GÜHRING

Solid carbide circular segment milling cutter G-Mold 55 CS

Efficient finishing on 5-axis machines

G-Mold 55 CS

Efficient 3D line-by-line machining of surfaces and contours

Up to 80 % faster machining or 10 times better surfaces

If you are finishing large, flat surfaces and contours on a 5-axis machine and rely on ball nose cutters, you are missing out on significant cost-saving potentials.

The special geometry of circular segment milling cutters is characterized by significantly larger radii, thereby enabling much larger line jumps during finishing.

INDUSTRIES & APPLICATIONS:

- **Aerospace**
  e. g., turbine blades and impeller blades
- **Mould and die**
  e. g., form inserts and slide guides
- **Medical sector**
  e. g., implants

X 80 % faster machining

X or **10 times better surface finish**

face radius with 4 cutting edges
up to the center

large working radii
with line shape ± 0.01 mm

unequal blade pitch
for maximum running smoothness

Perrox HiPIMS coating
for maximum tool lives up to 55 HRC

Application example

Component:	injection moulding form insert, heat-treated tool steel 1.2311 (1050 N/mm²)	
Tool:	#6932, Ø 10 mm	
Customer goal:	reduced machining time with improved surface quality	
Difficulty:	deep contour (up to 280 mm) with steep form angle, long projection (363 mm), and minimal stock removal (0.1 mm)	
Cutting data:	**Gühring** v_f 3,000 mm/min a_p 1 mm	**Competitor** v_f 1,500 mm/min a_p 0.1 mm
Surface:	R_z 1.8µm	R_z 2.5 µm
Machining time:	68 min	420 min

In comparison

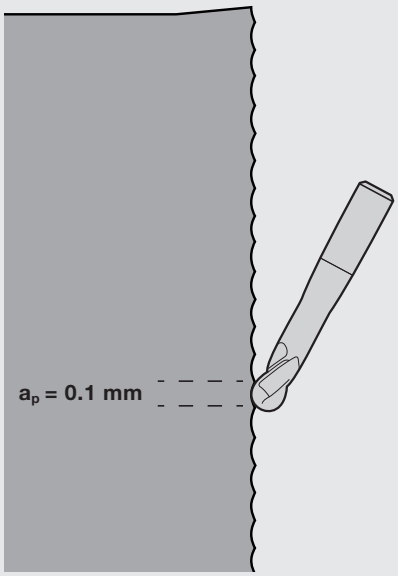
Circular segment milling cutter vs. ball nose cutter

Ball nose cutters and circular segment milling cutters are proven tools for machining complex geometries. While the ball nose cutter is considered the standard, the circular segment milling cutter opens up new possibilities thanks to its geometry.

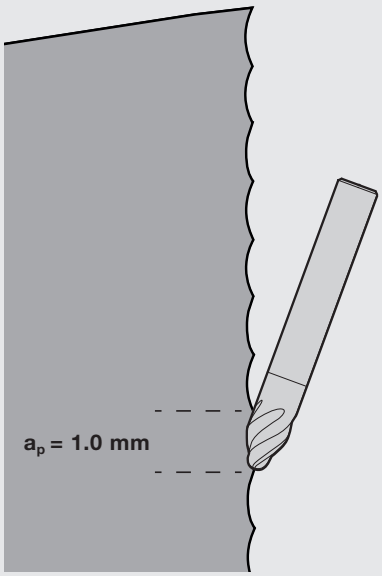
Larger line breaks with the circular segment milling cutter

Compared to ball nose cutters, circular segment milling cutters have a larger contact area with the component. The significantly larger radius allows for a greater path spacing during line-by-line machining.

Ball nose cutter



Circular segment milling cutter



up to 10 times larger line spacing size!

The differences at a glance

When is it worth switching to a circular segment milling cutter? The following overview shows the differences in a direct comparison – for the perfect tool selection depending on the application.

Tool	**Ball nose cutter** **The universal copying specialist**	**Circular segment milling cutter** **Maximum efficiency in finishing**
Advantages	Versatile for use in profile milling of variable free-form surfaces	Fast & clean line-by-line machining of uniform surfaces
Application	Profile milling & finishing of complex, non-separable form contours & free-form surfaces	First finishing, finishing, and fine finishing of surfaces of different sizes, including uniform standard & 3D surfaces
Maximum step size a_p	**1 % of the diameter** during finishing	**10 % of the diameter** during finishing
Possible work angles	Variable: **from 0°– 90°**	Defined: **1–10° / 20° / 40°**
Requirements	3-5-axis machining universal CAM application	3 + 2 tilted & 5-axis machining specialized CAM application
Limitations	Time-consuming when machining surfaces of large sizes, rough surfaces	Not suitable for complex, variable shape contours without clearly definable sub-surfaces
Gühring product recommendation	**Ball nose end mill** **G-Mold 55 B**	**Circular segment milling cutter** **G-Mold 55 CS**

Gühring covers the entire process

In particular, complex CAM programming often poses a hurdle in practice – and leads to the use of inefficient ball nose cutters despite significant potential savings.

As a manufacturer, we bring together all the expertise surrounding the use of circular segment milling cutters – and are here to assist you personally from tool selection and programming all the way to the finished component.

4 steps to success

Your journey with Gühring

Would you like to benefit from the potential savings of our circular segment milling cutters? Or are you unsure whether the necessary requirements are met? Get advice for free from Gühring now.

01 Non-binding consultation

Send us information about your component, the application, and your machine. We will assess on a case-by-case basis whether and to what extent switching to a circular segment milling cutter is worthwhile for you.

02 Process design

Our team of experts analyses your process and provides you with the success factors for your desired result:

- Powerful circular segment milling cutter tailored to your application
- Reliable clamping system for secure tool holding & collision-free machining operations
- Optimal machining strategy & cutting parameters for the desired result
- Tailor-made CAM programming – our experienced programmers support you

03 Process optimization with on-site support

You carry out the initial trials using the customized recommendations. If the results do not yet meet your expectations, we are here for you. Our application technicians will also support you in person on-site if needed and work with you to make adjustments until the process runs smoothly.

04 Optimal results

Depending on your objectives, we achieve measurable results:

x Faster machining

up to 80% time savings with the same surface quality

or:

x Better surfaces

up to 10 times better surface quality with the same machining time

Schedule now!

Contact your **personal Gühring representative** or **g-mold@guehring.de** for a non-binding consultation.

Find the right tool

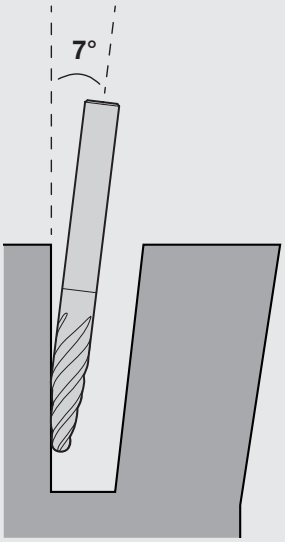
All circular segment milling cutters G-Mold 55 CS at a glance

Tool and clamping device selection made easy:
Here, you will find our programme for circular segment cutters and recommendations for suitable clamping systems. Detailed tool data follows on the next pages, information on the clamping systems can be found in the Gühring Online Shop.

General product information for all three models:

- Material suitability up to 55 HRC: 

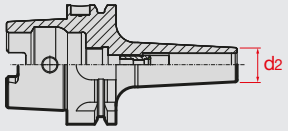
- Surface with Perrox HiPIMS coating
- Number of teeth = 4 with uneven pitch



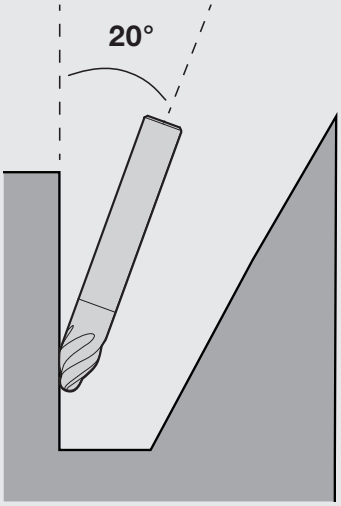
Teardrop shape, 7° (1° – 10°) #6931

Dimensions Milling cutter d1 (Ø)	Recommended clamping system (Clamping system dimension d2)
6 mm	d2 = 12 mm
8 mm	d2 = 14 mm
10 mm	d2 = 16 mm
12 mm	d2 = 18 mm

Shrink fit chuck
(slim design)



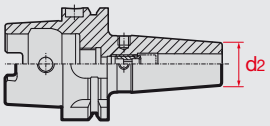
HSK-A: #4787 | SK: #4788 | Extension: #4719



Tapers, 20° #6932

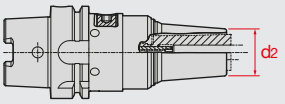
Dimensions Milling cutter d1 (Ø)	Recommended clamping system (Clamping system dimension d2)
6 mm	d2 = 21 mm
8 mm	d2 = 21 mm
10 mm	d2 = 24 mm
12 mm	d2 = 32 mm
16 mm	d2 = 32 mm

Shrink fit chuck

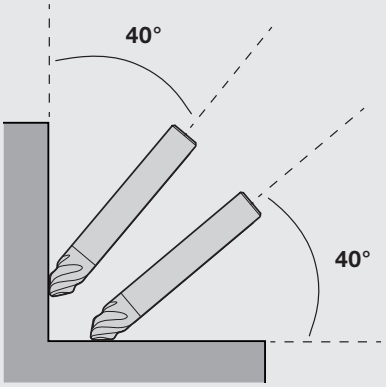


HSK-A: #4736 | SK: #4738 | MAS-BT: #4739

HPC clamping chuck



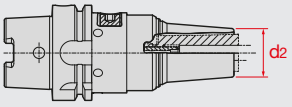
HSK-A: #4300 | SK: #4301 | MAS-BT: #4244



Tapers, 40°#6933

Dimensions Milling cutter d1 (Ø)	Recommended clamping system (Clamping system dimension d2)
10 mm	d2 = 40 mm
12 mm	d2 = 40 mm
16 mm	d2 = 40 mm

HPC clamping chuck



HSK-A: #4300 | SK: #4301 | MAS-BT: #4244

Circular segment milling cutter G-Mold 55 CS

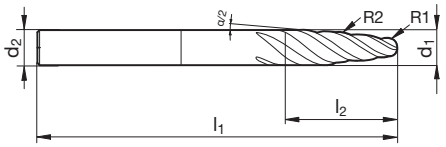
Article no. **6931**

cutting data see page 160

VHM | N | WN | 27° | 4 | HA | R ±0,01 | 3° | 55 HRC

P	M	K	N	S	H
●	●			●	●

Tangential mould, work angle α/2 = 7° • Reduced processing time due to large line widths • Large working radii R2 produce the best surfaces • 4 face cutting edges up to the centre



Article no. **6931**

d1 mm	d2 h5 mm	l1 mm	l2 mm	R1 mm	R2 mm	α /2 °	Z	Order no.
6.0	6.0	65	18.5	1.5	100.0	7.0	4	6931 6.000
8.0	8.0	75	25.0	2.0	133.6	7.0	4	6931 8.000
10.0	10.0	80	31.6	2.5	167.0	7.0	4	6931 10.000
12.0	12.0	100	38.1	3.0	200.0	7.0	4	6931 12.000

Circular segment milling cutter G-Mold 55 CS

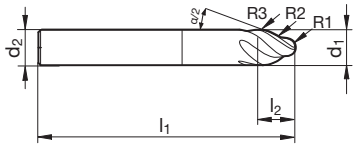
Article no. **6932**

cutting data see page 160

VHM | X | N | WN | 22° | 4 | HA | R ±0,01 | 3° | 55 HRC

P	M	K	N	S	H
●	●			●	●

Taper, work angle α/2 = 20° • Reduced processing time due to large line widths • Large working radii R2 produce the best surfaces • 4 face cutting edges up to the centre



Article no. **6932**

d1 mm	d2 h5 mm	l1 mm	l2 mm	R1 mm	R2 mm	R3 mm	α /2 °	Z	Order no.
6.0	6.0	57	7.0	1.5	200	3.0	20.0	4	6932 6.000
8.0	8.0	63	9.4	2.0	350	4.0	20.0	4	6932 8.000
10.0	10.0	72	11.8	2.5	500	5.0	20.0	4	6932 10.000
12.0	12.0	83	14.1	3.0	700	6.0	20.0	4	6932 12.000
16.0	16.0	92	20.8	3.0	1000	8.0	20.0	4	6932 16.000

Circular segment milling cutter G-Mold 55 CS

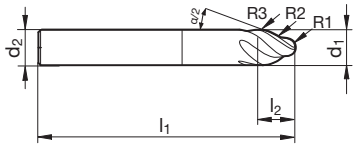
Article no. **6933**

cutting data see page 160

VHM | X | N | WN | 22° | 4 | HA | R ±0,01 | 3° | 55 HRC

P	M	K	N	S	H
●	●			●	●

Taper, work angle α/2 = 40° • Reduced processing time due to large line widths • Large working radii R2 produce the best surfaces • 4 face cutting edges up to the centre



Article no. **6933**

d1 mm	d2 h5 mm	l1 mm	l2 mm	R1 mm	R2 mm	R3 mm	α /2 °	Z	Order no.
10.0	10.0	72	6.8	1.5	500	2.0	40.0	4	6933 10.000
12.0	12.0	83	8.3	2.0	700	3.0	40.0	4	6933 12.000
16.0	16.0	92	10.9	3.0	1000	4.0	40.0	4	6933 16.000

Perfect 3D finishing in aluminium

Are you machining a non-ferrous metal component with large free-form surfaces? Upon request, we can quickly manufacture a circular segment milling cutter for you with our proven Carbo+ coating – ideal for finishing aluminium components.

Make an enquiry now with your personal contact or via email at g-mold@guehring.de!

Circular segment milling cutter G-Mold 55 CS

Milling conditions:

HSC stable machining conditions, shallow cutting depths, high cutting data

long tools

clamped in short tool holders $l_1 \leq 100$ mm

Correction factors:

medium-length tools — v_c -25 % f_z -25 %

clamped in long tool holders $l_1 > 100 – 160$ mm — v_c -25 % f_z -25 %

clamped in very long tool holders $l_1 > 160$ mm — a_p, a_e, v_c, f_z -40 %

Machining group	Application	v_c (m/min)	a_p max.	a_e max.	f_z (mm) with nom. Ø 6	8	10	12	16
P1.1.1 Unalloyed steel, annealed, 0.15 % C, Rm 420 N/mm², 125 HB **P1.1.2** Unalloyed steel, heat-treated, 0.15 % C, Rm 420 N/mm², 125 HB **P1.1.3** Unalloyed steel, annealed, 0.45 % C, Rm 640 N/mm², 190 HB **P1.1.4** Unalloyed steel, heat-treated, 0.45 % C, Rm 640 N/mm², 190 HB **P1.1.5** Unalloyed steel, heat-treated, 0.45 % C, Rm 850 N/mm², 250 HB **P1.1.6** Unalloyed steel, annealed, 0.75 % C, Rm 915 N/mm², 270 HB **P1.1.7** Unalloyed steel, heat-treated, 0.75 % C, Rm 1020 N/mm², 300 HB	first-finishing	370	0.5xD	0.05xD	0,105	0,140	0,175	0,210	0,280
	finishing	370	0.25xD	0.02xD	0,090	0,120	0,155	0,185	0,245
	Fine finishing	370	0.1xD	0.005xD	0,050	0,070	0,085	0,105	0,140
P2.1.1 Low-alloy steel, annealed, Rm 610 N/mm², 180 HB **P2.1.2** Low-alloy steel, heat-treated, Rm 930 N/mm², 275 HB **P2.1.3** Low-alloy steel, heat-treated, Rm 1020 N/mm², 300 HB **P2.1.4** Low-alloy steel, heat-treated, Rm 1190 N/mm², 350 HB	first-finishing	370	0.5xD	0.05xD	0,105	0,140	0,175	0,210	0,280
	finishing	370	0.25xD	0.02xD	0,090	0,120	0,155	0,185	0,245
	Fine finishing	370	0.01xD	0.005xD	0,050	0,070	0,085	0,105	0,140
P3.1.1 High-alloy steel and tool steel, annealed, Rm 680 N/mm², 200 HB **P3.1.2** High-alloy steel and tool steel, hardened and tempered, Rm 1100 N/mm², 325 HB	first-finishing	320	0.5xD	0.05xD	0,100	0,135	0,165	0,200	0,265
	finishing	320	0.25xD	0.02xD	0,085	0,115	0,145	0,175	0,235
	Fine finishing	320	0.01xD	0.005xD	0,050	0,065	0,085	0,100	0,135
M1.1.1 Stainless steel, ferritic/martensitic, with machining additives **M1.1.2** Stainless steel, ferritic/martensitic, annealed, Rm 680 N/mm², 200 HB	first-finishing	270	0.5xD	0.05xD	0,095	0,125	0,160	0,190	0,255
	finishing	270	0.25xD	0.02xD	0,085	0,110	0,140	0,165	0,220
	Fine finishing	270	0.01xD	0.005xD	0,045	0,065	0,080	0,095	0,125
M1.1.3 Stainless steel, ferritic/martensitic, heat-treated, Rm 810 N/mm², 240 HB	first-finishing	200	0.5xD	0.05xD	0,085	0,115	0,145	0,170	0,230
	finishing	200	0.25xD	0.02xD	0,075	0,100	0,125	0,150	0,200
	Fine finishing	200	0.01xD	0.005xD	0,045	0,055	0,070	0,085	0,115
M2.1.1 Stainless steel, austenitic, quenched, 180 HB	first-finishing	175	0.5xD	0.05xD	0,090	0,120	0,150	0,180	0,240
	finishing	175	0.25xD	0.02xD	0,080	0,105	0,130	0,155	0,210
	Fine finishing	175	0.01xD	0.005xD	0,045	0,060	0,075	0,090	0,120
M2.2.1 Duplex steel, high-strength stainless steels	first-finishing	130	0.5xD	0.05xD	0,080	0,105	0,130	0,155	0,210
	finishing	130	0.25xD	0.02xD	0,070	0,090	0,115	0,140	0,185
	Fine finishing	130	0.01xD	0.005xD	0,040	0,050	0,065	0,080	0,105
K1.1.1 Grey cast iron, pearlitic/ferritic, 180 HB **K1.1.2** Grey cast iron, pearlitic/martensitic, 260 HB **K1.2.1** Cast iron with spheroidal graphite, ferritic, 160 HB **K1.2.2** Cast iron with spheroidal graphite, pearlitic, 250 HB									
K1.3.1 Malleable cast iron, ferritic, 130 HB **K1.3.2** Malleable cast iron, pearlitic, 230 HB									
K2.1.1 Vermicular graphite cast iron (GJV) **K2.2.1** Austenitic-ferritic spheroidal graphite cast iron (ADI)									
N1.1.1 Wrought aluminium alloys, non-hardened, 60 HB **N1.1.2** Wrought aluminium alloys, hardened, 100 HB									
N2.1.1 Aluminium casting alloys, non-hardened, ≤ 12 % Si, 75 HB **N2.1.2** Aluminium casting alloys, hardened, ≤ 12 % Si, 90 HB									
N2.1.3 Aluminium casting alloys, non-hardened, > 12 % Si, 130 HB									

All the values stated are guide values. You can find detailed cutting values online in our Gühring Navigator at webnavigator.guehring.de/en.

Machining group	Application	v_c (m/min)	a_p max.	a_e max.	f_z (mm) with nom. Ø				
					6	8	10	12	16
N3.1.1 Copper and copper alloys: Free-machining alloy, Pb > 1 % **N3.1.2** Copper and copper alloys: CuZn, CuSnZn									
N3.1.3 Copper and copper alloys: CuSn, lead-free copper and copper electrolyte									
N4.1.1 Non-metallic materials: Duroplastics, fibre-reinforced plastics									
N4.1.2 Non-metallic materials: Hard rubber, wood, etc.									
N4.1.3 Non-metallic materials: Graphite									
S1.1.1 Heat-resistant alloys, Fe-based, annealed, 200 HB	first-finishing	85	0.5xD	0.05xD	0,085	0,115	0,140	0,170	0,225
	finishing	85	0.25xD	0.02xD	0,075	0,100	0,125	0,150	0,200
	Fine finishing	85	0.01xD	0.005xD	0,040	0,055	0,070	0,085	0,115
S1.1.2 Heat-resistant alloys, Fe-based, hardened, 280 HB	first-finishing	75	0.5xD	0.05xD	0,085	0,115	0,140	0,170	0,225
	finishing	75	0.25xD	0.02xD	0,075	0,100	0,125	0,150	0,200
	Fine finishing	75	0.01xD	0.005xD	0,040	0,055	0,070	0,085	0,115
S1.1.3 Heat-resistant alloys, Ni- or Co-based, annealed, 250 HB	first-finishing	50	0.5xD	0.05xD	0,070	0,090	0,115	0,140	0,185
	finishing	50	0.25xD	0.02xD	0,060	0,080	0,100	0,120	0,160
	Fine finishing	50	0.01xD	0.005xD	0,035	0,045	0,055	0,070	0,090
S1.1.4 Heat-resistant alloys, Ni- or Co-based, hardened, 350 HB	first-finishing	35	0.5xD	0.05xD	0,065	0,085	0,110	0,130	0,175
	finishing	35	0.25xD	0.02xD	0,055	0,075	0,095	0,115	0,150
	Fine finishing	35	0.01xD	0.005xD	0,035	0,045	0,055	0,065	0,085
S1.1.5 Heat-resistant alloys, Ni- or Co-based, cast, 320 HB	first-finishing	45	0.5xD	0.05xD	0,070	0,090	0,115	0,140	0,185
	finishing	45	0.25xD	0.02xD	0,060	0,080	0,100	0,120	0,160
	Fine finishing	45	0.01xD	0.005xD	0,035	0,045	0,055	0,070	0,090
S2.1.1 Titanium alloys, pure titanium, Rm 400 N/mm²	first-finishing	170	0.5xD	0.05xD	0,100	0,135	0,170	0,205	0,275
	finishing	170	0.25xD	0.02xD	0,090	0,120	0,150	0,180	0,240
	Fine finishing	170	0.01xD	0.005xD	0,050	0,070	0,085	0,100	0,135
S2.1.2 Titanium alloys, Alpha and Beta alloys, hardened, Rm 1050 N/mm²	first-finishing	145	0.5xD	0.05xD	0,090	0,125	0,155	0,185	0,245
	finishing	145	0.25xD	0.02xD	0,080	0,105	0,135	0,160	0,215
	Fine finishing	145	0.01xD	0.005xD	0,045	0,060	0,075	0,090	0,125
H1.1.1 Hardened steel, hardened and tempered, < 55 HRC	first-finishing	150	0.5xD	0.05xD	0,075	0,100	0,125	0,150	0,200
	finishing	150	0.25xD	0.02xD	0,065	0,085	0,110	0,130	0,175
	Fine finishing	150	0.01xD	0.005xD	0,035	0,050	0,060	0,075	0,100
H1.1.2 Hardened steel, hardened and tempered, < 60 HRC									
H1.1.3 Hardened steel, hardened and tempered, > 60 HRC									
H2.1.1 Chilled cast iron, 400 HB	first-finishing	185	0.5xD	0.05xD	0,070	0,095	0,120	0,145	0,195
	finishing	185	0.25xD	0.02xD	0,065	0,085	0,105	0,125	0,170
	Fine finishing	185	0.01xD	0.005xD	0,035	0,050	0,060	0,070	0,095
H2.1.2 Chilled cast iron, hardened and tempered, < 55 HRC	first-finishing	135	0.5xD	0.05xD	0,065	0,085	0,105	0,130	0,170
	finishing	135	0.25xD	0.02xD	0,055	0,075	0,095	0,115	0,150
	Fine finishing	135	0.01xD	0.005xD	0,030	0,045	0,055	0,065	0,085

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