

# ENGINEERED COMPONENTS

## Carbide Rods



Your supplier for tungsten carbide blanks

# Kennametal, The Wear Parts Experts

At Kennametal, we strive to offer our customers outstanding performance in everything we do.

As part of Kennametal, the round tool product business enables resources to help solve our customers' most complex wear and performance problems.

Kennametal provides high-performance cemented carbide blanks, with high accuracy in dimensions and metallurgical properties. This advantage ensures smooth and flawless processing for tool makers and highly automated drill and end mill manufacturing plants.

At Kennametal, we strive to increase productivity and decrease complexity to aid in our customers' successes.

Consistent metallurgical properties and dimensional accuracy have formed a strong reputation for Kennametal blanks all over the world. Kennametal has been a constant innovator in the field of hard metal blanks, and continues to develop new processes and materials to maintain a strong presence in the market.

Working closely with tool makers and tool users, Kennametal takes pride in our experience and commitment to new product development for the benefits of our customers. Our grades are made of high purity raw materials, ensuring consistency in the performance of the tools.

Our proprietary grades and binder phase formulations prevent staining and corrosion created by the working environments: air moisture, grinding coolant, etc. This optimises adhesion of PVD coatings used by many tool makers and ultimately the tool performance.



# Carbide Rods for Drills and End Mills

<b>Rods, Without Coolant Channel, Unground</b>	
∅ 1,2–32,3mm, Length 330 + 10mm .....	3–4
<b>Rods, Without Coolant Channel, h6 Ground</b>	
∅ 3,0–32,0mm, Length 330 + 10mm .....	5
<b>Rods, h6 Ground, in Fixed Lengths for End Mill Cutters</b>	
∅ 3,0–20,0mm, Diverse Lengths.....	6
<b>Rods, h5 Ground, in Fixed Lengths for End Mill Cutters</b>	
∅ 3,0–20,0mm, Length 100mm.....	7
<b>Rods With 2 Helical Coolant Channels, Unground</b>	
∅ 3,3–25,2mm, Length 330 + 10mm .....	8
<b>Rods With 3 Helical Coolant Channels, Unground</b>	
∅ 5,3–16,3mm, Length 330 + 10mm .....	9
<b>Rods With 2 Parallel Coolant Channels, Unground</b>	
∅ 4,3–25,3mm, Length 330 + 10mm .....	10
<b>Rods With 1 Central Coolant Channel, Unground</b>	
∅ 6,3–20,3mm, Length 330 + 10mm .....	11
<b>Technical Information .....</b>	<b>12</b>

*All above listed rods are also available upon request in special dimensions in inch sizes, as well as in other grades.*

## Classification of WC-Co-Grades

Grain size	German designation	English designation
<0,2 µm	Nano	Nano
0,2–0,5 µm	Ultrafein	Ultra fine
0,5–0,8 µm	Feinst	Submicron
0,8–1,3 µm	Fein	Fine
1,3–2,5 µm	Mittel	Medium
2,5–6,0 µm	Grob	Coarse
>6,0 µm	Extragrob	Extra coarse

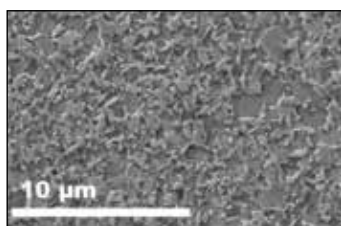
# Carbide Rods

## ■ Properties of WC-Co Submicron and Ultra Fine Grades

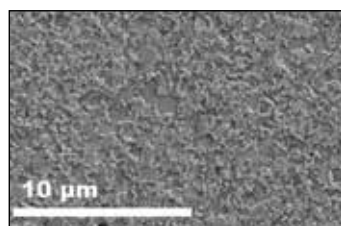
Description	THA-U	THM-F	KF1	KMS
<b>Application Range</b>				
(ISO 513)	K20	K10	K10	K30
<b>Composition (Weight %)</b>				
WC	86,7	91,8	93,7	89,3
Additional carbides	1,3	1,7	0,3	0,7
Co	12	6,5	6	10
<b>Density</b>				
(ISO 3369) g/cm <sup>3</sup>	14,1	14,8	14,9	14,4
<b>Vickers Hardness HV 30</b>				
(ISO 3878)	1660	1780	1740	1550
<b>Compressive Strength (Typical)</b>				
(ISO 4506) MPa	6800	6000	6000	5500
<b>Transverse Rupture Strength (Typical)</b>				
(ISO 3327) MPa	4500	3000	3700	4200
<b>Fracture Toughness</b>				
K <sub>1C</sub> * (MNm <sup>-3/2</sup> )	10,3	9,5	9,2	10,8
<b>Average</b>				
Grain size μm	Ultrafine	Submicron	Submicron	Submicron

\* The measured K<sub>1C</sub> factors depend on the sample geometry and sample preparation.  
A direct comparison with parameters which have been determined with different methods are therefore not admissible.

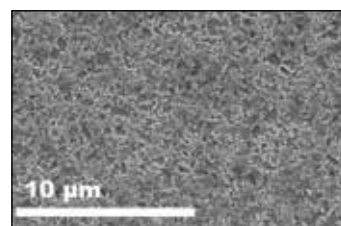
## ■ SEM-Structure Photos of WC-Co Grades with Different Grain Sizes



Fine



Submicron

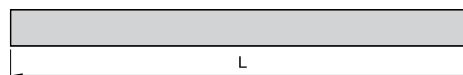


Ultra Fine



**Manufacturing tolerance**

Tolerance in diameter	1,2–5,7mm	+0,20mm
	6,2–9,7mm	+0,25mm
	10,2–14,7mm	+0,30mm
	15,2–25,2mm	+0,40mm
	26,3–31,3mm	+0,50mm
	32,3mm	+0,60mm
Tolerance in length	+10mm	



■ **Rods Without Coolant Channel, Unground**

part number	grade	Ø (mm)	length (mm)	concentricity (mm)
6308045	KMS	1,20	330	0,34
6308046	KMS	1,70	330	0,34
6308039	KMS	2,20	330	0,34
6308040	KMS	2,70	330	0,34
6308041	KMS	3,25	330	0,34
6308042	KMS	3,70	330	0,34
6308043	KMS	4,20	330	0,34
6308044	KMS	4,70	330	0,34
6308226	KMS	5,20	330	0,34
6308227	KMS	5,70	330	0,34
6308228	KMS	6,20	330	0,34
6308229	KMS	6,70	330	0,34
6308230	KMS	7,20	330	0,34
6308231	KMS	7,70	330	0,34
6308232	KMS	8,20	330	0,34
6308247	KMS	8,70	330	0,34
6308248	KMS	9,20	330	0,34
6308249	KMS	9,70	330	0,34
6308246	KMS	10,20	330	0,34
6308250	KMS	10,70	330	0,34
6308251	KMS	11,20	330	0,34
6308252	KMS	11,70	330	0,34
6308253	KMS	12,20	330	0,34
6308254	KMS	12,70	330	0,34
6308255	KMS	13,20	330	0,34
6308256	KMS	13,70	330	0,34
6308257	KMS	14,20	330	0,34
6308258	KMS	14,70	330	0,34
6308259	KMS	15,20	330	0,34
6308260	KMS	15,70	330	0,34
6308261	KMS	16,20	330	0,34
6308262	KMS	16,70	330	0,34
6308263	KMS	17,20	330	0,34
6308264	KMS	17,70	330	0,34
6308265	KMS	18,20	330	0,34
6308266	KMS	18,70	330	0,34
6308267	KMS	19,20	330	0,34
6308268	KMS	19,70	330	0,34
6308240	KMS	20,20	330	0,34
6308241	KMS	21,20	330	0,34
6308242	KMS	22,20	330	0,34
6308243	KMS	23,20	330	0,34
6308244	KMS	24,20	330	0,34
6308245	KMS	25,20	330	0,34
6308233	KMS	26,30	330	0,34
6308234	KMS	27,30	330	0,34
6308235	KMS	28,30	330	0,34
6308236	KMS	29,30	330	0,34
6308237	KMS	30,30	330	0,34
6308238	KMS	31,30	330	0,34
6308239	KMS	32,30	330	0,34

NOTE: Other grades and dimensions available upon request.  
For more availability information, please visit [kennametal.com](http://kennametal.com) or contact a representative.

### Manufacturing tolerance

Tolerance in diameter	1,2-5,7mm	+0,20mm
	6,2-9,7mm	+0,25mm
	10,2-14,7mm	+0,30mm
	15,2-25,2mm	+0,40mm
	26,3-31,3mm	+0,50mm
Tolerance in length	32,3mm	+0,60mm
		+10mm



### ■ Rods Without Coolant Channel, Unground

part number	grade	Ø (mm)	length (mm)	concentricity (mm)
6308047	THM-F	1,20	330	0,34
6308048	THM-F	1,70	330	0,34
6308049	THM-F	2,20	330	0,34
6308050	THM-F	2,70	330	0,34
6308051	THM-F	3,25	330	0,34
6308052	THM-F	3,70	330	0,34
6308053	THM-F	4,20	330	0,34
6308054	THM-F	4,70	330	0,34
6308055	THM-F	5,20	330	0,34
6308056	THM-F	5,70	330	0,34
6308057	THM-F	6,20	330	0,34
6308058	THM-F	6,70	330	0,34
6308059	THM-F	7,20	330	0,34
6308060	THM-F	7,70	330	0,34
6308061	THM-F	8,20	330	0,34
6308062	THM-F	8,70	330	0,34
6308063	THM-F	9,20	330	0,34
6308064	THM-F	9,70	330	0,34
6308065	THM-F	10,20	330	0,34
6308066	THM-F	10,70	330	0,34
6308067	THM-F	11,20	330	0,34
6308068	THM-F	11,70	330	0,34
6308069	THM-F	12,20	330	0,34
6308070	THM-F	12,70	330	0,34
6308071	THM-F	13,20	330	0,34
6308072	THM-F	13,70	330	0,34
6308073	THM-F	14,20	330	0,34
6308074	THM-F	14,70	330	0,34
6308075	THM-F	15,20	330	0,34
6308076	THM-F	16,20	330	0,34
6308077	THM-F	17,20	330	0,34
6308078	THM-F	18,20	330	0,34
6308079	THM-F	19,20	330	0,34
6308080	THM-F	20,20	330	0,34
6308081	THM-F	21,20	330	0,34
6308082	THM-F	22,20	330	0,34
6308083	THM-F	23,20	330	0,34
6308084	THM-F	24,20	330	0,34
6308085	THM-F	25,20	330	0,34
6308086	THM-F	26,30	330	0,34
6308087	THM-F	27,30	330	0,34
6308088	THM-F	28,30	330	0,34
6308089	THM-F	29,30	330	0,34
6308090	THM-F	30,30	330	0,34
6308091	THM-F	31,30	330	0,34
6308092	THM-F	32,30	330	0,34

NOTE: Other grades and dimensions available upon request.  
For more availability information, please visit [kenametal.com](http://kenametal.com) or contact a representative.

Manufacturing tolerance	
Tolerance in diameter h6	
Tolerance in length	+10mm
Surface finish	0,05

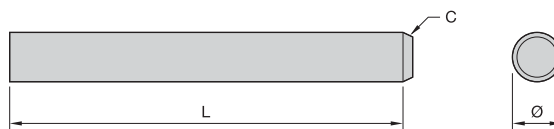


■ **Rods Without Coolant Channel, h6 Ground**

part number	grade	Ø (mm)	length (mm)	concentricity (mm)
6308093	KMS	3,0	330	0,20
6308094	KMS	3,5	330	0,20
6308095	KMS	4,0	330	0,20
6308096	KMS	4,5	330	0,20
6308287	KMS	5,0	330	0,20
6308288	KMS	6,0	330	0,15
6308289	KMS	7,0	330	0,15
6308290	KMS	8,0	330	0,15
6308291	KMS	9,0	330	0,15
6308292	KMS	10,0	330	0,15
6308315	KMS	11,0	330	0,15
6308316	KMS	12,0	330	0,15
6308317	KMS	13,0	330	0,15
6308318	KMS	14,0	330	0,15
6308319	KMS	15,0	330	0,15
6308320	KMS	16,0	330	0,15
6308322	KMS	17,0	330	0,15
6308323	KMS	18,0	330	0,15
6308324	KMS	19,0	330	0,15
6308298	KMS	20,0	330	0,15
6308299	KMS	21,0	330	0,15
6308293	KMS	22,0	330	0,15
6308294	KMS	23,0	330	0,15
6308295	KMS	24,0	330	0,15
6308296	KMS	25,0	330	0,15
6308297	KMS	26,0	330	0,15
6308300	KMS	27,0	330	0,15
6308311	KMS	28,0	330	0,15
6308312	KMS	29,0	330	0,15
6308313	KMS	30,0	330	0,15
6308314	KMS	32,0	330	0,15

NOTE: Other grades and dimensions available upon request.  
For more availability information, please visit [kennametal.com](http://kennametal.com) or contact a representative.

Manufacturing tolerance		
Tolerance in diameter h6		
Tolerance in length	3-8mm	+0,6mm
	9-10mm	+0,8mm
	10-18mm	+0,9mm
	20mm	+1mm
Surface finish	0,05	



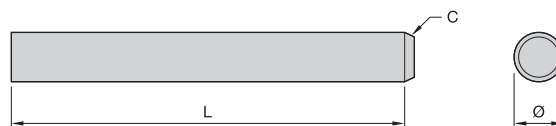
### ■ Rods, h6 Ground, in Fixed Length for End Mills According to DIN 6527/6528

part number	grade	Ø (mm)	length (mm)	chamfer (mm)
3493326	KMS	3,0	39,0	0,3 x 20°
3493328	KMS	4,0	51,0	0,4 x 20°
3493329	KMS	5,0	51,0	0,4 x 20°
3493330	KMS	6,0	51,0	0,4 x 20°
3494855	KMS	6,0	55,0	0,4 x 20°
3494856	KMS	6,0	58,0	0,4 x 20°
3494858	KMS	8,0	59,0	0,6 x 20°
3494859	KMS	8,0	64,0	0,6 x 20°
3494862	KMS	9,0	68,0	0,6 x 20°
3494864	KMS	10,0	67,0	0,6 x 20°
3494868	KMS	10,0	73,0	0,8 x 20°
3494869	KMS	12,0	76,0	0,8 x 20°
3494871	KMS	12,0	84,0	0,8 x 20°
3494872	KMS	14,0	76,0	0,8 x 20°
3494873	KMS	14,0	84,0	0,8 x 20°
3494874	KMS	16,0	83,0	0,8 x 20°
3494875	KMS	16,0	93,0	0,8 x 20°
3494876	KMS	18,0	85,0	1,0 x 20°
3494877	KMS	18,0	93,0	1,0 x 20°
3494879	KMS	20,0	105,0	1,0 x 20°

NOTE: Other grades and dimensions available upon request.  
For more availability information, please visit [kennametal.com](http://kennametal.com) or contact a representative.



Manufacturing tolerance	
Tolerance in diameter h5	
Tolerance in length	+1mm
Surface finish	0,05


**■ Rods, h5 Ground, in Fixed Length for End Mills According to DIN 6527/6528**

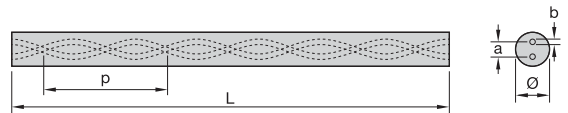
part number	grade	Ø (mm)	length (mm)	chamfer (mm)
3493219	KMS	3,0	100,0	0,3 x 20°
3493220	KMS	4,0	100,0	0,4 x 20°
3493292	KMS	5,0	100,0	0,4 x 20°
3493296	KMS	6,0	100,0	0,4 x 20°
3493316	KMS	8,0	100,0	0,6 x 20°
3493317	KMS	9,0	100,0	0,6 x 20°
3493318	KMS	10,0	100,0	0,8 x 20°
3493320	KMS	12,0	100,0	0,8 x 20°
3493321	KMS	14,0	100,0	0,8 x 20°
3493322	KMS	16,0	100,0	0,8 x 20°
3493324	KMS	18,0	100,0	1,0 x 20°
3519580	KMS	20,0	100,0	1,0 x 20°

NOTE: Other grades and dimensions available upon request.

For more availability information, please visit [kennametal.com](http://kennametal.com) or contact a representative.

**Manufacturing tolerance**

Tolerance in diameter	3,3–10,3mm	+0,30mm
	12,3–25,2 mm	+0,40mm
Tolerance in length	+10mm	



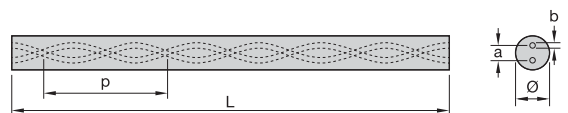
■ **Rods With 2 Helical Coolant Channels, Unground**

part number	grade	Ø (mm)	length (mm)	int. Ø a (mm)	hole Ø b (mm)	pitch (mm)	degree of pitch
6308097	KMS	3,3	330	1,39	0,35	16,32	30,0
6308098	KMS	3,3	330	1,60	0,42	16,32	30,0
6308099	KMS	4,3	330	1,86	0,50	21,75	30,0
6308100	KMS	4,3	330	2,12	0,56	21,75	30,0
6308101	KMS	5,3	330	2,20	0,64	27,21	30,0
6308102	KMS	5,3	330	2,65	0,77	27,21	30,0
6308103	KMS	6,3	330	1,60	0,50	18,00	46,2
6308104	KMS	6,3	330	1,90	0,60	23,00	39,2
6308105	KMS	6,3	330	2,20	0,70	32,65	30,0
6308106	KMS	8,3	330	3,30	1,00	35,00	35,4
6308107	KMS	8,3	330	3,30	1,00	43,50	30,0
6308108	KMS	10,3	330	4,40	1,15	46,00	34,2
6308109	KMS	10,3	330	4,80	1,30	54,40	30,0
6308110	KMS	12,3	330	5,40	1,50	57,00	33,3
6308111	KMS	12,3	330	6,30	1,70	65,30	30,0
6308112	KMS	14,3	330	7,00	2,00	76,20	30,0
6308269	KMS	16,20	330	8,20	2,24	89,20	30,0
6308270	KMS	16,20	330	4,80	1,44	69,00	36,0
6308281	KMS	18,20	330	9,60	2,24	100,00	30,0
6308282	KMS	18,20	330	5,60	1,60	77,00	36,0
6308283	KMS	20,20	330	10,80	2,40	11 1,00	30,0
6308284	KMS	20,20	330	6,30	1,76	86,00	36,0
6308285	KMS	25,20	330	14,00	3,20	136,00	30,0
6308286	KMS	25,20	330	7,90	2,24	108,00	36,0

NOTE: Other grades and dimensions available upon request.  
For more availability information, please visit [kennametal.com](http://kennametal.com) or contact a representative.

**Manufacturing tolerance**

Tolerance in diameter	3,3–10,3mm	+0,30mm
	+10mm	
Tolerance in length		



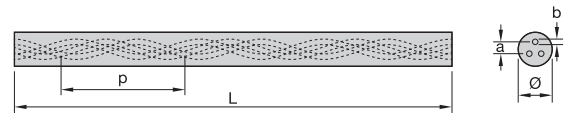
■ **Rods With 2 Helical Coolant Channels, Unground**

part number	grade	Ø (mm)	length (mm)	int. Ø a (mm)	hole Ø b (mm)	pitch (mm)	degree of pitch
6308124	THA-U	3,3	330	1,39	0,35	16,32	30,0
6308125	THA-U	4,3	330	1,78	0,42	21,77	30,0
6308126	THA-U	5,3	330	2,25	0,49	27,21	30,0
6308127	THA-U	6,3	330	2,72	0,70	32,65	30,0
6308128	THA-U	7,3	330	3,27	0,85	38,09	30,0
6308129	THA-U	8,3	330	3,68	0,99	43,53	30,0
6308130	THA-U	9,3	330	4,16	1,13	48,97	30,0
6308131	THA-U	10,3	330	4,63	1,44	54,41	30,0

NOTE: Other grades and dimensions available upon request.  
For more availability information, please visit [kennametal.com](http://kennametal.com) or contact a representative.

**Manufacturing tolerance**

Tolerance in diameter	5,3–10,3mm	+0,30mm
	11,3–16,3mm	+0,40mm
Tolerance in length	+10mm	

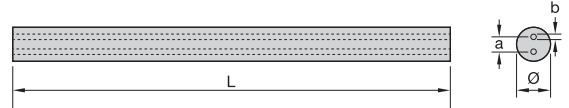

**■ Rods With 3 Helical Coolant Channels, Unground**

part number	grade	Ø (mm)	length (mm)	int. Ø a (mm)	hole Ø b (mm)	pitch (mm)	degree of pitch
6308113	KMS	5,3	330	2,90	0,42	27,21	30,0
6308114	KMS	6,3	330	3,50	0,56	32,65	30,0
6308115	KMS	7,3	330	4,00	0,63	38,09	30,0
6308116	KMS	8,3	330	4,50	0,63	43,50	30,0
6308117	KMS	10,3	330	5,70	0,84	54,40	30,0
6308118	KMS	11,3	330	6,00	1,05	59,86	30,0
6308119	KMS	12,3	330	6,25	1,25	65,30	30,0
6308120	KMS	13,3	330	6,50	1,25	70,74	30,0
6308121	KMS	14,3	330	7,10	1,40	76,20	30,0
6308122	KMS	15,3	330	7,70	1,40	81,62	30,0
6308123	KMS	16,3	330	8,30	1,40	87,10	30,0

NOTE: Other grades and dimensions available upon request.

For more availability information, please visit [kennametal.com](http://kennametal.com) or contact a representative.

Manufacturing tolerance		
Tolerance in diameter	6,3–10,3mm	+0,30mm
	12,3–18,3mm	+0,40mm
	20,3mm	+0,50mm
Tolerance in length	+10mm	

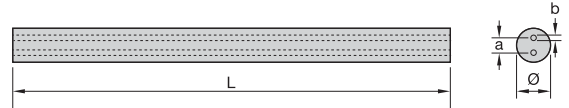


■ **Rods With 2 Parallel Coolant Channels, Unground**

part number	grade	Ø (mm)	length (mm)	int. Ø a (mm)	hole Ø b (mm)
6308132	KMS	8,3	330	3,02	1, 12
6308133	KMS	8,3	330	3,65	1,28
6308134	KMS	10,3	330	4,22	1,44
6308135	KMS	12,3	330	5,67	1,60
6308136	KMS	14,3	330	7,06	1,84
6308137	KMS	16,3	330	8,52	2,00
6308215	KMS	18,3	330	9,92	2,24
6308216	KMS	20,3	330	11,32	2,48

NOTE: Other grades and dimensions available upon request.  
For more availability information, please visit [kennametal.com](http://kennametal.com) or contact a representative.

Manufacturing tolerance		
Tolerance in diameter	4,3–10,3mm	+0,30mm
	12,3–18,25mm	+0,40mm
	20,25–25,3mm	+0,50mm
Tolerance in length	+10mm	



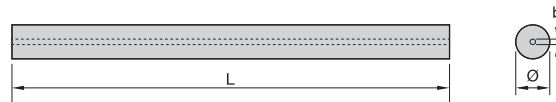
■ **Rods With 2 Parallel Coolant Channels, Unground**

part number	Grade	Ø (mm)	length (mm)	int. Ø a (mm)	hole Ø b (mm)
6308037	THM-F	4,3	330	1,50	0,90
6308034	THM-F	6,3	330	1, 10	0,50
6308015	THM-F	6,3	330	2,00	0,90
6308038	THM-F	6,3	330	3,00	0,90
6308016	THM-F	8,3	330	2,00	0,90
6308017	THM-F	8,3	330	3,60	1,20
6308018	THM-F	10,3	330	2,60	1,20
6308019	THM-F	10,3	330	4,00	1,50
6308020	THM-F	12,3	330	3,50	1,50
6308031	THM-F	12,3	330	5,00	2,00
6308032	THM-F	14,3	330	5,00	2,00
6308035	THM-F	14,3	330	7,00	1,70
6308036	THM-F	16,3	330	5,00	2,00
6308033	THM-F	16,3	330	8,00	2,70
6308325	KF1	18,3	330	9,92	2,24
6308326	KF1	18,3	330	5,60	1,60
6308328	KF1	20,3	330	11,32	2,48
6308329	KF1	20,3	330	6,34	1,84
6308330	KF1	21,3	330	13,01	2,48
6308331	KF1	21,3	330	6,84	1,84
6308333	KF1	22,3	330	13,51	2,80
6308334	KF1	22,3	330	7,25	2,00
6308335	KF1	25,3	330	13,85	3,20
6308336	KF1	25,3	330	7,74	2,24

NOTE: Other grades and dimensions available upon request.  
For more availability information, please visit [kennametal.com](http://kennametal.com) or contact a representative.

**Manufacturing tolerance**

<b>Tolerance in diameter</b>	6,3–10,3mm	+0,30mm
	12,3–18,3mm	+0,40mm
	20,3mm	+0,50mm
<b>Tolerance in length</b>	+10mm	



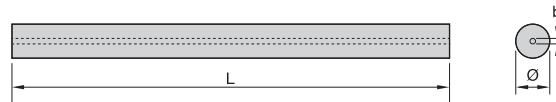
■ **Rods With 1 Central Coolant Channel, Unground**

part number	grade	Ø (mm)	length (mm)	hole Ø b (mm)
6308220	KF1	6,3	330	1,00
6308222	KF1	8,3	330	1,30
6308218	KF1	10,3	330	2,00
6308140	KF1	12,3	330	2,00
6308223	KF1	14,3	330	2,00
6308224	KF1	16,3	330	2,00
6308225	KF1	18,3	330	2,00
6308221	KF1	20,3	330	3,00

NOTE: Other grades and dimensions available upon request.  
For more availability information, please visit [kennametal.com](http://kennametal.com) or contact a representative.

**Manufacturing tolerance**

<b>Tolerance in diameter</b>	6,3–10,3mm	+0,30mm
	12,3–18,3mm	+0,40mm
	20,3mm	+0,50mm
<b>Tolerance in length</b>	+10mm	



■ **Rods With 1 Central Coolant Channel, Unground**

part number	grade	Ø (mm)	length (mm)	hole Ø b (mm)
6308211	KMS	6,3	330	1,00
6308139	KMS	8,3	330	1,30
6308138	KMS	10,3	330	2,00
6308212	KMS	12,3	330	2,00
6308213	KMS	14,3	330	2,00
6308214	KMS	16,3	330	2,00
6308219	KMS	18,3	330	2,00
6308217	KMS	20,3	330	3,00

NOTE: Other grades and dimensions available upon request.  
For more availability information, please visit [kennametal.com](http://kennametal.com) or contact a representative.

## Properties of Cemented Carbide

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Tungsten carbide blanks are made of a combination of hard and wear-resistant particles of different sizes (tungsten carbide WC) mixed and bonded together by a ductile metal (cobalt, nickel, chromium, iron). Minor alloying additions are sometimes necessary to address specific properties for best performance in a given application. Very accurately composed mixes, combined with specific sintering processes, will round out the final mechanical properties of the products.

Hardness and toughness of the sintered material, especially at higher temperatures, are the key characteristics for optimal performance of carbide round tools. These properties are the result of a fine balance between the WC grain sizes and the binder content.

Hardness (ASTM B-294/ISO 3738 and 3878) is defined as the resistance of a material to indentation by a diamond indenter. It is commonly tested in the Vickers system with a load of 30 kgs (HV30).

Strength (ASTM B-406/ISO 3327) is expressed in Transverse Rupture Strength (TRS). It is a measure of the stress at the breaking point of the material in a simple 3-point bending test.

High hardness equates to better abrasive wear resistance, but is generally achieved at the expense of toughness. The optimisation between hardness and toughness is a fine balance between WC grain size distribution and binder phase volume composition. Using the best carbide blank substrate, as well as combining with the optimal coating, is key to maximising the tool performance for end users. Kennametal technology, with the heritage of the Hertel and WIDIA™ grades, has pioneered many products and manufacturing process developments over the last 80 years.

Homogeneity and consistency over time of the micro structure is also critical for quality and reliability of the end product. The results are the well-known Kennametal grades optimised with the cooperation of tool makers and end users worldwide. Ask your Kennametal sales engineer for the optimised grade specification for your rotary tool applications (end mills, drills, and reamers).

## Dimensional characteristics and control

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Geometric characteristics are defined in the ANSI Y14.5M-1982 norm.

Straightness, roundness, and cylindricity are captured in the measure of specific circular runout. The blanks are placed in fixtures and rotate 360°, with indicators placed in specific positions.

Surface finish: For ground blanks, the surface finish is defined in Ra (deviation from the mean line over a specified length). The general values range from Ra 0.05 (polished) to Ra 0.45 (rough ground). The characteristics of the surface finish, within the above listed range, is independent from the tolerance on the diameter of the blanks.

## Quality

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Our Kennametal plants are certified  
DIN EN ISO 9001-2000 and VDA6.4-2004.





# Carbide Rods

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