied upon customer request according to EN 10 204:

- Test report 2.2
- Inspection certificate 3.1 (extra costs are charged)

### 5. Order instructions

Please quote following when ordering:

- Product description
- Quality (the number of this specification **must** be mentioned)
- Diameter
- Quantity (**m or kg**)
- Required certificate
- Special packing

For further information on our delivery possibilities, please look into our <http://www.plansee.com>



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## 6. International standards

International standards, applicable on this product: **ASTM-B 387**<sup>a</sup>

The standards applied for the test methods are listed in the PLANSEE-standard infobase and are made available upon request.

<sup>a</sup> **Except for following items, the requirements of the ASTM B 387 are met with this product specification:**

- Out-of-round tolerances in case of the quality „cleaned“ for diameters  $\geq 15$  mm
- Diameter tolerances in case of the quality “cleaned” for diameters 15.0 – 22.2 mm and 70.0 – 82.6 mm
- Length tolerances in case of  $L > 2000$  mm and  $\varnothing > 30$  mm

## 7. Changes to the version dated 2010-10-20

- Head of the document
- Item 3 Chemical composition (Fe-value)
- Item 6 International standards