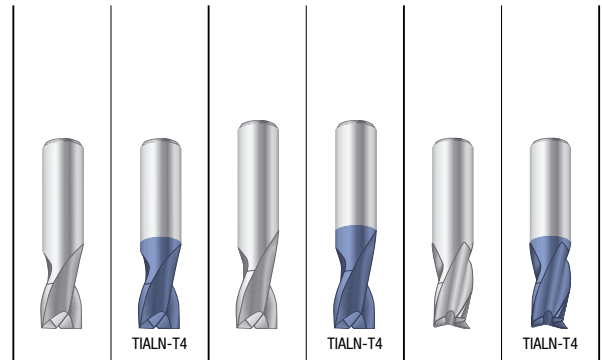


General Purpose	Solid carbide end mills	General Purpose
3D Milling	Solid carbide torus cutters and ball nose cutters	3D Milling
Aluminum	Solid carbide and PCD end mills, torus cutters and ball nose cutters, milling cutters with indexable inserts	Aluminum
Titanium	Solid carbide end mills, milling cutters with indexable inserts	Titanium
Graphite	Solid carbide end mills, torus cutters and ball nose cutters, milling cutters with indexable inserts	Graphite
Hard Milling	Solid carbide end mills and ball nose cutters	Hard Milling
CBN / PCD	CBN and PCD end mills, torus cutters and ball nose cutters	CBN / PCD
High Productivity Cutting	Solid carbide end mills, torus cutters and ball nose cutters, milling cutters with indexable inserts	HPC
HSS Roughing	High speed steel end mills	HSS Roughing
Carbide Insert Tooling	End mills, screw type end mills and shell type milling cutters with indexable inserts	Carb. Insert Tooling
 HOLDERS & COLLETS	Collet chucks, weldon chucks, screw type chucks and adapters, shell type chucks, shrink-fit chucks, accessories	Holders & Collets
SHRINK-FIT & ACCESSORIES	Shrink-fit work station SHRINK-MASTER, cold-air nozzle, accessories	Shrink-Fit & Access.
TECHNICAL DATA	Troubleshooter	Troubleshooter
GENERAL INFORMATION	General product information, other EMUGE catalogs, tool finder, index of EDP tool identifications, test-a-tool mill application form, terms & conditions	General Info

Solid carbide end mills

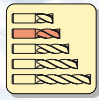


Type	N		N		N	
Diameter range inch	1/32 - 1		1/32 - 1		1/32 - 1	
Diameter range mm	1 - 20		2 - 20		2 - 20	
Page	6		8		10	

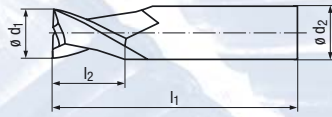
■ = Preferred suitable milling cutter

Material group	Hardness range			Material example	1800		1850		1803	
	HRC	BHN	N/mm ²		1801	1800A 1801A	1851	1850A 1851A	1804	1803A 1804A
1 Steel materials										
1.1 Cold-extrusion steels, Magnetic soft iron		≤ 120	≤ 400	1008 / 1010	■	■	■	■	■	■
1.2 Free-cutting steels, General construction steels		≤ 180	≤ 600	1008 / 1010 / 12L14 / A36 11L17, 1140, 12L15	■	■	■	■	■	■
1.3 Free-cutting steels, Construction steels, Alloyed steels, Steel castings	≤ 25	≤ 250	≤ 850	1018, 1060, 4130, 4140, 41L30, 41L45, 86L20, 86L40, 1045	■	■	■	■	■	■
1.4 Chrome alloy steels, Heat-treatable steels, Nitriding steels, Cold work steels	≤ 35	≤ 320	≤ 1100	5115, A29, A519, J404 4130, 8030, 4140, 4330 Nitralloy125, 135, 230, EZ, A7	■	■	■	■	■	■
1.5 Heat-treatable steels, Nitriding steels, Hot work steels, Hardened steels up to 44 HRC, Cold work steels	≤ 44	≤ 410	≤ 1400	D2, D3, D4, D5, D7 4130, 8030, 4140, 4330 H10, H11, H14, H21, H22, H46 4130, 4340, 150, 4161, 5160, 8660	■	■	■	■	■	■
1.6 Hardened steels	> 44 - 55			4130, 4340, 150, 4161, H13, H10						
1.7 Hardened steels	> 55 - 60			52100, M-50, 4340, D5ac, H11						
1.8 Hardened steels	> 60 - 63			M1-M47, 52100						
1.9 Hardened steels	> 63 - 66			M1-M47						
1.10 Corrosion-proof steels, Acid-proof steels, Heat-resistant steels	≤ 25	≤ 250	≤ 850	303, 304, 316, 316L, 416, 420 303, 304, 316, 316L, 416, 420 303, 304, 316, 316L, 416, 420	■	■	■	■	■	■
1.11 Corr./Acid-proof steels, Heat-resist. steels	≤ 35	≤ 320	≤ 1100	410, 420, Cf8m, 17-4ph		■		■		■
1.12 Corr./Acid-proof steels, Heat-resist. steels	≤ 44	≤ 410	≤ 1400	347, 420, 440, 15-5ph, 17-4ph		■		■		■
1.13 Special steel materials				Ferro-TiC, Hardox 500		■		■		■
2 Cast materials										
2.1 Cast iron		< 280		ASTM A48, SAE J431c grade, 1800	■	■	■	■	■	■
2.2 Cast iron with nodular graphite			≤ 1000	ASTM A48 class 20, 30, 35, 40 SAE J431c grade G3000	■	■	■	■	■	■
2.3 Cast iron with vermicular graphite		< 280			■	■	■	■	■	■
2.4 Malleable cast iron			≤ 700	ASTM A47 grades 32510, 35018	■	■	■	■	■	■
2.5 Hard castings up to 400 BHN		< 400				■		■		■
3 Copper, Copper alloys, Bronze, Brass										
3.1 Pure copper and low alloyed copper		≤ 150	≤ 500	99% pure	■	■	■	■	■	■
3.2 Copper-zinc alloys (brass, long-chipping)				320, 360	■	■	■	■	■	■
3.3 Copper-zinc alloys (brass, short-chipping)					■	■	■	■	■	■
3.4 Copper-alum. alloys (alubronze, long-ch.) Copper-tin alloys (bronze, long-chipping)					■	■	■	■	■	■
3.5 Copper-tin alloys (bronze, short-chipping)					■	■	■	■	■	■
3.6 Special copper alloys, up to Q18						■		■		■
3.7 Special copper alloys, over Q18						■		■		■
4 Nickel/Cobalt alloys										
4.1 Nickel/Cobalt alloys heat-resistant	≤ 25	≤ 250	≤ 850	Hastelloy B, C, C-276		■		■		■
4.2 Nickel/Cobalt alloys high-heat resistant	25 - 44	250 - 410	850 - 1400	Inconell 718, Rene 100		■		■		■
4.3 Nickel/Cobalt alloys high-heat resistant	> 44	> 410	> 1400	Inconell 718, Haynes 25		■		■		■
5 Aluminium alloys										
5.1 Aluminium wrought alloys				2014, 2117, 5050, 6061, 7004						
5.2 Aluminium cast alloys Si ≤ 5%				201, 213, 295, 435.2, 511.0						
5.3 Aluminium cast alloys 5% < Si ≤ 12%				319, 333, 356, 343, 369, 380						
5.4 Aluminium cast alloys 12% < Si				390, 393, 413						
6 Magnesium alloys										
6.1 Magnesium wrought alloys										
6.2 Magnesium cast alloys										
7 Titanium, Titanium alloys										
7.1 Pure titanium, Titanium alloys	≤ 27	≤ 270	≤ 900	Commercially pure C-1, C-2						
7.2 Titanium alloys	27 - 39	270 - 370	900 - 1250	6Al4V						
8 Synthetics										
8.1 Duroplastics (short-chipping)				Bakelite	■	■	■	■	■	■
8.2 Thermoplastics (long-chipping)				PVC	■	■	■	■	■	■
8.3 Fibre-reinforced synthetics				Phenolic	■	■	■	■	■	■
9 Materials for special applications										
9.1 Graphite						■		■		■
9.2 Tungsten-copper alloys						■		■		■

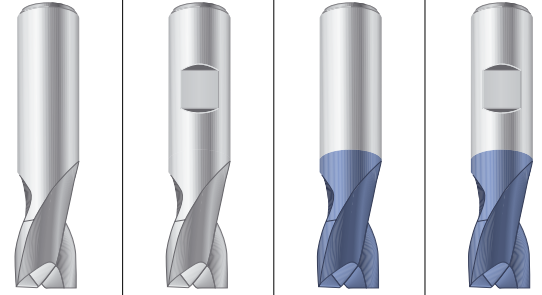
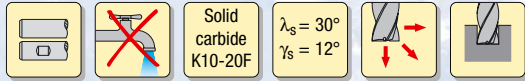
N



Short



$\phi d_1 \leq 1/16$



HSM

TIALN-T4

Coating

EDP tool identification

INCH

ϕd_1 h10	l_2	l_1	ϕd_2 h6	# of teeth	EDP Size ID	1800	1801	1800A	1801A
1/32	1/16	1 1/2	1/8	2	003125	●		●	
1/16	1/8	1 1/2	1/8	2	00625	●		●	
3/32	3/16	1 1/2	1/8	2	009375	●		●	
1/8	1/4	1 1/2	1/8	2	0125	●		●	
3/16	3/8	2	3/16	2	01875	●		●	
1/4	1/2	2	1/4	2	0250	●		●	
5/16	1/2	2	5/16	2	03125	●		●	
3/8	5/8	2 1/4	3/8	2	0375	●	●	●	●
7/16	5/8	2 1/2	7/16	2	04375	●		●	
1/2	5/8	2 1/2	1/2	2	0500	●	●	●	●
5/8	3/4	3	5/8	2	0625	●	●	●	●
3/4	1	3	3/4	2	0750	●	●	●	●
1	1	3 1/2	1	2	1000	●	●	●	●

METRIC (Dimensions in mm)

ϕd_1 e8	l_2	l_1	ϕd_2 h6	# of teeth	EDP Size ID	1800	1801	1800A	1801A
1	2	38	3	2	001	●		●	
2	6	38	3	2	00203	●		●	
3	4	50	6	2	003	●	●	●	●
4	5	54	6	2	004	●	●	●	●
5	6	54	6	2	005	●	●	●	●
6	7	54	6	2	006	●	●	●	●
8	9	58	8	2	008	●	●	●	●
10	11	66	10	2	010	●	●	●	●
12	12	73	12	2	012	●	●	●	●
14	14	75	14	2	014	●	●	●	●
16	16	82	16	2	016	●	●	●	●
18	18	84	18	2	018	●	●	●	●
20	20	92	20	2	020	●	●	●	●

Cutting speed v_c [sfm]

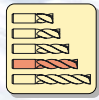
Material group	Hardness range			Material example	Correction factor	Uncoated	Coated
	HRC	BHN	N/mm ²				
1 Steel materials							
1.1 Cold-extrusion steels, Magnetic soft iron		≤ 120	≤ 400	1008 / 1010	1.2	520 - 620	820 - 980
1.2 Free-cutting steels, General construction steels		≤ 180	≤ 600	1008 / 1010 / 12L14 / A36 11L17, 1140, 12L15	1.2	390 - 520	650 - 820
1.3 Free-cutting steels, Construction steels, Alloyed steels, Steel castings	≤ 25	≤ 250	≤ 850	1018, 1060, 4130, 4140, 41L30, 41L45, 86L20, 86L40, 1045	1.1	330 - 390	590 - 920
1.4 Chrome alloy steels, Heat-treatable steels, Nitriding steels, Cold work steels	≤ 35	≤ 320	≤ 1100	5115, A29, A519, J404 4130, 8030, 4140, 4330 Nitralloy125, 135, 230, EZ, A7	1.0	300 - 360	525 - 720
1.5 Heat-treatable steels, Nitriding steels, Hot work steels, Hardened steels up to 44 HRC, Cold work steels	≤ 44	≤ 410	≤ 1400	D2, D3, D4, D5, D7 4130, 8030, 4140, 4330 H10, H11, H14, H21, H22, H46 4130, 4340, 150, 4161, 5160, 8660	0.8	230 - 300	460 - 660
1.10 Corrosion-proof steels, Acid-proof steels, Heat-resistant steels	≤ 25	≤ 250	≤ 850	303, 304, 316, 316L, 416, 420 303, 304, 316, 316L, 416, 420 303, 304, 316, 316L, 416, 420	1.0	230 - 260	260 - 390
1.11 Corr.-/Acid-proof steels, Heat-resist. steels	≤ 35	≤ 320	≤ 1100	410, 420, C18m, 17-4ph	0.9		190 - 300
1.12 Corr.-/Acid-proof steels, Heat-resist. steels	≤ 44	≤ 410	≤ 1400	347, 420, 440, 15-5ph, 17-4ph	0.7		190 - 260
1.13 Special steel materials				Ferro-TiC, Hardox 500	0.7		160 - 230
2 Cast materials							
2.1 Cast iron		< 280		ASTM A48, SAE J431c grade, 1800	1.1	360 - 430	460 - 520
2.2 Cast iron with nodular graphite			≤ 1000	ASTM A48 class 20, 30, 35, 40 SAE J431c grade G3000	1.1	330 - 360	390 - 490
2.3 Cast iron with vermicular graphite		< 280			1.0	230 - 300	330 - 390
2.4 Malleable cast iron			≤ 700	ASTM A47 grades 32510, 35018	1.1	390 - 430	490 - 590
2.5 Hard castings up to 400 BHN		< 400			0.8		230 - 260
3 Copper, Copper alloys, Bronze, Brass							
3.1 Pure copper and low alloyed copper		≤ 150	≤ 500	99% pure	1.2	520 - 720	820 - 980
3.2 Copper-zinc alloys (brass, long-chipping)				320, 360	1.1	660 - 720	790 - 890
3.3 Copper-zinc alloys (brass, short-chipping)					1.1	590 - 660	750 - 850
3.4 Copper-alum. alloys (alubronze, long-ch.) Copper-tin alloys (bronze, long-chipping)					1.2	460 - 590	660 - 790
3.5 Copper-tin alloys (bronze, short-chipping)					1.2	720 - 790	920 - 1050
3.6 Special copper alloys, up to Q18					1.0		200 - 260
3.7 Special copper alloys, over Q18					0.7		50 - 70
4 Nickel/Cobalt alloys							
4.1 Nickel/Cobalt alloys heat-resistant	≤ 25	≤ 250	≤ 850	Hastelloy B, C, C-276	1.1		200 - 230
4.2 Nickel/Cobalt alloys high-heat resistant	25 - 44	250 - 410	850 - 1400	Inconell 718, Rene 100	1.0		130 - 200
4.3 Nickel/Cobalt alloys high-heat resistant	> 44	> 410	> 1400	Inconell 718, Haynes 25	0.7		100 - 130
8 Synthetics							
8.1 Duroplastics (short-chipping)				Bakelite	2.0	390 - 430	490 - 520
8.2 Thermoplastics (long-chipping)				PVC	2.0	590 - 660	820 - 980
8.3 Fibre-reinforced synthetics				Phenolic	1.0	260 - 330	390 - 460
9 Materials for special applications							
9.1 Graphite					1.0		230 - 290
9.2 Tungsten-copper alloys					1.1		290 - 390

Chipload per tooth f_z [inch]

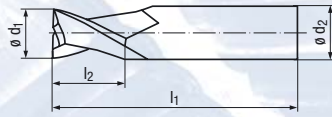
INCH	Finishing		Roughing		Slotting		METRIC	Finishing		Roughing		Slotting	
	a_e	a_p	a_e	a_p	a_e	a_p		a_e	a_p	a_e	a_p	a_e	a_p
	$a_e = .01$ in	$a_p = 1.5 \times d_1$	$a_e = 0.25 \times d_1$	$a_p = 1.5 \times d_1$	$a_e = d_1$	$a_p = 0.5 \times d_1$		$a_e = .01$ in	$a_p = 1.5 \times d_1$	$a_e = 0.25 \times d_1$	$a_p = 1.5 \times d_1$	$a_e = d_1$	$a_p = 0.5 \times d_1$
$\emptyset d_1$	Uncoated	TIALN-T4	Uncoated	TIALN-T4	Uncoated	TIALN-T4	$\emptyset d_1$ [mm]	Uncoated	TIALN-T4	Uncoated	TIALN-T4	Uncoated	TIALN-T4
1/32	.0001	.0001	.0001	.0001	.00004	.0001	1	.0001	.0002	.0001	.0001	.00005	.0001
1/16	.0002	.0002	.0002	.0002	.0001	.0002	2	.0002	.0003	.0002	.0002	.0001	.0002
3/32	.0002	.0003	.0002	.0003	.0002	.0002	3	.0004	.0005	.0003	.0003	.0002	.0003
1/8	.0003	.0004	.0002	.0003	.0002	.0003	4	.0005	.0006	.0004	.0004	.0003	.0004
3/16	.0006	.0006	.0004	.0004	.0004	.0004	5	.0007	.0008	.0004	.0005	.0003	.0004
1/4	.0008	.0008	.0005	.0006	.0004	.0005	6	.0008	.0009	.0005	.0006	.0004	.0005
5/16	.0011	.0012	.0007	.0008	.0006	.0007	8	.0011	.0013	.0007	.0008	.0005	.0007
3/8	.0015	.0016	.0009	.0010	.0008	.0008	10	.0013	.0016	.0009	.0010	.0007	.0009
7/16	.0018	.0020	.0011	.0012	.0009	.0010	12	.0016	.0019	.0011	.0012	.0008	.0011
1/2	.0023	.0025	.0013	.0014	.0011	.0012	14	.0019	.0022	.0012	.0014	.0009	.0012
5/8	.0027	.0029	.0015	.0017	.0013	.0014	16	.0021	.0025	.0014	.0016	.0011	.0014
3/4	.0034	.0036	.0018	.0019	.0015	.0017	18	.0024	.0028	.0016	.0018	.0012	.0016
1	.0047	.0051	.0022	.0024	.0018	.0020	20	.0026	.0032	.0017	.0020	.0013	.0017

Please note that the value f_z from the above table must be multiplied with the corresponding correction factor.

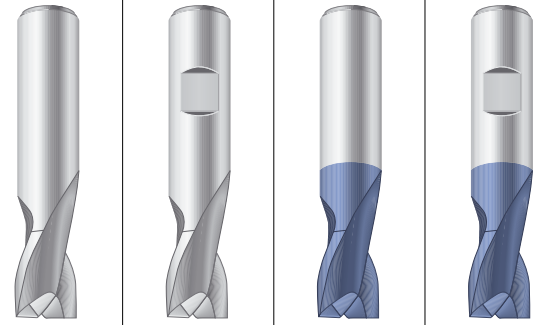
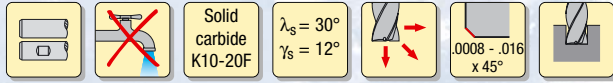
N



Long



$\phi d_1 \leq 1/16$



HSM

TIALN-T4

Coating

EDP tool identification

INCH

						1850	1851	1850A	1851A
ϕd_1	l_2	l_1	ϕd_2	# of teeth	EDP Size ID				
h10			h6						
1/32	3/32	1 1/2	1/8	2	003125	•		•	
1/16	1/4	1 1/2	1/8	2	00625	•		•	
3/32	3/8	1 1/2	1/8	2	009375	•		•	
1/8	1/2	1 3/4	1/8	2	0125	•		•	
3/16	5/8	2	3/16	2	01875	•		•	
1/4	3/4	2 1/2	1/4	2	0250	•		•	
5/16	7/8	2 1/2	5/16	2	03125	•		•	
3/8	7/8	2 1/2	3/8	2	0375	•	•	•	•
7/16	1	2 3/4	7/16	2	04375	•		•	
1/2	1	3	1/2	2	0500	•	•	•	•
5/8	1 1/4	3 1/2	5/8	2	0625	•	•	•	•
3/4	1 1/2	4	3/4	2	0750	•	•	•	•
1	1 1/2	4	1	2	1000	•	•	•	•

METRIC (Dimensions in mm)

						1850	1851	1850A	1851A
ϕd_1	l_2	l_1	ϕd_2	# of teeth	EDP Size ID				
h10			h6						
2	6	38	2	2	00202	•		•	
3	7	38	3	2	003	•		•	
4	8	50	4	2	004	•		•	
5	10	50	5	2	005	•		•	
6	10	57	6	2	006	•	•	•	•
8	16	63	8	2	008	•	•	•	•
10	19	72	10	2	010	•	•	•	•
12	22	83	12	2	012	•	•	•	•
14	22	83	14	2	014	•	•	•	•
16	26	92	16	2	016	•	•	•	•
18	26	92	18	2	018	•	•	•	•
20	32	104	20	2	020	•	•	•	•

Cutting speed v_c [sfm]

	Material group	Hardness range			Material example	Correction factor	Uncoated	Coated
		HRC	BHN	N/mm ²				
1	Steel materials							
1.1	Cold-extrusion steels, Magnetic soft iron		≤ 120	≤ 400	1008 / 1010	1.2	520 - 620	820 - 980
1.2	Free-cutting steels, General construction steels		≤ 180	≤ 600	1008 / 1010 / 12L14 / A36 11L17, 1140, 12L15	1.2	390 - 520	650 - 820
1.3	Free-cutting steels, Construction steels, Alloyed steels, Steel castings	≤ 25	≤ 250	≤ 850	1018, 1060, 4130, 4140, 41L30, 41L45, 86L20, 86L40, 1045	1.1	330 - 390	590 - 920
1.4	Chrome alloy steels, Heat-treatable steels, Nitriding steels, Cold work steels	≤ 35	≤ 320	≤ 1100	5115, A29, A519, J404 4130, 8030, 4140, 4330 Nitralloy125, 135, 230, EZ, A7	1.0	300 - 360	525 - 720
1.5	Heat-treatable steels, Nitriding steels, Hot work steels, Hardened steels up to 44 HRC, Cold work steels	≤ 44	≤ 410	≤ 1400	D2, D3, D4, D5, D7 4130, 8030, 4140, 4330 H10, H11, H14, H21, H22, H46 4130, 4340, 150, 4161, 5160, 8660	0.8	230 - 300	460 - 660
1.10	Corrosion-proof steels, Acid-proof steels, Heat-resistant steels	≤ 25	≤ 250	≤ 850	303, 304, 316, 316L, 416, 420 303, 304, 316, 316L, 416, 420 303, 304, 316, 316L, 416, 420	1.0	230 - 260	260 - 390
1.11	Corr.-/Acid-proof steels, Heat-resist. steels	≤ 35	≤ 320	≤ 1100	410, 420, C18m, 17-4ph	0.9		190 - 300
1.12	Corr.-/Acid-proof steels, Heat-resist. steels	≤ 44	≤ 410	≤ 1400	347, 420, 440, 15-5ph, 17-4ph	0.7		190 - 260
1.13	Special steel materials				Ferro-TiC, Hardox 500	0.7		160 - 230
2	Cast materials							
2.1	Cast iron		< 280		ASTM A48, SAE J431c grade, 1800	1.1	360 - 430	460 - 520
2.2	Cast iron with nodular graphite			≤ 1000	ASTM A48 class 20, 30, 35, 40 SAE J431c grade G3000	1.1	330 - 360	390 - 490
2.3	Cast iron with vermicular graphite		< 280			1.0	230 - 300	330 - 390
2.4	Malleable cast iron			≤ 700	ASTM A47 grades 32510, 35018	1.1	390 - 430	490 - 590
2.5	Hard castings up to 400 BHN		< 400			0.8		230 - 260
3	Copper, Copper alloys, Bronze, Brass							
3.1	Pure copper and low alloyed copper		≤ 150	≤ 500	99% pure	1.2	520 - 720	820 - 980
3.2	Copper-zinc alloys (brass, long-chipping)				320, 360	1.1	660 - 720	790 - 890
3.3	Copper-zinc alloys (brass, short-chipping)					1.1	590 - 660	750 - 850
3.4	Copper-alum. alloys (alubronze, long-ch.) Copper-tin alloys (bronze, long-chipping)					1.2	460 - 590	660 - 790
3.5	Copper-tin alloys (bronze, short-chipping)					1.2	720 - 790	920 - 1050
3.6	Special copper alloys, up to Q18					1.0		200 - 260
3.7	Special copper alloys, over Q18					0.7		50 - 70
4	Nickel/Cobalt alloys							
4.1	Nickel/Cobalt alloys heat-resistant	≤ 25	≤ 250	≤ 850	Hastelloy B, C, C-276	1.1		200 - 230
4.2	Nickel/Cobalt alloys high-heat resistant	25 - 44	250 - 410	850 - 1400	Inconell 718, Rene 100	1.0		130 - 200
4.3	Nickel/Cobalt alloys high-heat resistant	> 44	> 410	> 1400	Inconell 718, Haynes 25	0.7		100 - 130
8	Synthetics							
8.1	Duroplastics (short-chipping)				Bakelite	2.0	390 - 430	490 - 520
8.2	Thermoplastics (long-chipping)				PVC	2.0	590 - 660	820 - 980
8.3	Fibre-reinforced synthetics				Phenolic	1.0	260 - 330	390 - 460
9	Materials for special applications							
9.1	Graphite					1.0		230 - 290
9.2	Tungsten-copper alloys					1.1		290 - 390

Chipload per tooth f_z [inch]

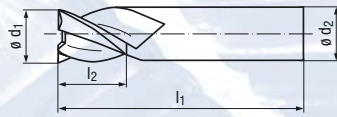
INCH	Finishing		Roughing		Slotting		METRIC	Finishing		Roughing		Slotting	
	a_e	a_p	a_e	a_p	a_e	a_p		a_e	a_p	a_e	a_p	a_e	a_p
	$a_e = .01$ in	$a_p = 1.5 \times d_1$	$a_e = 0.25 \times d_1$	$a_p = 1.5 \times d_1$	$a_e = d_1$	$a_p = 0.5 \times d_1$		$a_e = .01$ in	$a_p = 1.5 \times d_1$	$a_e = 0.25 \times d_1$	$a_p = 1.5 \times d_1$	$a_e = d_1$	$a_p = 0.5 \times d_1$
$\emptyset d_1$	Uncoated	TIALN-T4	Uncoated	TIALN-T4	Uncoated	TIALN-T4	$\emptyset d_1$ [mm]	Uncoated	TIALN-T4	Uncoated	TIALN-T4	Uncoated	TIALN-T4
1/32	.0001	.0001	.0001	.0001	.00004	.0001	2	.0002	.0003	.0002	.0002	.0001	.0002
1/16	.0002	.0002	.0002	.0002	.0001	.0002	3	.0004	.0005	.0003	.0003	.0002	.0003
3/32	.0002	.0003	.0002	.0003	.0002	.0002	4	.0005	.0006	.0004	.0004	.0003	.0004
1/8	.0003	.0004	.0002	.0003	.0002	.0003	5	.0007	.0008	.0004	.0005	.0003	.0004
3/16	.0006	.0006	.0004	.0004	.0004	.0004	6	.0008	.0009	.0005	.0006	.0004	.0005
1/4	.0008	.0008	.0005	.0006	.0004	.0005	8	.0011	.0013	.0007	.0007	.0005	.0007
5/16	.0011	.0012	.0007	.0008	.0006	.0007	10	.0013	.0016	.0009	.0010	.0007	.0009
3/8	.0015	.0016	.0009	.0010	.0008	.0008	12	.0016	.0019	.0011	.0012	.0008	.0011
7/16	.0018	.0020	.0011	.0012	.0009	.0010	14	.0019	.0022	.0012	.0014	.0009	.0012
1/2	.0023	.0025	.0013	.0014	.0011	.0012	16	.0021	.0025	.0014	.0016	.0011	.0014
5/8	.0027	.0029	.0015	.0017	.0013	.0014	18	.0024	.0028	.0016	.0018	.0012	.0016
3/4	.0034	.0036	.0018	.0019	.0015	.0017	20	.0026	.0032	.0017	.0020	.0013	.0017
1	.0047	.0051	.0022	.0024	.0018	.0020							

Please note that the value f_z from the above table must be multiplied with the corresponding correction factor.

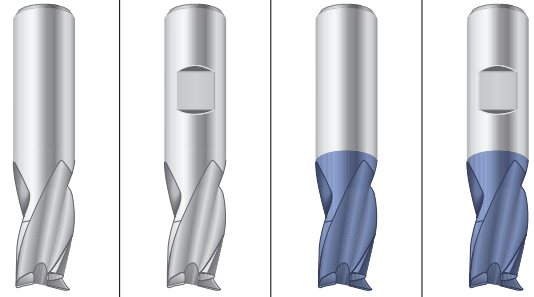
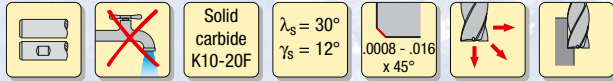
N



Short



$\phi d_1 \leq 1/16$



Coating

– TIALN-T4

EDP tool identification

1803 **1804** **1803A** **1804A**

INCH

ϕd_1 h10	l_2	l_1	ϕd_2 h6	# of teeth	EDP Size ID	1803	1804	1803A	1804A
1/32	1/16	1 1/2	1/8	3	003125	•		•	
1/16	1/8	1 1/2	1/8	3	00625	•		•	
3/32	3/16	1 1/2	1/8	3	009375	•		•	
1/8	1/4	1 1/2	1/8	3	0125	•		•	
3/16	3/8	2	3/16	3	01875	•		•	
1/4	1/2	2	1/4	3	0250	•		•	
5/16	1/2	2	5/16	3	03125	•		•	
3/8	5/8	2 1/4	3/8	3	0375	•	•	•	•
7/16	5/8	2 1/2	7/16	3	04375	•		•	
1/2	5/8	2 1/2	1/2	3	0500	•	•	•	•
5/8	3/4	3	5/8	3	0625	•	•	•	•
3/4	1	3	3/4	3	0750	•	•	•	•
1	1	3 1/2	1	3	1000	•	•	•	•

METRIC (Dimensions in mm)

ϕd_1 h10	l_2	l_1	ϕd_2 h6	# of teeth	EDP Size ID	1803	1804	1803A	1804A
2	3	38	3	3	00203	•		•	
3	4	38	3	3	00303	•		•	
4	5	54	6	3	004	•	•	•	•
5	6	54	6	3	005	•	•	•	•
6	7	54	6	3	006	•	•	•	•
8	9	58	8	3	008	•	•	•	•
10	11	66	10	3	010	•	•	•	•
12	12	73	12	3	012	•	•	•	•
14	14	75	14	3	014	•	•	•	•
16	16	82	16	3	016	•	•	•	•
18	18	84	18	3	018	•	•	•	•
20	20	92	20	3	020	•	•	•	•

Cutting speed v_c [sfm]

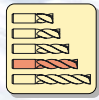
	Material group	Hardness range			Material example	Correction factor	Uncoated	Coated
		HRC	BHN	N/mm ²				
1	Steel materials							
1.1	Cold-extrusion steels, Magnetic soft iron		≤ 120	≤ 400	1008 / 1010	1.2	520 - 620	820 - 980
1.2	Free-cutting steels, General construction steels		≤ 180	≤ 600	1008 / 1010 / 12L14 / A36 11L17, 1140, 12L15	1.2	390 - 520	650 - 820
1.3	Free-cutting steels, Construction steels, Alloyed steels, Steel castings	≤ 25	≤ 250	≤ 850	1018, 1060, 4130, 4140, 41L30, 41L45, 86L20, 86L40, 1045	1.1	330 - 390	590 - 920
1.4	Chrome alloy steels, Heat-treatable steels, Nitriding steels, Cold work steels	≤ 35	≤ 320	≤ 1100	5115, A29, A519, J404 4130, 8030, 4140, 4330 Nitralloy125, 135, 230, EZ, A7	1.0	300 - 360	525 - 720
1.5	Heat-treatable steels, Nitriding steels, Hot work steels, Hardened steels up to 44 HRC, Cold work steels	≤ 44	≤ 410	≤ 1400	D2, D3, D4, D5, D7 4130, 8030, 4140, 4330 H10, H11, H14, H21, H22, H46 4130, 4340, 150, 4161, 5160, 8660	0.8	230 - 300	460 - 660
1.10	Corrosion-proof steels, Acid-proof steels, Heat-resistant steels	≤ 25	≤ 250	≤ 850	303, 304, 316, 316L, 416, 420 303, 304, 316, 316L, 416, 420 303, 304, 316, 316L, 416, 420	1.0	230 - 260	260 - 390
1.11	Corr.-/Acid-proof steels, Heat-resist. steels	≤ 35	≤ 320	≤ 1100	410, 420, C18m, 17-4ph	0.9		190 - 300
1.12	Corr.-/Acid-proof steels, Heat-resist. steels	≤ 44	≤ 410	≤ 1400	347, 420, 440, 15-5ph, 17-4ph	0.7		190 - 260
1.13	Special steel materials				Ferro-TiC, Hardox 500	0.7		160 - 230
2	Cast materials							
2.1	Cast iron		< 280		ASTM A48, SAE J431c grade, 1800	1.1	360 - 430	460 - 520
2.2	Cast iron with nodular graphite			≤ 1000	ASTM A48 class 20, 30, 35, 40 SAE J431c grade G3000	1.1	330 - 360	390 - 490
2.3	Cast iron with vermicular graphite		< 280			1.0	230 - 300	330 - 390
2.4	Malleable cast iron			≤ 700	ASTM A47 grades 32510, 35018	1.1	390 - 430	490 - 590
2.5	Hard castings up to 400 BHN		< 400			0.8		230 - 260
3	Copper, Copper alloys, Bronze, Brass							
3.1	Pure copper and low alloyed copper		≤ 150	≤ 500	99% pure	1.2	520 - 720	820 - 980
3.2	Copper-zinc alloys (brass, long-chipping)				320, 360	1.1	660 - 720	790 - 890
3.3	Copper-zinc alloys (brass, short-chipping)					1.1	590 - 660	750 - 850
3.4	Copper-alum. alloys (alubronze, long-ch.) Copper-tin alloys (bronze, long-chipping)					1.2	460 - 590	660 - 790
3.5	Copper-tin alloys (bronze, short-chipping)					1.2	720 - 790	920 - 1050
3.6	Special copper alloys, up to Q18					1.0		200 - 260
3.7	Special copper alloys, over Q18					0.7		50 - 70
4	Nickel/Cobalt alloys							
4.1	Nickel/Cobalt alloys heat-resistant	≤ 25	≤ 250	≤ 850	Hastelloy B, C, C-276	1.1		200 - 230
4.2	Nickel/Cobalt alloys high-heat resistant	25 - 44	250 - 410	850 - 1400	Inconell 718, Rene 100	1.0		130 - 200
4.3	Nickel/Cobalt alloys high-heat resistant	> 44	> 410	> 1400	Inconell 718, Haynes 25	0.7		100 - 130
8	Synthetics							
8.1	Duroplastics (short-chipping)				Bakelite	2.0	390 - 430	490 - 520
8.2	Thermoplastics (long-chipping)				PVC	2.0	590 - 660	820 - 980
8.3	Fibre-reinforced synthetics				Phenolic	1.0	260 - 330	390 - 460
9	Materials for special applications							
9.1	Graphite					1.0		230 - 290
9.2	Tungsten-copper alloys					1.1		290 - 390

Chipload per tooth f_z [inch]

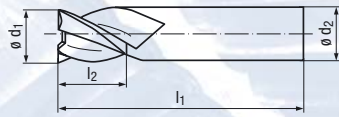
INCH	Finishing		Roughing		Slotting		METRIC	Finishing		Roughing		Slotting	
	a_e	a_p	a_e	a_p	a_e	a_p		a_e	a_p	a_e	a_p	a_e	a_p
	$a_e = .01$ in	$a_p = 1.5 \times d_1$	$a_e = 0.25 \times d_1$	$a_p = 1.5 \times d_1$	$a_e = d_1$	$a_p = 0.5 \times d_1$		$a_e = .01$ in	$a_p = 1.5 \times d_1$	$a_e = 0.25 \times d_1$	$a_p = 1.5 \times d_1$	$a_e = d_1$	$a_p = 0.5 \times d_1$
$\emptyset d_1$	Uncoated	TIALN-T4	Uncoated	TIALN-T4	Uncoated	TIALN-T4	$\emptyset d_1$ [mm]	Uncoated	TIALN-T4	Uncoated	TIALN-T4	Uncoated	TIALN-T4
1/32	.0001	.0001	.0001	.0001	.00004	.0001	2	.0002	.0003	.0002	.0002	.0001	.0002
1/16	.0002	.0002	.0002	.0002	.0001	.0002	3	.0004	.0005	.0003	.0003	.0002	.0003
3/32	.0002	.0003	.0002	.0003	.0002	.0002	4	.0005	.0006	.0004	.0004	.0003	.0004
1/8	.0003	.0004	.0002	.0003	.0002	.0003	5	.0007	.0008	.0004	.0005	.0003	.0004
3/16	.0006	.0006	.0004	.0004	.0004	.0004	6	.0008	.0009	.0005	.0006	.0004	.0005
1/4	.0008	.0008	.0005	.0006	.0004	.0005	8	.0011	.0013	.0007	.0008	.0005	.0007
5/16	.0011	.0012	.0007	.0008	.0006	.0007	10	.0013	.0016	.0009	.0010	.0007	.0009
3/8	.0015	.0016	.0009	.0010	.0008	.0008	12	.0016	.0019	.0011	.0012	.0008	.0011
7/16	.0018	.0020	.0011	.0012	.0009	.0010	14	.0019	.0022	.0012	.0014	.0009	.0012
1/2	.0023	.0025	.0013	.0014	.0011	.0012	16	.0021	.0025	.0014	.0016	.0011	.0014
5/8	.0027	.0029	.0015	.0017	.0013	.0014	18	.0024	.0028	.0016	.0018	.0012	.0016
3/4	.0034	.0036	.0018	.0019	.0015	.0017	20	.0026	.0032	.0017	.0020	.0013	.0017
1	.0047	.0051	.0022	.0024	.0018	.0020							

Please note that the value f_z from the above table must be multiplied with the corresponding correction factor.

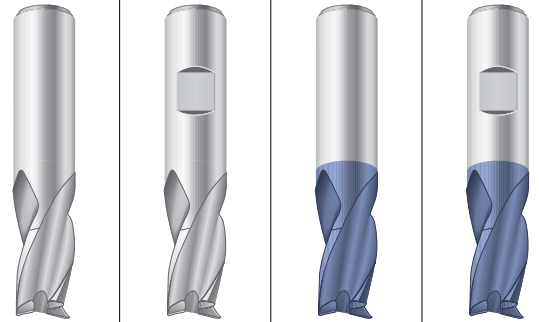
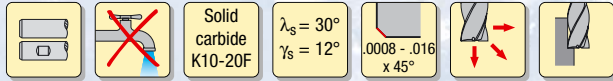
N



Long



$\phi d_1 \leq 1/16$



Coating

– TIALN-T4

EDP tool identification

1853 **1854** **1853A** **1854A**

INCH

ϕd_1 h10	l_2	l_1	ϕd_2 h6	# of teeth	EDP Size ID	1853	1854	1853A	1854A
1/32	3/32	1 1/2	1/8	3	003125	•		•	
1/16	1/4	1 1/2	1/8	3	00625	•		•	
3/32	3/8	1 1/2	1/8	3	009375	•		•	
1/8	1/2	1 3/4	1/8	3	0125	•		•	
3/16	5/8	2	3/16	3	01875	•		•	
1/4	3/4	2 1/2	1/4	3	0250	•		•	
5/16	7/8	2 1/2	5/16	3	03125	•		•	
3/8	7/8	2 1/2	3/8	3	0375	•	•	•	•
7/16	1	2 3/4	7/16	3	04375	•		•	
1/2	1	3	1/2	3	0500	•	•	•	•
5/8	1 1/4	3 1/2	5/8	3	0625	•	•	•	•
3/4	1 1/2	4	3/4	3	0750	•	•	•	•
1	1 1/2	4	1	3	1000	•	•	•	•

METRIC (Dimensions in mm)

ϕd_1 h10	l_2	l_1	ϕd_2 h6	# of teeth	EDP Size ID	1853	1854	1853A	1854A
2	6	38	2	3	00202	•		•	
3	7	38	3	3	003	•		•	
4	8	50	4	3	004	•		•	
5	10	50	5	3	005	•		•	
6	10	57	6	3	006	•	•	•	•
8	16	63	8	3	008	•	•	•	•
10	19	72	10	3	010	•	•	•	•
12	22	83	12	3	012	•	•	•	•
14	22	83	14	3	014	•	•	•	•
16	26	92	16	3	016	•	•	•	•
18	26	92	18	3	018	•	•	•	•
20	32	104	20	3	020	•	•	•	•

Cutting speed v_c [sfm]

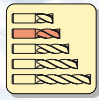
Material group	Hardness range			Material example	Correction factor	Uncoated	Coated
	HRC	BHN	N/mm ²				
1 Steel materials							
1.1 Cold-extrusion steels, Magnetic soft iron		≤ 120	≤ 400	1008 / 1010	1.2	520 - 620	820 - 980
1.2 Free-cutting steels, General construction steels		≤ 180	≤ 600	1008 / 1010 / 12L14 / A36 11L17, 1140, 12L15	1.2	390 - 520	650 - 820
1.3 Free-cutting steels, Construction steels, Alloyed steels, Steel castings	≤ 25	≤ 250	≤ 850	1018, 1060, 4130, 4140, 41L30, 41L45, 86L20, 86L40, 1045	1.1	330 - 390	590 - 920
1.4 Chrome alloy steels, Heat-treatable steels, Nitriding steels, Cold work steels	≤ 35	≤ 320	≤ 1100	5115, A29, A519, J404 4130, 8030, 4140, 4330 Nitralloy125, 135, 230, EZ, A7	1.0	300 - 360	525 - 720
1.5 Heat-treatable steels, Nitriding steels, Hot work steels, Hardened steels up to 44 HRC, Cold work steels	≤ 44	≤ 410	≤ 1400	D2, D3, D4, D5, D7 4130, 8030, 4140, 4330 H10, H11, H14, H21, H22, H46 4130, 4340, 150, 4161, 5160, 8660	0.8	230 - 300	460 - 660
1.10 Corrosion-proof steels, Acid-proof steels, Heat-resistant steels	≤ 25	≤ 250	≤ 850	303, 304, 316, 316L, 416, 420 303, 304, 316, 316L, 416, 420 303, 304, 316, 316L, 416, 420	1.0	230 - 260	260 - 390
1.11 Corr.-/Acid-proof steels, Heat-resist. steels	≤ 35	≤ 320	≤ 1100	410, 420, C18m, 17-4ph	0.9		190 - 300
1.12 Corr.-/Acid-proof steels, Heat-resist. steels	≤ 44	≤ 410	≤ 1400	347, 420, 440, 15-5ph, 17-4ph	0.7		190 - 260
1.13 Special steel materials				Ferro-TiC, Hardox 500	0.7		160 - 230
2 Cast materials							
2.1 Cast iron		< 280		ASTM A48, SAE J431c grade, 1800	1.1	360 - 430	460 - 520
2.2 Cast iron with nodular graphite			≤ 1000	ASTM A48 class 20, 30, 35, 40 SAE J431c grade G3000	1.1	330 - 360	390 - 490
2.3 Cast iron with vermicular graphite		< 280			1.0	230 - 300	330 - 390
2.4 Malleable cast iron			≤ 700	ASTM A47 grades 32510, 35018	1.1	390 - 430	490 - 590
2.5 Hard castings up to 400 BHN		< 400			0.8		230 - 260
3 Copper, Copper alloys, Bronze, Brass							
3.1 Pure copper and low alloyed copper		≤ 150	≤ 500	99% pure	1.2	520 - 720	820 - 980
3.2 Copper-zinc alloys (brass, long-chipping)				320, 360	1.1	660 - 720	790 - 890
3.3 Copper-zinc alloys (brass, short-chipping)					1.1	590 - 660	750 - 850
3.4 Copper-alum. alloys (alubronze, long-ch.) Copper-tin alloys (bronze, long-chipping)					1.2	460 - 590	660 - 790
3.5 Copper-tin alloys (bronze, short-chipping)					1.2	720 - 790	920 - 1050
3.6 Special copper alloys, up to Q18					1.0		200 - 260
3.7 Special copper alloys, over Q18					0.7		50 - 70
4 Nickel/Cobalt alloys							
4.1 Nickel/Cobalt alloys heat-resistant	≤ 25	≤ 250	≤ 850	Hastelloy B, C, C-276	1.1		200 - 230
4.2 Nickel/Cobalt alloys high-heat resistant	25 - 44	250 - 410	850 - 1400	Inconell 718, Rene 100	1.0		130 - 200
4.3 Nickel/Cobalt alloys high-heat resistant	> 44	> 410	> 1400	Inconell 718, Haynes 25	0.7		100 - 130
8 Synthetics							
8.1 Duroplastics (short-chipping)				Bakelite	2.0	390 - 430	490 - 520
8.2 Thermoplastics (long-chipping)				PVC	2.0	590 - 660	820 - 980
8.3 Fibre-reinforced synthetics				Phenolic	1.0	260 - 330	390 - 460
9 Materials for special applications							
9.1 Graphite					1.0		230 - 290
9.2 Tungsten-copper alloys					1.1		290 - 390

Chipload per tooth f_z [inch]

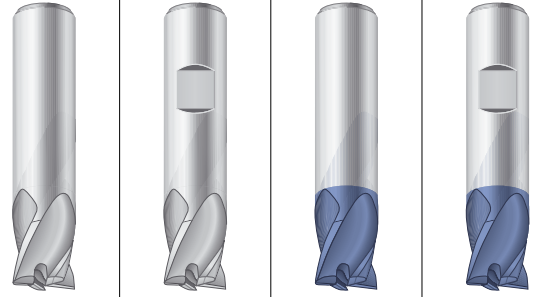
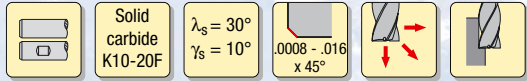
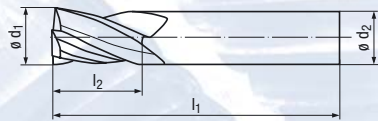
INCH	Finishing		Roughing		Slotting		METRIC	Finishing		Roughing		Slotting	
	a_e	a_p	a_e	a_p	a_e	a_p		a_e	a_p	a_e	a_p	a_e	a_p
	$a_e = .01$ in	$a_p = 1.5 \times d_1$	$a_e = 0.25 \times d_1$	$a_p = 1.5 \times d_1$	$a_e = d_1$	$a_p = 0.5 \times d_1$		$a_e = .01$ in	$a_p = 1.5 \times d_1$	$a_e = 0.25 \times d_1$	$a_p = 1.5 \times d_1$	$a_e = d_1$	$a_p = 0.5 \times d_1$
$\emptyset d_1$	Uncoated	TIALN-T4	Uncoated	TIALN-T4	Uncoated	TIALN-T4	$\emptyset d_1$ [mm]	Uncoated	TIALN-T4	Uncoated	TIALN-T4	Uncoated	TIALN-T4
1/32	.0001	.0001	.0001	.0001	.00004	.0001	2	.0002	.0003	.0002	.0002	.0001	.0002
1/16	.0002	.0002	.0002	.0002	.0001	.0002	3	.0004	.0005	.0003	.0003	.0002	.0003
3/32	.0002	.0003	.0002	.0003	.0002	.0002	4	.0005	.0006	.0004	.0004	.0003	.0004
1/8	.0003	.0004	.0002	.0003	.0002	.0003	5	.0007	.0008	.0004	.0005	.0003	.0004
3/16	.0006	.0006	.0004	.0004	.0004	.0004	6	.0008	.0009	.0005	.0006	.0004	.0005
1/4	.0008	.0008	.0005	.0006	.0004	.0005	8	.0011	.0013	.0007	.0008	.0005	.0007
5/16	.0011	.0012	.0007	.0008	.0006	.0007	10	.0013	.0016	.0009	.0010	.0007	.0009
3/8	.0015	.0016	.0009	.0010	.0008	.0008	12	.0016	.0019	.0011	.0012	.0008	.0011
7/16	.0018	.0020	.0011	.0012	.0009	.0010	14	.0019	.0022	.0012	.0014	.0009	.0012
1/2	.0023	.0025	.0013	.0014	.0011	.0012	16	.0021	.0025	.0014	.0016	.0011	.0014
5/8	.0027	.0029	.0015	.0017	.0013	.0014	18	.0024	.0028	.0016	.0018	.0012	.0016
3/4	.0034	.0036	.0018	.0019	.0015	.0017	20	.0026	.0032	.0017	.0020	.0013	.0017
1	.0047	.0051	.0022	.0024	.0018	.0020							

Please note that the value f_z from the above table must be multiplied with the corresponding correction factor.

N



Short



HSM

TIALN-T4

Coating

EDP tool identification

INCH

						1809	1810	1809A	1810A
ϕd_1	l_2	l_1	ϕd_2	# of teeth	EDP Size ID				
h10			h6						
1/32	1/16	1 1/2	1/8	4	003125	•		•	
1/16	1/8	1 1/2	1/8	4	00625	•		•	
3/32	3/16	1 1/2	1/8	4	009375	•		•	
1/8	1/4	1 1/2	1/8	4	0125	•		•	
3/16	3/8	2	3/16	4	01875	•		•	
1/4	1/2	2	1/4	4	0250	•		•	
5/16	1/2	2	5/16	4	03125	•		•	
3/8	5/8	2 1/4	3/8	4	0375	•	•	•	•
7/16	5/8	2 1/2	7/16	4	04375	•		•	
1/2	5/8	2 1/2	1/2	4	0500	•	•	•	•
5/8	3/4	3	5/8	6	0625	•	•	•	•
3/4	1	3	3/4	6	0750	•	•	•	•
1	1	3 1/2	1	8	1000	•	•	•	•

METRIC (Dimensions in mm)

						1809	1810	1809A	1810A
ϕd_1	l_2	l_1	ϕd_2	# of teeth	EDP Size ID				
h10			h6						
2	4	38	3	4	00203	•		•	
3	5	38	3	4	00303	•		•	
4	8	54	6	4	004	•	•	•	•
5	9	54	6	4	005	•	•	•	•
6	10	54	6	4	006	•	•	•	•
8	12	58	8	4	008	•	•	•	•
10	14	66	10	4	010	•	•	•	•
12	16	73	12	4	012	•	•	•	•
14	18	75	14	4	014	•	•	•	•
16	22	82	16	4	016	•	•	•	•
18	24	84	18	4	018	•	•	•	•
20	26	92	20	4	020	•	•	•	•

Cutting speed v_c [sfm]

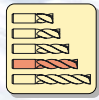
Material group	Hardness range			Material example	Correction factor	Uncoated	Coated
	HRC	BHN	N/mm ²				
1 Steel materials							
1.1 Cold-extrusion steels, Magnetic soft iron		≤ 120	≤ 400	1008 / 1010	1.2	520 - 620	820 - 980
1.2 Free-cutting steels, General construction steels		≤ 180	≤ 600	1008 / 1010 / 12L14 / A36 11L17, 1140, 12L15	1.2	390 - 520	650 - 820
1.3 Free-cutting steels, Construction steels, Alloyed steels, Steel castings	≤ 25	≤ 250	≤ 850	1018, 1060, 4130, 4140, 41L30, 41L45, 86L20, 86L40, 1045	1.1	330 - 390	590 - 920
1.4 Chrome alloy steels, Heat-treatable steels, Nitriding steels, Cold work steels	≤ 35	≤ 320	≤ 1100	5115, A29, A519, J404 4130, 8030, 4140, 4330 Nitralloy125, 135, 230, EZ, A7	1.0	300 - 360	525 - 720
1.5 Heat-treatable steels, Nitriding steels, Hot work steels, Hardened steels up to 44 HRC, Cold work steels	≤ 44	≤ 410	≤ 1400	D2, D3, D4, D5, D7 4130, 8030, 4140, 4330 H10, H11, H14, H21, H22, H46 4130, 4340, 150, 4161, 5160, 8660	0.8	230 - 300	460 - 660
1.10 Corrosion-proof steels, Acid-proof steels, Heat-resistant steels	≤ 25	≤ 250	≤ 850	303, 304, 316, 316L, 416, 420 303, 304, 316, 316L, 416, 420 303, 304, 316, 316L, 416, 420	1.0	230 - 260	260 - 390
1.11 Corr.-/Acid-proof steels, Heat-resist. steels	≤ 35	≤ 320	≤ 1100	410, 420, C18m, 17-4ph	0.9		190 - 300
1.12 Corr.-/Acid-proof steels, Heat-resist. steels	≤ 44	≤ 410	≤ 1400	347, 420, 440, 15-5ph, 17-4ph	0.7		190 - 260
1.13 Special steel materials				Ferro-TiC, Hardox 500	0.7		160 - 230
2 Cast materials							
2.1 Cast iron		< 280		ASTM A48, SAE J431c grade, 1800	1.1	360 - 430	460 - 520
2.2 Cast iron with nodular graphite			≤ 1000	ASTM A48 class 20, 30, 35, 40 SAE J431c grade G3000	1.1	330 - 360	390 - 490
2.3 Cast iron with vermicular graphite		< 280			1.0	230 - 300	330 - 390
2.4 Malleable cast iron			≤ 700	ASTM A47 grades 32510, 35018	1.1	390 - 430	490 - 590
2.5 Hard castings up to 400 BHN		< 400			0.8		230 - 260
3 Copper, Copper alloys, Bronze, Brass							
3.1 Pure copper and low alloyed copper		≤ 150	≤ 500	99% pure	1.2	520 - 720	820 - 980
3.2 Copper-zinc alloys (brass, long-chipping)				320, 360	1.1	660 - 720	790 - 890
3.3 Copper-zinc alloys (brass, short-chipping)					1.1	590 - 660	750 - 850
3.4 Copper-alum. alloys (alubronze, long-ch.) Copper-tin alloys (bronze, long-chipping)					1.2	460 - 590	660 - 790
3.5 Copper-tin alloys (bronze, short-chipping)					1.2	720 - 790	920 - 1050
3.6 Special copper alloys, up to Q18					1.0		200 - 260
3.7 Special copper alloys, over Q18					0.7		50 - 70
4 Nickel/Cobalt alloys							
4.1 Nickel/Cobalt alloys heat-resistant	≤ 25	≤ 250	≤ 850	Hastelloy B, C, C-276	1.1		200 - 230
4.2 Nickel/Cobalt alloys high-heat resistant	25 - 44	250 - 410	850 - 1400	Inconell 718, Rene 100	1.0		130 - 200
4.3 Nickel/Cobalt alloys high-heat resistant	> 44	> 410	> 1400	Inconell 718, Haynes 25	0.7		100 - 130
8 Synthetics							
8.1 Duroplastics (short-chipping)				Bakelite	2.0	390 - 430	490 - 520
8.2 Thermoplastics (long-chipping)				PVC	2.0	590 - 660	820 - 980
8.3 Fibre-reinforced synthetics				Phenolic	1.0	260 - 330	390 - 460
9 Materials for special applications							
9.1 Graphite					1.0		230 - 290
9.2 Tungsten-copper alloys					1.1		290 - 390

Chipload per tooth f_z [inch]

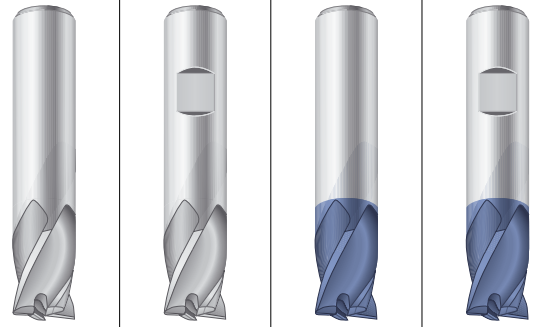
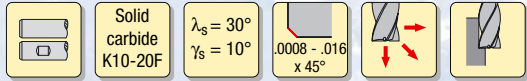
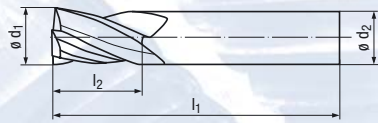
INCH	Finishing		Roughing		Slotting		METRIC	Finishing		Roughing		Slotting	
	a_e	a_p	a_e	a_p	a_e	a_p		a_e	a_p	a_e	a_p	a_e	a_p
	$a_e = .01$ in	$a_p = 1.5 \times d_1$	$a_e = 0.25 \times d_1$	$a_p = 1.5 \times d_1$	$a_e = d_1$	$a_p = 0.5 \times d_1$		$a_e = .01$ in	$a_p = 1.5 \times d_1$	$a_e = 0.25 \times d_1$	$a_p = 1.5 \times d_1$	$a_e = d_1$	$a_p = 0.5 \times d_1$
$\emptyset d_1$	Uncoated	TIALN-T4	Uncoated	TIALN-T4	Uncoated	TIALN-T4	$\emptyset d_1$ [mm]	Uncoated	TIALN-T4	Uncoated	TIALN-T4	Uncoated	TIALN-T4
1/32	.0001	.0001	.0001	.0001	.00004	.0001	2	.0002	.0003	.0002	.0002	.0001	.0002
1/16	.0002	.0002	.0002	.0002	.0001	.0002	3	.0004	.0005	.0003	.0003	.0002	.0003
3/32	.0002	.0003	.0002	.0003	.0002	.0002	4	.0005	.0006	.0004	.0004	.0003	.0004
1/8	.0003	.0004	.0002	.0003	.0002	.0003	5	.0007	.0008	.0004	.0005	.0003	.0004
3/16	.0006	.0006	.0004	.0004	.0004	.0004	6	.0008	.0010	.0005	.0006	.0004	.0005
1/4	.0008	.0008	.0005	.0006	.0004	.0005	8	.0011	.0013	.0007	.0008	.0005	.0007
5/16	.0011	.0012	.0007	.0008	.0006	.0007	10	.0013	.0016	.0009	.0010	.0007	.0009
3/8	.0015	.0016	.0009	.0010	.0008	.0008	12	.0016	.0019	.0011	.0012	.0008	.0011
7/16	.0018	.0020	.0011	.0012	.0009	.0010	14	.0019	.0022	.0012	.0014	.0009	.0012
1/2	.0023	.0025	.0013	.0014	.0011	.0012	16	.0021	.0025	.0014	.0016	.0011	.0014
5/8	.0027	.0029	.0015	.0017	.0013	.0014	18	.0024	.0028	.0016	.0018	.0012	.0016
3/4	.0034	.0036	.0018	.0019	.0015	.0017	20	.0026	.0032	.0017	.0020	.0013	.0017
1	.0047	.0051	.0022	.0024	.0018	.0020							

Please note that the value f_z from the above table must be multiplied with the corresponding correction factor.

N



Long



HSM

Coating

– TIALN-T4

EDP tool identification

1859 **1860** **1859A** **1860A**

INCH

$\varnothing d_1$ h10	l_2	l_1	$\varnothing d_2$ h6	# of teeth	EDP Size ID	1859	1860	1859A	1860A
1/32	3/32	1 1/2	1/8	4	003125	•		•	
1/16	1/4	1 1/2	1/8	4	00625	•		•	
3/32	3/8	1 1/2	1/8	4	009375	•		•	
1/8	1/2	1 3/4	1/8	4	0125	•		•	
3/16	5/8	2	3/16	4	01875	•		•	
1/4	3/4	2 1/2	1/4	4	0250	•		•	
5/16	7/8	2 1/2	5/16	4	03125	•		•	
3/8	7/8	2 1/2	3/8	4	0375	•	•	•	•
7/16	1	2 3/4	7/16	4	04375	•		•	
1/2	1	3	1/2	4	0500	•	•	•	•
5/8	1 1/4	3 1/2	5/8	6	0625	•	•	•	•
3/4	1 1/2	4	3/4	6	0750	•	•	•	•
1	1 1/2	4	1	8	1000	•	•	•	•

METRIC (Dimensions in mm)

$\varnothing d_1$ h10	l_2	l_1	$\varnothing d_2$ h6	# of teeth	EDP Size ID	1859	1860	1859A	1860A
2	7	38	2	4	00202	•		•	
3	8	38	3	4	003	•		•	
4	11	50	4	4	004	•		•	
5	13	50	5	4	005	•		•	
6	13	57	6	4	006	•	•	•	•
8	19	63	8	4	008	•	•	•	•
10	22	72	10	4	010	•	•	•	•
12	26	83	12	4	012	•	•	•	•
14	26	83	14	4	014	•	•	•	•
16	32	92	16	4	016	•	•	•	•
18	32	92	18	4	018	•	•	•	•
20	38	104	20	4	020	•	•	•	•

Cutting speed v_c [sfm]

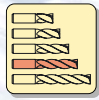
	Material group	Hardness range			Material example	Correction factor	Uncoated	Coated
		HRC	BHN	N/mm ²				
1	Steel materials							
1.1	Cold-extrusion steels, Magnetic soft iron		≤ 120	≤ 400	1008 / 1010	1.2	520 - 620	820 - 980
1.2	Free-cutting steels, General construction steels		≤ 180	≤ 600	1008 / 1010 / 12L14 / A36 11L17, 1140, 12L15	1.2	390 - 520	650 - 820
1.3	Free-cutting steels, Construction steels, Alloyed steels, Steel castings	≤ 25	≤ 250	≤ 850	1018, 1060, 4130, 4140, 41L30, 41L45, 86L20, 86L40, 1045	1.1	330 - 390	590 - 920
1.4	Chrome alloy steels, Heat-treatable steels, Nitriding steels, Cold work steels	≤ 35	≤ 320	≤ 1100	5115, A29, A519, J404 4130, 8030, 4140, 4330 Nitralloy125, 135, 230, EZ, A7	1.0	300 - 360	525 - 720
1.5	Heat-treatable steels, Nitriding steels, Hot work steels, Hardened steels up to 44 HRC, Cold work steels	≤ 44	≤ 410	≤ 1400	D2, D3, D4, D5, D7 4130, 8030, 4140, 4330 H10, H11, H14, H21, H22, H46 4130, 4340, 150, 4161, 5160, 8660	0.8	230 - 300	460 - 660
1.10	Corrosion-proof steels, Acid-proof steels, Heat-resistant steels	≤ 25	≤ 250	≤ 850	303, 304, 316, 316L, 416, 420 303, 304, 316, 316L, 416, 420 303, 304, 316, 316L, 416, 420	1.0	230 - 260	260 - 390
1.11	Corr.-/Acid-proof steels, Heat-resist. steels	≤ 35	≤ 320	≤ 1100	410, 420, C18m, 17-4ph	0.9		190 - 300
1.12	Corr.-/Acid-proof steels, Heat-resist. steels	≤ 44	≤ 410	≤ 1400	347, 420, 440, 15-5ph, 17-4ph	0.7		190 - 260
1.13	Special steel materials				Ferro-TiC, Hardox 500	0.7		160 - 230
2	Cast materials							
2.1	Cast iron		< 280		ASTM A48, SAE J431c grade, 1800	1.1	360 - 430	460 - 520
2.2	Cast iron with nodular graphite			≤ 1000	ASTM A48 class 20, 30, 35, 40 SAE J431c grade G3000	1.1	330 - 360	390 - 490
2.3	Cast iron with vermicular graphite		< 280			1.0	230 - 300	330 - 390
2.4	Malleable cast iron			≤ 700	ASTM A47 grades 32510, 35018	1.1	390 - 430	490 - 590
2.5	Hard castings up to 400 BHN		< 400			0.8		230 - 260
3	Copper, Copper alloys, Bronze, Brass							
3.1	Pure copper and low alloyed copper		≤ 150	≤ 500	99% pure	1.2	520 - 720	820 - 980
3.2	Copper-zinc alloys (brass, long-chipping)				320, 360	1.1	660 - 720	790 - 890
3.3	Copper-zinc alloys (brass, short-chipping)					1.1	590 - 660	750 - 850
3.4	Copper-alum. alloys (alubronze, long-ch.) Copper-tin alloys (bronze, long-chipping)					1.2	460 - 590	660 - 790
3.5	Copper-tin alloys (bronze, short-chipping)					1.2	720 - 790	920 - 1050
3.6	Special copper alloys, up to Q18					1.0		200 - 260
3.7	Special copper alloys, over Q18					0.7		50 - 70
4	Nickel/Cobalt alloys							
4.1	Nickel/Cobalt alloys heat-resistant	≤ 25	≤ 250	≤ 850	Hastelloy B, C, C-276	1.1		200 - 230
4.2	Nickel/Cobalt alloys high-heat resistant	25 - 44	250 - 410	850 - 1400	Inconell 718, Rene 100	1.0		130 - 200
4.3	Nickel/Cobalt alloys high-heat resistant	> 44	> 410	> 1400	Inconell 718, Haynes 25	0.7		100 - 130
8	Synthetics							
8.1	Duroplastics (short-chipping)				Bakelite	2.0	390 - 430	490 - 520
8.2	Thermoplastics (long-chipping)				PVC	2.0	590 - 660	820 - 980
8.3	Fibre-reinforced synthetics				Phenolic	1.0	260 - 330	390 - 460
9	Materials for special applications							
9.1	Graphite					1.0		230 - 290
9.2	Tungsten-copper alloys					1.1		290 - 390

Chipload per tooth f_z [inch]

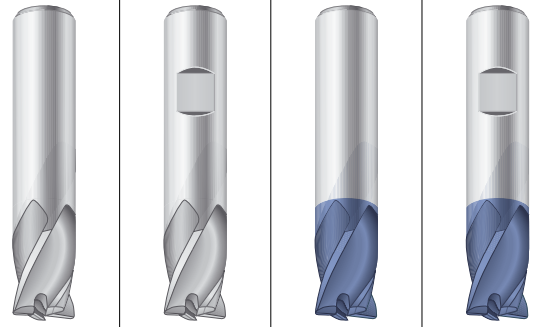
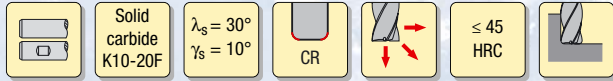
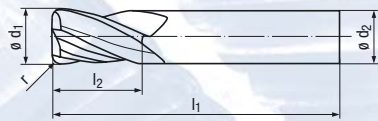
INCH	Finishing		Roughing		Slotting		METRIC	Finishing		Roughing		Slotting	
	a_e	a_p	a_e	a_p	a_e	a_p		a_e	a_p	a_e	a_p	a_e	a_p
	$a_e = .01$ in	$a_p = 1.5 \times d_1$	$a_e = 0.25 \times d_1$	$a_p = 1.5 \times d_1$	$a_e = d_1$	$a_p = 0.5 \times d_1$		$a_e = .01$ in	$a_p = 1.5 \times d_1$	$a_e = 0.25 \times d_1$	$a_p = 1.5 \times d_1$	$a_e = d_1$	$a_p = 0.5 \times d_1$
$\emptyset d_1$	Uncoated	TIALN-T4	Uncoated	TIALN-T4	Uncoated	TIALN-T4	$\emptyset d_1$ [mm]	Uncoated	TIALN-T4	Uncoated	TIALN-T4	Uncoated	TIALN-T4
1/32	.0001	.0001	.0001	.0001	.00004	.0001	2	.0002	.0003	.0002	.0002	.0001	.0002
1/16	.0002	.0002	.0002	.0002	.0001	.0002	3	.0004	.0005	.0003	.0003	.0002	.0003
3/32	.0002	.0003	.0002	.0003	.0002	.0002	4	.0005	.0006	.0004	.0004	.0003	.0004
1/8	.0003	.0004	.0002	.0003	.0002	.0003	5	.0007	.0008	.0004	.0005	.0003	.0004
3/16	.0006	.0006	.0004	.0004	.0004	.0004	6	.0008	.0009	.0005	.0006	.0004	.0005
1/4	.0008	.0008	.0005	.0006	.0004	.0005	8	.0011	.0013	.0007	.0008	.0005	.0007
5/16	.0011	.0012	.0007	.0008	.0006	.0007	10	.0013	.0016	.0009	.0010	.0007	.0009
3/8	.0015	.0016	.0009	.0010	.0008	.0008	12	.0016	.0019	.0011	.0012	.0008	.0011
7/16	.0018	.0020	.0011	.0012	.0009	.0010	14	.0019	.0022	.0012	.0014	.0009	.0012
1/2	.0023	.0025	.0013	.0014	.0011	.0012	16	.0021	.0025	.0014	.0016	.0011	.0014
5/8	.0027	.0029	.0015	.0017	.0013	.0014	18	.0024	.0028	.0016	.0018	.0012	.0016
3/4	.0034	.0036	.0018	.0019	.0015	.0017	20	.0026	.0032	.0017	.0020	.0013	.0017
1	.0047	.0051	.0022	.0024	.0018	.0020							

Please note that the value f_z from the above table must be multiplied with the corresponding correction factor.

N



Long



HSM

Coating

TIALN-T4

EDP tool identification

1923 1924 1923A 1924A

INCH

ϕd_1 h10	r	l_2	l_1	ϕd_2 h6	# of teeth	EDP Size ID	1923	1924	1923A	1924A
1/4	.01	1/4	2 1/2	1/4	4	025010	•		•	
1/4	.025	1/4	2 1/2	1/4	4	025025	•		•	
1/4	.05	1/4	2 1/2	1/4	4	025050	•		•	
5/16	.025	7/8	2 1/2	5/16	4	031025	•		•	
5/16	.05	7/8	2 1/2	5/16	4	031050	•		•	
5/16	.075	7/8	2 1/2	5/16	4	031070	•		•	
3/8	.01	7/8	2 1/2	3/8	4	037010	•	•	•	•
3/8	.025	7/8	2 1/2	3/8	4	037025	•	•	•	•
3/8	.05	7/8	2 1/2	3/8	4	037050	•	•	•	•
7/16	.025	1	2 3/4	7/16	4	043025	•		•	
7/16	.05	1	2 3/4	7/16	4	043050	•		•	
7/16	.075	1	2 3/4	7/16	4	043070	•		•	
7/16	.1	1	2 3/4	7/16	4	043100	•		•	
1/2	.025	1	3	1/2	4	050025	•	•	•	•
1/2	.05	1	3	1/2	4	050050	•	•	•	•
1/2	.075	1	3	1/2	4	050070	•	•	•	•
1/2	.1	1	3	1/2	4	050100	•	•	•	•
5/8	.04	1 1/4	3 1/2	5/8	6	062040	•	•	•	•
5/8	.06	1 1/4	3 1/2	5/8	6	062060	•	•	•	•
5/8	.08	1 1/4	3 1/2	5/8	6	062080	•	•	•	•
5/8	.1	1 1/4	3 1/2	5/8	6	062100	•	•	•	•
3/4	.06	1 1/2	4	3/4	6	075060	•	•	•	•
3/4	.08	1 1/2	4	3/4	6	075080	•	•	•	•
3/4	.1	1 1/2	4	3/4	6	075100	•	•	•	•

METRIC (Dimensions in mm)

ϕd_1 h10	r	l_2	l_1	ϕd_2 h6	# of teeth	EDP Size ID	1923	1924	1923A	1924A
3	0.3	8	57	6	4	003003	•	•	•	•
3	0.5	8	57	6	4	003005	•	•	•	•
4	0.3	11	57	6	4	004003	•	•	•	•
4	0.5	11	57	6	4	004005	•	•	•	•
5	0.3	13	57	6	4	005003	•	•	•	•
5	0.5	13	57	6	4	005005	•	•	•	•
6	0.5	13	57	6	4	006005	•	•	•	•
6	1	13	57	6	4	006010	•	•	•	•
6	1.5	13	57	6	4	006015	•	•	•	•
8	0.5	19	63	8	4	008005	•	•	•	•
8	1	19	63	8	4	008010	•	•	•	•
8	1.5	19	63	8	4	008015	•	•	•	•
10	1	22	72	10	4	010010	•	•	•	•
10	1.5	22	72	10	4	010015	•	•	•	•
10	2	22	72	10	4	010020	•	•	•	•
12	1	26	83	12	4	012010	•	•	•	•
12	1.5	26	83	12	4	012015	•	•	•	•
12	2	26	83	12	4	012020	•	•	•	•
16	1	32	92	16	4	016010	•	•	•	•
16	1.5	32	92	16	4	016015	•	•	•	•
16	2	32	92	16	4	016020	•	•	•	•
16	3	32	92	16	4	016030	•	•	•	•
20	1.5	38	104	20	4	020015	•	•	•	•
20	2	38	104	20	4	020020	•	•	•	•
20	3	38	104	20	4	020030	•	•	•	•

Cutting speed v_c [sfm]

	Material group	Hardness range			Material example	Correction factor	Uncoated	Coated
		HRC	BHN	N/mm ²				
1	Steel materials							
1.1	Cold-extrusion steels, Magnetic soft iron		≤ 120	≤ 400	1008 / 1010	1.2	520 - 620	800 - 900
1.2	Free-cutting steels, General construction steels		≤ 180	≤ 600	1008 / 1010 / 12L14 / A36 11L17, 1140, 12L15	1.2	390 - 520	850 - 980
1.3	Free-cutting steels, Construction steels, Alloyed steels, Steel castings	≤ 25	≤ 250	≤ 850	1018, 1060, 4130, 4140, 41L30, 41L45, 86L20, 86L40, 1045	1.1	330 - 390	600 - 900
1.4	Chrome alloy steels, Heat-treatable steels, Nitriding steels, Cold work steels	≤ 35	≤ 320	≤ 1100	5115, A29, A519, J404 4130, 8030, 4140, 4330 Nitralloy125, 135, 230, EZ, A7	1.0	300 - 360	530 - 720
1.5	Heat-treatable steels, Nitriding steels, Hot work steels, Hardened steels up to 44 HRC, Cold work steels	≤ 44	≤ 410	≤ 1400	D2, D3, D4, D5, D7 4130, 8030, 4140, 4330 H10, H11, H14, H21, H22, H46 4130, 4340, 150, 4161, 5160, 8660	0.8	230 - 300	530 - 660
1.10	Corrosion-proof steels, Acid-proof steels, Heat-resistant steels	≤ 25	≤ 250	≤ 850	303, 304, 316, 316L, 416, 420 303, 304, 316, 316L, 416, 420 303, 304, 316, 316L, 416, 420	1.0		260 - 400
2	Cast materials							
2.1	Cast iron		< 280		ASTM A48, SAE J431c grade, 1800	1.1	360 - 430	590 - 720
2.2	Cast iron with nodular graphite			≤ 1000	ASTM A48 class 20, 30, 35, 40 SAE J431c grade G3000	1.1		460 - 650
2.3	Cast iron with vermicular graphite		< 280			1.0		260 - 400
2.4	Malleable cast iron			≤ 700	ASTM A47 grades 32510, 35018	1.1		330 - 520
2.5	Hard castings up to 400 BHN		< 400			0.8		
3	Copper, Copper alloys, Bronze, Brass							
3.1	Pure copper and low alloyed copper		≤ 150	≤ 500	99% pure	1.2	390 - 460	520 - 650
3.2	Copper-zinc alloys (brass, long-chipping)				320, 360	1.1		460 - 590
3.3	Copper-zinc alloys (brass, short-chipping)					1.1		460 - 590
3.4	Copper-alum. alloys (alubronze, long-ch.) Copper-tin alloys (bronze, long-chipping)					1.2		390 - 530
3.5	Copper-tin alloys (bronze, short-chipping)					1.2		400 - 530
3.6	Special copper alloys, up to Q18					1.0		260 - 400
3.7	Special copper alloys, over Q18					0.7		
4	Nickel/Cobalt alloys							
4.1	Nickel/Cobalt alloys heat-resistant	≤ 25	≤ 250	≤ 850	Hastelloy B, C, C-276	1.1		200 - 230
4.2	Nickel/Cobalt alloys high-heat resistant	25 - 44	250 - 410	850 - 1400	Inconell 718, Rene 100	1.0		130 - 200
4.3	Nickel/Cobalt alloys high-heat resistant	> 44	> 410	> 1400	Inconell 718, Haynes 25	0.7		100 - 130
7	Titanium, Titanium alloys							
7.1	Pure titanium, Titanium alloys	≤ 27	≤ 270	≤ 900	Commercially pure C-1, C-2	1.0		330 - 460
7.2	Titanium alloys	27 - 39	270 - 370	900 - 1250	6Al4V	0.9		130 - 200
8	Synthetics							
8.1	Duroplastics (short-chipping)				Bakelite	2.0		650 - 790
8.2	Thermoplastics (long-chipping)				PVC	2.0		520 - 650
8.3	Fibre-reinforced synthetics				Phenolic	1.0		360 - 460
9	Materials for special applications							
9.1	Graphite					1.0		580 - 720
9.2	Tungsten-copper alloys					1.1		580 - 720

Chipload per tooth f_z [inch]

INCH	Finishing		Roughing		Slotting		METRIC	Finishing		Roughing		Slotting	
	a_e	a_p	a_e	a_p	a_e	a_p		a_e	a_p	a_e	a_p	a_e	a_p
	$a_e = .01$ in	$a_p = 1.5 \times d_1$	$a_e = 0.25 \times d_1$	$a_p = 1.5 \times d_1$	$a_e = d_1$	$a_p = 0.5 \times d_1$		$a_e = .01$ in	$a_p = 1.5 \times d_1$	$a_e = 0.25 \times d_1$	$a_p = 1.5 \times d_1$	$a_e = d_1$	$a_p = 0.5 \times d_1$
$\emptyset d_1$	Uncoated	TIALN-T4	Uncoated	TIALN-T4	Uncoated	TIALN-T4	$\emptyset d_1$ [mm]	Uncoated	TIALN-T4	Uncoated	TIALN-T4	Uncoated	TIALN-T4
1/4	.0008	.0008	.0005	.0006	.0004	.0005	3	.0004	.0005	.0003	.0003	.0002	.0003
5/16	.0011	.0012	.0007	.0008	.0006	.0007	4	.0005	.0006	.0004	.0004	.0003	.0004
3/8	.0014	.0016	.0009	.0010	.0008	.0008	5	.0007	.0008	.0004	.0005	.0003	.0004
7/16	.0018	.0020	.0011	.0012	.0009	.0010	6	.0008	.0009	.0005	.0006	.0004	.0005
1/2	.0023	.0025	.0013	.0014	.0011	.0012	8	.0011	.0013	.0007	.0008	.0005	.0007
5/8	.0027	.0029	.0015	.0017	.0013	.0014	10	.0013	.0016	.0009	.0010	.0007	.0009
3/4	.0034	.0036	.0018	.0019	.0015	.0017	12	.0016	.0019	.0011	.0012	.0008	.0011
							16	.0021	.0025	.0014	.0016	.0011	.0014
							20	.0026	.0032	.0017	.0020	.0013	.0017

Please note that the value f_z from the above table must be multiplied with the corresponding correction factor.