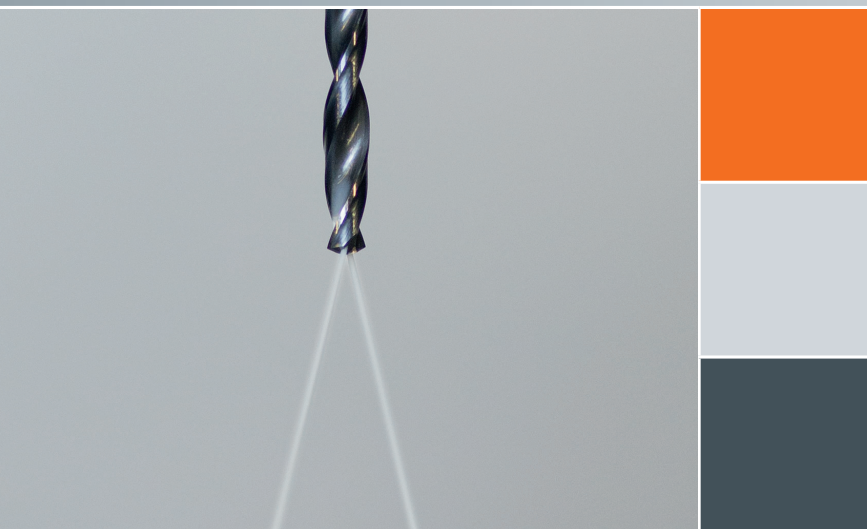
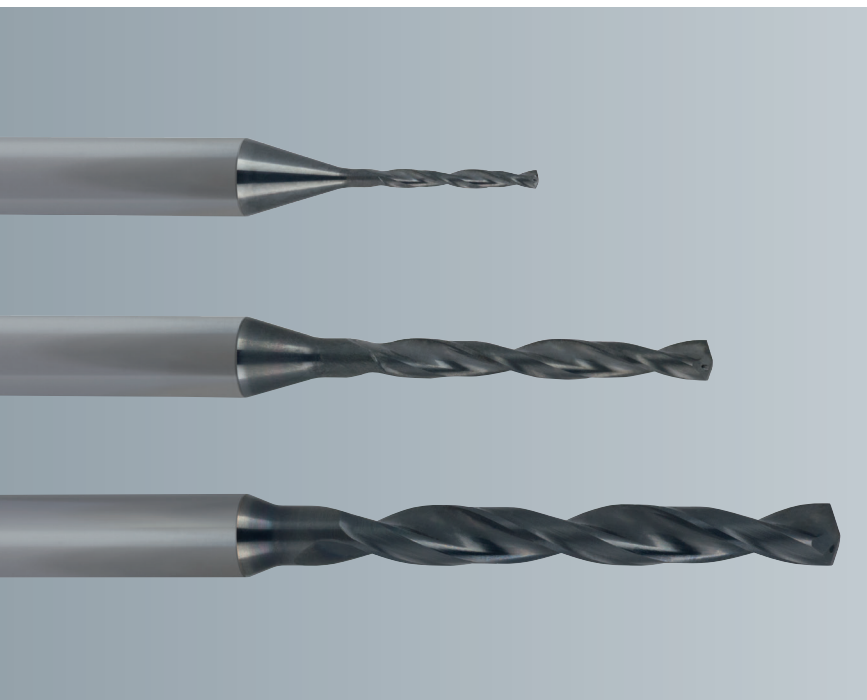


NEW!

EMUGE



**HIGH PERFORMANCE SOLID CARBIDE
EF-MICRO DRILLS**

INTRODUCING

EMUGE Solid Carbide Coolant-fed Micro Drills.

For Precision + Performance

Emuge has expanded its EF-Series of high penetration rate drills with a new line of sub-micro grain carbide coolant-fed micro drills.

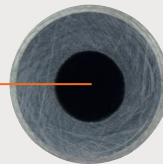
Emuge EF Series Drills are the result of extensive research and development and incorporate special geometry, proprietary carbide grades and a PVD coating design that is unique to the industry. The result is three to five times faster penetration rate than conventional carbide and cobalt drills, in addition to exceptional, high quality threads and longer tool life.

EF High Performance Micro Drills range from 0.0295 in. (0.75 mm) up to 0.1181 in. (3.0 mm) in diameter, and all feature coolant through design. The micro face point and flute geometry, in addition to the coolant-fed design, enable excellent chip evacuation for the highest possible drilling speed, while reducing the need for peck cycles or clearing chips.



New Emuge EF-Micro Drills feature:

- **Unique face geometry** generates short chips in the drill operation, ensuring high drill hole accuracy.
- **TiALN T99 multi-layer PVD coating** designed for added heat and wear resistance. This significantly reduces built-up edges and edge chipping, substantially increasing tool life.
- **Double margin design** for added stability and superior hole surface finish.
- **All tools are 6 x D length** and can accommodate most production applications.



Large central tool shank channel guarantees maximum coolant intake capacity, allowing optimal coolant transfer.

Internal coolant supply enables economically efficient, high performance machining down to even the smallest drilling diameter of 0.75 mm.

*German engineered
Emuge quality*

EF Solid Carbide Coolant-Fed Micro Drills are ideal for aerospace, medical and precision automotive applications, designed for producing very small deep holes in steel, alloyed steel, titanium, stainless steel and non-ferrous materials.



Applications / Materials

Please note:

Drill suitability is identified in the respective columns as follows:

- = very suitable
- = suitable

See page 5 for appropriate cutting speeds V_c [m/min] and feed per revolution values f [mm/rev.]

Coolant Information:

Coolant filtration is important with micro drills. A general recommendation for filtering is:

- Filter quality of 10 microns for diameters under 1 mm
- Filter quality of 20 microns for diameters between 1 mm and 3 mm

Coolant pressure:

High pressure coolant is recommended with micro drills. Peck cycles might be needed if coolant pressure is under 500psi. You should not need peck cycles if the psi is over 500psi.

Coolant-lubricant recommendation



EF-Micro
6 x D

Applications – Materials		Hardness Range			Material Examples	Emulsion	Oil	Minimum quantity lubrication (MQL)	Dry / Pressurized air		
		HRC	BHN	N/mm ²							
Steel materials											
P	1.1	Cold-extrusion steels, Construction steels, Free-cutting steels, etc.		≤ 180	≤ 600	1010 / 1018 / 1020 / 12L14 / 12L15 / A36 / T1	■	■	□		■
	2.1	Construction steels, Cementation steels, Steel castings, etc.	≤ 22	≤ 235	≤ 800	A36 / T1 / 1030-1095 / 4140 / 4340 / 8620	■	■	□		■
	3.1	Cementation steels, Heat-treatable steels, Cold work steels, etc.	≤ 31	≤ 295	≤ 1000	4140 / 4340 / 8620 / P20 / H13 / D2 / A2 / S7 / H1150	■	■	□		■
	4.1	Heat-treatable steels, Cold work steels, Nitriding steels, etc.	≤ 38	≤ 355	≤ 1200	4140 / 4340 / 8620 / P20 / H13 / D2 / 300M / 52100 / M1-M42	■	■	□		■
	5.1	High-alloyed steels, Cold work steels, Hot work steels, etc.	≤ 44	≤ 415	≤ 1400	4140 / 4340 / 8620 / P20 / H13 / D2 / 300M / 52100	■	■	□		■
Stainless steel materials											
M	1.1	Ferritic, martensitic	≤ 29	≤ 280	≤ 950	410 / 440 / 440C / 17-4 PH	■	□			■
	2.1	Austenitic	≤ 29	≤ 280	≤ 950	303 / 304 / 316 / 316L / 321	■	□			□
	3.1	Austenitic-ferritic (Duplex)	≤ 35	≤ 325	≤ 1100		■	□			□
	4.1	Austenitic-ferritic heat-resistant (Super Duplex)	≤ 39	≤ 370	≤ 1250		■	□			□
Cast materials											
K	1.1	Cast iron with lamellar graphite (GJL)		30 - 75	100 - 250	Grey cast irons G10-GG40	■	□	□	□	□
	1.2			75 - 135	250 - 450		■	□	□	□	□
	2.1	Cast iron with nodular graphite (GJS)		105 - 150	350 - 500	Nodular GGG40-GGG70	■	□	□	□	□
	2.2			150 - 265	500 - 900		■	□	□	□	□
	3.1	Cast iron with vermicular graphite (GJV)		90 - 120	300 - 400		■	□	□	□	□
	3.2			120 - 150	400 - 500	Compact graphite iron (CGI)	■	□	□	□	□
	4.1	Malleable cast iron (GTMW, GTMB)		70 - 145	250 - 500		■	□	□	□	□
	4.2			150 - 235	500 - 800	White iron	■	□	□	□	□
Non ferrous materials											
Aluminum alloys											
N	1.1			≤ 60	≤ 200	7075	■	□			□
	1.2	Aluminum wrought alloys		≤ 105	≤ 350	6061-T6 / 2024-T4	■	□			■
	1.3			≤ 165	≤ 550		■	□			■
	1.4	Aluminum cast alloys Si ≤ 7%					■	□			■
	1.5	Aluminum cast alloys 7% < Si ≤ 12%					■	□			■
	1.6	Aluminum cast alloys 12% < Si ≤ 17%					■	□			□
Copper alloys											
N	2.1	Pure copper, low-alloyed copper		≤ 120	≤ 400						
	2.2	Copper-zinc alloys (brass, long-chipping)		≤ 165	≤ 550		■	□			■
	2.3	Copper-zinc alloys (brass, short-chipping)		≤ 165	≤ 550		■	□			■
	2.4	Copper-aluminum alloys (alu bronze, long-chipping)		≤ 235	≤ 800						
	2.5	Copper-tin alloys (tin bronze, long-chipping)		≤ 205	≤ 700						
	2.6	Copper-tin alloys (tin bronze, short-chipping)		≤ 120	≤ 400						
	2.7			≤ 180	≤ 600						
	2.8	Special copper alloys	≤ 44	≤ 415	≤ 1400						
Magnesium alloys											
N	3.1	Magnesium wrought alloys		≤ 150	≤ 500						
	3.2	Magnesium cast alloys		≤ 150	≤ 500						
Synthetics											
N	4.1	Duroplastics (short-chipping)									
	4.2	Thermoplastics (long-chipping)									
	4.3	Fiber-reinforced synthetics (fiber content ≤ 30%)									
	4.4	Fiber-reinforced synthetics (fiber content > 30%)									
Special materials											
S	5.1	Graphite									
	5.2	Tungsten-copper alloys									
	5.3	Composite materials									
Special materials											
Titanium alloys											
S	1.1	Pure titanium		≤ 135	≤ 450	CP1 / CP2					□
	1.2	Titanium alloys	≤ 27	≤ 265	≤ 900	6AL4V	■	□			□
	1.3		≤ 39	≤ 370	≤ 1250		■	□			□
Nickel alloys, cobalt alloys and iron alloys											
S	2.1	Pure nickel		≤ 180	≤ 600						
	2.2			≤ 31	≤ 295	≤ 1000					
	2.3	Nickel-base alloys	≤ 49	≤ 475	≤ 1600	Monel 500 718 Inconel					
	2.4		≤ 31	≤ 295	≤ 1000						
	2.5	Cobalt-base alloys	≤ 49	≤ 475	≤ 1600	Haynes 25					
	2.6	Iron-base alloys	≤ 46	≤ 445	≤ 1500	Incoloy 925					
Hard materials											
H	1.1			44 - 50							
	1.2			50 - 55							
	1.3	High strength steels, hardened steels, hard castings		55 - 60							
	1.4			60 - 63							
	1.5			63 - 66							

- Solid carbide coolant-fed twist drills
- 2 Flutes
- 2 Margins
- Point angle 140°

VHM

TiAlN
T99

↓

R30

↓

Z2

2FF

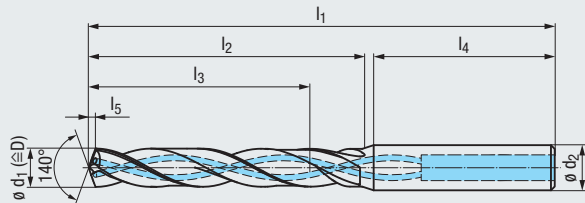
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140°

IT9-IT10

↓

DIN 6535
HA



Drill depth

6 x D

Applications – material (see page 4)

P 1.1-5.1

M 1.1-4.1

K 1.1-4.2

N 1.1-6

N 2.2-3

S 1.2-3

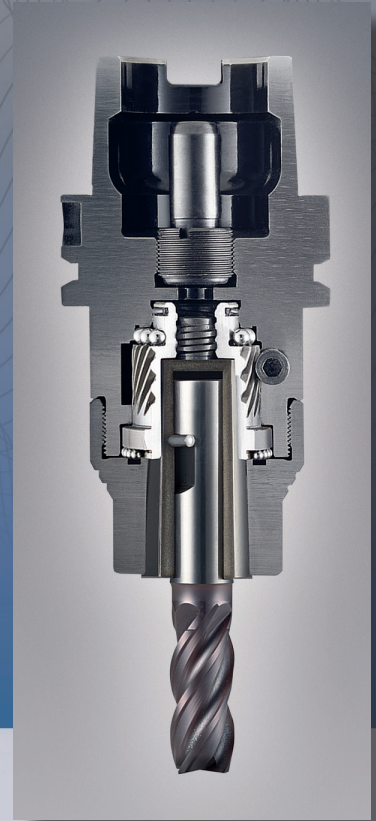
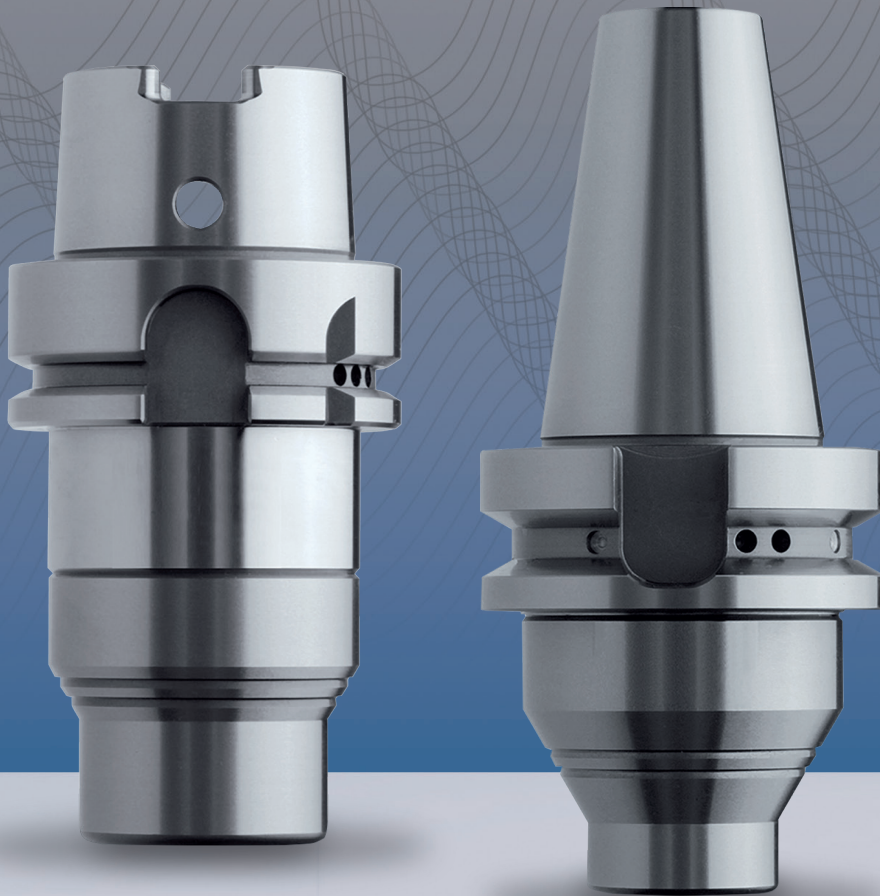
EF-Micro

Tool no.

ø d1 k5			l1	l2	l3	l4	l5	ø d2	EF-Micro Drill TiAlN-T99
0.75	M1	—	51.5	5.7	4.5	28	0.105	3	TE213324.0075
0.80	—	—	51.5	6.1	4.8	28	0.112	3	TE213324.0080
0.85	M1.1	—	51.5	6.5	5.1	28	0.119	3	TE213324.0085
0.90	—	M1	51.5	6.9	5.4	28	0.126	3	TE213324.0090
0.95	M1.2	—	51.5	7.3	5.7	28	0.132	3	TE213324.0095
1.00	—	M1.1	55	7.7	6	28	0.139	4	TE213324.0100
1.10	M1.4	M1.2	55	8.5	6.6	28	0.153	4	TE213324.0110
1.20	—	—	55	9.3	7.2	28	0.167	4	TE213324.0120
1.25	M1.6	—	55	9.7	7.5	28	0.174	4	TE213324.0125
1.28	—	M1.4	55	9.7	7.7	28	0.178	4	TE213324.0128
1.30	—	—	57	10.1	7.8	28	0.181	4	TE213324.0130
1.35	—	—	57	10.5	8.1	28	0.188	4	TE213324.0135
1.40	—	—	57	10.9	8.4	28	0.195	4	TE213324.0140
1.45	M1.8	—	57	11.3	8.7	28	0.202	4	TE213324.0145
1.47	—	M1.6	57	11.3	8.8	28	0.202	4	TE213324.0147
1.50	—	—	57	11.7	9	28	0.209	4	TE213324.0150
1.57	—	M1.7	59	11.7	9.4	28	0.219	4	TE213324.0157
1.60	M2	—	59	12.5	9.6	28	0.223	4	TE213324.0160
1.67	—	M1.8	59	12.5	10	28	0.233	4	TE213324.0167
1.70	—	—	59	13.3	10.2	28	0.237	4	TE213324.0170
1.75	M2.2, M2 x 0.25	—	59	13.7	10.5	28	0.244	4	TE213324.0175
1.80	—	—	61	14.1	10.8	28	0.251	4	TE213324.0180
1.85	—	M2	61	14.5	11.1	28	0.258	4	TE213324.0185
1.90	M2.3	M2 x 0.25	61	14.9	11.4	28	0.265	4	TE213324.0190
1.95	M2.2 x 0.25	—	61	15.3	11.7	28	0.272	4	TE213324.0195
2.00	—	—	63	15.7	12	28	0.279	4	TE213324.0200
2.03	—	M2.2	63	15.7	12.2	28	0.283	4	TE213324.0203
2.05	M2.5, M2.5 x 0.35	—	63	16.1	12.3	28	0.286	4	TE213324.0205
2.10	M2.6	M2.2 x 0.25	63	16.5	12.6	28	0.293	4	TE213324.0210
2.15	M2.5 x 0.35	M2.3	63	16.9	12.9	28	0.300	4	TE213324.0215
2.20	—	—	63	17.3	13.2	28	0.307	4	TE213324.0220
2.30	—	—	65	18.1	13.8	28	0.321	4	TE213324.0230
2.33	—	M2.5	65	18.1	14	28	0.325	4	TE213324.0233
2.40	—	—	65	18.9	14.4	28	0.335	4	TE213324.0240
2.43	—	M2.6	65	18.9	14.6	28	0.339	4	TE213324.0243
2.50	M3	M2.6 x 0.25	65	19.7	15	28	0.349	4	TE213324.0250
2.60	—	—	66.5	20.5	15.6	28	0.363	4	TE213324.0260
2.65	M3 x 0.35	—	66.5	20.9	15.9	28	0.370	4	TE213324.0265
2.70	—	—	66.5	21.3	16.2	28	0.377	4	TE213324.0270
2.80	—	M3	68.5	22.1	16.8	28	0.390	4	TE213324.0280
2.90	M3.5	M3 x 0.25, M3 x 0.35	68.5	22.9	17.4	28	0.404	4	TE213324.0290
3.00	MJ3.5 x 0.6	—	73	23.7	18	36	0.418	4	TE213324.0300

Emuge High Precision / Performance FPC Milling / Drilling Chucks

Emuge FPC Chucks provide unprecedented rigidity, vibration dampening, concentricity, machining speed and tool life vs. conventional chuck technologies for milling and drilling applications. Available in a wide range of styles, internal and peripheral coolant collet options, and MQL-adaptable.



FPC chucks available in CAT, SK, BT, CAPTO and HSK styles.



Carbide micro drills can be successfully run in sealed precision collets.

FMC collet extensions also available.

EMUGE HIGH PERFORMANCE TOOLS

**Ask about our convenient
NEW EF-C Drill-Chamfer
Tool Program.**

*Combination carbide drill-countersink
tools, many sizes available from
stock or order customized lengths
in less than 4 weeks!*

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