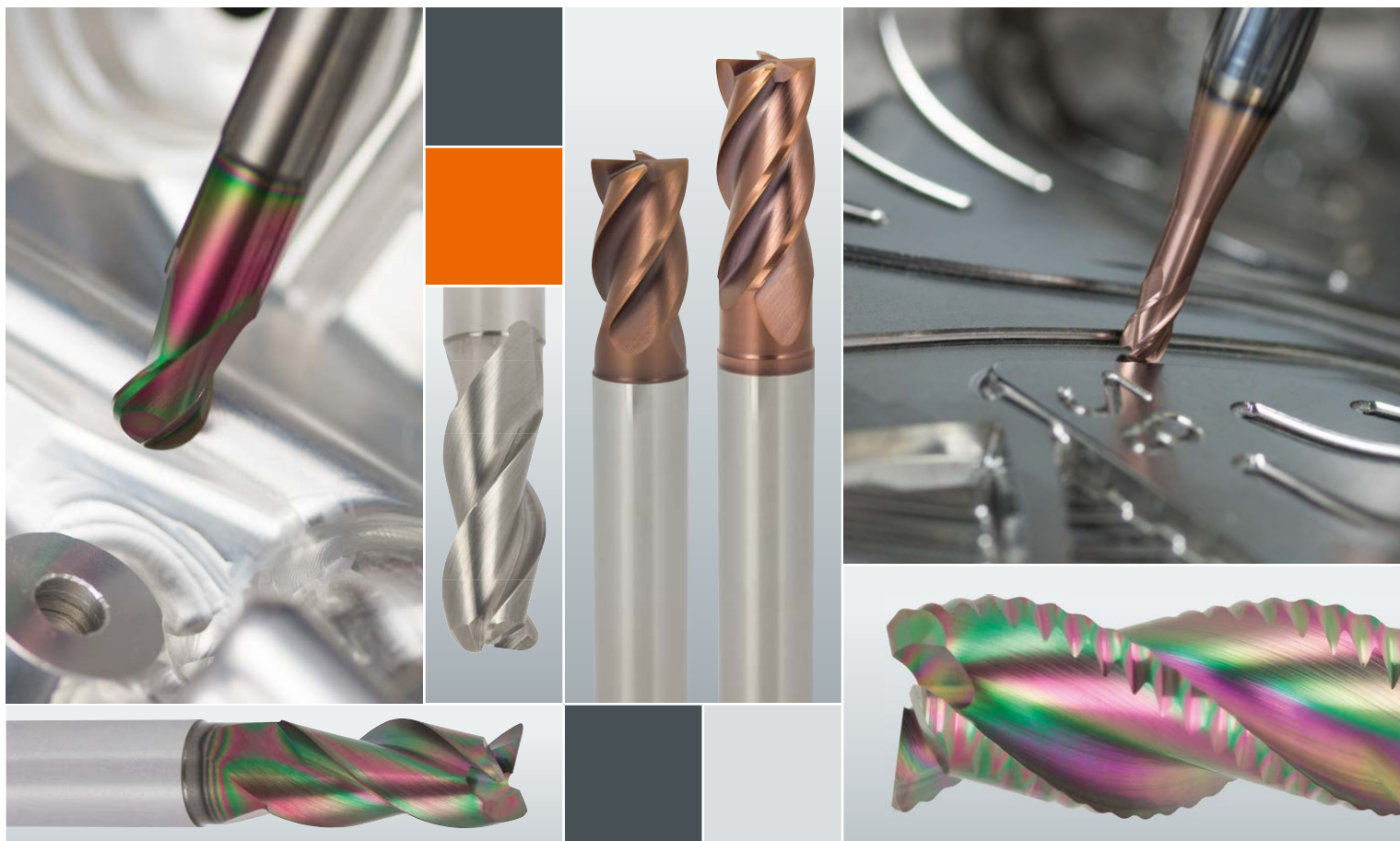




■ Made
■ in
■ Germany



SELECTION Milling 2019 valid until 29.02.2020

FRANKEN

Economical Tools for Milling

*Economical high performance cutting tools
for the demanding industries of today and tomorrow...*

Automotive



Energy



Die and Mould Industry



Micro & Mini



General Engineering



Aerospace



EMUGE-FRANKEN UK Ltd.

EMUGE-FRANKEN UK are the UK subsidiary of EMUGE-FRANKEN Germany. We have been established in Rotherham in the UK for over 25 years. Part of the EMUGE-FRANKEN group which has almost 100 years experience in the development & production of precision tools for the machining industry.

We particularly specialise in threading technology, thread milling technology, gauging technology, milling technology, tool clamping / holding & work piece clamping.

- We have a full UK distributor network who will be happy to deal with your enquiries.
- We have available a full range of literature including electronic content for all your tooling requirements.

- We can offer sales/product training on our range both in house in Rotherham and Germany and also at your premises.
- We attend trade fairs / exhibitions throughout the world and look forward to welcoming you on our stand.
- We offer a full next day delivery service of goods direct from Germany by UPS to either you or your customers.
- We also have a small selection of standard items in stock in Rotherham for collections or next day delivery.

Please call us or email us for full details.

EMUGE-FRANKEN in GERMANY – A company association with almost 100 years of experience

EMUGE develops and produces precision tools for the machining industry. Custom-made solutions in the thread cutting and in the thread milling technology form the center of our business.

The most modern production facilities and an extensive checking and testing system guarantee the high quality of our products.

This, of course, goes also for our programme of precision clamping tools. Only the right choice of a high-precision tap holder or tapping attachment makes it possible to maximise the efficiency of our machining tools.

Our newly developed twist drills and a comprehensive programme of thread gauges complete our product range.



Ever since its foundation, **FRANKEN** has been developing and manufacturing milling tools. As a result, the company today offers a very wide range of solid carbide and HSS end mills as well as milling cutters with inserts.

Our products include end mills, slot drills, die-sinking end mills, shell end mills, gear cutters, and even the most sophisticated special profile milling cutters.

With this large variety of tool types and cutting materials, consistently high

standards and uncompromising precision, our product range of milling cutters meets even the highest quality requirements.

In addition to our selection of cutting tools, we also offer a comprehensive range of clamping systems, tool holders and accessories.

Our Technical Service Department provides application-based consulting services and we also offer support to customers in developing modern milling strategies using our own machines in the R&D Department.



Please note:

The suitability of the milling cutters is indicated as follows:

- = Milling cutter is very suitable
- = Milling cutter is suitable

Please find the cutting conditions on pages 26 - 37.

				Solid carbide end mills			
							
				Allround	Allround	Allround	Allround
				N	N	N	N
				1.5 - 20 mm	2 - 20 mm	3 - 20 mm	3 - 25 mm
Flutes					3	3	4
					2516A	2518A	1916A
					2517A	2519A	1917A
Page				9	9	10	10
 v_c / f_z				26	27	26	27
P	Steel materials						
	1.1	Cold-extrusion steels, Construction steels, Free-cutting steels, etc.	$\leq 600 \text{ N/mm}^2$	■	■	■	■
	2.1	Construction steels, Cementation steels, Steel castings, etc.	$\leq 800 \text{ N/mm}^2$	■	■	■	■
	3.1	Cementation steels, Heat-treatable steels, Cold work steels, etc.	$\leq 1000 \text{ N/mm}^2$	■	■	■	■
	4.1	Heat-treatable steels, Cold work steels, Nitriding steels, etc.	$\leq 1200 \text{ N/mm}^2$	■	■	■	■
	5.1	High-alloyed steels, Cold work steels, Hot work steels, etc.	$\leq 1400 \text{ N/mm}^2$	■	■	■	■
M	Stainless steel materials						
	1.1	Ferritic, martensitic	$\leq 950 \text{ N/mm}^2$	■	■	■	■
	2.1	Austenitic	$\leq 950 \text{ N/mm}^2$	■	■	■	■
	3.1	Austenitic-ferritic (Duplex)	$\leq 1100 \text{ N/mm}^2$	■	■	■	■
	4.1	Austenitic-ferritic heat-resistant (Super Duplex)	$\leq 1250 \text{ N/mm}^2$	■	■	■	■
K	Cast materials						
	1.1	Cast iron with lamellar graphite (GJL)	100-250 N/mm ²	■	■	■	■
	1.2		250-450 N/mm ²	■	■	■	■
	2.1		350-500 N/mm ²	■	■	■	■
	2.2	Cast iron with nodular graphite (GJS)	500-900 N/mm ²	■	■	■	■
	3.1		300-400 N/mm ²	■	■	■	■
	3.2	Cast iron with vermicular graphite (GJV)	400-500 N/mm ²	■	■	■	■
	4.1		250-500 N/mm ²	■	■	■	■
	4.2	Malleable cast iron (GTMW, GTMB)	500-800 N/mm ²	■	■	■	■
N	Non-ferrous materials						
	Aluminium alloys						
	1.1		$\leq 200 \text{ N/mm}^2$	■	■		
	1.2	Aluminium wrought alloys	$\leq 350 \text{ N/mm}^2$	■	■	■	■
	1.3		$\leq 550 \text{ N/mm}^2$	■	■	■	■
	1.4		Si $\leq 7\%$	■	■	■	■
	1.5	Aluminium cast alloys	7% < Si $\leq 12\%$				
	1.6		12% < Si $\leq 17\%$				
	Copper alloys						
	2.1	Pure copper, low-alloyed copper	$\leq 400 \text{ N/mm}^2$	■	■	■	■
	2.2	Copper-zinc alloys (brass, long-chipping)	$\leq 550 \text{ N/mm}^2$	■	■	■	■
	2.3	Copper-zinc alloys (brass, short-chipping)	$\leq 550 \text{ N/mm}^2$	■	■	■	■
	2.4	Copper-aluminium alloys (alu bronze, long-chipping)	$\leq 800 \text{ N/mm}^2$	■	■	■	■
	2.5	Copper-tin alloys (tin bronze, long-chipping)	$\leq 700 \text{ N/mm}^2$	■	■	■	■
	2.6	Copper-tin alloys (tin bronze, short-chipping)	$\leq 400 \text{ N/mm}^2$	■	■	■	■
	2.7		$\leq 600 \text{ N/mm}^2$	■	■	■	■
	2.8	Special copper alloys	$\leq 1400 \text{ N/mm}^2$	■	■	■	■
	Magnesium alloys						
	3.1	Magnesium wrought alloys	$\leq 500 \text{ N/mm}^2$			■	■
	3.2	Magnesium cast alloys	$\leq 500 \text{ N/mm}^2$			■	■
	Synthetics						
	4.1	Duroplastics (short-chipping)		□	□	■	■
	4.2	Thermoplastics (long-chipping)		□	□		
	4.3	Fibre-reinforced synthetics (fibre content $\leq 30\%$)					
	4.4	Fibre-reinforced synthetics (fibre content > 30%)					
	Special materials						
	5.1	Graphite					
	5.2	Tungsten-copper alloys		■	■	■	■
	5.3	Composite materials					
S	Special materials						
	Titanium alloys						
	1.1	Pure titanium	$\leq 450 \text{ N/mm}^2$	■	■	■	■
	1.2		$\leq 900 \text{ N/mm}^2$	□	□	■	■
	1.3	Titanium alloys	$\leq 1250 \text{ N/mm}^2$	□	□	■	■
	Nickel alloys, cobalt alloys and iron alloys						
	2.1	Pure nickel	$\leq 600 \text{ N/mm}^2$	■	■	■	■
	2.2		$\leq 1000 \text{ N/mm}^2$	□	□	■	■
	2.3	Nickel-base alloys	$\leq 1600 \text{ N/mm}^2$	□	□	■	■
	2.4		$\leq 1000 \text{ N/mm}^2$	□	□	■	■
	2.5	Cobalt-base alloys	$\leq 1600 \text{ N/mm}^2$	□	□	■	■
	2.6	Iron-base alloys	$\leq 1500 \text{ N/mm}^2$	□	□	■	■
H	Hard materials						
	1.1		44 - 50 HRC	■	■	■	■
	1.2		50 - 55 HRC	■	■	□	□
	1.3	High strength steels, hardened steels, hard castings	55 - 60 HRC			□	□
	1.4		60 - 63 HRC				
	1.5		63 - 66 HRC				

Solid carbide end mills

		 CR	 coarse	 coarse			 CR	 CR	
Allround N	Allround N	Allround N	AI WR	AI/Cu WR	AI W	AI/Cu W	AI W	AI/Cu W	
3 - 20 mm	6 - 20 mm	3 - 20 mm	3 - 20 mm	3 - 20 mm	2 - 20 mm	2 - 20 mm	6 - 20 mm	6 - 20 mm	
4 - 5	4 - 5	4	3	3	2 - 3	2 - 3	3	3	Flutes
2526A	2528A	2698A	2548	2548K	2544	2544K	2546	2546K	
2527A	2529A	2699A	2549	2549K	2545	2545K	2547	2547K	
11	11	12 - 13	14	14	15	15	16	16	Page
28	28	27	29	29	29	29	29	29	 v _c / f _z
■	■	■							1.1
■	■	■							2.1
■	■	■							3.1
■	■	■							4.1
■	■	■							5.1
■	■	■							
■	■	■							1.1
■	■	■							2.1
■	■	■							3.1
■	■	■							4.1
■	■	■							
■	■	■							1.1
■	■	■							1.2
■	■	■							2.1
■	■	■							2.2
■	■	■							3.1
■	■	■							3.2
■	■	■							4.1
■	■	■							4.2
■	■	■							
■	■	■	■	■	■	■	■	■	1.1
■	■	■	■	■	■	■	■	■	1.2
■	■	■	■	■	■	■	■	■	1.3
■	■	■	■	■	■	■	■	■	1.4
□	□		□	■	□	■	□	■	1.5
□	□								1.6
■	■	■		□		□		□	2.1
■	■	■		□		□		□	2.2
■	■	■		□		□		□	2.3
■	■	■		□		□		□	2.4
■	■	■		□		□		□	2.5
■	■	■		□		□		□	2.6
■	■	■		□		□		□	2.7
■	■	■							2.8
		■							3.1
		■							3.2
		■							
									4.1
									4.2
									4.3
									4.4
									5.1
■	■	■							5.2
									5.3
■	■	■							1.1
■	■	■							1.2
■	■	■							1.3
□	□	■							2.1
□	□	■							2.2
□	□	■							2.3
□	□	■							2.4
□	□	■							2.5
□	□	■							2.6
		■							1.1
		□							1.2
		□							1.3
									1.4
									1.5

Please note:

The suitability of the milling cutters is indicated as follows:

- = Milling cutter is very suitable
- = Milling cutter is suitable

Please find the cutting conditions on pages 26 - 37.

Solid carbide ball nose end mills					
					
Allround	Allround	Allround	Allround	Al/Cu	
N	N	N	N	W	
0.5 - 12 mm	1 - 12 mm	2 - 16 mm	6 - 16 mm	0.5 - 12 mm	
Flutes	2	2	3 - 4	4	2
	2550A	2551A	2502A	2504A	2452K
	-	-	-	-	-
Page	17	17	18	18	19
 v_c / f_z	30	30	31	31	32

P	Steel materials						
	1.1 Cold-extrusion steels, Construction steels, Free-cutting steels, etc.	≤ 600 N/mm ²	■	■	■	■	
	2.1 Construction steels, Cementation steels, Steel castings, etc.	≤ 800 N/mm ²	■	■	■	■	
	3.1 Cementation steels, Heat-treatable steels, Cold work steels, etc.	≤ 1000 N/mm ²	■	■	■	■	
	4.1 Heat-treatable steels, Cold work steels, Nitriding steels, etc.	≤ 1200 N/mm ²	■	■	■	■	
	5.1 High-alloyed steels, Cold work steels, Hot work steels, etc.	≤ 1400 N/mm ²	■	■	■	■	
M	Stainless steel materials						
	1.1 Ferritic, martensitic	≤ 950 N/mm ²	■	■	■	■	
	2.1 Austenitic	≤ 950 N/mm ²	■	■	■	■	
	3.1 Austenitic-ferritic (Duplex)	≤ 1100 N/mm ²	■	■	□	□	
K	4.1 Austenitic-ferritic heat-resistant (Super Duplex)	≤ 1250 N/mm ²	■	■	□	□	
	Cast materials						
	1.1 Cast iron with lamellar graphite (GJL)	100-250 N/mm ²	■	■	■	■	
	1.2 Cast iron with lamellar graphite (GJL)	250-450 N/mm ²	■	■	■	■	
N	2.1 Cast iron with nodular graphite (GJS)	350-500 N/mm ²	■	■	■	■	
	2.2 Cast iron with nodular graphite (GJS)	500-900 N/mm ²	■	■	■	■	
	3.1 Cast iron with vermicular graphite (GJV)	300-400 N/mm ²	■	■	□	□	
	3.2 Cast iron with vermicular graphite (GJV)	400-500 N/mm ²	■	■	□	□	
S	4.1 Malleable cast iron (GTMW, GTMB)	250-500 N/mm ²	■	■	□	□	
	4.2 Malleable cast iron (GTMW, GTMB)	500-800 N/mm ²	■	■	□	□	
	Non-ferrous materials						
	Aluminium alloys						
H	1.1 Aluminium wrought alloys	≤ 200 N/mm ²					■
	1.2 Aluminium wrought alloys	≤ 350 N/mm ²	□	□			■
	1.3 Aluminium wrought alloys	≤ 550 N/mm ²	□	□			■
	1.4 Aluminium wrought alloys	Si ≤ 7%	□	□			■
N	1.5 Aluminium cast alloys	7% < Si ≤ 12%					
	1.6 Aluminium cast alloys	12% < Si ≤ 17%					
	Copper alloys						
	2.1 Pure copper, low-alloyed copper	≤ 400 N/mm ²	■	■	■	■	■
S	2.2 Copper-zinc alloys (brass, long-chipping)	≤ 550 N/mm ²	■	■	■	■	■
	2.3 Copper-zinc alloys (brass, short-chipping)	≤ 550 N/mm ²	■	■	■	■	■
	2.4 Copper-aluminium alloys (alu bronze, long-chipping)	≤ 800 N/mm ²	■	■	■	■	□
	2.5 Copper-tin alloys (tin bronze, long-chipping)	≤ 700 N/mm ²	■	■	■	■	□
H	2.6 Copper-tin alloys (tin bronze, short-chipping)	≤ 400 N/mm ²	■	■	■	■	□
	2.7 Special copper alloys	≤ 600 N/mm ²	■	■	■	■	□
	2.8 Special copper alloys	≤ 1400 N/mm ²	■	■	■	■	□
	Magnesium alloys						
S	3.1 Magnesium wrought alloys	≤ 500 N/mm ²					■
	3.2 Magnesium cast alloys	≤ 500 N/mm ²					■
	Synthetics						
	4.1 Duroplastics (short-chipping)			■	■	■	■
H	4.2 Thermoplastics (long-chipping)			■	■	■	■
	4.3 Fibre-reinforced synthetics (fibre content ≤ 30%)						■
	4.4 Fibre-reinforced synthetics (fibre content > 30%)						■
	Special materials						
S	5.1 Graphite						
	5.2 Tungsten-copper alloys		■	■	■	■	■
	5.3 Composite materials			■	■	■	■
	Special materials						
S	Titanium alloys						
	1.1 Pure titanium	≤ 450 N/mm ²			□	□	■
	1.2 Titanium alloys	≤ 900 N/mm ²			□	□	■
	1.3 Titanium alloys	≤ 1250 N/mm ²			□	□	■
H	Nickel alloys, cobalt alloys and iron alloys						
	2.1 Pure nickel	≤ 600 N/mm ²	■	■	□	□	■
	2.2 Nickel-base alloys	≤ 1000 N/mm ²	■	■	□	□	□
	2.3 Nickel-base alloys	≤ 1600 N/mm ²	■	■	□	□	□
H	2.4 Cobalt-base alloys	≤ 1000 N/mm ²	□	□	□	□	□
	2.5 Cobalt-base alloys	≤ 1600 N/mm ²	□	□	□	□	□
	2.6 Iron-base alloys	≤ 1500 N/mm ²	□	□	□	□	□
	Hard materials						
H	1.1 High strength steels, hardened steels, hard castings	44 - 50 HRC	■	■			
	1.2 High strength steels, hardened steels, hard castings	50 - 55 HRC	■	■			
	1.3 High strength steels, hardened steels, hard castings	55 - 60 HRC					
	1.4 High strength steels, hardened steels, hard castings	60 - 63 HRC					
H	1.5 High strength steels, hardened steels, hard castings	63 - 66 HRC					

Solid carbide torus end mills				HSS End Mills		Flutes
						
						
Allround N	Allround N	Allround N	Allround N	Allround HR	Allround HR	
0.5 - 12 mm	1 - 12 mm	3 - 12 mm	3 - 12 mm	6 - 20 mm	4 - 50 mm	
2	2	4	4	4	3 - 8	
2552A	2553A	2554A	2555A	—	—	
—	—	—	—	1351C	1381C	
20	21	22	23	24	24	Page
33	33	34	34	35	35	 v_c / f_z
■	■	■	■	■	■	1.1
■	■	■	■	■	■	2.1
■	■	■	■	■	■	3.1
■	■	■	■	□	□	4.1
■	■	■	■	□	□	5.1
■	■	■	■	■	■	1.1
■	■	■	■	□	□	2.1
■	■	■	■	□	□	3.1
■	■	■	■	□	□	4.1
■	■	■	■	■	■	1.1
■	■	■	■	■	■	1.2
■	■	■	■	■	■	2.1
■	■	■	■	□	□	2.2
■	■	■	■	□	□	3.1
■	■	■	■	□	□	3.2
■	■	■	■	■	■	4.1
■	■	■	■	□	□	4.2
□	□	□	□	□	□	1.1
□	□	□	□	□	□	1.2
□	□	□	□	□	□	1.3
□	□	□	□	□	□	1.4
□	□	□	□	□	□	1.5
□	□	□	□	□	□	1.6
■	■	□	□	■	■	2.1
■	■	■	■	□	□	2.2
■	■	■	■	□	□	2.3
■	■	■	■	□	□	2.4
■	■	■	■	□	□	2.5
■	■	■	■	□	□	2.6
■	■	■	■	□	□	2.7
■	■	■	■	□	□	2.8
□	□	□	□	□	□	3.1
□	□	□	□	□	□	3.2
□	□	□	□	□	□	4.1
□	□	□	□	□	□	4.2
□	□	□	□	□	□	4.3
□	□	□	□	□	□	4.4
■	■	■	■	□	□	5.1
■	■	■	■	□	□	5.2
■	■	■	■	□	□	5.3
■	■	■	■	□	□	1.1
■	■	■	■	□	□	1.2
■	■	■	■	□	□	1.3
■	■	■	■	□	□	2.1
■	■	■	■	□	□	2.2
□	□	■	■	□	□	2.3
□	□	■	■	□	□	2.4
□	□	■	■	□	□	2.5
□	□	■	■	□	□	2.6
■	■	■	■	□	□	1.1
■	■	■	■	□	□	1.2
■	■	■	■	□	□	1.3
■	■	■	■	□	□	1.4
■	■	■	■	□	□	1.5

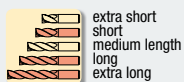


The FRANKEN Catalogue 250 provides an overview of the following product groups including all related technical information

- Solid carbide end mills and slot drills
- Solid carbide ball nose and torus end mills
- PCD, CBN and diamond coated end mills
- Circle segment and solid carbide tapered end mills
- Indexable milling cutters and end mills
- HSS end mills and slot drills
- HSS and solid carbide form end mills
- Milling cutters with bore
- Clamping systems, tool holders and accessories

Description of the symbols

Constructional length



The relevant length is marked in red.

Shank design

The shank designs to be found on the respective page are marked in grey.



Shank design for metric tools



Helix angle



The helix angle of these tools is shown. If there are variable helix angles, these are all shown.

Chip breaker



Depending on form (e.g. round or flat) and size (coarse, medium, fine) of the chip breakers these end mills generate appropriate milling marks.

Cutting material



Solid carbide



High speed steel

Cutting conditions



The cutting conditions and work parameters for these tools are to be found on the page number given in the symbol.

Cutting edge design and face geometry



Bevelled edge



Corner radius



Ball nose



Torus

Coolant and lubrication



Dry machining



Cold-air nozzle



Minimum-quantity lubrication



Emulsion

Feed direction



The red arrows mark the recommended feed directions of the respective cutters.

Ramping angle



The specified angle is the recommended angle for ramping applications.

Hard milling



These tools are suitable for hard milling. The hardness range or the maximum hardness of the material to be machined is indicated in Rockwell (HRC).

Design I4:

N

Carbide

DIN 6535
HA
HB

34/36/38°

KB x 45°

Vc/fz
26-27

Optional

Allround **Allround**

Coating

- Multi-functional, high performance tool
- Newly developed geometry
- Low-vibration machining
- Centre cutting
- For almost all materials
- Suitable for roughing and finishing

TIALN

P	1.1-5.1
M	1.1-4.1
K	1.1-4.2
N	1.1-1.4
N	2.1-2.8, 5.2 4.1-4.2
S	1.1 1.2-1.3
S	2.1 2.2-2.6
H	1.1-1.2

TIALN

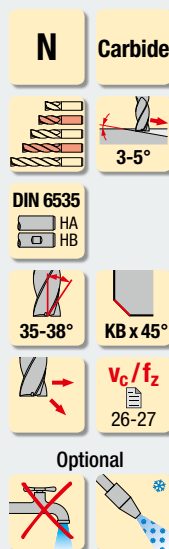
P	1.1-5.1
M	1.1-4.1
K	1.1-4.2
N	1.1-1.4
N	2.1-2.8, 5.2 4.1-4.2
S	1.1 1.2-1.3
S	2.1 2.2-2.6
H	1.1-1.2

DIN 6527 – Short design

Order code	$\emptyset d_1$ h10	l_2	l_3	l_1	$\emptyset d_3$	l_4	$\emptyset d_2$ h5	l_A 	KB	Flutes	Dimens. Code	2516A £	2517A £		
1.5	3	—	50	—	14	6	14	0.04	3	.0015		17.83	17.85		
2	3	5	50	1.9	14	6	14	0.04	3	.002		15.88	15.88		
2.5	3	5	50	2.4	14	6	14	0.07	3	.0025		17.30	17.30		
2.8	4	7	50	2.7	14	6	14	0.07	3	.0028		18.62	18.62		
3	4	7	50	2.9	14	6	14	0.07	3	.003		15.44	15.44		
3.5	4	7	50	3.3	14	6	14	0.07	3	.0035		17.30	17.30		
3.8	5	9	54	3.6	18	6	18	0.07	3	.0038		18.18	18.18		
4	5	9	54	3.8	18	6	18	0.07	3	.004		15.44	15.44		
4.5	5	9	54	4.3	18	6	18	0.12	3	.0045		17.30	17.30		
4.8	6	11	54	4.6	18	6	18	0.12	3	.0048		18.18	18.18		
5	6	11	54	4.8	18	6	18	0.12	3	.005		15.44	15.44		
5.5	7	12	54	5.3	18	6	18	0.12	3	.0055		15.88	15.88		
5.75	7	16	54	5.55	18	6	18	0.12	3	.00575		16.54	16.54		
6	7	16	54	5.8	—	6	18	0.12	3	.006		14.35	14.35		
7.75	9	18	58	7.45	20	8	22	0.12	3	.00775		24.20	24.20		
8	9	20	58	7.7	—	8	22	0.12	3	.008		20.81	20.81		
9.7	11	22	66	9.4	24	10	26	0.2	3	.0097		31.10	31.10		
10	11	24	66	9.5	—	10	26	0.2	3	.010		27.16	27.16		
11.7	12	24	73	11.2	26	12	28	0.2	3	.0117		44.57	44.57		
12	12	26	73	11.5	—	12	28	0.2	3	.012		38.55	38.55		
16	16	32	82	15.5	—	16	34	0.2	3	.016		70.64	70.64		
20	20	40	92	19.5	—	20	42	0.3	3	.020		117.62	117.62		

DIN 6527 – Long design

Order code	$\emptyset d_1$ h10	l_2	l_3	l_1	$\emptyset d_3$	l_4	$\emptyset d_2$ h5	l_A 	KB	Flutes	Dimens. Code			2518A £	2519A £
2	6	8	57	1.9	20	6	21	0.04	3	.002				18.62	18.62
3	7	10	57	2.9	20	6	21	0.07	3	.003				18.18	18.18
4	8	12	57	3.8	20	6	21	0.07	3	.004				18.18	18.18
5	10	15	57	4.8	20	6	21	0.12	3	.005				18.18	18.18
6	10	20	57	5.8	—	6	21	0.12	3	.006				16.21	16.21
7	13	23	63	6.7	25	8	27	0.12	3	.007				27.16	27.16
8	16	25	63	7.7	—	8	27	0.12	3	.008				24.20	24.20
10	19	30	72	9.5	—	10	32	0.2	3	.010				30.77	30.77
12	22	35	83	11.5	—	12	38	0.2	3	.012				44.13	44.13
16	26	40	92	15.5	—	16	44	0.2	3	.016				80.72	80.72
20	32	50	104	19.5	—	20	54	0.3	3	.020				135.36	135.36



Allround

Allround

Coating

- Multi-functional, high performance tool
- With ENORM geometry
- Low-vibration machining
- Centre cutting
- 3 lengths available
- For almost all materials
- Suitable for roughing and finishing

TIALN

TIALN

P	1.1-5.1
M	1.1-4.1
K	1.1-4.2
N	1.2-1.4
N	2.1-4.1, 5.2
S	1.1-2.6
H	1.1 1.2-1.3

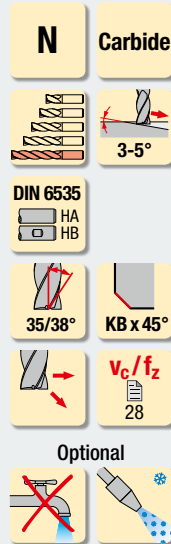
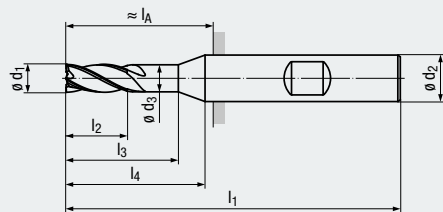
P	1.1-5.1
M	1.1-4.1
K	1.1-4.2
N	1.2-1.4
N	2.1-4.1, 5.2
S	1.1-2.6
H	1.1 1.2-1.3

DIN 6527 – Short design

Order code												1916A	1917A		
$\varnothing d_1$ h10	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h6	l_A 	KB	Flutes	Dimens. Code	£	£			
3	5	9	50	2.9	14	6	14	0.07	4	.003	19.27	19.27			
4	8	12	54	3.8	18	6	18	0.07	4	.004	18.95	18.95			
5	9	16	54	4.8	18	6	18	0.07	4	.005	18.95	18.95			
6	10	16	54	5.8	—	6	18	0.12	4	.006	17.85	17.85			
8	12	20	58	7.7	—	8	22	0.12	4	.008	26.72	26.72			
10	15	24	66	9.5	—	10	26	0.2	4	.010	35.27	35.27			
12	18	26	73	11.5	—	12	28	0.2	4	.012	47.86	47.86			
16	24	32	82	15.5	—	16	34	0.2	4	.016	75.78	75.78			
18	27	34	84	17.5	—	18	36	0.2	4	.018	98.89	98.89			
20	30	40	92	19.5	—	20	42	0.3	4	.020	117.62	117.62			

DIN 6527 – Long design

Order code	ϕd_1 h10	l_2	l_3	l_1	ϕd_3	l_4	ϕd_2 h6	l_A h6	KB	Flutes	Dimens. Code			1998A £	1999A £
3	8	14	57	2.9	20	6	21	0.07	4	.003				21.14	21.14
4	11	18	57	3.8	20	6	21	0.07	4	.004				20.81	20.81
5	13	19	57	4.8	20	6	21	0.12	4	.005				20.04	20.04
6	13	20	57	5.8	—	6	21	0.12	4	.006				19.27	19.27
7	19	23	63	6.8	25	8	27	0.12	4	.007				30.00	30.00
8	19	25	63	7.7	—	8	27	0.12	4	.008				30.00	30.00
9	22	28	72	8.7	30	10	32	0.2	4	.009				39.32	39.32
10	22	30	72	9.5	—	10	32	0.2	4	.010				39.32	39.32
11	26	32	83	10.5	35	12	38	0.2	4	.011				54.21	50.71
12	26	35	83	11.5	—	12	38	0.2	4	.012				48.63	48.63
14	26	35	83	13.5	—	14	38	0.2	4	.014				65.27	65.27
15	32	38	92	14.5	40	16	44	0.2	4	.015				80.38	80.38
16	32	40	92	15.5	—	16	44	0.2	4	.016				80.38	80.38
18	32	50	100	17.5	—	18	52	0.2	4	.018				106.89	106.89
20	38	50	104	19.5	—	20	54	0.3	4	.020				127.04	127.04
25	45	65	125	24.5	—	25	69	0.3	6	.025				199.47	199.47



Allround

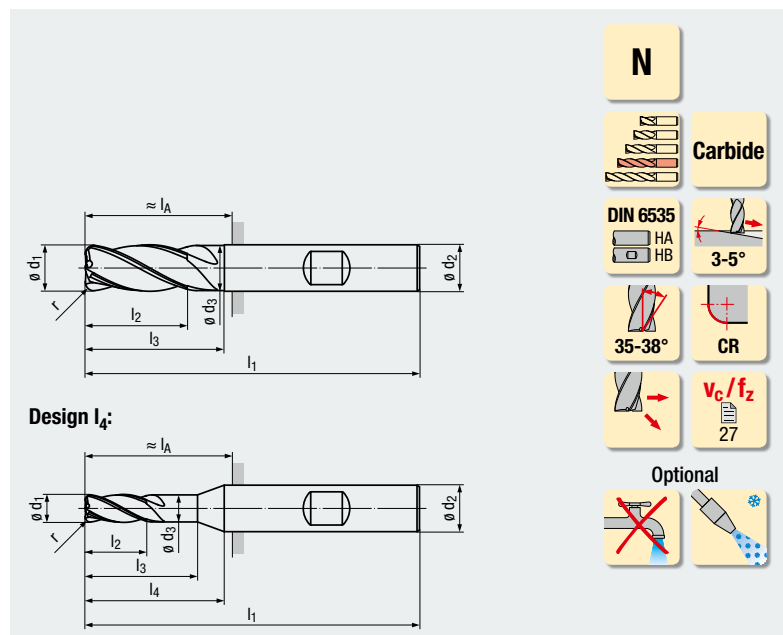
TIALN

- | | | |
|---|--------------|---------|
| P | 1.1-5.1 | |
| M | 1.1-4.1 | |
| K | 1.1-4.2 | |
| N | 1.1-1.4 | 1.5-1.6 |
| N | 2.1-2.8, 5.2 | |
| S | 1.1-1.3 | 2.1-2.6 |

Order code											2526A	2527A		
$\varnothing d_1$ h10	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h6	l_A 	KB	Flutes	Dimens. Code	£	£		
3	9	12	62	2.9	23	6	26	0.07	4	.003	28.15	28.15		
4	12	16	62	3.8	25	6	26	0.07	4	.004	28.58	28.58		
5	15	20	62	4.8	25	6	26	0.12	4	.005	28.58	28.58		
6	18	25	62	5.8	—	6	26	0.12	4	.006	26.18	26.18		
8	24	30	68	7.7	—	8	32	0.12	5	.008	40.63	40.63		
10	30	35	80	9.5	—	10	40	0.2	5	.010	54.21	54.21		
12	36	45	93	11.5	—	12	48	0.2	5	.012	77.87	77.87		
16	48	60	112	15.5	—	16	64	0.2	5	.016	143.47	143.47		
20	60	75	130	19.5	—	20	80	0.3	5	.020	229.00	229.00		

Order code													2528A	2529A
$\varnothing d_1$ h10	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h6	l_A 	KB	Flutes	Dimens. Code				
6	24	30	68	5.8	—	6	32	0.12	4	.006			36.58	36.58
8	32	40	80	7.7	—	8	44	0.12	5	.008			57.65	57.65
10	40	50	95	9.5	—	10	55	0.2	5	.010			78.12	78.12
12	48	60	107	11.5	—	12	62	0.2	5	.012			96.56	96.56
16	64	75	128	15.5	—	16	80	0.2	5	.016			167.61	167.61
20	80	90	150	19.5	—	20	100	0.3	5	.020			267.96	267.96

Universal use, for all material groups.



Allround

Coating

- Multi-functional, high performance tool
- With ENORM geometry
- Low-vibration machining
- Several corner radii per cutting diameter
- Centre cutting
- For almost all materials, including tough materials
- Very suitable for roughing and finishing

TIALN

P	1.1-5.1
M	1.1-4.1
K	1.1-4.2
N	1.2-1.4
N	2.1-4.1, 5.2
S	1.1-2.6
H	1.1 1.2-1.3

DIN 6527 – Long design

Corner radius

Order code											2698A	2699A		
ϕd_1 h10	r ± 0.02	l_2	l_3	l_1	ϕd_3	l_4	ϕd_2 h6	l_A 	Flutes	Dimens. Code	£	£		
3	0.1	8	14	57	2.9	20	6	21	4	.003001	26.39	26.39		
3	0.3	8	14	57	2.9	20	6	21	4	.003003	25.62	25.62		
3	0.5	8	14	57	2.9	20	6	21	4	.003005	25.62	25.62		
4	0.1	11	18	57	3.8	20	6	21	4	.004001	26.06	26.06		
4	0.3	11	18	57	3.8	20	6	21	4	.004003	25.30	25.30		
4	0.4	11	18	57	3.8	20	6	21	4	.004004	25.30	25.30		
4	0.5	11	18	57	3.8	20	6	21	4	.004005	25.30	25.30		
5	0.1	13	19	57	4.8	20	6	21	4	.005001	25.62	25.62		
5	0.3	13	19	57	4.8	20	6	21	4	.005003	24.97	24.97		
5	0.5	13	19	57	4.8	20	6	21	4	.005005	24.97	24.97		
5	1	13	19	57	4.8	20	6	21	4	.005010	24.97	24.97		
6	0.1	13	20	57	5.8	—	6	21	4	.006001	24.20	24.20		
6	0.5	13	20	57	5.8	—	6	21	4	.006005	23.00	23.00		
6	1.0	13	20	57	5.8	—	6	21	4	.006010	23.00	23.00		
6	1.5	13	20	57	5.8	—	6	21	4	.006015	24.97	24.97		
8	0.15	19	25	63	7.7	—	8	27	4	.008001	34.94	34.94		
8	0.5	19	25	63	7.7	—	8	27	4	.008005	33.84	33.84		
8	1	19	25	63	7.7	—	8	27	4	.008010	33.84	33.84		
8	1.5	19	25	63	7.7	—	8	27	4	.008015	35.27	35.27		
8	2	19	25	63	7.7	—	8	27	4	.008020	35.27	35.27		
10	0.15	22	30	72	9.5	—	10	32	4	.010001	44.13	44.13		
10	0.5	22	30	72	9.5	—	10	32	4	.010005	43.48	43.48		
10	1	22	30	72	9.5	—	10	32	4	.010010	43.48	43.48		
10	1.5	22	30	72	9.5	—	10	32	4	.010015	44.13	44.13		
10	2	22	30	72	9.5	—	10	32	4	.010020	44.13	44.13		
10	2.5	22	30	72	9.5	—	10	32	4	.010025	44.13	44.13		
10	3	22	30	72	9.5	—	10	32	4	.010030	45.27	45.27		
12	0.2	26	35	83	11.5	—	12	38	4	.012002	58.59	58.59		
12	0.5	26	35	83	11.5	—	12	38	4	.012005	57.83	57.83		
12	1	26	35	83	11.5	—	12	38	4	.012010	57.83	57.83		
12	1.5	26	35	83	11.5	—	12	38	4	.012015	58.59	58.59		
12	2	26	35	83	11.5	—	12	38	4	.012020	58.59	58.59		
12	2.5	26	35	83	11.5	—	12	38	4	.012025	58.59	58.59		
12	3	26	35	83	11.5	—	12	38	4	.012030	59.36	59.36		
12	4	26	35	83	11.5	—	12	38	4	.012040	59.36	59.36		
14	1	26	35	83	13.5	—	14	38	4	.014010	70.53	70.53		
16	0.3	32	40	92	15.5	—	16	44	4	.016003	92.76	92.76		
16	0.5	32	40	92	15.5	—	16	44	4	.016005	91.55	91.55		
16	1	32	40	92	15.5	—	16	44	4	.016010	91.55	91.55		
16	1.5	32	40	92	15.5	—	16	44	4	.016015	92.32	92.32		
16	2	32	40	92	15.5	—	16	44	4	.016020	92.32	92.32		
16	2.5	32	40	92	15.5	—	16	44	4	.016025	92.32	92.32		
16	3	32	40	92	15.5	—	16	44	4	.016030	93.09	93.09		
16	4	32	40	92	15.5	—	16	44	4	.016040	94.73	94.73		

Design l4:

N

Carbide

DIN 6535
HA
HB

3-5°

35-38°

CR

Vc/fz
27

Optional

Allround

Coating

TIALN

- Multi-functional, high performance tool
- With ENORM geometry
- Low-vibration machining
- Several corner radii per cutting diameter
- Centre cutting
- For almost all materials, including tough materials
- Very suitable for roughing and finishing

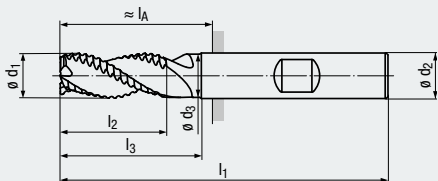
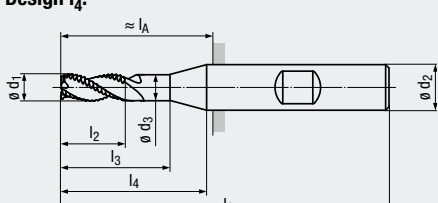
P	1.1-5.1
M	1.1-4.1
K	1.1-4.2
N	1.2-1.4
N	2.1-4.1, 5.2
S	1.1-2.6
H	1.1 1.2-1.3

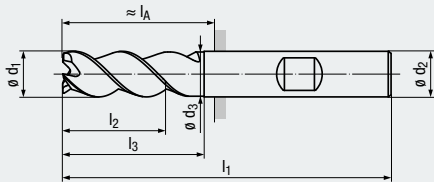
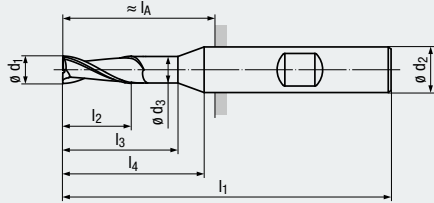
DIN 6527 – Long design

Corner radius

Order code											2698A	2699A		
$\emptyset d_1$ h10	r ±0.02	l_2	l_3	l_1	$\emptyset d_3$	l_4	$\emptyset d_2$ h6	l_A G	Flutes	Dimens. Code	£	£		
20	0.3	38	50	104	19.5	—	20	54	4	.020003	137.55	137.55		
20	0.5	38	50	104	19.5	—	20	54	4	.020005	136.24	136.24		
20	1	38	50	104	19.5	—	20	54	4	.020010	136.24	136.24		
20	1.5	38	50	104	19.5	—	20	54	4	.020015	137.11	137.11		
20	2	38	50	104	19.5	—	20	54	4	.020020	137.11	137.11		
20	2.5	38	50	104	19.5	—	20	54	4	.020025	137.11	137.11		
20	3	38	50	104	19.5	—	20	54	4	.020030	139.30	139.30		
20	4	38	50	104	19.5	—	20	54	4	.020040	139.30	139.30		

Other corner radii available on request

 Design I₄: 	WR coarse  Carbide DIN 6535  HA HB  40°  45°  3-5°  v_c/f_z 29	 Al  Al/Cu  Al/Cu  Al/Cu											
Coating		GLT											
- High performance tool - Special geometry for the machining of aluminium - Centre cutting - For wrought aluminium alloys - For aluminium alloys with a silicon content of up to 7% - With GLT coating also for copper alloys	N 1.1-1.3 1.4	N 1.1-1.4 2.1-2.7											
DIN 6527 – Long design													
Order code	2548	2549	2548K	2549K									
$\varnothing d_1$ h11 l_2 l_3 l_1 $\varnothing d_3$ l_4 $\varnothing d_2$ h6 l_A  Flutes Dimens. Code £ £ £ £	£	£	£	£									
3	7	14	57	2.9	20	6	21	3	.003	45.58	45.58	53.62	53.62
4	8	18	57	3.8	20	6	21	3	.004	45.06	45.06	53.10	53.10
5	10	19	57	4.8	20	6	21	3	.005	44.54	44.54	52.58	52.58
6	13	20	57	5.8	—	6	21	3	.006	41.85	41.85	49.91	49.91
8	19	25	63	7.7	—	8	34	3	.008	45.58	45.58	55.77	55.77
10	22	30	72	9.5	—	10	32	3	.010	50.42	50.42	63.30	63.30
12	26	35	83	11.5	—	12	38	3	.012	62.73	62.73	79.39	79.39
16	32	40	92	15.5	—	16	44	3	.016	108.89	108.89	129.75	129.75
20	38	50	104	19.5	—	20	54	3	.020	145.83	145.83	173.77	173.77

 Design I4: 	W  Carbide DIN 6535  HA  HB  2Fl. 45°  3Fl. 38-40°  KB x 45°  Vc/fz 29	 Al  Al  Al/Cu  Al/Cu		
Coating		GLT		
- High performance tool - Special geometry for the machining of aluminium - Low-vibration machining - With 2 and 3 flutes - Centre cutting - For wrought aluminium alloys - For aluminium alloys with a silicon content of up to 7% - With GLT coating also for copper alloys - Suitable for z-axis milling - Suitable for roughing and finishing	N 1.1-1.3 1.4	N 1.1-1.4 2.1-2.7		
DIN 6527 – Long design				
Order code	2544	2545	2544K	2545K
Ø d1 h10 l2 l3 l1 Ø d3 l4 Ø d2 h6  lA KB Flutes Dimens. Code	£	£	£	£
2 6 10 57 1.9 20 6 21 0.06 2 .002	24.31	24.31	32.63	32.63
3 7 14 57 2.9 20 6 21 0.1 2 .003	26.83	26.83	36.15	36.15
4 8 18 57 3.8 20 6 21 0.1 2 .004	26.83	26.83	36.15	36.15
5 10 19 57 4.8 20 6 21 0.15 2 .005	26.83	26.83	36.15	36.15
6 13 20 57 5.8 — 6 21 0.125 3 .006	28.25	28.25	38.34	38.34
8 19 25 63 7.7 — 8 34 0.125 3 .008	35.49	35.49	44.91	44.91
10 22 30 72 9.5 — 10 32 0.2 3 .010	43.04	43.04	55.30	55.30
12 26 35 83 11.5 — 12 38 0.2 3 .012	54.10	54.10	67.24	67.24
16 32 40 92 15.5 — 16 44 0.2 3 .016	95.06	95.06	113.13	113.13
20 38 50 104 19.5 — 20 54 0.3 3 .020	128.90	128.90	150.25	150.25

The versatile solution for machining aluminium



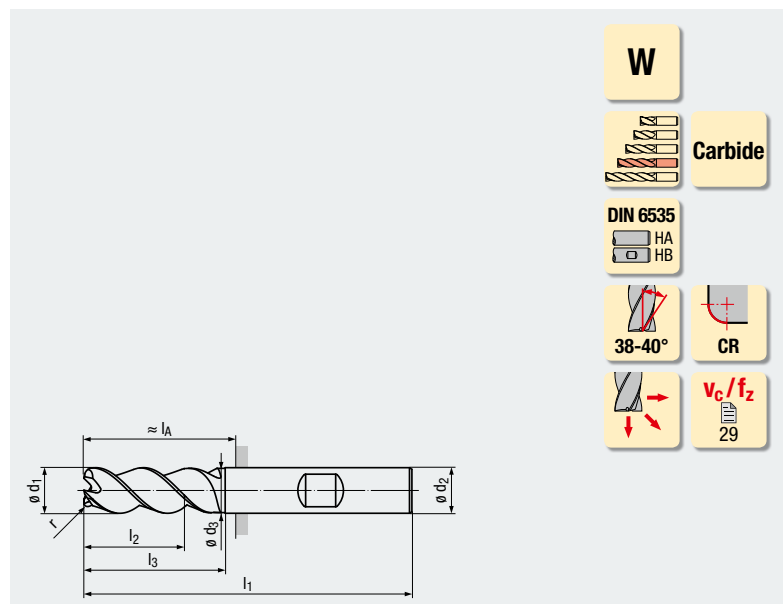
These new tools have been developed for machining aluminium and non-ferrous metals. The new, very smooth coating protects the tool against built-up edge and wear.

Characteristics:

- Variable spacing
- Available with WR profile for roughing
- Special geometry for machining aluminium
- Tools with and without corner radii

Main feature:

Suitable for milling of Aluminium-alloys with up to 7% Silicon.



Al



Al/Cu



Coating

- High performance tool
- Special geometry for the machining of aluminium
- Low-vibration machining
- Several corner radii per cutting diameter
- Centre cutting
- For wrought aluminium alloys
- For aluminium alloys with a silicon content of up to 7%
- With GLT coating also for copper alloys
- Suitable for z-axis milling
- Suitable for roughing and finishing

GLT

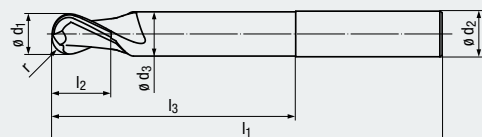
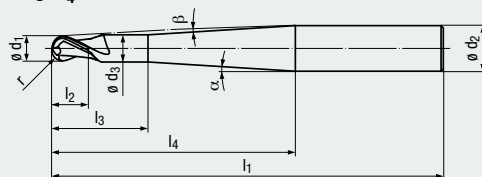
N 1.1-1.3 1.4

N 1.1-1.4 2.1-2.7

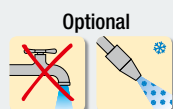
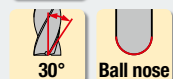
DIN 6527 – Long design

Corner radius

Order code										2546	2547	2546K	2547K
$\emptyset d_1$ h10	r ± 0.02	l_2	l_3	l_1	$\emptyset d_3$	$\emptyset d_2$ h6	l_A 	Flutes	Dimens. Code	£	£	£	£
6	0.5	13	20	57	5.8	6	21	3	.006005	26.18	26.18	34.50	34.50
6	1	13	20	57	5.8	6	21	3	.006010	26.18	26.18	34.50	34.50
8	1	19	25	63	7.7	8	27	3	.008010	39.65	39.65	49.07	49.07
8	1.5	19	25	63	7.7	8	27	3	.008015	40.74	40.74	50.05	50.05
8	2	19	25	63	7.7	8	27	3	.008020	40.74	40.74	50.05	50.05
10	1	22	30	72	9.5	10	32	3	.010010	49.07	49.07	61.55	61.55
10	1.5	22	30	72	9.5	10	32	3	.010015	50.16	50.16	62.64	62.64
10	2	22	30	72	9.5	10	32	3	.010020	50.16	50.16	62.64	62.64
12	1	26	35	83	11.5	12	38	3	.012010	61.65	61.65	75.57	75.57
12	1.5	26	35	83	11.5	12	38	3	.012015	62.64	61.65	76.56	76.56
12	2	26	35	83	11.5	12	38	3	.012020	62.64	62.64	76.56	76.56
12	2.5	26	35	83	11.5	12	38	3	.012025	63.52	63.52	77.43	77.43
12	3	26	35	83	11.5	12	38	3	.012030	63.52	63.52	77.43	77.43
12	4	26	35	83	11.5	12	38	3	.012040	65.38	65.38	79.29	79.29
16	1	32	40	92	15.5	16	44	3	.016010	100.65	100.65	118.72	118.72
16	1.5	32	40	92	15.5	16	44	3	.016015	101.52	101.52	119.70	119.70
16	2	32	40	92	15.5	16	44	3	.016020	101.52	101.52	119.70	119.70
16	2.5	32	40	92	15.5	16	44	3	.016025	101.86	101.86	119.59	117.84
16	3	32	40	92	15.5	16	44	3	.016030	101.86	101.86	119.59	117.84
16	4	32	40	92	15.5	16	44	3	.016040	105.80	105.80	123.86	123.86
20	1	38	50	104	19.5	20	54	3	.020010	143.25	143.25	166.14	166.14
20	1.5	38	50	104	19.5	20	54	3	.020015	144.89	144.89	167.89	167.89
20	2	38	50	104	19.5	20	54	3	.020020	144.89	144.89	167.89	167.89
20	2.5	38	50	104	19.5	20	54	3	.020025	145.87	145.87	168.76	168.76
20	3	38	50	104	19.5	20	54	3	.020030	145.87	145.87	168.76	168.76
20	4	38	50	104	19.5	20	54	3	.020040	149.16	149.16	172.38	172.38

Design I₄:

N

≤ 55
HRC

Allround

Allround

Coating

TIALN

TIALN

- Multi-functional, high performance tool
- Patented chisel edge
- 2 lengths available

- For almost all materials
- Suitable for roughing, finishing and HSC finishing

P	1.1-5.1	P	1.1-5.1
M	1.1-4.1	M	1.1-4.1
K	1.1-4.2	K	1.1-4.2
N	2.1-2.8, 5.2	N	2.1-2.8, 5.2
S	2.1-2.3	S	2.1-2.3
H	1.1-1.2	H	1.1-1.2

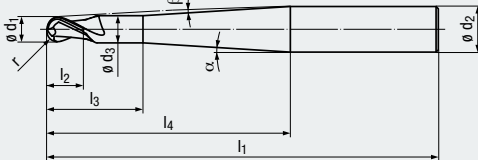
Short design

Order code												2550A		
ϕd_1 ±0.01	r ±0.005	l_2	l_3	l_1	ϕd_3	l_4	ϕd_2 h5	α	β	Flutes	Dimens. Code	£		
0.5	0.25	1	2	57	0.45	20	6	10°	8.5°	2	.0005	52.54		
1	0.5	2	4	57	0.95	20	6	10°	8°	2	.001	47.42		
1.5	0.75	2.5	7.5	57	1.4	20	6	12.5°	7°	2	.0015	41.38		
2	1	3	8	57	1.8	20	6	12°	6.5°	2	.002	34.87		
3	1.5	3.5	10	57	2.8	20	6	11.5°	5°	2	.003	33.01		
4	2	4	12	57	3.8	20	6	11°	3.5°	2	.004	32.08		
5	2.5	5	14	57	4.7	20	6	10°	2°	2	.005	32.08		
6	3	6	20	57	5.6	—	6	—	—	2	.006	29.29		
8	4	7	25	63	7.6	—	8	—	—	2	.008	40.45		
10	5	8	30	72	9.6	—	10	—	—	2	.010	59.52		
12	6	10	35	83	11.5	—	12	—	—	2	.012	73.46		

Extra long design

Order code													2551A	
ϕd_1 ±0.01	r ±0.005	l_2	l_3	l_1	ϕd_3	l_4	ϕd_2 h5	α	β	Flutes	Dimens. Code		£	
1	0.5	2	4	80	0.95	40	6	4.5°	4°	2	.001		52.54	
1.5	0.75	2.5	7.5	80	1.4	40	6	4.5°	3.5°	2	.0015		47.42	
2	1	3	8	80	1.8	40	6	4°	3°	2	.002		40.91	
3	1.5	3.5	12	80	2.8	40	6	3.5°	2.5°	2	.003		39.98	
4	2	4	20	80	3.8	40	6	4°	1.5°	2	.004		38.59	
5	2.5	5	25	80	4.7	40	6	3°	1°	2	.005		38.13	
6	3	6	40	80	5.6	—	6	—	—	2	.006		36.26	
8	4	7	60	100	7.6	—	8	—	—	2	.008		47.88	
10	5	8	50	100	9.6	—	10	—	—	2	.010		65.55	
10	5	8	75	120	9.6	—	10	—	—	2	.010		96.71	
12	6	10	70	120	11.5	—	12	—	—	2	.012		56.72	
12	6	10	70	160	11.5	—	12	—	—	2	.012		91.12	

Design I₄:	N Carbide DIN 6535 HA HB 35-38° Ball nose v_c/f_z 31 Optional	Allround	Allround																																																																																																													
Coating - Multi-functional, high performance tool - 2 centre cutting edges - 2 lengths available - For almost all materials - Suitable for HSC finishing	TIALN P 1.1-5.1 M 1.1-2.1 3.1-4.1 K 1.1-2.2 3.1-4.2 N 2.1-2.8, 4.1-4.2 N 5.2-5.3 S 1.1-2.6	TIALN P 1.1-5.1 M 1.1-2.1 3.1-4.1 K 1.1-2.2 3.1-4.2 N 2.1-2.8, 4.1-4.2 N 5.2-5.3 S 1.1-2.6																																																																																																														
Long design <table><tr><th>Order code</th><th>ϕd_1 h10</th><th>r</th><th>l_2</th><th>l_3</th><th>l_1</th><th>ϕd_3</th><th>l_4</th><th>ϕd_2 h6</th><th>Flutes</th><th>Dimens. Code</th></tr><tr><td>2</td><td>1</td><td>6</td><td>10</td><td>57</td><td>1.9</td><td>20</td><td>6</td><td>6</td><td>3</td><td>.002</td></tr><tr><td>3</td><td>1.5</td><td>8</td><td>14</td><td>57</td><td>2.9</td><td>20</td><td>6</td><td>6</td><td>3</td><td>.003</td></tr><tr><td>4</td><td>2</td><td>11</td><td>18</td><td>57</td><td>3.8</td><td>20</td><td>6</td><td>6</td><td>3</td><td>.004</td></tr><tr><td>5</td><td>2.5</td><td>13</td><td>19</td><td>57</td><td>4.8</td><td>20</td><td>6</td><td>6</td><td>3</td><td>.005</td></tr><tr><td>6</td><td>3</td><td>13</td><td>20</td><td>57</td><td>5.8</td><td>—</td><td>6</td><td>6</td><td>4</td><td>.006</td></tr><tr><td>8</td><td>4</td><td>19</td><td>25</td><td>63</td><td>7.7</td><td>—</td><td>8</td><td>8</td><td>4</td><td>.008</td></tr><tr><td>10</td><td>5</td><td>22</td><td>30</td><td>72</td><td>9.5</td><td>—</td><td>10</td><td>10</td><td>4</td><td>.010</td></tr><tr><td>12</td><td>6</td><td>26</td><td>35</td><td>83</td><td>11.5</td><td>—</td><td>12</td><td>12</td><td>4</td><td>.012</td></tr><tr><td>16</td><td>8</td><td>32</td><td>40</td><td>92</td><td>15.5</td><td>—</td><td>16</td><td>16</td><td>4</td><td>.016</td></tr></table>	Order code	ϕd_1 h10	r	l_2	l_3	l_1	ϕd_3	l_4	ϕd_2 h6	Flutes	Dimens. Code	2	1	6	10	57	1.9	20	6	6	3	.002	3	1.5	8	14	57	2.9	20	6	6	3	.003	4	2	11	18	57	3.8	20	6	6	3	.004	5	2.5	13	19	57	4.8	20	6	6	3	.005	6	3	13	20	57	5.8	—	6	6	4	.006	8	4	19	25	63	7.7	—	8	8	4	.008	10	5	22	30	72	9.5	—	10	10	4	.010	12	6	26	35	83	11.5	—	12	12	4	.012	16	8	32	40	92	15.5	—	16	16	4	.016	2502A £	
Order code	ϕd_1 h10	r	l_2	l_3	l_1	ϕd_3	l_4	ϕd_2 h6	Flutes	Dimens. Code																																																																																																						
2	1	6	10	57	1.9	20	6	6	3	.002																																																																																																						
3	1.5	8	14	57	2.9	20	6	6	3	.003																																																																																																						
4	2	11	18	57	3.8	20	6	6	3	.004																																																																																																						
5	2.5	13	19	57	4.8	20	6	6	3	.005																																																																																																						
6	3	13	20	57	5.8	—	6	6	4	.006																																																																																																						
8	4	19	25	63	7.7	—	8	8	4	.008																																																																																																						
10	5	22	30	72	9.5	—	10	10	4	.010																																																																																																						
12	6	26	35	83	11.5	—	12	12	4	.012																																																																																																						
16	8	32	40	92	15.5	—	16	16	4	.016																																																																																																						
Extra long design <table><tr><th>Order code</th><th>ϕd_1 h10</th><th>r</th><th>l_2</th><th>l_3</th><th>l_1</th><th>ϕd_3</th><th>l_4</th><th>ϕd_2 h6</th><th>Flutes</th><th>Dimens. Code</th></tr><tr><td>6</td><td>3</td><td>40</td><td>60</td><td>100</td><td>5.8</td><td>—</td><td>6</td><td>6</td><td>4</td><td>.006</td></tr><tr><td>8</td><td>4</td><td>40</td><td>60</td><td>100</td><td>7.7</td><td>—</td><td>8</td><td>8</td><td>4</td><td>.008</td></tr><tr><td>10</td><td>5</td><td>40</td><td>55</td><td>100</td><td>9.5</td><td>—</td><td>10</td><td>10</td><td>4</td><td>.010</td></tr><tr><td>12</td><td>6</td><td>45</td><td>50</td><td>100</td><td>11.5</td><td>—</td><td>12</td><td>12</td><td>4</td><td>.012</td></tr><tr><td>16</td><td>8</td><td>65</td><td>90</td><td>150</td><td>15.5</td><td>—</td><td>16</td><td>16</td><td>4</td><td>.016</td></tr></table>	Order code	ϕd_1 h10	r	l_2	l_3	l_1	ϕd_3	l_4	ϕd_2 h6	Flutes	Dimens. Code	6	3	40	60	100	5.8	—	6	6	4	.006	8	4	40	60	100	7.7	—	8	8	4	.008	10	5	40	55	100	9.5	—	10	10	4	.010	12	6	45	50	100	11.5	—	12	12	4	.012	16	8	65	90	150	15.5	—	16	16	4	.016		2504A £																																												
Order code	ϕd_1 h10	r	l_2	l_3	l_1	ϕd_3	l_4	ϕd_2 h6	Flutes	Dimens. Code																																																																																																						
6	3	40	60	100	5.8	—	6	6	4	.006																																																																																																						
8	4	40	60	100	7.7	—	8	8	4	.008																																																																																																						
10	5	40	55	100	9.5	—	10	10	4	.010																																																																																																						
12	6	45	50	100	11.5	—	12	12	4	.012																																																																																																						
16	8	65	90	150	15.5	—	16	16	4	.016																																																																																																						

W Carbide DIN 6535 HA HB 30° Ball nose V_c/f_z 32  Al/Cu																																																																																																																																																																																																														
Design I₄:  Coating - High performance tool - Patented chisel edge - Sharp cutting edges - Very smooth CRN coating - 3 lengths available - For wrought aluminium alloys - For aluminium alloys with a silicon content of up to 7% - With CRN coating also for copper alloys GLT N 1.1-1.4 N 2.1-2.3 2.4-2.8 N 3.1-4.4, 5.3 S 1.1-2.1 2.2-2.3																																																																																																																																																																																																														
Short design <table><tr><th>Order code</th><th>ϕd_1 ± 0.01</th><th>r ± 0.005</th><th>l_2</th><th>l_3</th><th>l_1</th><th>ϕd_3</th><th>l_4</th><th>ϕd_2 h5</th><th>α</th><th>β</th><th>Flutes</th><th>Dimens. Code</th><th>2452K</th><th>£</th><th></th><th></th></tr><tr><td>0.5</td><td>0.25</td><td>1</td><td>2</td><td>38</td><td>0.45</td><td>9</td><td>3</td><td>10°</td><td>8°</td><td>2</td><td>2</td><td>.0005</td><td>28.58</td><td></td><td></td><td></td></tr><tr><td>1</td><td>0.5</td><td>2</td><td>4</td><td>38</td><td>0.95</td><td>9</td><td>3</td><td>12.5°</td><td>6.5°</td><td>2</td><td>2</td><td>.001</td><td>28.69</td><td></td><td></td><td></td></tr><tr><td>1.5</td><td>0.75</td><td>2.5</td><td>7.5</td><td>38</td><td>1.4</td><td>9</td><td>3</td><td>32°</td><td>5°</td><td>2</td><td>2</td><td>.0015</td><td>29.19</td><td></td><td></td><td></td></tr><tr><td>2</td><td>1</td><td>3</td><td>8</td><td>38</td><td>1.8</td><td>9</td><td>3</td><td>31°</td><td>3.5°</td><td>2</td><td>2</td><td>.002</td><td>30.99</td><td></td><td></td><td></td></tr><tr><td>3</td><td>1.5</td><td>3.5</td><td>10</td><td>57</td><td>2.8</td><td>20</td><td>6</td><td>11.5°</td><td>5°</td><td>2</td><td>2</td><td>.003</td><td>30.99</td><td></td><td></td><td></td></tr><tr><td>4</td><td>2</td><td>4</td><td>12</td><td>57</td><td>3.8</td><td>20</td><td>6</td><td>11°</td><td>3.5°</td><td>2</td><td>2</td><td>.004</td><td>32.09</td><td></td><td></td><td></td></tr><tr><td>5</td><td>2.5</td><td>5</td><td>14</td><td>57</td><td>4.7</td><td>20</td><td>6</td><td>10°</td><td>2°</td><td>2</td><td>2</td><td>.005</td><td>32.09</td><td></td><td></td><td></td></tr><tr><td>6</td><td>3</td><td>6</td><td>20</td><td>57</td><td>5.6</td><td>—</td><td>6</td><td>—</td><td>—</td><td>2</td><td>2</td><td>.006</td><td>33.52</td><td></td><td></td><td></td></tr><tr><td>8</td><td>4</td><td>7</td><td>25</td><td>63</td><td>7.6</td><td>—</td><td>8</td><td>—</td><td>—</td><td>2</td><td>2</td><td>.008</td><td>38.12</td><td></td><td></td><td></td></tr><tr><td>10</td><td>5</td><td>8</td><td>30</td><td>72</td><td>9.6</td><td>—</td><td>10</td><td>—</td><td>—</td><td>2</td><td>2</td><td>.010</td><td>52.24</td><td></td><td></td><td></td></tr><tr><td>12</td><td>6</td><td>10</td><td>35</td><td>83</td><td>11.5</td><td>—</td><td>12</td><td>—</td><td>—</td><td>2</td><td>2</td><td>.012</td><td>82.91</td><td></td><td></td><td></td></tr></table>	Order code	ϕd_1 ± 0.01	r ± 0.005	l_2	l_3	l_1	ϕd_3	l_4	ϕd_2 h5	α	β	Flutes	Dimens. Code	2452K	£			0.5	0.25	1	2	38	0.45	9	3	10°	8°	2	2	.0005	28.58				1	0.5	2	4	38	0.95	9	3	12.5°	6.5°	2	2	.001	28.69				1.5	0.75	2.5	7.5	38	1.4	9	3	32°	5°	2	2	.0015	29.19				2	1	3	8	38	1.8	9	3	31°	3.5°	2	2	.002	30.99				3	1.5	3.5	10	57	2.8	20	6	11.5°	5°	2	2	.003	30.99				4	2	4	12	57	3.8	20	6	11°	3.5°	2	2	.004	32.09				5	2.5	5	14	57	4.7	20	6	10°	2°	2	2	.005	32.09				6	3	6	20	57	5.6	—	6	—	—	2	2	.006	33.52				8	4	7	25	63	7.6	—	8	—	—	2	2	.008	38.12				10	5	8	30	72	9.6	—	10	—	—	2	2	.010	52.24				12	6	10	35	83	11.5	—	12	—	—	2	2	.012	82.91					
Order code	ϕd_1 ± 0.01	r ± 0.005	l_2	l_3	l_1	ϕd_3	l_4	ϕd_2 h5	α	β	Flutes	Dimens. Code	2452K	£																																																																																																																																																																																																
0.5	0.25	1	2	38	0.45	9	3	10°	8°	2	2	.0005	28.58																																																																																																																																																																																																	
1	0.5	2	4	38	0.95	9	3	12.5°	6.5°	2	2	.001	28.69																																																																																																																																																																																																	
1.5	0.75	2.5	7.5	38	1.4	9	3	32°	5°	2	2	.0015	29.19																																																																																																																																																																																																	
2	1	3	8	38	1.8	9	3	31°	3.5°	2	2	.002	30.99																																																																																																																																																																																																	
3	1.5	3.5	10	57	2.8	20	6	11.5°	5°	2	2	.003	30.99																																																																																																																																																																																																	
4	2	4	12	57	3.8	20	6	11°	3.5°	2	2	.004	32.09																																																																																																																																																																																																	
5	2.5	5	14	57	4.7	20	6	10°	2°	2	2	.005	32.09																																																																																																																																																																																																	
6	3	6	20	57	5.6	—	6	—	—	2	2	.006	33.52																																																																																																																																																																																																	
8	4	7	25	63	7.6	—	8	—	—	2	2	.008	38.12																																																																																																																																																																																																	
10	5	8	30	72	9.6	—	10	—	—	2	2	.010	52.24																																																																																																																																																																																																	
12	6	10	35	83	11.5	—	12	—	—	2	2	.012	82.91																																																																																																																																																																																																	



Cold-air nozzle and socket with magnetic shoe, see page 25

Design l₄:

N

Carbide

DIN 6535

HA
HB

30°

Torus

V_c/f_z

33

Optional

≤ 55 HRC

Allround

Coating

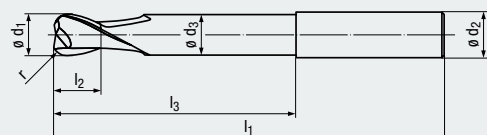
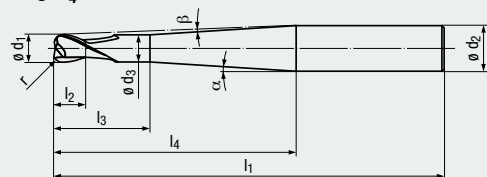
TIALN

- Multi-functional, high performance tool
- High-precision corner radius
- 2 lengths available
- For almost all materials
- Suitable for roughing, finishing and HSC finishing

P	1.1-5.1	
M	1.1-4.1	
K	1.1-4.2	
N	2.1-2.8, 5.2	1.2-1.4
S	2.1-2.3	2.4-2.6
H	1.1-1.2	

Short design

Order code												2552A			
ø d ₁ ±0.01	r ±0.005	l ₂	l ₃	l ₁	ø d ₃	l ₄	ø d ₂ h5	α	β	Flutes	Dimens. Code	£			
0.5	0.1	1	2	57	0.45	20	6	10°	8.5°	2	.0005	56.26			
1	0.2	2	4	57	0.95	20	6	10°	8°	2	.101	52.08			
1	0.25	2	4	57	0.95	20	6	10°	8°	2	.001	52.08			
1.5	0.2	2.5	7.5	57	1.4	20	6	12.5°	7°	2	.1015	46.49			
1.5	0.3	2.5	7.5	57	1.4	20	6	12.5°	7°	2	.0015	46.49			
2	0.2	3	8	57	1.8	20	6	12°	6.5°	2	.102	37.19			
2	0.5	3	8	57	1.8	20	6	12°	6.5°	2	.002	37.19			
3	0.2	3.5	10	57	2.8	20	6	11.5°	5°	2	.103	35.80			
3	0.5	3.5	10	57	2.8	20	6	11.5°	5°	2	.003	35.80			
4	0.3	4	12	57	3.8	20	6	11°	3.5°	2	.204	35.34			
4	0.5	4	12	57	3.8	20	6	11°	3.5°	2	.104	35.34			
4	1	4	12	57	3.8	20	6	11°	3.5°	2	.004	35.34			
5	0.3	5	14	57	4.7	20	6	10°	2°	2	.305	34.87			
5	0.5	5	14	57	4.7	20	6	10°	2°	2	.205	34.87			
5	1	5	14	57	4.7	20	6	10°	2°	2	.105	34.87			
5	1.5	5	14	57	4.7	20	6	10°	2°	2	.005	34.87			
6	0.3	6	20	57	5.6	—	6	—	—	2	.306	32.08			
6	0.5	6	20	57	5.6	—	6	—	—	2	.206	32.08			
6	1	6	20	57	5.6	—	6	—	—	2	.106	32.08			
6	2	6	20	57	5.6	—	6	—	—	2	.006	32.08			
8	0.3	7	25	63	7.6	—	8	—	—	2	.408	42.31			
8	0.5	7	25	63	7.6	—	8	—	—	2	.308	42.31			
8	1	7	25	63	7.6	—	8	—	—	2	.208	42.31			
8	2	7	25	63	7.6	—	8	—	—	2	.008	42.31			
10	0.5	8	30	72	9.6	—	10	—	—	2	.710	65.09			
10	1	8	30	72	9.6	—	10	—	—	2	.610	65.09			
10	1.5	8	30	72	9.6	—	10	—	—	2	.210	65.09			
10	2	8	30	72	9.6	—	10	—	—	2	.410	65.09			
10	3	8	30	72	9.6	—	10	—	—	2	.010	65.09			
12	0.5	10	35	83	11.5	—	12	—	—	2	.612	79.04			
12	1	10	35	83	11.5	—	12	—	—	2	.512	79.04			
12	1.5	10	35	83	11.5	—	12	—	—	2	.112	79.04			
12	2	10	35	83	11.5	—	12	—	—	2	.312	79.04			
12	4	10	35	83	11.5	—	12	—	—	2	.012	79.04			

Design I₄:

N



Carbide



DIN 6535

HA
HB

30°

Torus

 V_c/f_z

33



Optional

 ≤ 55
HRC

Allround

Coating

TIALN

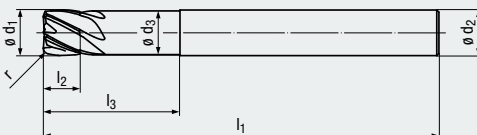
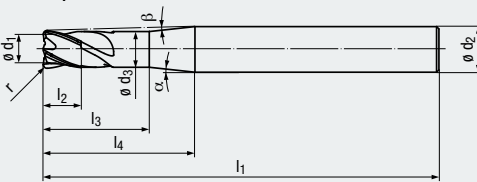
- Multi-functional, high performance tool
- High-precision corner radius
- 2 lengths available

- For almost all materials
- Suitable for roughing, finishing and HSC finishing

P	1.1-5.1
M	1.1-4.1
K	1.1-4.2
N	2.1-2.8, 5.2 1.2-1.4
S	2.1-2.3 2.4-2.6
H	1.1-1.2

Extra long design

Order code												2553A			
ϕd_1 ± 0.01	r ± 0.005	l_2	l_3	l_1	ϕd_3	l_4	ϕd_2 h6	α	β	Flutes	Dimens. Code				
1	0.2	2	4	80	0.95	40	6	4.5°	4°	2	.101	55.32			
1	0.25	2	4	80	0.95	40	6	4.5°	4°	2	.001	55.32			
1.5	0.2	2.5	7.5	80	1.4	40	6	4.5°	3.5°	2	.1015	52.08			
1.5	0.3	2.5	7.5	80	1.4	40	6	4.5°	3.5°	2	.0015	52.08			
2	0.2	3	8	80	1.8	40	6	4°	3°	2	.102	43.24			
2	0.5	3	8	80	1.8	40	6	4°	3°	2	.002	43.24			
3	0.2	3.5	12	80	2.8	40	6	3.5°	2.5°	2	.103	41.85			
3	0.5	3.5	12	80	2.8	40	6	3.5°	2.5°	2	.003	41.85			
4	0.3	4	20	80	3.8	40	6	4°	1.5°	2	.204	40.45			
4	0.5	4	20	80	3.8	40	6	4°	1.5°	2	.104	40.45			
4	1	4	20	80	3.8	40	6	4°	1.5°	2	.004	40.45			
5	0.3	5	25	80	4.7	40	6	3°	1°	2	.305	39.98			
5	0.5	5	25	80	4.7	40	6	3°	1°	2	.205	39.98			
5	1	5	25	80	4.7	40	6	3°	1°	2	.105	39.98			
5	1.5	5	25	80	4.7	40	6	3°	1°	2	.005	39.98			
6	0.3	6	40	80	5.6	—	6	—	—	2	.306	38.59			
6	0.5	6	40	80	5.6	—	6	—	—	2	.206	38.59			
6	1	6	40	80	5.6	—	6	—	—	2	.106	38.59			
6	2	6	40	80	5.6	—	6	—	—	2	.006	38.59			
8	0.3	7	60	100	7.6	—	8	—	—	2	.408	51.14			
8	0.5	7	60	100	7.6	—	8	—	—	2	.308	51.14			
8	1	7	60	100	7.6	—	8	—	—	2	.208	51.14			
8	2	7	60	100	7.6	—	8	—	—	2	.008	51.14			
8	2.5	7	60	100	7.6	—	8	—	—	2	.108	51.14			
10	0.5	8	50	100	9.6	—	10	—	—	2	.710	65.55			
10	1	8	50	100	9.6	—	10	—	—	2	.610	65.55			
10	1.5	8	50	100	9.6	—	10	—	—	2	.510	65.55			
10	1.5	8	75	120	9.6	—	10	—	—	2	.210	71.14			
10	2	8	50	100	9.6	—	10	—	—	2	.410	65.55			
10	2.5	8	75	120	9.6	—	10	—	—	2	.110	71.14			
10	3	8	50	100	9.6	—	10	—	—	2	.310	65.55			
10	3	8	75	120	9.6	—	10	—	—	2	.010	71.14			
12	0.5	10	70	120	11.5	—	12	—	—	2	.612	96.71			
12	1	10	70	120	11.5	—	12	—	—	2	.512	96.71			
12	1.5	10	70	120	11.5	—	12	—	—	2	.412	96.71			
12	1.5	10	70	160	11.5	—	12	—	—	2	.112	103.22			
12	2	10	70	120	11.5	—	12	—	—	2	.312	96.71			
12	4	8	70	120	11.5	—	12	—	—	2	.212	96.71			
12	4	10	70	160	11.5	—	12	—	—	2	.012	103.22			

 Design I₄: 													N  Carbide DIN 6535  HA  HB  30°  Torus  1-2°  V_c/f_z 34 Optional   ≤ 55 HRC  Allround							
Coating													TIALN							
- Multi-functional, high performance tool - High-precision corner radius - 2 lengths available - For difficult to cut materials - Suitable for roughing, finishing and HSC finishing													P 1.1-5.1							
													M 1.1-2.1							
													K 1.1-4.2							
													N 2.2-2.8, 5.2 2.1							
													S 1.1-2.6							
													H 1.1-1.2							
Short design																				
Order code													2554A							
ø d ₁ ±0.01	r ±0.005	l ₂	l ₃	l ₁	ø d ₃	l ₄	ø d ₂ h6	α	β	Flutes	Dimens. Code	£								
3	0.2	3.5	10	57	2.8	20	6	11.5°	5°	4	.103	41.38								
3	0.5	3.5	10	57	2.8	20	6	11.5°	5°	4	.003	41.38								
4	0.3	4	12	57	3.8	20	6	11°	3.5°	4	.104	40.45								
4	0.5	4	12	57	3.8	20	6	11°	3.5°	4	.004	40.45								
4	1	4	12	57	3.8	20	6	11°	3.5°	4	.204	40.45								
5	0.3	5	14	57	4.7	20	6	10°	1.5°	4	.105	39.52								
5	0.5	5	14	57	4.7	20	6	10°	1.5°	4	.005	39.52								
5	1	5	14	57	4.7	20	6	10°	1.5°	4	.205	39.52								
6	0.3	6	20	57	5.6	—	6	—	—	4	.406	39.98								
6	0.5	6	20	57	5.6	—	6	—	—	4	.506	39.98								
6	0.8	6	20	57	5.6	—	6	—	—	4	.006004	39.98								
6	1	6	20	57	5.6	—	6	—	—	4	.606	39.98								
8	0.3	7	25	63	7.6	—	8	—	—	4	.408	56.72								
8	0.5	7	25	63	7.6	—	8	—	—	4	.508	56.72								
8	1	7	25	63	7.6	—	8	—	—	4	.008004	56.72								
10	0.5	8	30	72	9.6	—	10	—	—	4	.410	61.37								
10	1	8	30	72	9.6	—	10	—	—	4	.010004	61.37								
10	1.5	8	30	72	9.6	—	10	—	—	4	.510	71.14								
10	2	8	30	72	9.6	—	10	—	—	4	.610	71.14								
12	0.5	10	35	83	11.5	—	12	—	—	4	.312	80.90								
12	1	10	35	83	11.5	—	12	—	—	4	.412	80.90								
12	1.5	10	35	83	11.5	—	12	—	—	4	.012004	80.90								
12	2	10	35	83	11.5	—	12	—	—	4	.512	92.99								

Design I₄:

N

Carbide

DIN 6535
HA
HB

30°

Torus

1-2°

V_c/f_z
34

Optional

≤ 55
HRC

Allround

Coating

TIALN

- Multi-functional, high performance tool
- High-precision corner radius
- 2 lengths available
- For difficult to cut materials
- Suitable for roughing, finishing and HSC finishing

P	1.1-5.1
M	1.1-2.1
K	1.1-4.2
N	2.2-2.8, 5.2 2.1
S	1.1-2.6
H	1.1-1.2

Extra long design

Order code												2555A			
ϕd_1 ±0.01	r ±0.005	l_2	l_3	l_1	ϕd_3	l_4	ϕd_2 h6	α	β	Flutes	Dimens. Code				
3	0.2	3.5	12	80	2.8	40	6	3.5°	2.5°	4	.103	92.99			
3	0.5	3.5	12	80	2.8	40	6	3.5°	2.5°	4	.003	43.70			
4	0.3	4	20	80	3.8	40	6	4°	3.5°	4	.104	42.31			
4	0.5	4	20	80	3.8	40	6	4°	3.5°	4	.004	42.31			
4	1	4	20	80	3.8	40	6	4°	3.5°	4	.204	42.31			
5	0.3	5	25	80	4.7	40	6	3°	1°	4	.105	41.38			
5	0.5	5	25	80	4.7	40	6	3°	1°	4	.005	41.38			
5	1	5	25	80	4.7	40	6	3°	1°	4	.205	41.38			
6	0.3	6	40	80	5.6	—	6	—	—	4	.406	40.91			
6	0.5	6	40	80	5.6	—	6	—	—	4	.506	40.91			
6	0.8	6	40	80	5.6	—	6	—	—	4	.606	40.91			
6	1	6	40	80	5.6	—	6	—	—	4	.606	40.91			
8	0.3	7	40	80	7.6	—	8	—	—	4	.408	61.83			
8	0.5	7	40	80	7.6	—	8	—	—	4	.508	61.83			
8	1	7	40	80	7.6	—	8	—	—	4	.608	61.83			
10	0.5	8	55	100	9.6	—	10	—	—	4	.410	76.25			
10	1	8	55	100	9.6	—	10	—	—	4	.610	76.25			
10	1.5	8	55	100	9.6	—	10	—	—	4	.510	76.25			
10	2	8	55	100	9.6	—	10	—	—	4	.610	76.25			
12	0.5	10	70	120	11.5	—	12	—	—	4	.312	97.17			
12	1	10	70	120	11.5	—	12	—	—	4	.412	97.17			
12	1.5	10	70	120	11.5	—	12	—	—	4	.612	97.17			
12	2	10	70	120	11.5	—	12	—	—	4	.512	97.17			

Design I1:

Design I4:

HR

fine

HSSE

DIN 1835

30°

45°

ø4 - 28

ø 30 - 50

Vc/fz
35

Allround

Allround

Coating		TIALN	TIALN
- Roughing end mill with fine, round chip breakers - Generates milling marks - Centre cutting of up to 28 mm dia. - Wide range of diameters - 5 lengths available - Highly versatile	- For almost all ferrous materials and non-ferrous metals - For materials with a tensile strength of up to 1400 N/mm²	P 1.1-3.1 4.1-5.1	P 1.1-3.1 4.1-5.1
		M 1.1 2.1-4.1	M 1.1 2.1-4.1
		K 1.1-2.1 2.2-3.2	K 1.1-2.1 2.2-3.2
		K 4.1 4.2	K 4.1 4.2
		N 2.1 2.2-2.6, 5.2	N 2.1 2.2-2.6, 5.2
		S 1.1-1.2, 2.1-2.2	S 1.1-1.2, 2.1-2.2

Extra short design

Order code										1351C			
ø d1 k12	l2	l3	l1	ø d3	l4	ø d2 h6	lA	Flutes	Dimens. Code	£			
6	8	14	52	5.5	—	6	16	4	.006	19.43			
8	11	17	61	7.5	19	10	21	4	.008	26.01			
10	13	21	63	9.5	—	10	23	4	.010	27.86			
12	16	26	73	11.5	—	12	28	4	.012	30.77			
14	16	26	73	11.5	—	12	28	4	.014	41.05			
16	19	29	79	15	—	16	31	4	.016	42.51			
18	19	29	79	15	—	16	31	4	.018	56.42			
20	22	36	88	19	—	20	38	4	.020	57.90			

DIN 844 – Short design

Order code												1381C	
ø d1 k12	l2	l3	l1	ø d3	l4	ø d2 h6	lA	Flutes	Dimens. Code			£	
4	11	17	55	—	—	6	19	3	.004			21.49	
5	13	19	57	—	—	6	21	3	.005			21.49	
6	13	19	57	5.5	—	6	21	4	.006			17.39	
8	19	25	69	7.5	27	10	29	4	.008			24.02	
10	22	30	72	9.5	—	10	32	4	.010			25.93	
12	26	36	83	11.5	—	12	38	4	.012			27.19	
14	26	36	83	11.5	—	12	38	4	.014			33.82	
16	32	42	92	15	—	16	44	4	.016			38.57	
18	32	42	92	15	—	16	44	4	.018			49.95	
20	38	52	104	19	—	20	54	4	.020			51.24	
22	38	52	104	19	—	20	54	4	.022			63.53	
24	45	61	121	23	63	25	65	4	.024			78.40	
25	45	63	121	24	—	25	65	4	.025			74.61	
28	45	63	121	24	—	25	65	5	.028			91.99	
30	45	63	121	24	—	25	65	5	.030			100.85	
32	53	70	133	31	—	32	73	6	.032			95.16	
36	53	70	133	31	—	32	73	6	.036			140.37	
40	63	80	155	38	—	40	85	6	.040			163.78	
45	63	80	155	38	—	40	85	6	.045			221.31	
50	75	95	177	48	—	50	97	8	.050			250.71	

Cold-Air Nozzle



Delivery includes:

- With flexible hose (length approx. 300 mm) for cold air
- Silencer (SN14) for hot exhaust air
- Ball-valve with fitting (1/4") for inlet hose (6 mm) with quick-change attachment (7.2 mm)

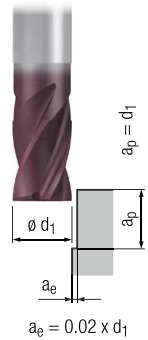
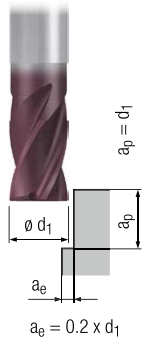
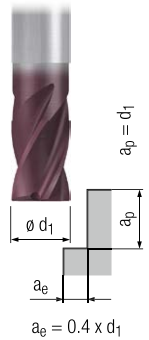
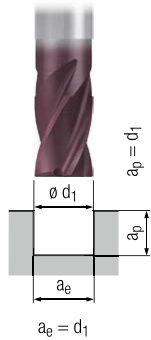
Order code		6910
Length (without hose)	Dimens. Code	£
225 mm	.15	323.73

Socket with Magnetic Shoe



Order code		6910
Dimensions	Dimens. Code	£
dia. 80 x 80 mm	.25	128.46


Solid carbide end mills – short design
N
Valid for

1916A
1917A
2516A
2517A


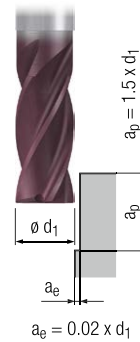
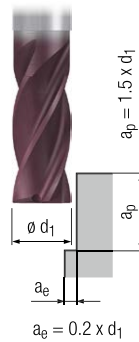
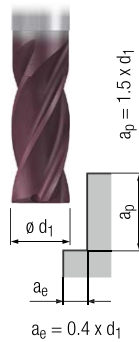
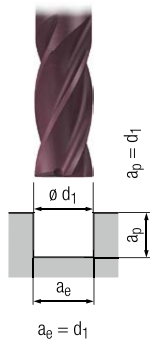
		V_c [m/min]	f_z [mm]	V_c [m/min]	f_z [mm]	V_c [m/min]	f_z [mm]	V_c [m/min]	f_z [mm]				
P	1.1	170	$0.005 \times d_1$	190	$0.006 \times d_1$	200	$0.007 \times d_1$	240	$0.008 \times d_1$	□	■	□	■
	2.1	150	$0.004 \times d_1$	170	$0.005 \times d_1$	180	$0.006 \times d_1$	210	$0.007 \times d_1$	□	■	□	■
	3.1	130	$0.004 \times d_1$	140	$0.005 \times d_1$	160	$0.005 \times d_1$	180	$0.006 \times d_1$	□	■	□	■
	4.1	120	$0.003 \times d_1$	130	$0.004 \times d_1$	140	$0.004 \times d_1$	170	$0.005 \times d_1$	□	■		
	5.1	100	$0.003 \times d_1$	110	$0.003 \times d_1$	120	$0.004 \times d_1$	140	$0.004 \times d_1$	□	■		
M	1.1	80	$0.003 \times d_1$	90	$0.004 \times d_1$	100	$0.004 \times d_1$	110	$0.005 \times d_1$			□	■
	2.1	70	$0.003 \times d_1$	80	$0.004 \times d_1$	80	$0.004 \times d_1$	100	$0.005 \times d_1$			□	■
	3.1	50	$0.002 \times d_1$	60	$0.003 \times d_1$	60	$0.003 \times d_1$	70	$0.004 \times d_1$			□	■
	4.1	30	$0.002 \times d_1$	30	$0.003 \times d_1$	40	$0.003 \times d_1$	40	$0.004 \times d_1$			□	■
K	1.1	170	$0.005 \times d_1$	190	$0.006 \times d_1$	200	$0.007 \times d_1$	240	$0.008 \times d_1$	□	■		
	1.2	170	$0.005 \times d_1$	190	$0.006 \times d_1$	200	$0.007 \times d_1$	240	$0.008 \times d_1$	□	■		
	2.1	150	$0.004 \times d_1$	170	$0.005 \times d_1$	180	$0.006 \times d_1$	210	$0.006 \times d_1$	□	■		
	2.2	150	$0.004 \times d_1$	170	$0.005 \times d_1$	180	$0.006 \times d_1$	210	$0.006 \times d_1$	□	■		
	3.1	130	$0.004 \times d_1$	140	$0.005 \times d_1$	160	$0.006 \times d_1$	180	$0.006 \times d_1$	□	■		
	3.2	130	$0.004 \times d_1$	140	$0.005 \times d_1$	160	$0.006 \times d_1$	180	$0.006 \times d_1$	□	■		
	4.1	100	$0.003 \times d_1$	110	$0.004 \times d_1$	120	$0.004 \times d_1$	140	$0.005 \times d_1$	□	■		
	4.2	80	$0.003 \times d_1$	90	$0.004 \times d_1$	100	$0.004 \times d_1$	110	$0.005 \times d_1$	□	■		
N	1.1	220	$0.009 \times d_1$	250	$0.010 \times d_1$	280	$0.011 \times d_1$	300	$0.013 \times d_1$			□	■
	1.2	220	$0.008 \times d_1$	250	$0.009 \times d_1$	280	$0.010 \times d_1$	300	$0.011 \times d_1$			□	■
	1.3	220	$0.007 \times d_1$	250	$0.008 \times d_1$	280	$0.009 \times d_1$	300	$0.010 \times d_1$			□	■
	1.4	200	$0.008 \times d_1$	250	$0.009 \times d_1$	280	$0.010 \times d_1$	300	$0.011 \times d_1$			□	■
	1.5												
	1.6												
	2.1	150	$0.005 \times d_1$	170	$0.006 \times d_1$	180	$0.007 \times d_1$	210	$0.008 \times d_1$			□	■
	2.2	150	$0.005 \times d_1$	170	$0.006 \times d_1$	180	$0.007 \times d_1$	210	$0.008 \times d_1$			□	■
	2.3	150	$0.005 \times d_1$	170	$0.006 \times d_1$	180	$0.007 \times d_1$	210	$0.008 \times d_1$			□	■
	2.4	130	$0.004 \times d_1$	140	$0.005 \times d_1$	160	$0.006 \times d_1$	180	$0.006 \times d_1$			□	■
	2.5	130	$0.004 \times d_1$	140	$0.005 \times d_1$	160	$0.006 \times d_1$	180	$0.006 \times d_1$			□	■
	2.6	130	$0.004 \times d_1$	140	$0.005 \times d_1$	160	$0.006 \times d_1$	180	$0.006 \times d_1$			□	■
	2.7	80	$0.003 \times d_1$	90	$0.004 \times d_1$	100	$0.004 \times d_1$	110	$0.005 \times d_1$			□	■
	2.8	80	$0.003 \times d_1$	90	$0.004 \times d_1$	100	$0.004 \times d_1$	110	$0.005 \times d_1$			□	■
	3.1	340	$0.009 \times d_1$	370	$0.011 \times d_1$	410	$0.013 \times d_1$	480	$0.014 \times d_1$			□	■
	3.2	340	$0.007 \times d_1$	370	$0.008 \times d_1$	410	$0.010 \times d_1$	480	$0.011 \times d_1$			□	■
	4.1	340	$0.008 \times d_1$	370	$0.009 \times d_1$	410	$0.011 \times d_1$	480	$0.012 \times d_1$			□	■
	4.2	500	$0.008 \times d_1$	550	$0.009 \times d_1$	600	$0.011 \times d_1$	700	$0.012 \times d_1$			□	■
	4.3												
	4.4												
	5.1												
	5.2	80	$0.003 \times d_1$	90	$0.004 \times d_1$	100	$0.004 \times d_1$	110	$0.005 \times d_1$				■
	5.3												
S	1.1	80	$0.004 \times d_1$	90	$0.004 \times d_1$	100	$0.005 \times d_1$	110	$0.006 \times d_1$				■
	1.2	70	$0.003 \times d_1$	80	$0.004 \times d_1$	80	$0.004 \times d_1$	100	$0.005 \times d_1$				■
	1.3	40	$0.003 \times d_1$	40	$0.003 \times d_1$	50	$0.004 \times d_1$	60	$0.004 \times d_1$				■
	2.1	70	$0.002 \times d_1$	80	$0.002 \times d_1$	80	$0.003 \times d_1$	100	$0.003 \times d_1$				■
	2.2	30	$0.002 \times d_1$	30	$0.002 \times d_1$	35	$0.003 \times d_1$	40	$0.003 \times d_1$				■
	2.3	20	$0.002 \times d_1$	25	$0.002 \times d_1$	25	$0.003 \times d_1$	30	$0.003 \times d_1$				■
	2.4	20	$0.002 \times d_1$	25	$0.002 \times d_1$	25	$0.003 \times d_1$	30	$0.003 \times d_1$				■
	2.5	20	$0.002 \times d_1$	20	$0.002 \times d_1$	20	$0.003 \times d_1$	30	$0.003 \times d_1$				■
	2.6	20	$0.002 \times d_1$	20	$0.002 \times d_1$	20	$0.003 \times d_1$	30	$0.003 \times d_1$				■
H	1.1	100	$0.003 \times d_1$	110	$0.003 \times d_1$	120	$0.004 \times d_1$	140	$0.004 \times d_1$	□	■		
	1.2	80	$0.003 \times d_1$	90	$0.003 \times d_1$	100	$0.004 \times d_1$	110	$0.004 \times d_1$	□	■		
	1.3			90	$0.003 \times d_1$	100	$0.003 \times d_1$	110	$0.004 \times d_1$	□	■		
	1.4												
	1.5												

Solid carbide end mills – long design

N

Valid for

1998A	2698A	2518A
1999A	2699A	2519A



		v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]				
P	1.1	140	$0.005 \times d_1$	150	$0.005 \times d_1$	170	$0.006 \times d_1$	200	$0.007 \times d_1$	□	■	□	■
	2.1	130	$0.004 \times d_1$	140	$0.005 \times d_1$	160	$0.005 \times d_1$	180	$0.006 \times d_1$	□	■	□	■
	3.1	110	$0.004 \times d_1$	120	$0.004 \times d_1$	130	$0.005 \times d_1$	150	$0.005 \times d_1$	□	■	□	■
	4.1	100	$0.003 \times d_1$	110	$0.003 \times d_1$	120	$0.004 \times d_1$	140	$0.004 \times d_1$	□	■		
	5.1	90	$0.003 \times d_1$	100	$0.003 \times d_1$	110	$0.003 \times d_1$	130	$0.004 \times d_1$	□	■		
M	1.1	70	$0.003 \times d_1$	80	$0.003 \times d_1$	80	$0.004 \times d_1$	100	$0.004 \times d_1$			□	■
	2.1	60	$0.003 \times d_1$	70	$0.003 \times d_1$	70	$0.004 \times d_1$	80	$0.004 \times d_1$			□	■
	3.1	40	$0.002 \times d_1$	40	$0.003 \times d_1$	50	$0.003 \times d_1$	60	$0.003 \times d_1$			□	■
	4.1	30	$0.002 \times d_1$	30	$0.003 \times d_1$	40	$0.003 \times d_1$	40	$0.003 \times d_1$			□	■
K	1.1	140	$0.005 \times d_1$	150	$0.006 \times d_1$	170	$0.006 \times d_1$	200	$0.007 \times d_1$	□	■		
	1.2	140	$0.005 \times d_1$	150	$0.006 \times d_1$	170	$0.006 \times d_1$	200	$0.007 \times d_1$	□	■		
	2.1	130	$0.004 \times d_1$	140	$0.005 \times d_1$	160	$0.005 \times d_1$	180	$0.006 \times d_1$	□	■		
	2.2	130	$0.004 \times d_1$	140	$0.005 \times d_1$	160	$0.005 \times d_1$	180	$0.006 \times d_1$	□	■		
	3.1	110	$0.004 \times d_1$	120	$0.005 \times d_1$	130	$0.005 \times d_1$	150	$0.006 \times d_1$	□	■		
	3.2	110	$0.004 \times d_1$	120	$0.005 \times d_1$	130	$0.005 \times d_1$	150	$0.006 \times d_1$	□	■		
	4.1	90	$0.003 \times d_1$	100	$0.003 \times d_1$	110	$0.004 \times d_1$	130	$0.004 \times d_1$	□	■		
	4.2	70	$0.003 \times d_1$	80	$0.003 \times d_1$	80	$0.004 \times d_1$	100	$0.004 \times d_1$	□	■		
N	1.1	220	$0.009 \times d_1$	250	$0.010 \times d_1$	280	$0.011 \times d_1$	300	$0.013 \times d_1$			□	■
	1.2	220	$0.008 \times d_1$	250	$0.009 \times d_1$	280	$0.010 \times d_1$	300	$0.011 \times d_1$			□	■
	1.3	220	$0.007 \times d_1$	250	$0.008 \times d_1$	280	$0.009 \times d_1$	300	$0.010 \times d_1$			□	■
	1.4	200	$0.008 \times d_1$	250	$0.009 \times d_1$	280	$0.010 \times d_1$	300	$0.011 \times d_1$			□	■
	1.5												
	1.6												
	2.1	130	$0.005 \times d_1$	140	$0.006 \times d_1$	160	$0.006 \times d_1$	180	$0.007 \times d_1$			□	■
	2.2	130	$0.005 \times d_1$	140	$0.006 \times d_1$	160	$0.006 \times d_1$	180	$0.007 \times d_1$			□	■
	2.3	130	$0.005 \times d_1$	140	$0.006 \times d_1$	160	$0.006 \times d_1$	180	$0.007 \times d_1$	□		□	■
	2.4	120	$0.004 \times d_1$	130	$0.005 \times d_1$	140	$0.005 \times d_1$	170	$0.006 \times d_1$			□	■
	2.5	120	$0.004 \times d_1$	130	$0.005 \times d_1$	140	$0.005 \times d_1$	170	$0.006 \times d_1$			□	■
	2.6	120	$0.004 \times d_1$	130	$0.005 \times d_1$	140	$0.005 \times d_1$	170	$0.006 \times d_1$	□		□	■
	2.7	70	$0.003 \times d_1$	80	$0.003 \times d_1$	80	$0.004 \times d_1$	100	$0.004 \times d_1$			□	■
	2.8	70	$0.003 \times d_1$	80	$0.003 \times d_1$	80	$0.004 \times d_1$	100	$0.004 \times d_1$			□	■
	3.1	290	$0.009 \times d_1$	320	$0.010 \times d_1$	350	$0.011 \times d_1$	410	$0.013 \times d_1$			□	■
	3.2	290	$0.007 \times d_1$	320	$0.008 \times d_1$	350	$0.009 \times d_1$	410	$0.010 \times d_1$			□	■
	4.1	290	$0.008 \times d_1$	320	$0.009 \times d_1$	350	$0.009 \times d_1$	410	$0.011 \times d_1$	□		□	■
	4.2	430	$0.008 \times d_1$	470	$0.009 \times d_1$	520	$0.009 \times d_1$	600	$0.011 \times d_1$			□	■
	4.3												
	4.4												
	5.1												
	5.2	70	$0.003 \times d_1$	80	$0.003 \times d_1$	80	$0.004 \times d_1$	100	$0.004 \times d_1$				■
	5.3												
S	1.1	70	$0.004 \times d_1$	80	$0.004 \times d_1$	80	$0.004 \times d_1$	100	$0.005 \times d_1$				■
	1.2	60	$0.003 \times d_1$	70	$0.003 \times d_1$	70	$0.004 \times d_1$	80	$0.004 \times d_1$				■
	1.3	40	$0.003 \times d_1$	40	$0.003 \times d_1$	50	$0.003 \times d_1$	60	$0.004 \times d_1$				■
	2.1	60	$0.002 \times d_1$	70	$0.002 \times d_1$	70	$0.003 \times d_1$	80	$0.003 \times d_1$				■
	2.2	20	$0.002 \times d_1$	20	$0.002 \times d_1$	15	$0.003 \times d_1$	30	$0.003 \times d_1$				■
	2.3	20	$0.002 \times d_1$	25	$0.002 \times d_1$	25	$0.003 \times d_1$	30	$0.003 \times d_1$				■
	2.4	20	$0.002 \times d_1$	25	$0.002 \times d_1$	25	$0.003 \times d_1$	30	$0.003 \times d_1$				■
	2.5	20	$0.002 \times d_1$	20	$0.002 \times d_1$	20	$0.003 \times d_1$	30	$0.003 \times d_1$				■
	2.6	20	$0.002 \times d_1$	20	$0.002 \times d_1$	20	$0.003 \times d_1$	30	$0.003 \times d_1$				■
H	1.1	90	$0.003 \times d_1$	100	$0.003 \times d_1$	110	$0.003 \times d_1$	130	$0.004 \times d_1$	□	■		
	1.2	70	$0.003 \times d_1$	80	$0.003 \times d_1$	80	$0.003 \times d_1$	100	$0.004 \times d_1$	□	■		
	1.3			70	$0.003 \times d_1$	70	$0.003 \times d_1$	80	$0.003 \times d_1$	□	■		
	1.4												
	1.5												

 v_c = Cutting speed f_z = Feed per tooth

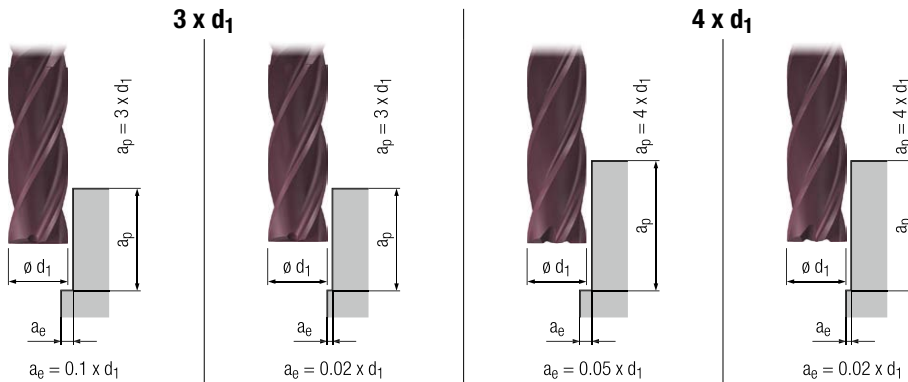


Solid carbide end mills – extra long design

N

Valid for

2526A
2527A
2528A
2529A

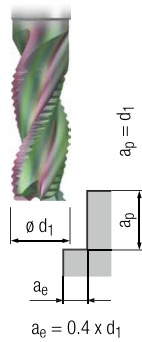
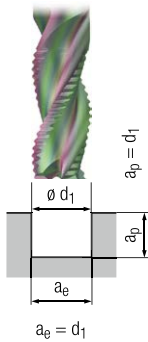


		V_c [m/min]	f_z [mm]	V_c [m/min]	f_z [mm]	V_c [m/min]	f_z [mm]	V_c [m/min]	f_z [mm]				
P	1.1	120	$0.005 \times d_1$	140	$0.006 \times d_1$	100	$0.005 \times d_1$	120	$0.005 \times d_1$	□	■	□	■
	2.1	110	$0.004 \times d_1$	130	$0.005 \times d_1$	90	$0.004 \times d_1$	110	$0.005 \times d_1$	□	■	□	■
	3.1	90	$0.004 \times d_1$	110	$0.005 \times d_1$	70	$0.004 \times d_1$	90	$0.004 \times d_1$	□	■	□	■
	4.1	70	$0.003 \times d_1$	80	$0.004 \times d_1$	60	$0.003 \times d_1$	70	$0.003 \times d_1$	□	■		
	5.1	60	$0.003 \times d_1$	70	$0.003 \times d_1$	50	$0.003 \times d_1$	60	$0.003 \times d_1$	□	■		
M	1.1	120	$0.003 \times d_1$	140	$0.004 \times d_1$	100	$0.003 \times d_1$	120	$0.003 \times d_1$			□	■
	2.1	100	$0.003 \times d_1$	120	$0.004 \times d_1$	80	$0.003 \times d_1$	100	$0.003 \times d_1$			□	■
	3.1	70	$0.003 \times d_1$	80	$0.003 \times d_1$	60	$0.003 \times d_1$	70	$0.003 \times d_1$			□	■
	4.1	50	$0.003 \times d_1$	60	$0.003 \times d_1$	40	$0.003 \times d_1$	50	$0.003 \times d_1$			□	■
K	1.1	120	$0.005 \times d_1$	140	$0.006 \times d_1$	100	$0.005 \times d_1$	120	$0.006 \times d_1$	□	■		
	1.2	120	$0.005 \times d_1$	140	$0.006 \times d_1$	100	$0.005 \times d_1$	120	$0.006 \times d_1$	□	■		
	2.1	110	$0.004 \times d_1$	130	$0.005 \times d_1$	90	$0.004 \times d_1$	110	$0.004 \times d_1$	□	■		
	2.2	110	$0.004 \times d_1$	130	$0.005 \times d_1$	90	$0.004 \times d_1$	110	$0.004 \times d_1$	□	■		
	3.1	90	$0.004 \times d_1$	110	$0.005 \times d_1$	70	$0.004 \times d_1$	90	$0.004 \times d_1$	□	■		
	3.2	90	$0.004 \times d_1$	110	$0.005 \times d_1$	70	$0.004 \times d_1$	90	$0.004 \times d_1$	□	■		
	4.1	70	$0.003 \times d_1$	80	$0.004 \times d_1$	60	$0.003 \times d_1$	70	$0.003 \times d_1$	□	■		
	4.2	60	$0.003 \times d_1$	70	$0.004 \times d_1$	50	$0.003 \times d_1$	60	$0.003 \times d_1$	□	■		
N	1.1	360	$0.009 \times d_1$	430	$0.011 \times d_1$	300	$0.009 \times d_1$	430	$0.009 \times d_1$			□	■
	1.2	360	$0.008 \times d_1$	430	$0.010 \times d_1$	300	$0.008 \times d_1$	430	$0.009 \times d_1$			□	■
	1.3	360	$0.007 \times d_1$	430	$0.008 \times d_1$	300	$0.007 \times d_1$	430	$0.008 \times d_1$			□	■
	1.4	240	$0.008 \times d_1$	290	$0.010 \times d_1$	200	$0.008 \times d_1$	290	$0.009 \times d_1$			□	■
	1.5	230	$0.007 \times d_1$	280	$0.008 \times d_1$	180	$0.007 \times d_1$	280	$0.008 \times d_1$			□	■
	1.6	160	$0.006 \times d_1$	190	$0.007 \times d_1$	130	$0.006 \times d_1$	190	$0.007 \times d_1$			□	■
	2.1	110	$0.005 \times d_1$	130	$0.006 \times d_1$	90	$0.005 \times d_1$	110	$0.006 \times d_1$			□	■
	2.2	110	$0.005 \times d_1$	130	$0.006 \times d_1$	90	$0.005 \times d_1$	110	$0.006 \times d_1$			□	■
	2.3	110	$0.005 \times d_1$	130	$0.006 \times d_1$	90	$0.005 \times d_1$	110	$0.006 \times d_1$	□		□	■
	2.4	100	$0.004 \times d_1$	120	$0.005 \times d_1$	80	$0.004 \times d_1$	100	$0.004 \times d_1$			□	■
	2.5	100	$0.004 \times d_1$	120	$0.005 \times d_1$	80	$0.004 \times d_1$	100	$0.004 \times d_1$			□	■
	2.6	100	$0.004 \times d_1$	120	$0.005 \times d_1$	80	$0.004 \times d_1$	100	$0.004 \times d_1$			□	■
	2.7	60	$0.003 \times d_1$	70	$0.004 \times d_1$	50	$0.003 \times d_1$	60	$0.003 \times d_1$			□	■
	2.8	60	$0.003 \times d_1$	70	$0.004 \times d_1$	50	$0.003 \times d_1$	60	$0.003 \times d_1$			□	■
	3.1												
	3.2												
	4.1												
	4.2												
	4.3												
	4.4												
	5.1												
	5.2	60	$0.003 \times d_1$	70	$0.004 \times d_1$	50	$0.003 \times d_1$	60	$0.003 \times d_1$				■
	5.3												
S	1.1	90	$0.004 \times d_1$	100	$0.005 \times d_1$	70	$0.004 \times d_1$	80	$0.004 \times d_1$				■
	1.2	70	$0.003 \times d_1$	80	$0.004 \times d_1$	60	$0.003 \times d_1$	70	$0.003 \times d_1$				■
	1.3	70	$0.003 \times d_1$	80	$0.003 \times d_1$	60	$0.003 \times d_1$	70	$0.003 \times d_1$				■
	2.1	70	$0.004 \times d_1$	80	$0.004 \times d_1$	60	$0.004 \times d_1$	70	$0.004 \times d_1$				■
	2.2	30	$0.003 \times d_1$	40	$0.004 \times d_1$	15	$0.003 \times d_1$	30	$0.003 \times d_1$				■
	2.3	20	$0.002 \times d_1$	25	$0.002 \times d_1$	25	$0.002 \times d_1$	20	$0.002 \times d_1$				■
	2.4	30	$0.003 \times d_1$	45	$0.003 \times d_1$	25	$0.003 \times d_1$	30	$0.003 \times d_1$				■
	2.5	20	$0.002 \times d_1$	20	$0.002 \times d_1$	20	$0.002 \times d_1$	20	$0.002 \times d_1$				■
	2.6	20	$0.003 \times d_1$	20	$0.003 \times d_1$	20	$0.003 \times d_1$	20	$0.003 \times d_1$				■
H	1.1												
	1.2												
	1.3												
	1.4												
	1.5												

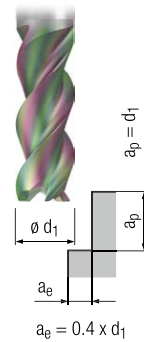
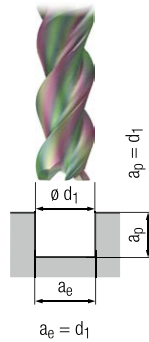
Solid carbide end mills – long design



WR



W



Valid for

2544	2546	2548
2544K	2546K	2548K
2545	2547	2549
2545K	2547K	2549K

Please note:
For uncoated design, please reduce cutting speed v_c by 30%!

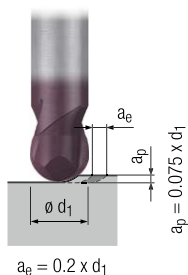
	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]				
P	1.1											
	2.1											
	3.1											
	4.1											
	5.1											
M	1.1											
	2.1											
	3.1											
	4.1											
K	1.1											
	1.2											
	2.1											
	2.2											
	3.1											
	3.2											
	4.1											
	4.2											
N	1.1	300	$0.009 \times d_1$	420	$0.011 \times d_1$	300	$0.006 \times d_1$	420	$0.011 \times d_1$		☐	☒
	1.2	430	$0.008 \times d_1$	620	$0.010 \times d_1$	430	$0.005 \times d_1$	620	$0.010 \times d_1$		☐	☒
	1.3	385	$0.007 \times d_1$	550	$0.008 \times d_1$	385	$0.005 \times d_1$	550	$0.008 \times d_1$		☐	☒
	1.4	270	$0.008 \times d_1$	380	$0.010 \times d_1$	270	$0.005 \times d_1$	380	$0.010 \times d_1$		☐	☒
	1.5											
	1.6											
	2.1	100	$0.005 \times d_1$	160	$0.006 \times d_1$	100	$0.005 \times d_1$	160	$0.006 \times d_1$	☐	☐	☒
	2.2	100	$0.005 \times d_1$	160	$0.006 \times d_1$	100	$0.005 \times d_1$	160	$0.006 \times d_1$	☐	☐	☒
	2.3	100	$0.005 \times d_1$	160	$0.006 \times d_1$	100	$0.005 \times d_1$	160	$0.006 \times d_1$	☐	☐	☒
	2.4	80	$0.004 \times d_1$	140	$0.005 \times d_1$	80	$0.004 \times d_1$	140	$0.005 \times d_1$	☐	☐	☒
	2.5	80	$0.004 \times d_1$	140	$0.005 \times d_1$	80	$0.004 \times d_1$	140	$0.005 \times d_1$	☐	☐	☒
	2.6	80	$0.004 \times d_1$	140	$0.005 \times d_1$	80	$0.004 \times d_1$	140	$0.005 \times d_1$	☐	☐	☒
	2.7	60	$0.003 \times d_1$	100	$0.004 \times d_1$	60	$0.003 \times d_1$	100	$0.004 \times d_1$			☒
	2.8											
	3.1											
	3.2											
	4.1											
	4.2											
	4.3											
	4.4											
	5.1											
	5.2											
	5.3											
S	1.1											
	1.2											
	1.3											
	2.1											
	2.2											
	2.3											
	2.4											
	2.5											
H	1.1											
	1.2											
	1.3											
	1.4											
	1.5											

 v_c = Cutting speed f_z = Feed per tooth

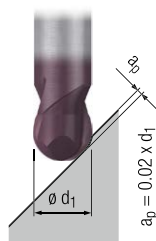

Solid carbide ball nose end mills – short and extra long design
N
Valid for

2550A
2551A

Roughing



Finishing

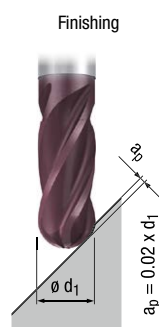
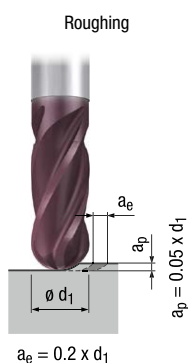

Please note:
For uncoated design, please reduce cutting speed v_c by 30%!

		v_c [m/min]	f_z [mm]		v_c [m/min]	f_z [mm]			MQL	
P	1.1	220	$0.014 \times d_1$		300	$0.010 \times d_1$	☐	☒	☐	☒
	2.1	190	$0.013 \times d_1$		260	$0.009 \times d_1$	☐	☒	☐	☒
	3.1	160	$0.011 \times d_1$		220	$0.008 \times d_1$	☐	☒	☐	
	4.1	130	$0.010 \times d_1$		180	$0.007 \times d_1$	☐	☒	☐	
	5.1	110	$0.008 \times d_1$		150	$0.006 \times d_1$	☐	☒	☐	
M	1.1	110	$0.008 \times d_1$		150	$0.006 \times d_1$			☐	☒
	2.1	90	$0.008 \times d_1$		120	$0.006 \times d_1$			☐	☒
	3.1	70	$0.006 \times d_1$		90	$0.005 \times d_1$			☐	☒
	4.1	50	$0.006 \times d_1$		70	$0.005 \times d_1$			☐	☒
K	1.1	220	$0.014 \times d_1$		300	$0.010 \times d_1$	☐	☒		☐
	1.2	220	$0.014 \times d_1$		300	$0.010 \times d_1$	☐	☒		☐
	2.1	200	$0.011 \times d_1$		260	$0.008 \times d_1$	☐	☒		☐
	2.2	200	$0.011 \times d_1$		260	$0.008 \times d_1$	☐	☒		☐
	3.1	160	$0.011 \times d_1$		220	$0.008 \times d_1$	☐	☒		
	3.2	160	$0.011 \times d_1$		220	$0.008 \times d_1$	☐	☒		
	4.1	130	$0.008 \times d_1$		180	$0.006 \times d_1$	☐	☒		
	4.2	110	$0.008 \times d_1$		150	$0.006 \times d_1$	☐	☒		
N	1.1									
	1.2	900	$0.020 \times d_1$		1200	$0.014 \times d_1$			☐	☒
	1.3	900	$0.017 \times d_1$		1200	$0.012 \times d_1$			☐	☒
	1.4	600	$0.020 \times d_1$		800	$0.014 \times d_1$			☐	☒
	1.5									
	1.6									
	2.1	200	$0.014 \times d_1$		260	$0.010 \times d_1$			☐	☒
	2.2	200	$0.014 \times d_1$		260	$0.010 \times d_1$			☐	☒
	2.3	200	$0.014 \times d_1$		260	$0.010 \times d_1$	☐	☐	☐	☒
	2.4	160	$0.011 \times d_1$		220	$0.008 \times d_1$			☐	☒
	2.5	160	$0.011 \times d_1$		220	$0.008 \times d_1$			☐	☒
	2.6	160	$0.011 \times d_1$		220	$0.008 \times d_1$	☐	☐	☐	☒
	2.7	100	$0.008 \times d_1$		130	$0.006 \times d_1$			☐	☒
	2.8	100	$0.008 \times d_1$		130	$0.006 \times d_1$			☐	☒
	3.1									
	3.2									
	4.1									
	4.2									
	4.3									
	4.4									
	5.1									
	5.2	110	$0.008 \times d_1$		150	$0.006 \times d_1$			☐	☒
	5.3									
S	1.1									
	1.2									
	1.3									
	2.1	80	$0.008 \times d_1$		110	$0.006 \times d_1$			☐	☒
	2.2	30	$0.006 \times d_1$		50	$0.004 \times d_1$			☐	☒
	2.3	30	$0.006 \times d_1$		40	$0.004 \times d_1$			☐	☒
	2.4	30	$0.006 \times d_1$		40	$0.004 \times d_1$			☐	☒
	2.5	20	$0.006 \times d_1$		30	$0.004 \times d_1$			☐	☒
H	1.1				150	$0.006 \times d_1$	☐	☒		
	1.2				130	$0.005 \times d_1$	☐	☒		
	1.3									
	1.4									
	1.5									



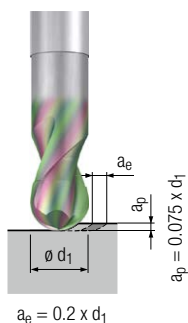
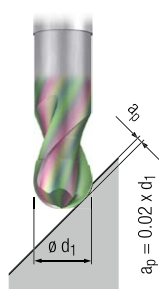
N

2502A
2504A



		v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]			MQL	
P	1.1	200	$0.014 \times d_1$	270	$0.010 \times d_1$	☐	☒	☐	☒
	2.1	170	$0.013 \times d_1$	230	$0.009 \times d_1$	☐	☒	☐	☒
	3.1	140	$0.011 \times d_1$	200	$0.008 \times d_1$	☐	☒	☐	☐
	4.1	110	$0.010 \times d_1$	160	$0.007 \times d_1$	☐	☒	☐	☐
	5.1	100	$0.008 \times d_1$	130	$0.006 \times d_1$	☐	☒	☐	☐
M									
	1.1	100	$0.008 \times d_1$	130	$0.006 \times d_1$			☐	☒
	2.1	80	$0.008 \times d_1$	110	$0.006 \times d_1$			☐	☒
	3.1	60	$0.006 \times d_1$	80	$0.005 \times d_1$			☐	☒
	4.1	40	$0.006 \times d_1$	60	$0.005 \times d_1$			☐	☒
K									
	1.1	200	$0.014 \times d_1$	270	$0.010 \times d_1$	☐	☒		☐
	1.2	200	$0.014 \times d_1$	270	$0.010 \times d_1$	☐	☒		☐
	2.1	180	$0.011 \times d_1$	230	$0.008 \times d_1$	☐	☒		☐
	2.2	180	$0.011 \times d_1$	230	$0.008 \times d_1$	☐	☒		☐
	3.1	140	$0.011 \times d_1$	200	$0.008 \times d_1$	☐	☒		
	3.2	140	$0.011 \times d_1$	200	$0.008 \times d_1$	☐	☒		
	4.1	110	$0.008 \times d_1$	160	$0.006 \times d_1$	☐	☒		
	4.2	100	$0.008 \times d_1$	130	$0.006 \times d_1$	☐	☒		
N									
	1.1								
	1.2								
	1.3								
	1.4								
	1.5								
	1.6								
	2.1	180	$0.014 \times d_1$	230	$0.010 \times d_1$			☐	☒
	2.2	180	$0.014 \times d_1$	230	$0.010 \times d_1$			☐	☒
	2.3	180	$0.014 \times d_1$	230	$0.010 \times d_1$	☐	☐	☐	☒
	2.4	140	$0.011 \times d_1$	200	$0.008 \times d_1$			☐	☒
	2.5	140	$0.011 \times d_1$	200	$0.008 \times d_1$			☐	☒
	2.6	140	$0.011 \times d_1$	200	$0.008 \times d_1$	☐	☐	☐	☒
	2.7	90	$0.008 \times d_1$	120	$0.006 \times d_1$			☐	☒
	2.8	90	$0.008 \times d_1$	120	$0.006 \times d_1$			☐	☒
	3.1								
	3.2								
4.1	290	$0.020 \times d_1$	400	$0.015 \times d_1$		☐	☐	☒	
4.2	430	$0.020 \times d_1$	580	$0.015 \times d_1$		☐	☐	☒	
4.3									
4.4									
5.1									
5.2	100	$0.008 \times d_1$	130	$0.006 \times d_1$			☐	☒	
5.3	180	$0.017 \times d_1$	270	$0.012 \times d_1$	☐	☒		☒	
S									
	1.1	100	$0.010 \times d_1$	130	$0.007 \times d_1$			☐	☒
	1.2	80	$0.008 \times d_1$	110	$0.006 \times d_1$			☐	☒
	1.3	40	$0.007 \times d_1$	60	$0.005 \times d_1$			☐	☒
	2.1	70	$0.008 \times d_1$	100	$0.006 \times d_1$			☐	☒
	2.2	25	$0.006 \times d_1$	40	$0.004 \times d_1$			☐	☒
	2.3	25	$0.006 \times d_1$	30	$0.004 \times d_1$			☐	☒
2.4	25	$0.006 \times d_1$	30	$0.004 \times d_1$			☐	☒	
2.5	15	$0.006 \times d_1$	25	$0.004 \times d_1$			☐	☒	
2.6	25	$0.006 \times d_1$	30	$0.004 \times d_1$			☐	☒	
H									
	1.1								
	1.2								
	1.3								
	1.4								


Solid carbide ball nose end mills – short design
W
Valid for
 2452K

Roughing

Finishing


		V_c [m/min]	f_z [mm]	V_c [m/min]	f_z [mm]			MQL	
P	1.1								
	2.1								
	3.1								
	4.1								
	5.1								
M	1.1								
	2.1								
	3.1								
	4.1								
K	1.1								
	1.2								
	2.1								
	2.2								
	3.1								
	3.2								
	4.1								
	4.2								
N	1.1	900	$0.022 \times d_1$	1200	$0.016 \times d_1$			□	■
	1.2	900	$0.020 \times d_1$	1200	$0.014 \times d_1$			□	■
	1.3	900	$0.017 \times d_1$	1200	$0.012 \times d_1$			□	■
	1.4	600	$0.020 \times d_1$	800	$0.014 \times d_1$			□	■
	1.5								
	1.6								
	2.1	200	$0.014 \times d_1$	260	$0.010 \times d_1$			□	■
	2.2	200	$0.014 \times d_1$	260	$0.010 \times d_1$			□	■
	2.3	200	$0.014 \times d_1$	260	$0.010 \times d_1$	□	□	□	■
	2.4	160	$0.011 \times d_1$	220	$0.008 \times d_1$			□	■
	2.5	160	$0.011 \times d_1$	220	$0.008 \times d_1$			□	■
	2.6	160	$0.011 \times d_1$	220	$0.008 \times d_1$	□	□	□	■
	2.7	100	$0.008 \times d_1$	140	$0.006 \times d_1$			□	■
	2.8	100	$0.008 \times d_1$	140	$0.006 \times d_1$			□	■
	3.1	450	$0.025 \times d_1$	600	$0.018 \times d_1$			□	■
	3.2	450	$0.020 \times d_1$	600	$0.014 \times d_1$			□	■
	4.1	350	$0.021 \times d_1$	450	$0.015 \times d_1$			□	■
	4.2	500	$0.021 \times d_1$	650	$0.015 \times d_1$			□	■
	4.3	200	$0.017 \times d_1$	250	$0.012 \times d_1$			□	■
	4.4	140	$0.017 \times d_1$	180	$0.012 \times d_1$			□	■
	5.1								
	5.2								
	5.3	220	$0.017 \times d_1$	300	$0.012 \times d_1$	□	■		■
S	1.1	110	$0.010 \times d_1$	150	$0.007 \times d_1$			□	■
	1.2	90	$0.010 \times d_1$	120	$0.006 \times d_1$			□	■
	1.3	50	$0.008 \times d_1$	70	$0.005 \times d_1$			□	■
	2.1	80	$0.008 \times d_1$	110	$0.006 \times d_1$			□	■
	2.2	30	$0.006 \times d_1$	50	$0.004 \times d_1$			□	■
	2.3	20	$0.006 \times d_1$	40	$0.004 \times d_1$			□	■
	2.4								
	2.5								
H	1.1								
	1.2								
	1.3								
	1.4								
	1.5								



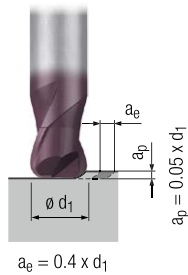
Solid carbide torus end mills – short and extra long design

N

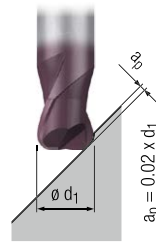
Valid for

2552A
2553A

Roughing



Finishing

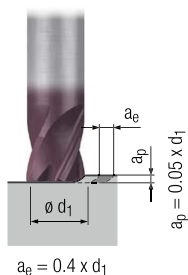
**Please note:**For uncoated design, please reduce cutting speed v_c by 30%!

		v_c [m/min]	f_z [mm]		v_c [m/min]	f_z [mm]				
P	1.1	220	$0.014 \times d_1$		300	$0.010 \times d_1$	☐	☒	☐	☒
	2.1	190	$0.013 \times d_1$		260	$0.009 \times d_1$	☐	☒	☐	☒
	3.1	160	$0.011 \times d_1$		220	$0.008 \times d_1$	☐	☒	☐	☐
	4.1	130	$0.010 \times d_1$		180	$0.007 \times d_1$	☐	☒	☐	☐
	5.1	110	$0.008 \times d_1$		150	$0.006 \times d_1$	☐	☒	☐	☐
M	1.1	110	$0.008 \times d_1$		150	$0.006 \times d_1$			☐	☒
	2.1	90	$0.008 \times d_1$		120	$0.006 \times d_1$			☐	☒
	3.1	70	$0.006 \times d_1$		90	$0.005 \times d_1$			☐	☒
	4.1	50	$0.006 \times d_1$		70	$0.005 \times d_1$			☐	☒
K	1.1	220	$0.014 \times d_1$		300	$0.010 \times d_1$	☐	☒		☐
	1.2	220	$0.014 \times d_1$		300	$0.010 \times d_1$	☐	☒		☐
	2.1	200	$0.011 \times d_1$		260	$0.008 \times d_1$	☐	☒		☐
	2.2	200	$0.011 \times d_1$		260	$0.008 \times d_1$	☐	☒		☐
	3.1	160	$0.011 \times d_1$		220	$0.008 \times d_1$	☐	☒		☐
	3.2	160	$0.011 \times d_1$		220	$0.008 \times d_1$	☐	☒		☐
	4.1	130	$0.008 \times d_1$		180	$0.006 \times d_1$	☐	☒		☐
	4.2	110	$0.008 \times d_1$		150	$0.006 \times d_1$	☐	☒		☐
N	1.1									
	1.2	1000	$0.020 \times d_1$		1350	$0.014 \times d_1$			☐	☒
	1.3	1000	$0.017 \times d_1$		1350	$0.012 \times d_1$			☐	☒
	1.4	600	$0.020 \times d_1$		800	$0.014 \times d_1$			☐	☒
	1.5									
	1.6									
	2.1	200	$0.014 \times d_1$		260	$0.010 \times d_1$			☐	☒
	2.2	200	$0.014 \times d_1$		260	$0.010 \times d_1$			☐	☒
	2.3	200	$0.014 \times d_1$		260	$0.010 \times d_1$	☐	☐	☐	☒
	2.4	160	$0.011 \times d_1$		220	$0.008 \times d_1$			☐	☒
	2.5	160	$0.011 \times d_1$		220	$0.008 \times d_1$			☐	☒
	2.6	160	$0.011 \times d_1$		220	$0.008 \times d_1$	☐	☐	☐	☒
	2.7	100	$0.008 \times d_1$		130	$0.006 \times d_1$			☐	☒
	2.8	100	$0.008 \times d_1$		130	$0.006 \times d_1$			☐	☒
	3.1									
	3.2									
	4.1									
	4.2									
	4.3									
	4.4									
	5.1									
	5.2	110	$0.008 \times d_1$		150	$0.006 \times d_1$			☐	☒
	5.3									
S	1.1									
	1.2									
	1.3									
	2.1	80	$0.008 \times d_1$		110	$0.006 \times d_1$			☐	☒
	2.2	30	$0.006 \times d_1$		50	$0.004 \times d_1$			☐	☒
	2.3	30	$0.006 \times d_1$		40	$0.004 \times d_1$			☐	☒
	2.4	30	$0.006 \times d_1$		40	$0.004 \times d_1$			☐	☒
	2.5	20	$0.006 \times d_1$		30	$0.004 \times d_1$			☐	☒
H	1.1				150	$0.006 \times d_1$	☐	☒		
	1.2				130	$0.005 \times d_1$	☐	☒		
	1.3									
	1.4									
	1.5									

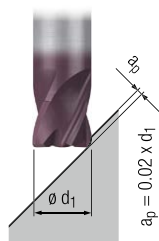
 v_c = Cutting speed f_z = Feed per tooth


Solid carbide torus end mills – short and extra long design
N
Valid for
 2554A
 2555A

Roughing



Finishing



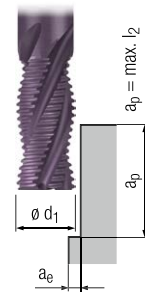
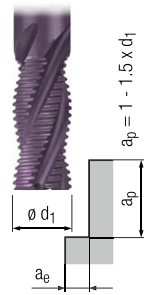
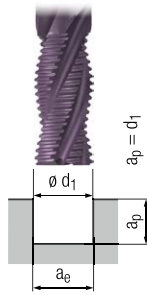
		V_c [m/min]	f_z [mm]	V_c [m/min]	f_z [mm]			MQL	
P	1.1	220	$0.014 \times d_1$	300	$0.010 \times d_1$	☐	☒	☐	☒
	2.1	190	$0.013 \times d_1$	260	$0.009 \times d_1$	☐	☒	☐	☒
	3.1	160	$0.011 \times d_1$	220	$0.008 \times d_1$	☐	☒	☐	☒
	4.1	130	$0.010 \times d_1$	180	$0.007 \times d_1$	☐	☒	☐	☒
	5.1	110	$0.008 \times d_1$	150	$0.006 \times d_1$	☐	☒	☐	☒
M	1.1	110	$0.008 \times d_1$	150	$0.006 \times d_1$			☐	☒
	2.1	90	$0.008 \times d_1$	120	$0.006 \times d_1$			☐	☒
	3.1								
	4.1								
K	1.1	220	$0.014 \times d_1$	300	$0.010 \times d_1$	☐	☒		☐
	1.2	220	$0.014 \times d_1$	300	$0.010 \times d_1$	☐	☒		☐
	2.1	200	$0.011 \times d_1$	260	$0.008 \times d_1$	☐	☒		☐
	2.2	200	$0.011 \times d_1$	260	$0.008 \times d_1$	☐	☒		☐
	3.1	160	$0.011 \times d_1$	220	$0.008 \times d_1$	☐	☒		☐
	3.2	160	$0.011 \times d_1$	220	$0.008 \times d_1$	☐	☒		☐
	4.1	130	$0.008 \times d_1$	180	$0.006 \times d_1$	☐	☒		☐
	4.2	110	$0.008 \times d_1$	150	$0.006 \times d_1$	☐	☒		☐
N	1.1								
	1.2								
	1.3								
	1.4								
	1.5								
	1.6								
	2.1	200	$0.014 \times d_1$	260	$0.010 \times d_1$			☐	☒
	2.2	200	$0.014 \times d_1$	260	$0.010 \times d_1$			☐	☒
	2.3	200	$0.014 \times d_1$	260	$0.010 \times d_1$	☐	☐	☐	☒
	2.4	160	$0.011 \times d_1$	220	$0.008 \times d_1$			☐	☒
	2.5	160	$0.011 \times d_1$	220	$0.008 \times d_1$			☐	☒
	2.6	160	$0.011 \times d_1$	220	$0.008 \times d_1$	☐	☐	☐	☒
	2.7	100	$0.008 \times d_1$	130	$0.006 \times d_1$			☐	☒
	2.8	100	$0.008 \times d_1$	130	$0.006 \times d_1$			☐	☒
	3.1								
	3.2								
	4.1								
	4.2								
	4.3								
	4.4								
	5.1								
	5.2	110	$0.008 \times d_1$	150	$0.006 \times d_1$			☐	☒
	5.3								
S	1.1	110	$0.010 \times d_1$	150	$0.007 \times d_1$			☐	☒
	1.2	90	$0.008 \times d_1$	120	$0.006 \times d_1$			☐	☒
	1.3	50	$0.007 \times d_1$	70	$0.005 \times d_1$			☐	☒
	2.1	80	$0.008 \times d_1$	110	$0.006 \times d_1$			☐	☒
	2.2	30	$0.006 \times d_1$	50	$0.004 \times d_1$			☐	☒
	2.3	30	$0.006 \times d_1$	40	$0.004 \times d_1$			☐	☒
	2.4	30	$0.006 \times d_1$	40	$0.004 \times d_1$			☐	☒
	2.5	20	$0.006 \times d_1$	30	$0.004 \times d_1$			☐	☒
	2.6	30	$0.006 \times d_1$	40	$0.004 \times d_1$			☐	☒
H	1.1			150	$0.006 \times d_1$	☐	☒		
	1.2			130	$0.005 \times d_1$	☐	☒		
	1.3								
	1.4								
	1.5								

HSS end mills – extra short and short design

Valid for

1351C
1381C

HR



		v_c [m/min]	$a_e = d_1$		$a_e = 0.5 \times d_1$		$a_e = 0.25 \times d_1$					
			f_z [mm]		f_z [mm]		f_z [mm]					
			$d_1 < 32 \text{ mm}$	$d_1 \geq 32 \text{ mm}$	$d_1 < 32 \text{ mm}$	$d_1 \geq 32 \text{ mm}$	$d_1 < 32 \text{ mm}$	$d_1 \geq 32 \text{ mm}$				
P		TICN										
	1.1	60	$0.0035 \times d_1$	$0.0034 \times d_1$	$0.0046 \times d_1$	$0.0036 \times d_1$	$0.0056 \times d_1$	$0.0044 \times d_1$			□	■
	2.1	55	$0.0032 \times d_1$	$0.0031 \times d_1$	$0.0042 \times d_1$	$0.0033 \times d_1$	$0.0052 \times d_1$	$0.0041 \times d_1$				■
	3.1	40	$0.0029 \times d_1$	$0.0028 \times d_1$	$0.0038 \times d_1$	$0.0030 \times d_1$	$0.0047 \times d_1$	$0.0037 \times d_1$				■
	4.1	38	$0.0026 \times d_1$	$0.0025 \times d_1$	$0.0034 \times d_1$	$0.0027 \times d_1$	$0.0042 \times d_1$	$0.0033 \times d_1$				■
5.1	30	$0.0026 \times d_1$	$0.0025 \times d_1$	$0.0034 \times d_1$	$0.0027 \times d_1$	$0.0042 \times d_1$	$0.0033 \times d_1$				■	
M												
	1.1	28	$0.0029 \times d_1$	$0.0028 \times d_1$	$0.0038 \times d_1$	$0.0030 \times d_1$	$0.0047 \times d_1$	$0.0037 \times d_1$				■
	2.1	24	$0.0026 \times d_1$	$0.0025 \times d_1$	$0.0034 \times d_1$	$0.0027 \times d_1$	$0.0042 \times d_1$	$0.0033 \times d_1$				■
	3.1	20	$0.0023 \times d_1$	$0.0022 \times d_1$	$0.0030 \times d_1$	$0.0024 \times d_1$	$0.0038 \times d_1$	$0.0030 \times d_1$				■
4.1	18	$0.0020 \times d_1$	$0.0020 \times d_1$	$0.0027 \times d_1$	$0.0021 \times d_1$	$0.0033 \times d_1$	$0.0026 \times d_1$				■	
K												
	1.1	48	$0.0035 \times d_1$	$0.0034 \times d_1$	$0.0046 \times d_1$	$0.0036 \times d_1$	$0.0056 \times d_1$	$0.0044 \times d_1$	□	□	□	■
	1.2	42	$0.0032 \times d_1$	$0.0031 \times d_1$	$0.0042 \times d_1$	$0.0033 \times d_1$	$0.0052 \times d_1$	$0.0041 \times d_1$	□	□	□	■
	2.1	38	$0.0032 \times d_1$	$0.0031 \times d_1$	$0.0042 \times d_1$	$0.0033 \times d_1$	$0.0052 \times d_1$	$0.0041 \times d_1$			□	■
	2.2	34	$0.0029 \times d_1$	$0.0028 \times d_1$	$0.0038 \times d_1$	$0.0030 \times d_1$	$0.0047 \times d_1$	$0.0037 \times d_1$			□	■
	3.1	29	$0.0026 \times d_1$	$0.0025 \times d_1$	$0.0034 \times d_1$	$0.0027 \times d_1$	$0.0042 \times d_1$	$0.0033 \times d_1$				■
	3.2	25	$0.0026 \times d_1$	$0.0025 \times d_1$	$0.0034 \times d_1$	$0.0027 \times d_1$	$0.0042 \times d_1$	$0.0033 \times d_1$				■
	4.1	40	$0.0032 \times d_1$	$0.0031 \times d_1$	$0.0042 \times d_1$	$0.0033 \times d_1$	$0.0052 \times d_1$	$0.0041 \times d_1$			□	■
4.2	27	$0.0029 \times d_1$	$0.0028 \times d_1$	$0.0038 \times d_1$	$0.0030 \times d_1$	$0.0047 \times d_1$	$0.0037 \times d_1$			□	■	
N												
	1.1											
	1.2											
	1.3											
	1.4											
	1.5											
	1.6											
	2.1	43	$0.0035 \times d_1$	$0.0034 \times d_1$	$0.0046 \times d_1$	$0.0036 \times d_1$	$0.0056 \times d_1$	$0.0044 \times d_1$				■
	2.2	47	$0.0032 \times d_1$	$0.0031 \times d_1$	$0.0042 \times d_1$	$0.0033 \times d_1$	$0.0052 \times d_1$	$0.0041 \times d_1$				■
	2.3	85	$0.0035 \times d_1$	$0.0034 \times d_1$	$0.0046 \times d_1$	$0.0036 \times d_1$	$0.0056 \times d_1$	$0.0044 \times d_1$			□	■
	2.4	44	$0.0026 \times d_1$	$0.0025 \times d_1$	$0.0034 \times d_1$	$0.0027 \times d_1$	$0.0042 \times d_1$	$0.0033 \times d_1$				■
	2.5	67	$0.0029 \times d_1$	$0.0028 \times d_1$	$0.0038 \times d_1$	$0.0030 \times d_1$	$0.0047 \times d_1$	$0.0037 \times d_1$			□	■
	2.6	77	$0.0035 \times d_1$	$0.0034 \times d_1$	$0.0046 \times d_1$	$0.0036 \times d_1$	$0.0056 \times d_1$	$0.0044 \times d_1$				■
	2.7											
	2.8											
	3.1											
	3.2											
	4.1		$0.0058 \times d_1$	$0.0056 \times d_1$	$0.0076 \times d_1$	$0.0060 \times d_1$	$0.0094 \times d_1$	$0.0074 \times d_1$				■
	4.2		$0.0058 \times d_1$	$0.0056 \times d_1$	$0.0076 \times d_1$	$0.0060 \times d_1$	$0.0094 \times d_1$	$0.0074 \times d_1$				■
	4.3											
4.4												
5.1												
5.2	28	$0.0026 \times d_1$	$0.0025 \times d_1$	$0.0034 \times d_1$	$0.0027 \times d_1$	$0.0042 \times d_1$	$0.0033 \times d_1$				■	
5.3												
S												
	1.1	40	$0.0029 \times d_1$	$0.0028 \times d_1$	$0.0038 \times d_1$	$0.0030 \times d_1$	$0.0047 \times d_1$	$0.0037 \times d_1$				■
	1.2	28	$0.0026 \times d_1$	$0.0025 \times d_1$	$0.0034 \times d_1$	$0.0027 \times d_1$	$0.0042 \times d_1$	$0.0033 \times d_1$				■
	1.3											
	2.1	26	$0.0029 \times d_1$	$0.0028 \times d_1$	$0.0038 \times d_1$	$0.0030 \times d_1$	$0.0047 \times d_1$	$0.0037 \times d_1$				■
	2.2	12	$0.0023 \times d_1$	$0.0022 \times d_1$	$0.0030 \times d_1$	$0.0024 \times d_1$	$0.0038 \times d_1$	$0.0030 \times d_1$				■
2.3												
2.4												
2.5												
2.6												
H												
	1.1											
	1.2											
	1.3											
	1.4											
1.5												

 v_c = Cutting speed f_z = Feed per tooth

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