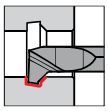
Cutting insert for internal pre-grooving and chamfering

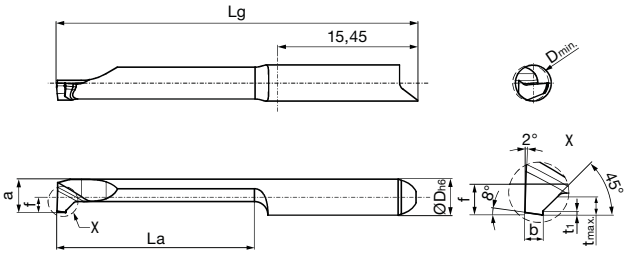


- **45° chamfer**

for tool holders type GH104/GB104 see from page 16

Cutting data page 148

Tool material	Solid carbide		
Type	GV 104	GV 104	GV 104
Surface	S	a	
	TiN	TiAlN-nanoA	bright



Right hand version shown
Left hand version mirror image

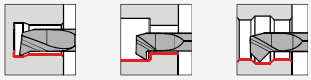
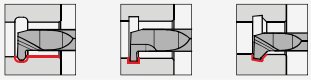
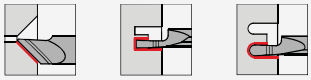
Series no.	25140	25142	25146
Cutting direction	R	R	R

Code no.	Description	D min	b	f	t1	a	t max	La	Lg	D h6
		mm	mm	mm	mm	mm	mm	mm	mm	mm
4.001	GV104.0807.045.04.20.R	2.00	0.70	1.95	0.20	1.80	0.50	4.00	25.00	4.00
4.002	GV104.0807.045.07.20.R	2.00	0.70	1.95	0.20	1.80	0.50	7.00	25.00	4.00
4.003	GV104.0807.045.12.20.R	2.00	0.70	1.95	0.20	1.80	0.50	12.00	30.00	4.00
4.004	GV104.0807.045.17.20.R	2.00	0.70	1.95	0.20	1.80	0.50	17.00	35.00	4.00
4.005	GV104.0807.045.07.30.R	3.00	0.70	1.95	0.20	2.70	0.70	7.00	25.00	4.00
4.006	GV104.0807.045.12.30.R	3.00	0.70	1.95	0.20	2.70	0.70	12.00	30.00	4.00
4.007	GV104.0807.045.17.30.R	3.00	0.70	1.95	0.20	2.70	0.70	17.00	35.00	4.00
4.008	GV104.0807.045.22.30.R	3.00	0.70	1.95	0.20	2.70	0.70	22.00	40.00	4.00
4.009	GV104.0810.045.12.40.R	4.00	1.00	1.70	0.20	3.70	1.00	12.00	30.00	4.00
4.010	GV104.0810.045.17.40.R	4.00	1.00	1.70	0.20	3.70	1.00	17.00	35.00	4.00
4.011	GV104.0810.045.22.40.R	4.00	1.00	1.70	0.20	3.70	1.00	22.00	40.00	4.00
4.012	GV104.0810.045.27.40.R	4.00	1.00	1.70	0.20	3.70	1.00	27.00	45.00	4.00
4.013	GV104.0810.045.32.40.R	4.00	1.00	1.70	0.20	3.70	1.00	32.00	50.00	4.00

Series no.	25141	25143	25147
Cutting direction	L	L	L

Code no.	Description	D min	b	f	t1	a	t max	La	Lg	D h6
		mm	mm	mm	mm	mm	mm	mm	mm	mm
4.001	GV104.0807.045.04.20.L	2.00	0.70	1.95	0.20	1.80	0.50	4.00	25.00	4.00
4.002	GV104.0807.045.07.20.L	2.00	0.70	1.95	0.20	1.80	0.50	7.00	25.00	4.00
4.003	GV104.0807.045.12.20.L	2.00	0.70	1.95	0.20	1.80	0.50	12.00	30.00	4.00
4.004	GV104.0807.045.17.20.L	2.00	0.70	1.95	0.20	1.80	0.50	17.00	35.00	4.00
4.005	GV104.0807.045.07.30.L	3.00	0.70	1.95	0.20	2.70	0.70	7.00	25.00	4.00
4.006	GV104.0807.045.12.30.L	3.00	0.70	1.95	0.20	2.70	0.70	12.00	30.00	4.00
4.007	GV104.0807.045.17.30.L	3.00	0.70	1.95	0.20	2.70	0.70	17.00	35.00	4.00
4.008	GV104.0807.045.22.30.L	3.00	0.70	1.95	0.20	2.70	0.70	22.00	40.00	4.00
4.009	GV104.0810.045.12.40.L	4.00	1.00	1.70	0.20	3.70	1.00	12.00	30.00	4.00
4.010	GV104.0810.045.17.40.L	4.00	1.00	1.70	0.20	3.70	1.00	17.00	35.00	4.00
4.011	GV104.0810.045.22.40.L	4.00	1.00	1.70	0.20	3.70	1.00	22.00	40.00	4.00
4.012	GV104.0810.045.27.40.L	4.00	1.00	1.70	0.20	3.70	1.00	27.00	45.00	4.00
4.013	GV104.0810.045.32.40.L	4.00	1.00	1.70	0.20	3.70	1.00	32.00	50.00	4.00

SYSTEM 104/106

Machining	Feed range f (IPR)	Point radius R (mm)	Cutting depth a_p (in)	General formulas
	0.0008 - 0.0031	R 0.05 (0.002in) R 0.10 (0.004in) R 0.15 (0.006in) R 0.20 (0.008in) R 0.25 (0.010in) R 0.30 (0.012in)	0.0008 - 0.0028 0.0020 - 0.0059 0.0031 - 0.0079 0.0047 - 0.0098 0.0051 - 0.0110 0.0067 - 0.0138	Cutting speed (SFM) RPM x Dia. / 3.82 = SFM
	0.0004 - 0.0012			Revolutions per minute (RPM) SFM x 3.82 / Dia. = RPM
	0.0004 - 0.0020		Rule of thumb: ap ~ r	Feed rate (IPM) IPR x RPM = IPM

Guide values for feed and cutting depths

ISO	Material		Material examples/ material number	Tensile strength (N/mm²)	Brinell hardness (HB)	Cutting speed SFM (surface feet / min) TiN (S)	TiAlN nanoA (a)	Bright
P	Carbon steel	C < = 0.15 %	11SMn30+C / 1.0715 C15 / 1.0401	500 600	150 180	65-525	165-655	50-295
		C ≥ 0.15 - 0.45 %	S235JR (ST37-2) / 1.0037 Ck22 / 1.1151	400 600	120 180			
		C > 0.45 %	S355JO (St52-3) / 1.0553 C60 / 1.0601	600 900	180 270	65-295	165-525	-
	Low-alloyed steel (alloy content ≤5%)	annealed	16MnCr5 / 1.7131 18CrNi8 / 1.5920	650 650	200 200	65-525	165-590	50-230
		heat-treatable	25CrMoV4 / 1.7218 42CrMo4V / 1.7225	900 1100	270 320	-	100-395	-
	High-alloyed steel (alloy content >5%)	annealed	X37CrMoV5-1 / 1.2343 X153CrMoV12 / 1.2379	750 850	220 250	80-295	130-460	-
		heat-treatable	55NiCrMoV7 / 1.2714	1200	350	-	100-330	
	Cast steel	un-alloyed, low-alloyed	GS52 / 1.0552	600	180	65-395	100-590	-
		high-alloyed	GX40CrNiSi22-10 / 1.4826	750	220	-	100-295	
M	Stainless steel	martensitic, ferritic, tempered	X14CrMoS17 / 1.4104 X4CrNiMo16-5-1 / 1.4418	800 1000	240 300	65-230	100-295	-
		austenitic, Ni > 8%	X5CrNi18-10 / 1.4301 X2CrNiMo17-12-2 / 1.4404	650	200	65-300	100-360	-
		austenitic, ferritic (Duplex)	X2CrNiMoCuN25-6-3 / 1.4507 X2CrNiMoN25-7-4 / 1.4410	850	250	-	100-330	-
K	Grey cast iron	low tensile strength	EN-GJL-200 (GG20) / 0.6020		180	100-490	100-590	100-295
		high tensile strength	EN-GJL-400 (GG40) / 0.6040		260	100-395	100-490	100-230
	Spheroidal graphite iron	low tensile strength	EN-GJS-400-15 (GGG40) / 0.7040		160	100-425	100-525	-
		high tensile strength	EN-GJS-700-2 (GGG70) / 0.7070		260	100-360	100-460	
	Malleable cast iron	low tensile strength	EN-GJMW-350-4 (GTW35) / 0.8035		125	100-425	100-525	-
		high tensile strength	EN-GJMB-550-4 (GTS55) / 0.8155		250	100-360	100-460	
N	Al-alloys	non-heat-treatable <12% Si	EN-AW-2017 (AlCuMg1) / 3.1325		60	100-1805	100-1805	100-820
		heat-treatable <12% Si	EN-AW-6082 (AlMgSi1) / 3.2315		100	100-1310	100-1310	100-590
	Al-cast-alloys	non-heat-treatable <12% Si	AlSi9Cu3 / 3.2163		80	100-1805	100-1805	100-820
		heat-treatable <12% Si	AlSi10Mg / 3.2383		100	100-1310	100-1310	100-590
	Copper alloys	brass, lead alloy	CuZn39Pb2 (MS58) / 2.0380	400	120	100-1310	100-1310	100-590
		bronze	CuSn6 / 2.1020	500	150	100-240	100-240	100-590
S	Heat resistant alloys, super alloys	NiFe-base, annealed	NiCr15Fe (Alloy600) / 2.4816	700		-	50-230	-
		NiFe-base, hardened		950		-	50-165	
		NiCo-base, annealed	NiMo16Cr15W (Alloy C-276) / 2.4819	800		-	50-165	
		NiCo-base, cast		1100		-	30-130	
		NiCo-base, hardened	NiCr19NbMo (Alloy718) / 2.4668	1200		-	30-115	
	Titanium-alloys	annealed	Ti6Al4V / 3.7164	900		-	15-165	
		hardened		1200		-	30-115	
H	Hardened steels		Heat-treatable steel		> 52 HRC	-	65-130	-
			Heat-treatable/case hardened steel		> 59 HRC	-	30-100	-
			Heat-treatable/case hardened steel		> 62 HRC	-	(CBN)	-

The specified values must be adapted to the machine and machining conditions.

Troubleshooting

Subject		Solution											
		Feed	Feed at centre	Cutting speed	RH/LH edge orientation	Corner radius	Wiper	Width of groove	Tool clamping	Workpiece clamping	Tool overhang	Centre height of cutting edge	Coolant
Related to wear	Edge chipping	⬇	⬇			⬆			🔍	🔍	🔍	🔍	
	Build up edge			⬆									👍
	Flank wear	🔍	⇩	⬇		⬆						🔍	👍
	Plastic deformation	⇩	⇧	⬇		⬆							👍
Related to the component	Vibrations	⇧		⇩		⇩		⬇	🔍	🔍	⇩	🔍	
	Burrs		⬇		👍	⬇						🔍	👍
	Surface	⬇	⇩	⇧		⇧	👍	⇧	🔍	🔍	⇩	🔍	👍
	Long chips (no chip breakage)	⬆		⇧									👍
	(too) short chips, compressed chips	⬇											

⬇ decrease values (large impact)

⬆ increase values (large impact)

⇩ decrease values (low impact)

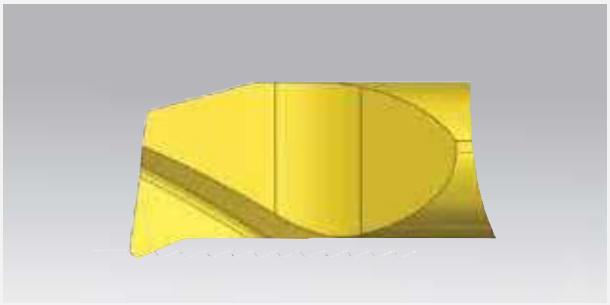
⇧ increase values (low impact)

🔍 check

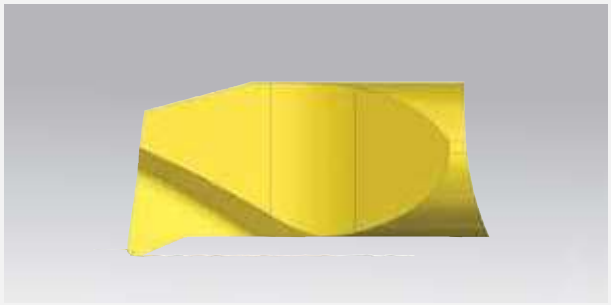
👍 apply

Application hints for the cutting insert GJ104/106 with wiper geometry

Without wiper geometry



With wiper geometry



The wiper geometry offers multiple options

- You retain the feed rate of the cutting insert without wiper geometry and achieve a considerably better surface finish.
- You increase the feed rate taking the entire process (material, chip formation, stability) into consideration and achieve the following improvements:
  - reduced machining time
  - therefore reduced engagement of the tool, improving tool life
  - improved chip formation/chip breakage
  - thicker chip enables better heat dissipation

Please note the following carefully!
The cutting insert/holder must be positioned axially parallel to optimize the wiper.
This is the only way the wiper geometry can achieve its desired effect to improve the surface finish.

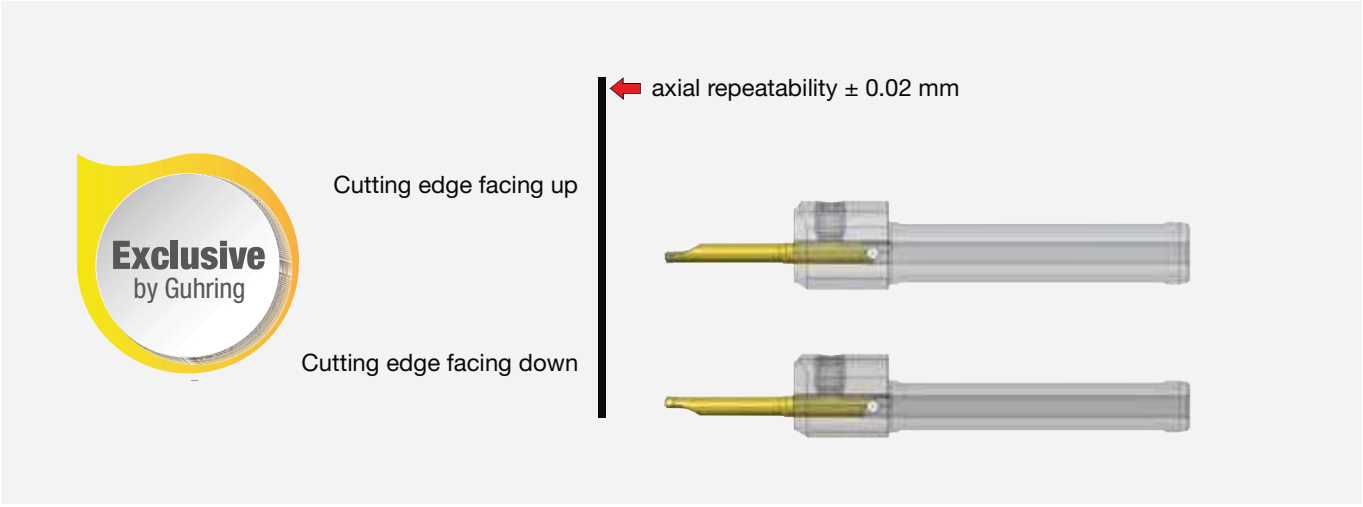
General formulas to determine the surface finish quality

$R_{th} = f^2 / 8 \cdot r$	$r = f^2 / 8 \cdot R_{th}$	$f = \sqrt{8 \cdot r \cdot R_{th}}$

Application example

Application: Boring out Ø 4 mm		Tool selection		Customer benefit
Component:	Sleeve	System:	104	Rz 5-8 µm was achieved with a cutting insert without wiper. With a wiper cutting insert Rz values could be improved to 2-4 µm. In the 2nd step vc was increased to 130 m/min. This resulted in an improved surface finish.
Material:	42CrMo4	Holder:	GB104.0016.075.00.15.N.IK	
	1.7225	Insert:	GJ104.2337.020.17.40.R	
Machine:	Spinner		TiAln nanoA	
Cooling:	20 bar			
Operat. step:	Finishing			
vc:	90 m/min			
f:	0.08 mm			
ap:	0.15			
Groov. depth:	-			

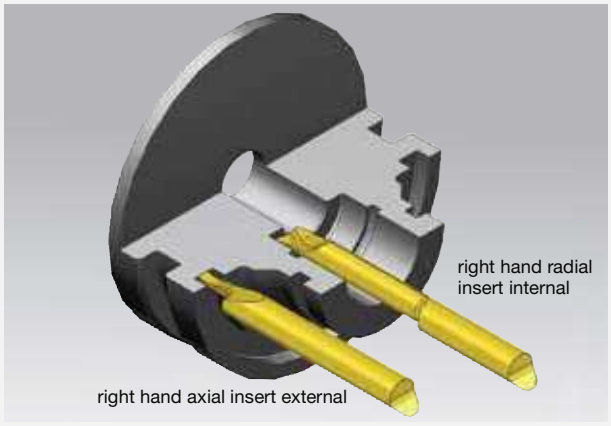
System 104/106
Positioning and clamping



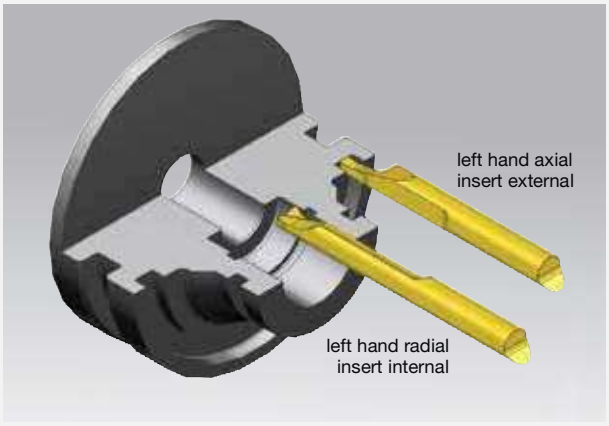
Guhring´s system 104/106 is unique in terms of insert positioning and clamping: The position between cutting edge facing up and cutting edge facing down can be changed by keeping the same length position without loosening the holder.

Definition of the cutting edge position

Main spindle clockwise



Main spindle counterclockwise



SYSTEM 104

MICRO-PRECISION TOOLS

Round shank holder

from page 16

Square shank holder

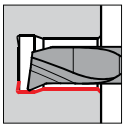
from page 23

Modular holder

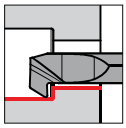
from page 25

Round shank holder
Broaching
page 56

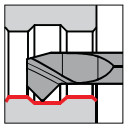
Tool holder



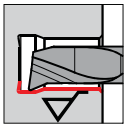
Boring out
and profiling, Type GT
from page 28



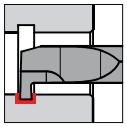
Back boring
and profiling, Type GT
from page 39



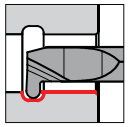
Boring out
and chamfering, Type GT
page 41



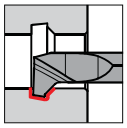
Boring out,
with Wiper, Type GJ
page 38



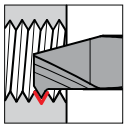
Internal grooving,
straight slots, Type GE
page 42



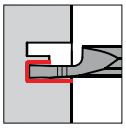
Internal grooving,
full radius slots, Type GE
page 44



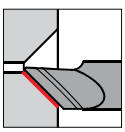
Internal pre-grooving
and chamfering, Type GV
page 45



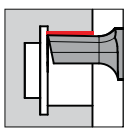
Internal threading,
Type GG
from page 51



Axial grooving bores,
Type GA
from page 46



Axial chamfering
bores, Type GA
page 50



Broaching,
Type GN
from page 57

Cutting inserts from hole-Ø 0.7 mm