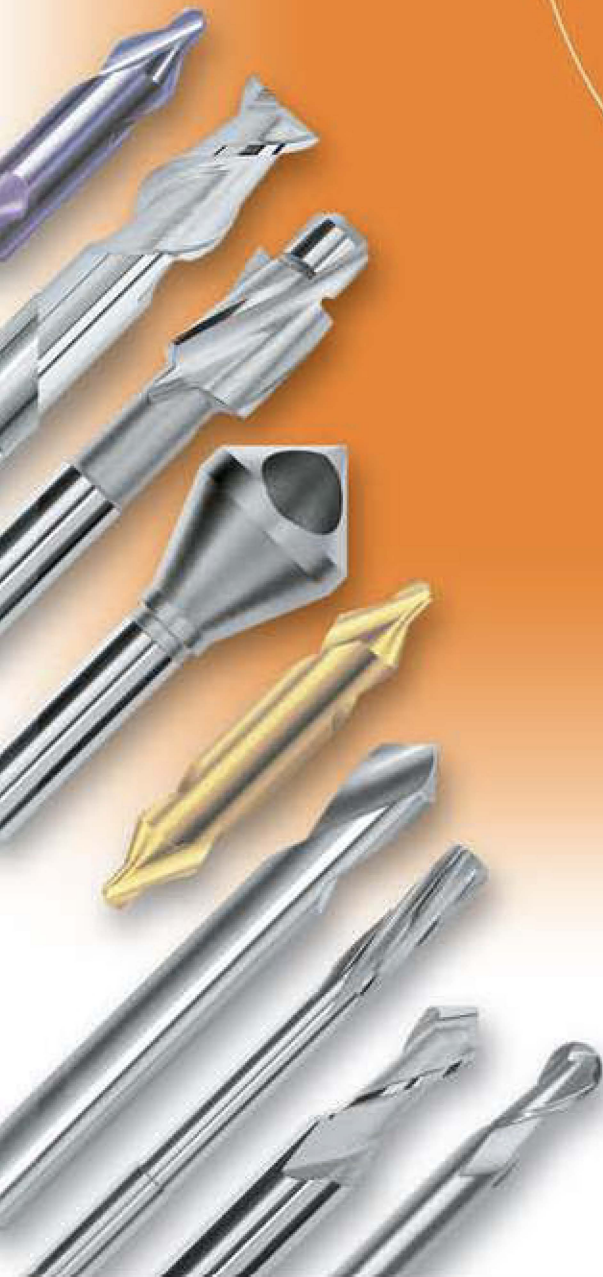


2017-2018

# magafor

*mu*



[www.newmantools.com](http://www.newmantools.com)

tel. 1-800-465-1384

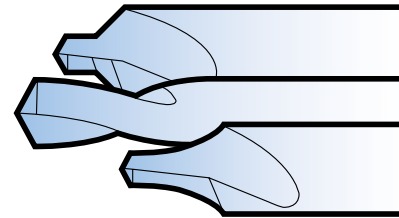
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PRECISION  
SPECIALIZATION

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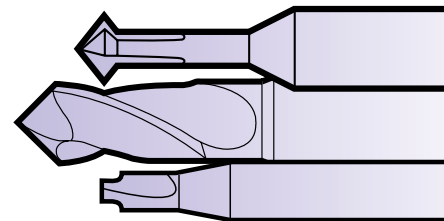
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CENTERING-SPOTTING  
 COMBINED MACHINING  
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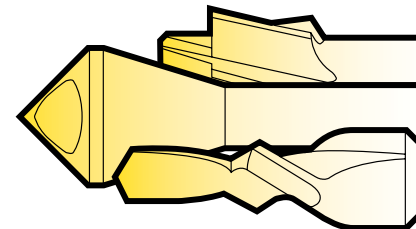
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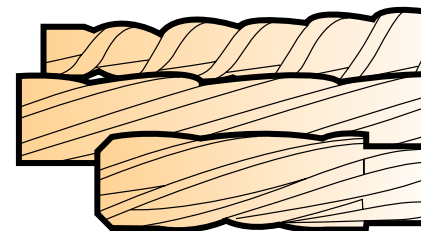
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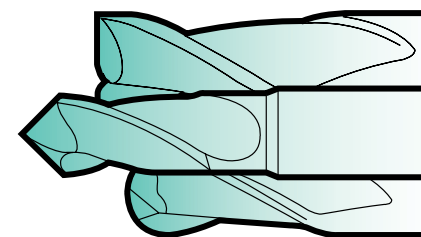
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## EDP NUMBERING SYSTEM

EDP # 88860001810 - 1.81 mm

Solid Carbide High Precision

Micro Reamer

88860001810

Prefix A B

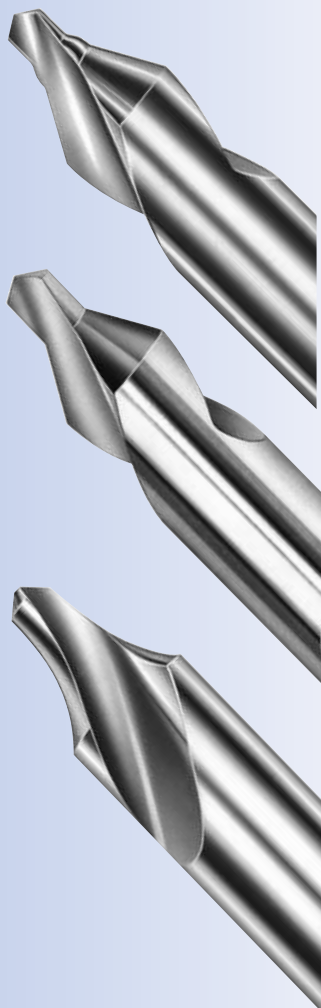
A = Series # - 8600

Series # 8600 refers to Solid Carbide

High Precision Micro Reamers

B = Size - 1.81 mm

Size 01810 refers to 1.81 mm



Note: Vickers Hardness Test  
HV = a unit of hardness  
given by the test known as  
the Vickers Pyramid Number

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201	95	4832	88	8196-H	79	8610	98
202	95	4833	88	8197	78	8670	97

## COATINGS

Engaged right from the start in the process aspiring to excellence, in addition to our Futura and TiN coatings, MAGAFOR offers three new "X" coatings, sprung from multi-layer nano technology.

**Red'X**: cobalt tool coating with higher hardness of (3700 HV) like TiAlN in a multi-layer coating. This coating can be used for dry machining. Using coolant will add lubricity.

**Hard'X**: carbide tool coating with a high hardness (3500 HV) this coating shows a high thermic stability and an excellent protection against heat and wear. Ideal for dry machining-high speed cut-in treated steels and dies up to 67 Rc.

**Graph'X**: diamond coating (8000 HV) particularly effective to machine graphite, composite materials, plastics with glass-fibers or carbon-fibers.

## MATERIALS USED IN THE MANUFACTURE OF OUR TOOLS AND COATINGS

### DESIGNATION

magafor	europaean	american	japanese
HSS	HSS	M2	SKH-51
HSS-E COBALT	HSS-E	M35	SKH-55
HSS-E 8% COBALT	HSS-E8	M42	SKH-59
TiN	TiN	TiN	TiN
Futura	TiAlN	TiAlN	TiAlN
Red'X	TiAlN with higher hardness (3700 HV)		
Hard'X	AlTiN	Latuma	
Graph'X	Diamond coating		
<b>K15 CARBIDE</b> — 6.5 - 7% Cobalt (0,006 - 0,008mm grain size)			



# SPECIAL? STANDARD MAGAFOR!

## SPECIALIZATION

With more than 250 product groups and over 8,000 standard products, Magafor offers the solution adapted to each of your machining applications. For example, the 0,40mm diameter micro end-mill is available in 26 different lengths and styles! Who offers more? Styles, materials and lengths vary within each specific range of tooling to offer you the widest selection.

## INNOVATION

To detect the needs created by new technologies – To analyze and compare the totality of the special tools which are required of us – To compare the heavy tendencies of the market – Such are the studies undertaken by Magafor to offer a standard answer, available with specific expectations of the most demanding customers.



## MINIATURE TOOLING

Forever Magafor has chosen to manufacture small tools at the feasibility limit. Naturally its production program has shown a trend towards the micro-tools.

**Micro-NC Spot Drills:**.....79-80

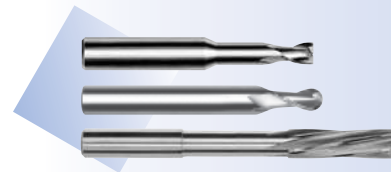
**Micro End-Mills:**..... 107-111

**Micro-Reamers:**..... 98-105

## PRODUCTIVITY

The multi-purpose concept is one of the recent major evolutions for machining operations. With its multi-function tools and tools for combined machining, Magafor emphasizes this evolution. These new concepts reduce the machining times, the number of tools needed and set-up time.

**Multi-Function Tools:** .....72, 81-86



## PRECISION

The miniaturization and the market requirements directed towards perfection have incited us to stock extensive series of standard items and an unrivalled range of types, forms, materials and coatings.

For Instance:

**High Precision Micro Reamers** available at every .0002" increment from .0078" to .0236" and every .0004 increment from .0240" to .7882"..... 98-105

**Micro End-Mills** available at every .0080" increment from .0020" to .2323".....107-111

*magafor is the only cutting tool manufacturer member of the European Commission that has been chosen to research micro-machining.*

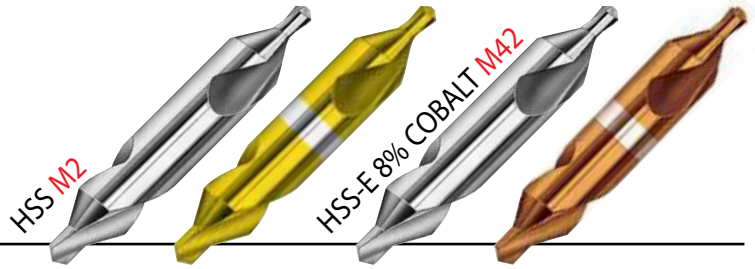
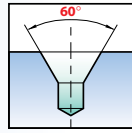
*This research targets performance improvements of all magafor tools for the greatest profit margins for our customers.*





# CENTERING - SPOTTING - COMBINED MACHINING

## Plain Type CENTER DRILLS 60°



SIZE	D	d	L	I	115	M2/TIN 08115	Cobalt + 1055	M42/RedX 0915
00000	1/8	.010	1-1/4	.008 - .018	8111500A000*	800811500A0*	81105500A00*	80091500A00*
0000	1/8	.015	1-1/4	.014 - .025	8111500B000*	800811500B0*	81105500B00*	80091500B00*
000	1/8	.020	1-1/4	.020 - .032	8111500C000	800811500C0	81105500C00*	80091500C00*
00	1/8	.025	1-1/4	.028 - .040	8111500D000	800811500D0	81105500D00*	80091500D00*
0	1/8	1/32	1-1/4	.035 - .047	8111500E000	800811500E0	81105500E00*	80091500E00*
1	1/8	3/64	1-1/4	.055 - .067	81115010000	80081150100	81105501000	80091501000
2	3/16	5/64	1-7/8	.095 - .106	81115020000	80081150200	81105502000	80091502000
3	1/4	7/64	2	.130 - .154	81115030000	80081150300	81105503000	80091503000
4	5/16	1/8	2-1/8	.150 - .175	81115040000	80081150400	81105504000	80091504000
4-1/2	3/8	9/64	2-1/2	.170 - .193	81115045000	80081150450		
5	7/16	3/16	2-3/4	.230 - .256	81115050000	80081150500	81105505000	80091505000
6	1/2	7/32	3	.270 - .295	81115060000	80081150600	81105506000	80091506000
7	5/8	1/4	3-1/4	.315 - .340	81115070000	80081150700	81105507000	80091507000
8	3/4	5/16	3-1/2	.390 - .420	81115080000	80081150800	81105508000	80091508000
9	7/8	11/32	3-5/8	.430 - .460	81115090000	80081150900		
10	1	3/8	3-3/4	.475 - .500	81115100000	80081151000		

Please Note: \*Single end tool



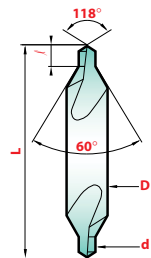
### Tolerances

Tool Diameters	D	d	Angle 60° 118°
.010 - 7/64	n/a	+ .0039	
1/8 - 7/32	-.0007	+ .0047	
1/4 - 3/8	-.0009	+ .0059	- 30' ± 2°
7/16 - 5/8	-.0011	+ .0059	
3/4 - 1	-.0013	+ .0059	

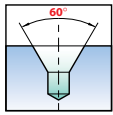
Concentricity of Drill Diameter to Body is:  
+/- .0005 runout

## Value SETS American Standard

15 PIECES				5 PIECES	
COMPOSITION Quantity	HSS 81115000015	COMPOSITION Quantity	HSS 81115000000	COMPOSITION Quantity	Cobalt 81105500000
3 pieces each	# 1	1 piece each	# 1	1 piece each	# 1
	# 2		# 2		# 2
	# 3		# 3		# 3
	# 4		# 4		# 4
2 pieces	# 4-1/2		# 5		# 5
1 piece	# 5				



Sets also available TiN coated



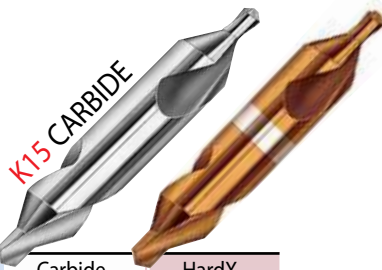
Inch sizes

**Plain Type**

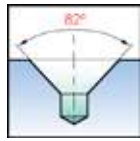
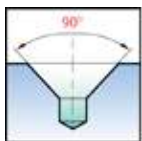
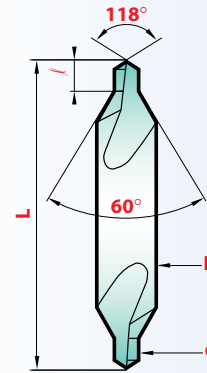
**60°, 82° & 90° Angles  
& Longs**

CENTERING

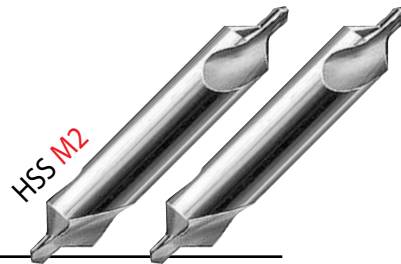
**NEW**  
**ASA Solid Carbide**  
**60° Angle**



SIZE	D	d	L	I	Carbide 8105	HardX 8105-H
00	1/8	.025	1-1/4	.028 - .040	88810500D00	888105H00D0
0	1/8	1/32	1-1/4	.035 - .047	88810500E00	888105H00E0
1	1/8	3/64	1-1/4	.055 - .067	88810501000	888105H100
2	3/16	5/64	1-7/8	.095 - .106	88810502000	888105H200
3	1/4	7/64	2	.130 - .154	88810503000	888105H300
4	5/16	1/8	2-1/8	.150 - .175	88810504000	888105H400
5	7/16	3/16	2-3/4	.230 - .256	88810505000	888105H500
6	1/2	7/32	3	.270 - .295	88810506000	888105H600



**82° - 90° Angles**



SIZE	D	d	L	I	Angle	
					82°	90°
					154	155
1	1/8	3/64	1-1/4	.055 - .067	81154010000	81155010000
2	3/16	5/64	1-7/8	.095 - .106	81154020000	81155020000
3	1/4	7/64	2	.130 - .154	81154030000	81155030000
4	5/16	1/8	2-1/8	.150 - .175	81154040000	81155040000
5	7/16	3/16	2-3/4	.230 - .256	81154050000	81155050000
6	1/2	7/32	3	.270 - .295	81154060000	81155060000
7	5/8	1/4	3-1/4	.315 - .340	81154070000	81155070000
8	3/4	5/16	3-1/2	.390 - .420	81154080000	81155080000



Inch sizes

**Value SETS**  
**American Standard**

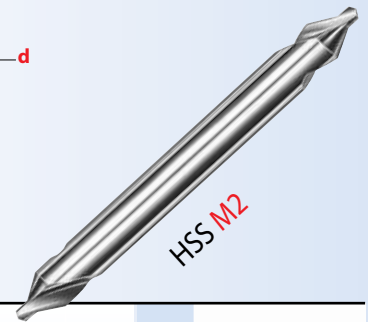
5 PIECES / 4" OAL

COMPOSITION magafor 81185000000 Long

# 1 - 2 - 3 - 4 - 5 Long 1 piece of each #



**Longs**

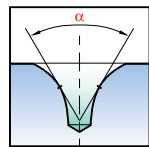
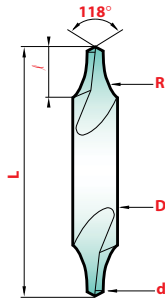


SIZE	D	d	L	185
1 x 3"	1/8	3/64	3	81185010300
1 x 4"			4	81185010400
1 x 5"			5	81185010500
1 x 6"			6	81185010600
2 x 3"	3/16	5/64	3	81185020300
2 x 4"			4	81185020400
2 x 5"			5	81185020500
2 x 6"			6	81185020600
3 x 3"	1/4	7/64	3	81185030300
3 x 4"			4	81185030400
3 x 5"			5	81185030500
3 x 6"			6	81185030600
4 x 3"	5/16	1/8	3	81185040300
4 x 4"			4	81185040400
4 x 5"			5	81185040500
4 x 6"			6	81185040600
4-1/2 x 4"	3/8	9/64	4	81185045400
4-1/2 x 5"			5	81185045500
4-1/2 x 6"			6	81185045600
5 x 4"	7/16	3/16	4	81185050400
5 x 5"			5	81185050500
5 x 6"			6	81185050600
6 x 4"	1/2	7/32	4	81185060400
6 x 5"			5	81185060500
6 x 6"			6	81185060600
7 x 5"	5/8	1/4	5	81185070500
7 x 6"			6	81185070600
8 x 6"	3/4	5/16	6	81185080600

# CENTER DRILLS RADIUS TYPE Form R

*magafor* center drill with radius, thanks to its special profile, is more robust than the 60° center drill:

- the radius eliminates the risk of breakage,
- it provides an exact bearing,
- it serves as a protective chamfer.

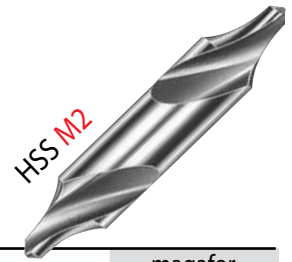


Tolerances

Tool Diameters	D	d	R max
.010 - 7/64	-0.0007	+ .0039	
1/8 - 7/32	-0.0007	+ .0047	
1/4 - 3/8	-0.0009	+ .0059	1.25 R
7/16 - 5/8	-0.0011	n/a	
3/4 - 1	-0.0013"	n/a	



Inch sizes



ASA #	D	d	L	R	l	magafor 125
1 - R	1/8	3/64	1-1/4	.150	.125 - .150	81125010000
2 - R	3/16	5/64	1-7/8	.230	.200 - .225	81125020000
3 - R	1/4	7/64	2	.315	.270 - .300	81125030000
4 - R	5/16	1/8	2-1/8	.400	.340 - .370	81125040000
5 - R	7/16	3/16	2-3/4	.500	.480 - .510	81125050000
6 - R	1/2	7/32	3	.530	.540 - .575	81125060000
7 - R	5/8	1/4	3-1/4	.700	.660 - .700	81125070000
8 - R	3/4	5/16	3-1/2	.790	.810 - .850	81125080000

## Form R SETS American Standard

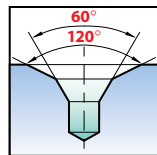
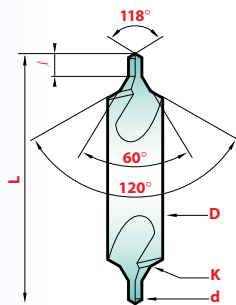
5 PIECES



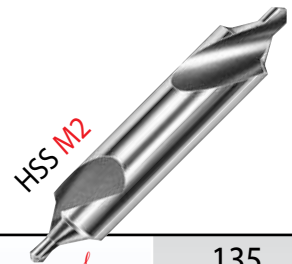
COMPOSITION	Quantity	81125000000
1 piece each		# 1-R
Radius Type		# 2-R
		# 3-R
		# 4-R
		# 5-R

# BELL TYPE With saved angle Form B

Center drills with protective chamfer guarantee the center obtained from any risk of blows and deformation. The splay resulting from the protective chamfer makes it easier to load parts between points on machines with automatic feed.



Inch sizes



SIZE	D	d	K	L	l	135
11	1/8	3/64	.100	1-1/4	.055 - .070	81135110000
12	3/16	1/16	.150	1-7/8	.070 - .090	81135120000
13	1/4	3/32	.200	2	.110 - .135	81135130000
14	5/16	7/64	.250	2-1/8	.125 - .155	81135140000
15	7/16	5/32	.350	2-3/4	.185 - .215	81135150000
16	1/2	3/16	.400	3	.230 - .260	81135160000
17	5/8	7/32	.500	3-1/4	.270 - .300	81135170000
18	3/4	1/4	.600	3-1/2	.310 - .340	81135180000
19	7/8	5/16	.700	3-5/8	.390 - .420	81135190000
20	1	3/8	.800	3-3/4	.470 - .500	81135200000

COMPOSITION	Quantity	81135000000
1 piece each		# 11
Bell Type		# 12
		# 13
		# 14
		# 15



Tolerances

Tool Diameters	D	d	Angle
.010 - 7/64	- .0007	+ .0039	60° 118° 120°
1/8 - 7/32	- .0007	+ .0047	
1/4 - 3/8	- .0009	+ .0059	- 30' ± 2° - 4°
7/16 - 5/8	- .0011	n/a	
3/4 - 1	- .0013	n/a	

## Form B SETS American Standard 5 PIECES





**magafor**  
 "UNIQUE"  
 CENTER DRILLS  
 With reinforcing bulge  
 Form W



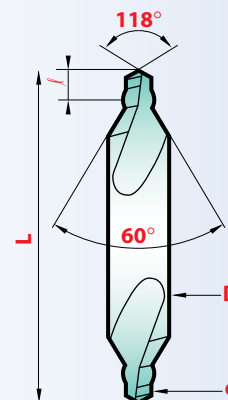
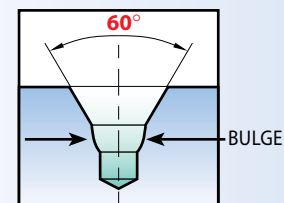
Inch sizes

HSS M2



PLAIN TYPE WITH BULGE

SIZE	D	d	L	ℓ	145
1 - W	1/8	3/64	1-1/4	.055 - .067	81145010000
2 - W	3/16	5/64	1-7/8	.095 - .106	81145020000
3 - W	1/4	7/64	2	.130 - .154	81145030000
4 - W	5/16	1/8	2-1/8	.150 - .175	81145040000
5 - W	7/16	3/16	2-3/4	.230 - .256	81145050000
6 - W	1/2	7/32	3	.270 - .295	81145060000
7 - W	5/8	1/4	3-1/4	.315 - .340	81145070000
8 - W	3/4	5/16	3-1/2	.390 - .420	81145080000



The **magafor** center drill form W is stronger than the common center drill :

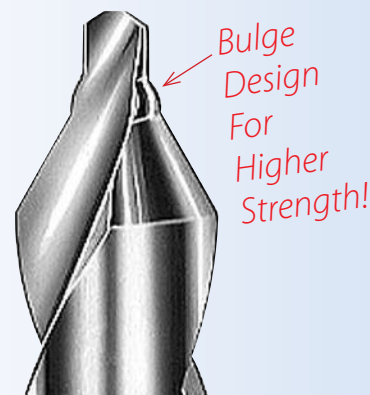
- the bulge reinforces the point,
- it increases the chips removal,
- it makes the lubrication of the drill easier,
- runs at faster speeds and feeds.

Tolerances

Tool Diameters	D	d	Angle	
			60°	118°
.010 - 7/64	- .0007	+ .0039		
1/8 - 7/32	- .0007	+ .0047		
1/4 - 3/8	- .0009	+ .0059	- 30'	± 2°
7/16 - 5/8	- .0011	n/a		
3/4 - 1	- .0013	n/a		

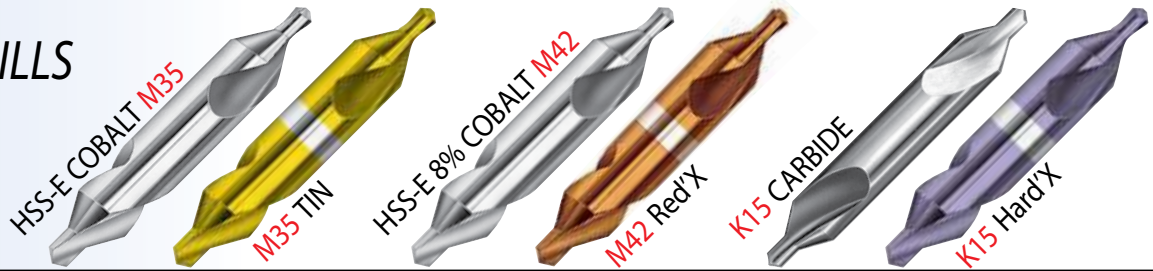
**Form W SETS**  
 American Standard  
 5 PIECES

COMPOSITION	Quantity	81145000000
1 piece each Bulge	# 1-W	
	# 2-W	
	# 3-W	
	# 4-W	
	# 5-W	





# METRIC CENTER DRILLS 60° Angle



ISO • NFE 66051-A • DIN 333-A • JIS-1

In Metric

D x d	L	ℓ	magafor 10	M35/TIN 0811	cobalt 105	M42/Red'X 0910	carbide 8100	K15/Hard'X 8100-H
3,15 x 0,5*	25	0,6 - 0,9		80081103105			88810003105	888100H031505
3,15 x 0,8*	25	1,0 - 1,3		80081103108			88810003108	888100H031508
3,15 x 1,0	31	1,3 - 1,7	81100315100	80081103151	81105031510	80091003151	88810003151	888100H03151
3,15 x 1,25	31	1,6 - 2,0	81100315125	80081103125	81105031512	80091003125	88810003125	888100H0315125
3,5 x 0,75	35	1,0 - 1,3	81100350750	800811035075				
4,0 x 1,0	35	1,3 - 1,7	81100410000	80081104100			88810004100	888100H04010
4,0 x 1,6	35	2,0 - 2,6	81100416000	80081104160	81105041600	80091004160	88810004160	888100H0416
5,0 x 1,5	40	2,0 - 2,6	81100515000	80081105150			88810005150	888100H0515
5,0 x 2,0	40	2,5 - 3,1	81100520000	80081105200	81105052000	80091005200	88810005200	888100H0520
6,0 x 2,0	45	2,5 - 3,1	81100620000	80081106200			88810006200	888100H0620
6,3 x 2,5	45	3,1 - 3,8	81100632500	80081106325	81105063250	80091006325	88810006325	888100H06325
8,0 x 2,5	50	3,1 - 3,8	81100825000	80081108250			88810008250	888100H0825
8,0 x 3,0	50	3,9 - 4,6	81100830000	80081108300			88810008300	888100H0830
8,0 x 3,15	50	3,9 - 4,6	81100831500	80081108315	81105083150	80091008315	88810008315	888100H08315
10,0 x 3,0	55	3,9 - 4,6	81101030000	80081110300			88810010300	888100H1030
10,0 x 4,0	55	5,0 - 5,9	81101040000	80081110400	81105104000	80091010400	88810010400	888100H1040
12,0 x 4,0	63	5,0 - 5,9	81101240000	80081112400				
12,0 x 5,0	63	6,3 - 7,2	81101250000	80081112500			88810012500	888100H1250
12,5 x 5,0	63	6,3 - 7,2	81101255000	80081112550	81105125500	80091012550	88810012550	888100H1255
14,0 x 5,0	69	6,3 - 7,2	81101450000	80081114500				
16,0 x 6,3	71	8,0 - 8,9		80081116630			88810016630	888100H1663
20,0 x 8,0	80	10,1 - 11,1		80081120800				

\* Single end

K15 CARBIDE — 6.5 - 7% Cobalt (0.006 - 0.008mm grain size)

*NOTE: all metric center drills are available within 2 weeks. Call for information.*



**magafor**



**The Largest Manufacturer of Center Drills World Wide, With Over 4 Million Units Sold Annually.**

**Our European Catalogue Promotes 19 Pages of Combined Drills and Countersinks for World Wide Consumption.**

**magafor, The choice!**

Material	HSS	HSS-Co	Hss-Co + TIN	HSS 8% Co	HSS 8% Co + Red'X	CARBIDE	CARBIDE + Hard'X
Hardness	63 HRC	65 HRC	65 HRC +2300 HV	67 HRC	67 HRC + 3500 HV	1800 HV	1800 HV + 3500
Use	Small Series	Production intensive		Hard and abrasive alloys		Treated steels	

# METRIC CENTER DRILLS 60° Angle Form A

CENTERING

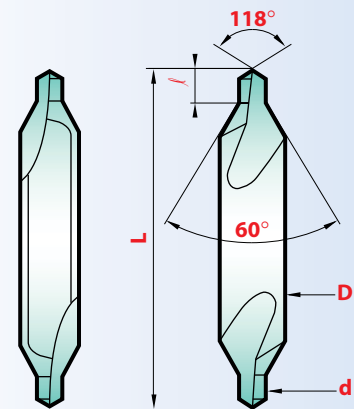
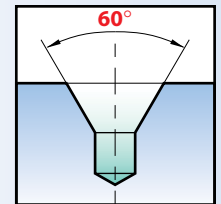


ISO • NFE 66051-A • DIN 333-A • JIS-1 In Metric

TYPE			Right hand	Left hand	With flat, right hand		
D x d	L	ℓ	11	16	P -0,1	Cobalt 0290	M35/TIN 0890
3,0 x 0,5	31	0,6 - 0,9	81110305000				
3,15 x 0,5*	25	0,6 - 0,9	81110315050	81160315050			
3,15 x 0,63*	25	0,7 - 1,0	81110315063	81160315063			
3,15 x 0,8*	25	1,0 - 1,3	81110315080	81160315080			
3,15 x 1,0	31	1,3 - 1,7	81110315100	81160315100			
3,15 x 1,25	31	1,6 - 2,0	81110315125	81160315125			
3,5 x 0,75	35	1,0 - 1,3	81110350750	81160350750			
4,0 x 1,0	35	1,3 - 1,7	81110410000	81160410000			
4,0 x 1,25	35	1,6 - 2,0	81110412500	81160412500			
4,0 x 1,6	35	2,0 - 2,6	81110416000	81160416000	3,25	80029004160	80089004160
5,0 x 1,5	40	2,0 - 2,6	81110515000	81160515000			
5,0 x 1,6	40	2,0 - 2,6	81110516000	81160516000			
5,0 x 2,0	40	2,5 - 3,1	81110520000	81160520000	4,20	80029005200	80089005200
6,0 x 2,0	45	2,5 - 3,1	81110620000	81160620000			
6,3 x 2,0	45	2,5 - 3,1	81110632000	81160632000			
6,3 x 2,5	45	3,1 - 3,8	81110632500	81160632500	5,35	80029006325	80089006325
8,0 x 2,5	50	3,1 - 3,8	81110825000	81160825000			
8,0 x 3,0	50	3,9 - 4,6	81110830000	81160830000			
8,0 x 3,15	50	3,9 - 4,6	81110831500	81160831500	6,95	80029008315	80089008315
10,0 x 3,0	55	3,9 - 4,6	81111030000	81161030000			
10,0 x 3,15	55	3,9 - 4,6	81111031500	81161031500			
10,0 x 4,0	55	5,0 - 5,9	81111040000	81161040000	8,40	80029010400	80089010400
12,0 x 4,0	63	5,0 - 5,9	81111240000	81161240000			
12,0 x 5,0	63	6,3 - 7,2	81111250000	81161250000			
12,5 x 4,0	63	5,0 - 5,9	81111254000	81161254000			
12,5 x 5,0	63	6,3 - 7,2	81111255000	81161255000	10,95	80029012550	80089012550
14,0 x 5,0	69	6,3 - 7,2	81111450000	81161450000			
16,0 x 5,0	71	6,3 - 7,2	81111650000	81161650000			
16,0 x 6,3	71	8,0 - 8,9	81111663000	81161663000	14,00	80029016630	80089016630
18,0 x 6,0	77	8,0 - 8,9	81111860000				
20,0 x 6,3	80	8,0 - 8,9	81112063000				
20,0 x 8,0	80	10,1 - 11,1	81112080000	81162080000	17,90	80029020800	
25,0 x 8,0	100	10,1 - 11,1	81112580000				
25,0 x 10,0	100	12,8 - 13,8	81112510000		22,50	80029025100	
31,5 x 10,0	125	12,8 - 13,8	81113151000				
31,5 x 12,5	125	16,5 - 17,5	81113151250				

\* Single end

NOTE: all metric center drills are available within 2 weeks. Call for information.

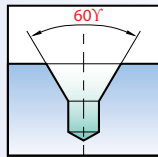


Tolerances

D	d	L	Angles	
			60°	118°
h8	k12	±1	-30'	±2°

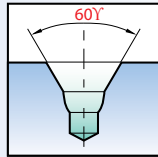
The **magafor** center drills are particularly effective thanks to their unique ground spiral flutes. Special attention to concentricity of drill diameter to body makes us superior to others.

## Form A



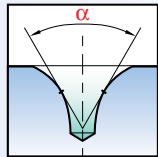
Most universal center drill.  
60° angle  
Standard center.  
118° point

## Form W



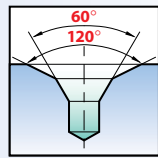
The bulge reinforces the point.  
Increases chip removal.  
Makes the lubrication of the drill easier.  
118° point

## Form R



The radius eliminates the risk of breakage,  
and is more robust than the 60° drill.  
Provides an exact bearing surface.  
Serves as a protective chamfer.  
118° point

## Form B



Center drill with protective chamfer  
guarantees the center from any risk of blows  
and deformation.  
118° point



**90° NC Spot Drill**  
By using the **magafor NC** drill of diameter  
over the drilling tool, centering and  
chamfering are obtained in a single operation.

### 120° & 140° NC Spot Drill

The preliminary hole obtained with the **magafor NC** drill corresponds to the angle at the end of the tool used in drilling and prevents it from deviating.

## Performance

# RECOMMENDATIONS FOR THE USE OF CENTER DRILLS AND NC SPOT DRILLS

- SFM:** Surface Feet per Minute
- RPM:** Revolutions per Minute
- IPT:** Inches per Tooth (chip load)
- IPM:** Inches per Minute
- IPR:** Inches per Revolution

### Speed Formula:

$$RPM = 3.82 \times (SFM \div \text{Diameter})$$

$$\text{Feed: } IPM = IPT \times \# \text{ of Flutes} \times RPM$$

$$IPR = IPM \div RPM$$

$$SFM = RPM \times \text{Diameter} \div 3.82$$

### FORMULA FOR SPEED (RPM)

Example	#1 Center Drill (.078) Cutting Soft Material: < 81 HRB
	SFM = 148 for 5/64 Ø HSS
	RPM = 3.82 x (148 ÷ .0787) = 7180
	IPM = .001 x 2 x 7180 = 14.36
	IPR = 14.36 ÷ 7180 = .002

MATERIAL	
STEEL:	< 81 HRB (B)
	< 24 Rc (C)
	24 - 32 Rc
	32 - 41 Rc
Stainless Steel/Titanium	
Inconel/Nimonic/Waspaloy	
Brass/Copper	
Copper Alloys/Bronze	
Aluminum	
Hardened Aluminum < 6% Si	
Cast Aluminum > 6% Si	
Thermoplastics	

HSS		FEED inch/rev					
SFM	2mm 5/64	3mm 1/8	6mm 1/4	10mm 3/8	16mm 5/8		
99 - 148	.0020	.0024	.0031	.0059	.0079		
82 - 99							
49 - 82							
33 - 49	.0012	.0016	.0024	.0039	.0059		
20 - 33							
16 - 20	.0008	.0012	.0020	.0028	.0039		
132 - 197							
99 - 132	.0020	.0028	.0035	.0059	.0079		
494 - 658	.0031	.0039	.0079	.0157	.0197		
197 - 329							
132 - 197	.0024	.0031	.0039	.0059	.0098		
329 - 428	.0031	.0035	.0079	.0138	.0157		

TIN		FEED inch/rev					
SFM	2mm 5/64	3mm 1/8	6mm 1/4	10mm 3/8	16mm 5/8		
197 - 296	.0031	.0035	.0047	.0098	.0118		
165 - 230							
115 - 148							
82 - 99	.0020	.0024	.0035	.0055	.0087		
39 - 53							
33 - 43	.0016	.0020	.0028	.0039	.0059		
362 - 428							
263 - 362	.0028	.0035	.0055	.0106	.0142		
1152 - 1481	.0047	.0055	.0118	.0217	.0256		
395 - 592							
263 - 395	.0031	.0039	.0059	.0118	.0157		
658 - 855	.0047	.0055	.0118	.0217	.0256		

MATERIAL	
STEEL:	< 81 HRB (B)
	< 24 Rc (C)
	24 - 32 Rc
	32 - 41 Rc
Stainless Steel/Titanium	
Inconel/Nimonic/Waspaloy	
Brass/Copper	
Copper Alloys/Bronze	
Aluminum	
Hardened Aluminum < 6% Si	
Cast Aluminum > 6% Si	
Thermoplastics	

Futura/Red'X		FEED inch/rev					
SFM	2mm 5/64	3mm 1/8	6mm 1/4	10mm 3/8	16mm 5/8		
296 - 395	.0039	.0047	.0063	.0118	.0177		
247 - 329							
165 - 214							
99 - 214	.0028	.0031	.0047	.0071	.0110		
59 - 79							
49 - 66	.0020	.0024	.0039	.0055	.0079		
428 - 494							
362 - 428	.0039	.0047	.0071	.0142	.0197		
1645 - 2300	.0063	.0071	.0157	.0295	.0354		
592 - 823							
395 - 559	.0039	.0047	.0071	.0142	.0197		
987 - 1316	.0063	.0071	.0157	.0295	.0354		

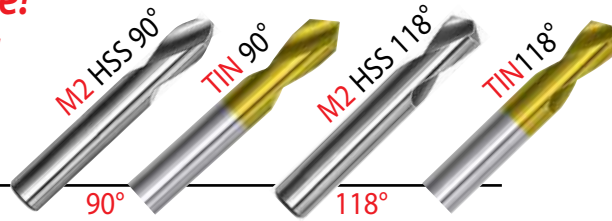
CARBIDE		FEED inch/rev					
SFM	2mm 5/64	3mm 1/8	6mm 1/4	10mm 3/8	16mm 5/8		
362 - 461	.0047	.0055	.0079	.0138	.0217		
296 - 362							
197 - 263							
115 - 165	.0035	.0039	.0055	.0087	.0094		
72 - 99							
63 - 82	.0031	.0028	.0047	.0067	.0094		
494 - 592							
428 - 494	.0047	.0055	.0087	.0173	.0240		
1974 - 2632	.0039	.0087	.0193	.0354	.0374		
658 - 987							
461 - 658	.0047	.0055	.0087	.0173	.0240		
1217 - 1579	.0079	.0087	.0193	.0354	.0374		

**High Performance!**  
**General Purpose!**

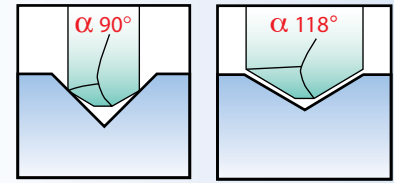
**M2 HSS**  
**Short & Long**  
**NC SPOTTING DRILLS**

SPOTTING

**M2 HSS & TIN - Short**



Angle					90°		118°	
D	L	f	T	M2 HSS 8119A	TIN 8008A	M2 HSS 8119B	TIN 8008B	
1/8"	1 1/4	0.380	0.012	8119A031700	8008A031700	8119B031700	8008B031700	
3/16"	1 3/8	0.500	0.020	8119A047600	8008A047600	8119B047600	8008B047600	
1/4"	1 1/2	0.640	0.025	8119A063500	8008A063500	8119B063500	8008B063500	
5/16"	1 1/2	0.640	0.031	8119A079300	8008A079300	8119B079300	8008A079300	
3/8"	2	1	0.039	8119A095200	8008A095200	8119B095200	8008B095200	
7/16"	2	1	0.043	8119A111100	8008A111100	8119B111100	8008B111100	
1/2"	2	1	0.051	8119A127000	8008A127000	8119B127000	8008B127000	
5/8"	2 1/4	1 1/8	0.063	8119A158700	8008A158700	8119B158700	8008B158700	
3/4"	2 1/4	1 1/8	0.075	8119A190500	8008A190500	8119B190500	8008B190500	
7/8"	2 1/2	1 1/4	0.088	8119A222200	8008A222200	8119B222200	8008B222200	
1"	2 1/2	1 1/4	0.100	8119A254000	8008A254000	8119B254000	8008B254000	



**90 degree angle:**

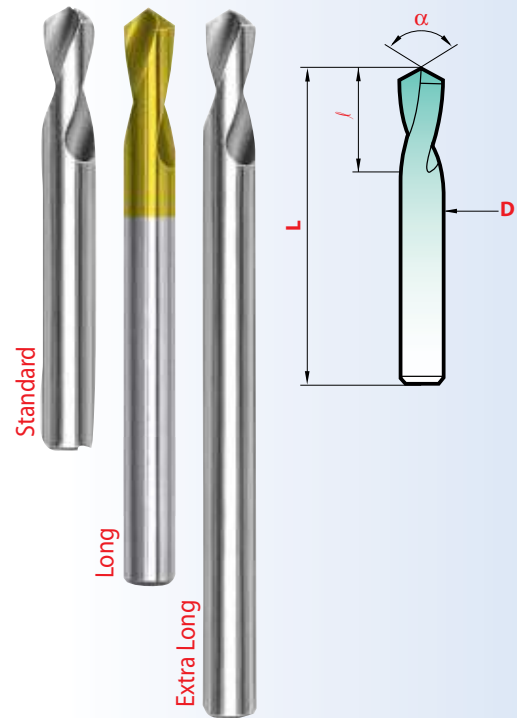
By using the **magafor NC** drill of diameter over the drilling tool, centering and chamfering are obtained in a single operation.

**118 and 120 degree angle:**

The preliminary hole obtained with the **magafor NC** drill corresponds to the angle at the end of the tool used in drilling and prevents it from drifting and allowing the drill point to cut first.

**M2 HSS & TIN - Long Series • 3 Different Lengths**

Angle					90°		120°	
D	L	f	T	M2 HSS 8119C	TIN 8008C	M2 HSS 8119D	TIN 8008D	
1/4"	2 5/8"	0.900	0.025	8119C063500	8008C063500	8119D063500	8008D063500	
1/4"	4"	0.900	0.025	8119C063504	8008C063504	8119D063504	8008D063504	
1/4"	5 1/2"	0.87	0.025	8119C0635055	8008C0635055	8119D0635055	8008D0635055	
3/8"	3 1/8"	1	0.039	8119C095200	8008C095200	8119D095200	8008D095200	
3/8"	5"	1	0.039	8119C095205	8008C095205	8119D095205	8008D095205	
3/8"	7"	1	0.039	8119C095207	8008C095207	8119D095207	8008D095207	
1/2"	3 3/4"	1 3/8	0.051	8119C127000	8008C127000	8119D127000	8008D127000	
1/2"	6"	1 3/8	0.051	8119C127006	8008C127006	8119D127006	8008D127006	
1/2"	8"	1 3/8	0.051	8119C127008	8008C127008	8119D127008	8008D127008	
5/8"	4 1/2"	1 3/8	0.063	8119C158700	8008C158700	8119D158700	8008D158700	
5/8"	8"	1 3/8	0.063	8119C158708	8008C158708	8119D158708	8008D158708	
5/8"	9"	1 3/8	0.063	8119C158709	8008C158709	8119D158709	8008D158709	
3/4"	5"	1 5/8	0.075	8119C190505	8008C190505	8119D190505	8008D190505	
3/4"	8"	1 5/8	0.075	8119C190508	8008C190508	8119D190508	8008D190508	
3/4"	10"	1 5/8	0.075	8119C190510	8008C190510	8119D190510	8008D190510	
1"	5 3/8"	1 3/4	0.100	8119C254000	8008C254000	8119D254000	8008D254000	
1"	8"	1 3/4	0.100	8119C254008	8008C254008	8119D254008	8008D254008	
1"	10"	1 3/4	0.100	8119C254010	8008C254010	8119D254010	8008D254010	



Inch sizes

**M2 HSS SPOT DRILL Value SETS**

4 PIECES American Standard

COMPOSITION: 1/4" x 2 5/8" - 3/8" x 3 1/8"  
1/2" x 3 3/4" - 5/8" x 4 1/2"

TYPE	M2 HSS
90° Spot Drill Kit	8119C000004
120° Spot Drill Kit	8119D000004

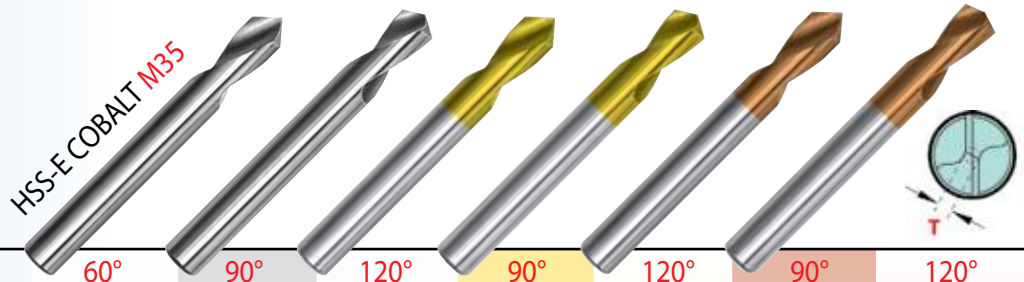


Tolerance in inches

Diameters	Tolerance D	Angle	L
1/8" - 3/16"	0 - .0005"	± 1°	± .0395
1/4" - 3/8"	0 - .0006"		
7/16" - 5/8"	0 - .0007"		
3/4" - 1"	0 - .0008"		
1-1/4" - 1-3/4"	0 - .0010"		



# COBALT NC SPOTTING DRILLS



Diameter		Angle			Cobalt 191		Cobalt 195		Cobalt 196		M35/TIN 0895		M35/TIN 0896		M35/Red'X 0995*		M35/Red'X 0996*	
inch	mm	L	λ	T														
.078	2	2	.315	.008														
.118	3	2	.400	.012														
1/8		2	.400	.012														
.157	4	2-1/16	.475	.016	81191040000	81195040000	81196040000	81196040000	81196040000	81196040000	81196040000	81196040000	81196040000	81196040000	81196040000	81196040000	81196040000	81196040000
3/16		2-3/8	.600	.020														
.197	5	2-3/8	.600	.020	81191050000	81195050000	81196050000	81196050000	81196050000	81196050000	81196050000	81196050000	81196050000	81196050000	81196050000	81196050000	81196050000	81196050000
.236	6	2-5/8	.800	.023	81191060000	81195060000	81196060000	81196060000	81196060000	81196060000	81196060000	81196060000	81196060000	81196060000	81196060000	81196060000	81196060000	81196060000
1/4		2-5/8	.900	.025														
5/16		3-1/8	1	.031														
.315	8	3-1/8	1	.031	81191080000	81195080000	81196080000	81196080000	81196080000	81196080000	81196080000	81196080000	81196080000	81196080000	81196080000	81196080000	81196080000	81196080000
3/8		3-1/2	1	.039														
.394	10	3-1/2	1	.039	81191100000	81195100000	81196100000	81196100000	81196100000	81196100000	81196100000	81196100000	81196100000	81196100000	81196100000	81196100000	81196100000	81196100000
.472	12	4	1-1/4	.047	81191120000	81195120000	81196120000	81196120000	81196120000	81196120000	81196120000	81196120000	81196120000	81196120000	81196120000	81196120000	81196120000	81196120000
1/2		4	1-3/8	.051														
.551	14	4-1/2	1-3/8	.055														
5/8		4-1/2	1-3/8	.063														
.630	16	4-1/2	1-3/8	.063	81191160000	81195160000	81196160000	81196160000	81196160000	81196160000	81196160000	81196160000	81196160000	81196160000	81196160000	81196160000	81196160000	81196160000
.709	18	5-1/8	1-5/8	.071														
3/4		5-1/8	1-5/8	.075														
.787	20	5-1/8	1-5/8	.079	81191200000	81195200000	81196200000	81196200000	81196200000	81196200000	81196200000	81196200000	81196200000	81196200000	81196200000	81196200000	81196200000	81196200000
.984	25	5-3/8	1-3/4	.098														
1		5-3/8	1-3/4	.100														

\*The Spotting Drills (0995 & 0996) with red'X coating are designed for machining abrasive hard alloys.

**See these tools at work!**

[www.hassay-savage.com/resource-center/product-videos](http://www.hassay-savage.com/resource-center/product-videos)



## Long series

Diameter		Angle			Cobalt 197		Cobalt 199		Carbide 8197		Carbide 8199	
inch	mm	L	λ	T								
.118	3	3-1/8	.400	.012	81197030000	81199030000	88819703000					
.157	4	4	.475	.016	81197040000	81199040000	88819704000	88819904000				
.197	5	4-3/4	.600	.020	81197050000	81199050000	88819705000	88819905000				
.236	6	5-1/2	.800	.023	81197060000	81199060000	88819706000	88819906000				
1/4		5-1/2	.870	.025	81197063500	81199063500	88819706350	88819906350				
.315	8	5-1/2	1	.031	81197080000	81199080000	88819708000	88819908000				
3/8		6-3/4	1	.039	81197095200	81199095200	88819709520	88819909520				
.394	10	6-3/4	1	.039	81197100000	81199100000	88819710000	88819910000				
.472	12	6-3/4	1-3/16	.047	81197120000	81199120000	88819712000	88819912000				
1/2		6-3/4	1-3/8	.051	81197127000	81199127000	88819712700	88819912700				
5/8		8	1-3/8	.063	81197158700	81199158700	88819715870	88819915870				
.630	16	8	1-3/8	.063	81197160000	81199160000	88819716000	88819916000				
3/4		8	1-5/8	.075	81197190500	81199190500	88819719050	88819919050				
.787	20	8	1-5/8	.079	81197200000	81199200000	88819720000	88819920000				
1		8	1-3/4	.100	81197254000	81199254000						



## COBALT SPOT DRILL Value SETS

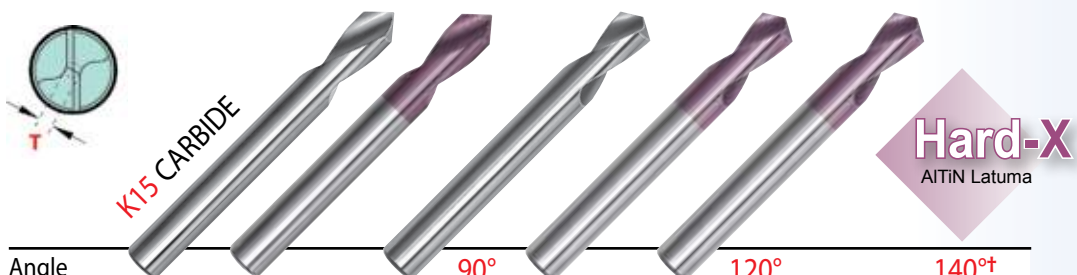
4 PIECES American Standard

COMPOSITION 1/4 - 3/8 - 1/2 - 5/8 - Ø

TYPE	Cobalt	
90°	Code	81195000004
120°	Code	81196000004

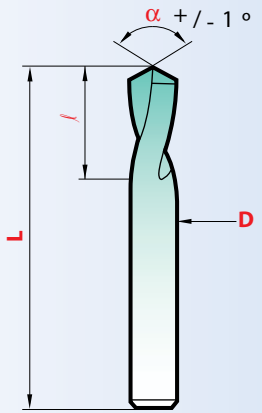
Sets also available TiN and Futura coated

Hard'X coatings available with K15 CARBIDE — 6.5 - 7% Cobalt (0,006 - 0,008mm grain size)

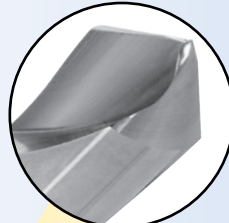


# NC SPOTTING DRILLS

Angle		90°			120°			140°†
Diameter inch mm	L	ℓ	T*	Carbide 8195	K15/Hard'X 8195-H	Carbide 8196	K15/Hard'X 8196-H	K15/Hard'X 8190-H
.078	2	1-9/16	.315	.008	88819502000	888195H0200	88819602000	888196H0200
.118	3	1-3/4	.400	.012	88819503000	888195H0300	88819603000	888196H0300
.157	4	2	.475	.016	88819504000	888195H0400	88819604000	888196H0400
.197	5	2	.600	.020	88819505000	888195H0500	88819605000	888196H0500
.236	6	2	.700	.023	88819506000	888195H0600	88819606000	888196H0600
1/4	2		.700	.023	88819506350	888195H0635	88819606350	888196H0635
5/16	2-3/8		.900	.031	88819507930	888195H0793		
.315	8	2-3/8	.900	.031	88819508000	888195H0800	88819608000	888196H0800
3/8	2-3/4		.950	.039	88819509520	888195H0952	88819609520	888196H0952
.394	10	2-3/4	.950	.039	88819510000	888195H1000	88819610000	888196H1000
.472	12	2-3/4	.950	.047	88819512000	888195H1200	88819612000	888196H1200
1/2	2-3/4		.950	.051	88819512700	888195H1270	88819612700	888196H1270
.551	14	3	.950	.055	88819514000	888195H1400	88819614000	888196H1400
5/8	3-1/8	1	.063	.063	88819515870	888195H15870	88819615870	888196H1587
.630	16	3-1/8	1	.063	88819516000	888195H1600	88819616000	888196H1600
.787	20	4	1-3/8	.079	88819520000	888195H2000	88819620000	888196H2000

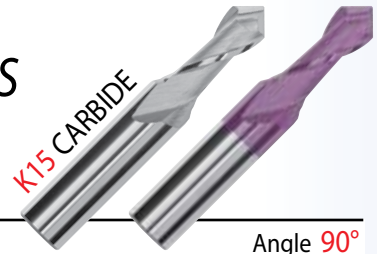


T\* = web thickness of split point  
 †140 degree angle : for hard alloys and high performance drilling  
 K15 CARBIDE — 6.5 - 7% Cobalt (0.006 - 0.008mm grain size)



STANDARD WEB THINNING "SPLIT-POINT" FEATURE FOR HIGH SPEED CUTTING

## Micro Range of Carbide MINIATURE NC SPOTTING DRILLS MULTI-V®

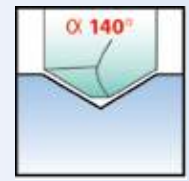
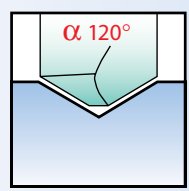
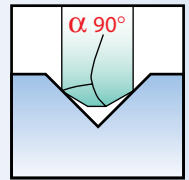


T\* = web thickness of split point  
 STANDARD magafor Angle 90°

Diameter inch mm	L	ℓ	d2	T*	MULTI-V 8090	K15/Hard'X 8090-H	
.003	0,1	1-1/2	.008	.118	.001	88809000100	888090H0010
.007	0,2	1-1/2	.016	.118	.001	88809000200	888090H0020
.011	0,3	1-1/2	.024	.118	.001	88809000300	888090H0030
.015	0,4	1-1/2	.032	.118	.002	88809000400	888090H0040
.020	0,5	1-1/2	.040	.118	.002	88809000500	888090H0050
.024	0,6	1-1/2	.047	.118	.002	88809000600	888090H0060
.028	0,7	1-1/2	.055	.118	.003	88809000700	888090H0070
.031	0,8	1-1/2	.063	.118	.003	88809000800	888090H0080
.035	0,9	1-1/2	.071	.118	.003	88809000900	888090H0090
.039	1,0	1-1/2	.080	.118	.004	88809001000	888090H0100
.043	1,1	1-1/2	.087	.118	.004	88809001100	888090H0110
.047	1,2	1-1/2	.095	.118	.005	88809001200	888090H0120
.051	1,3	1-1/2	.102	.118	.005	88809001300	888090H0130
.055	1,4	1-1/2	.110	.118	.006	88809001400	888090H0140
.059	1,5	1-1/2	.120	.118	.006	88809001500	888090H0150
.063	1,6	1-1/2	.125	.118	.006	88809001600	888090H0160
.066	1,7	1-1/2	.134	.118	.007	88809001700	888090H0170
.071	1,8	1-1/2	.140	.118	.007	88809001800	888090H0180
.074	1,9	1-1/2	.145	.118	.008	88809001900	888090H0190
.078	2,0	1-1/2	.160	.118	.008	88809002000	888090H0200

**90 degree angle :**  
 By using the magafor NC drill of diameter over the drilling tool, centering and chamfering are obtained in a single operation.

**120 and 140 degree angles :**  
 The preliminary hole obtained with the magafor NC drill corresponds to the angle at the end of the tool used in drilling and prevents it from drifting and allowing the drill point to cut first.



# NC SPOTTING DRILLS

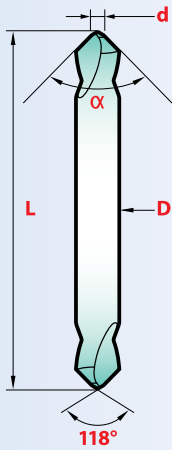
## "The Double Ended Spot Drill"

# DUO=MAG

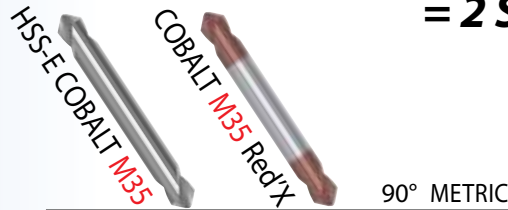
### = 2 Single End NC Spot Drills

1 Tool - 2 Points

Twice the Cutting - Same Price!



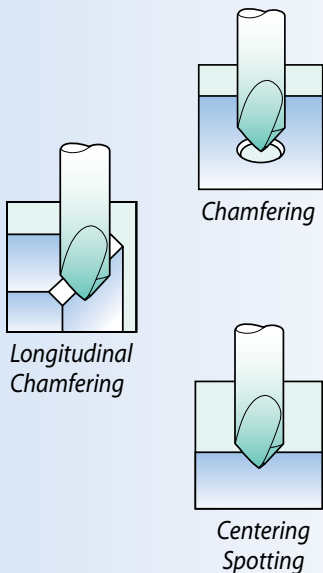
**Note:** The 118° sharpening angle makes tool penetration easier, while reinforcing the point. (d)



DUO=MAG		Double End NC Spot Drills	
D x d	L	Duo-Mag 019	Red'X 0919
3,0 x 0,5	40	80019030500	80091903050
4,0 x 1,0	45	80019041000	80091904100
6,0 x 2,0	55	80019062000	80091906200
8,0 x 2,5	65	80019082500	80091908250
10,0 x 3,0	75	80019103000	80091910300
12,0 x 3,5	85	80019123500	80091912350
16,0 x 4,0	90	80019164000	80091916400
20,0 x 5,0	100	80019205000	80091920500

DUO=MAG		Long Double End NC Spot Drills	
D x d	L	Duo-Mag 019L	Red'X 0919L
3,0 x 0,5	100	80019L03050	800919L3050
4,0 x 1,0	100	80019L04100	800919L0410
6,0 x 2,0	100	80019L06200	800919L0620
8,0 x 2,5	100	80019L08250	800919L0825
10,0 x 3,0	100	80019L10300	800919L1030
12,0 x 3,5	100	80019L12350	800919L1235
16,0 x 4,0	150	80019XL1640	800919XL164
20,0 x 5,0	150	80019XL2050	800919XL205

90° AMERICAN STANDARD					
DUO=MAG		Double End NC Spot Drills			
D	d	L	Duo-Mag 019	Red'X 0919	
3/16	1/16	2	80019010000	80091901000	
1/4	3/32	2	80019020000	80091902000	
3/8	9/64	3	80019030000	80091903000	
1/2	3/16	4	80019040000	80091904000	



### Duo Mag SETS American Standard 4 PIECE

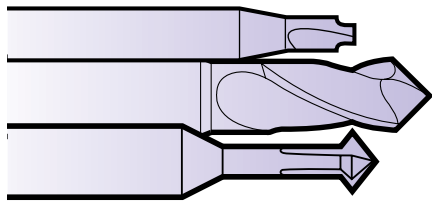
Inch sizes

COMPOSITION Quantity	Cobalt 80019000004	COMPOSITION Quantity	Red'X 80091900004
4 piece each Duo Mag	3/16"	4 piece each Duo Mag	3/16"
	1/4"		1/4"
	3/8"		3/8"
	1/2"		1/2"



Tolerance in inches

Diameters	Tolerance D	Angle	L
.078 - .118	0 + .0002"	± 1°	± .0395
1/8 - .236	0 + .0003"		
1/4 - .394	0 + .0004"		
.472 - 1	0 + .0005"		



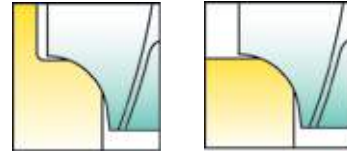
# Unique, Multi-Function, Problem Solving Tools

## Precision Corner Rounding with Superior Surface Finish!



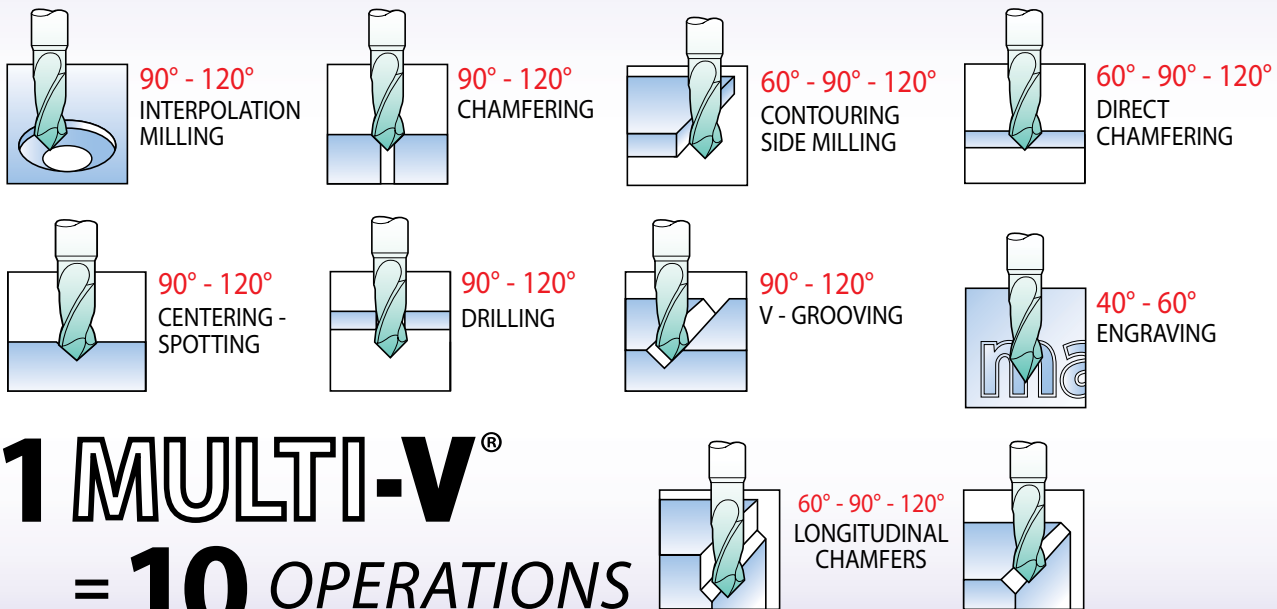
Page 86

CARBIDE MINIATURE  
CORNER ROUNDING END-MILLS



## One Tool = One Holder = 10 Operations!

Page  
82-83



**1 MULTI-V<sup>®</sup>**  
**= 10 OPERATIONS**

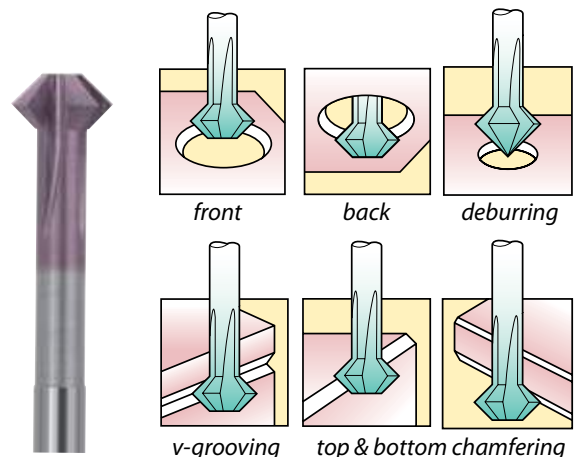
## Chamfering & Deburring in Hard to Reach Locations!



Page 85

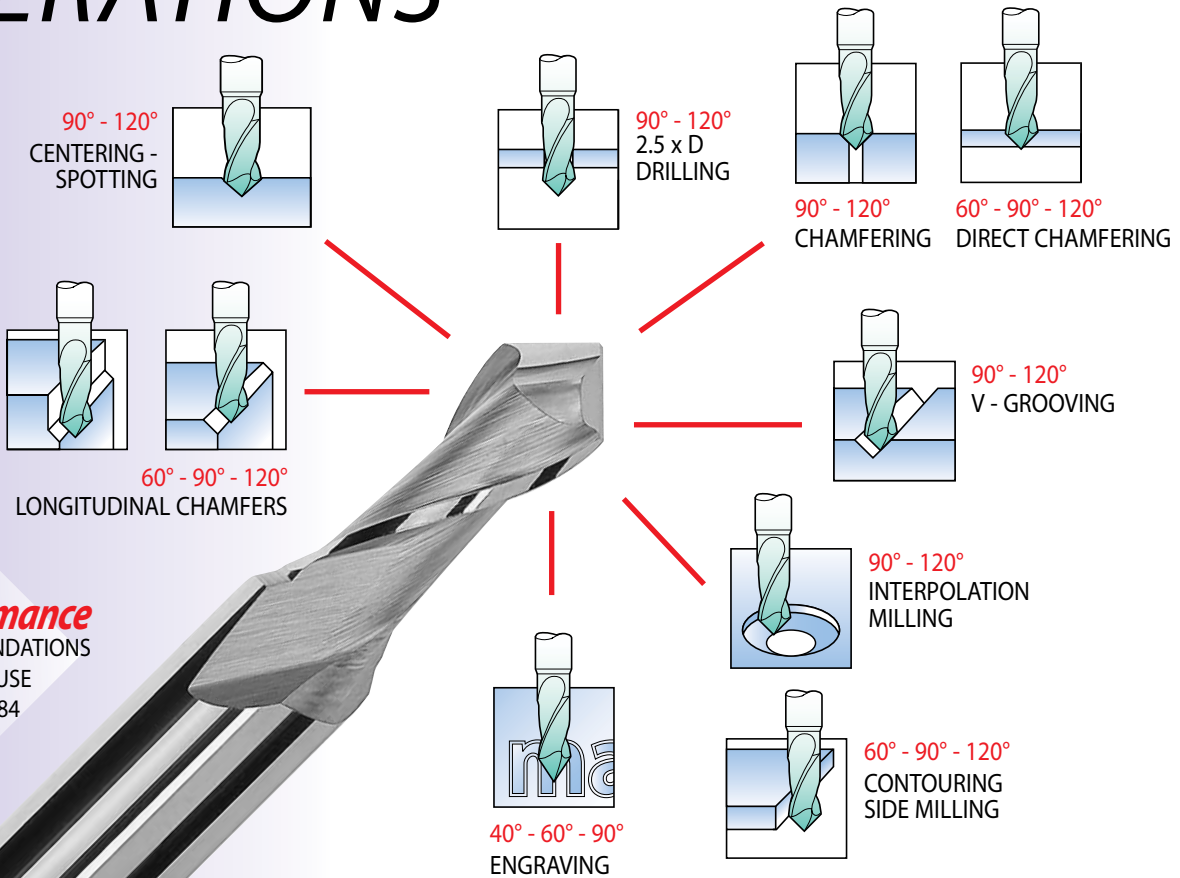
**Bi**face

FRONT AND BACK CHAMFERING  
BICONICAL CUTTERS





# 1 MULTI-V® = 10 OPERATIONS



**Performance**  
RECOMMENDATIONS  
FOR USE  
pg. 84

**This is the ideal tool for machine centers and NC processing machines.**

- **Combination of multiple machining process:**
  - reduction in machine set-up time.
  - reduction of operating time.
  - less overall tool changes.
- **Improved performances:**
  - fine cutting edge with improved depth and surface finish.
  - micrograin solid carbide for better wear resistance and greater rigidity.
  - 30° spiral helix facilitates better chip removal.
- **Easy storage:**
  - fewer tools required.
  - less tool spaces required in magazine.

METRIC  
magafor

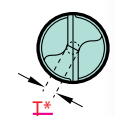
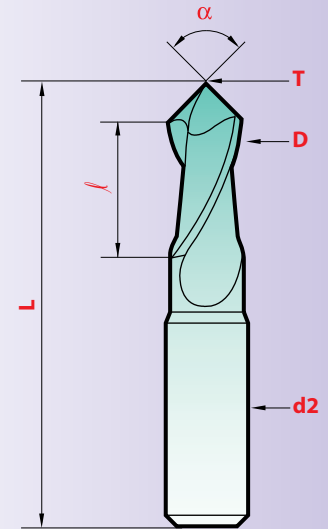


Angle						40°	60°	
Diameter inch	mm	L	ℓ	d2	T*	MULTI-V 8040†	MULTI-V 8088†	Hard'X 8088-H†
.020	0,5	1-1/2	.040	.118	.002	88804000500	8880880050	888088H0050
.031	0,8	1-1/2	.063	.118	.003		8880880080	888088H0080
.039	1,0	1-1/2	.080	.118	.004	88804001000	8880880100	888088H0100
.047	1,2	1-1/2	.095	.118	.005		8880880120	888088H0120
.059	1,5	1-1/2	.120	.118	.006	88804001500	8880880150	888088H0150
.070	1,8	1-1/2	.142	.118	.007		8880880180	888088H0180
.078	2,0	1-1/2	.160	.118	.008	88804002000	8880880200	888088H0200
.098	2,5	1-1/2	.195	.118	.010		8880880250	888088H0250
.118	3	2	.240	.157	.012	88804003000	8880880300	888088H0300
.157	4	2	.315	.197	.016		8880880400	888088H0400
.197	5	2	.395	.236	.020	88804005000	8880880500	888088H0500
.236	6	2-3/8	.475	.315	.023		8880880600	888088H0600
.315	8	2-3/4	.630	.394	.031		8880880800	888088H0800
.394	10	2-3/4	.710	.472	.039		8880881000	888088H1000
.472	12	2-3/4	.790	.472	.047		8880881200	888088H1200
.630	16	3-1/8	1.025	.630	.063		8880881600	888088H1600
.787	20	4	1.260	.787	.079		8880882000	888088H2000

† Angle 40° - 60° : ideal for engraving

# MULTI-V = 10 OPERATIONS

STANDARD magafor							Angle 90°	
Diameter inch	mm	L	$\ell$	d2	T*	MULTI-V 8090	Hard'X 8090-H	
.003	0,1	1-1/2	.008	.118	.001	88809000100	888090H0010	
.007	0,2	1-1/2	.016	.118	.001	88809000200	888090H0020	
.011	0,3	1-1/2	.024	.118	.001	88809000300	888090H0030	
.015	0,4	1-1/2	.032	.118	.002	88809000400	888090H0040	
.020	0,5	1-1/2	.040	.118	.002	88809000500	888090H0050	
.024	0,6	1-1/2	.047	.118	.002	88809000600	888090H0060	
.028	0,7	1-1/2	.055	.118	.003	88809000700	888090H0070	
.031	0,8	1-1/2	.063	.118	.003	88809000800	888090H0080	
.035	0,9	1-1/2	.071	.118	.003	88809000900	888090H0090	
.039	1,0	1-1/2	.080	.118	.004	88809001000	888090H0100	
.043	1,1	1-1/2	.087	.118	.004	88809001100	888090H0110	
.047	1,2	1-1/2	.095	.118	.005	88809001200	888090H0120	
.051	1,3	1-1/2	.102	.118	.005	88809001300	888090H0130	
.055	1,4	1-1/2	.110	.118	.006	88809001400	888090H0140	
.059	1,5	1-1/2	.120	.118	.006	88809001500	888090H0150	
.063	1,6	1-1/2	.125	.118	.006	88809001600	888090H0160	
.066	1,7	1-1/2	.134	.118	.007	88809001700	888090H0170	
.071	1,8	1-1/2	.140	.118	.007	88809001800	888090H0180	
.074	1,9	1-1/2	.145	.118	.008	88809001900	888090H0190	
.078	2,0	1-1/2	.160	.118	.008	88809002000	888090H0200	
.082	2,1	1-1/2	.165	.118	.008	88809002100	888090H0210	
.086	2,2	1-1/2	.173	.118	.009	88809002200	888090H0220	
.090	2,3	1-1/2	.181	.118	.009	88809002300	888090H0230	
.094	2,4	1-1/2	.190	.118	.009	88809002400	888090H0240	
.098	2,5	1-1/2	.195	.118	.010	88809002500	888090H0250	
.102	2,6	1-1/2	.205	.118	.010	88809002600	888090H0260	
.118	3	2	.240	.157	.012	88809003000	888090H0300	
.157	4	2	.315	.197	.016	88809004000	888090H0400	
3/16		2	.375	1/4	.020	88809004760	888090H0476	
.197	5	2	.395	.236	.020	88809005000	888090H0500	
.236	6	2-3/8	.475	.315	.023	88809006000	888090H0600	
1/4		2-3/8	.475	5/16	.025	88809006350	888090H0635	
5/16		2-3/4	.630	3/8	.031	88809007930	888090H0793	
.315	8	2-3/4	.630	.394	.031	88809008000	888090H0800	
3/8		2-3/4	.710	1/2	.039	88809009520	888090H0952	
.394	10	2-3/4	.710	.472	.039	88809010000	888090H1000	
.472	12	2-3/4	.790	.472	.047	88809012000	888090H1200	
1/2		2-3/4	.790	1/2	.051	88809012700	888090H1270	
5/8		3-1/8	1.000	5/8	.063	88809015870	888090H1587	
.630	16	3-1/8	1.025	.630	.063	88809016000	888090H1600	
.787	20	4	1.260	.787	.079	88809020000	888090H2000	



Diameters	$\alpha$	d2
.003 - .118	- 0 - .0010	.118 0 - .00020
.157 - .236	- 0 - .0012	.157 - .197 0 - .00030
.250 - .394	- 0 - .0014 $\pm 1^\circ$	.197 - .500 0 - .00035
.472 - .630	-.0018 - .0036	.500 - .630 0 - .00045
.787	-.0025 - .0045	.787 0 - .00050

Tolerances

K15 CARBIDE — 6.5 - 7% Cobalt (0,006 - 0,008mm grain size)  
T\* = web thickness of split point

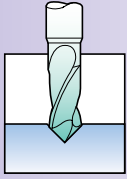
## METRIC magafor

Angle							100°	120°	
Diameter inch	mm	L	$\ell$	d2	T*	MULTI-V 8095+	Hard'X 8095-H+	MULTI-V 8092	Hard'X 8092-H
.039	1,0	1-1/2	.080	.118	.004			88809201000	888092H0100
.059	1,5	1-1/2	.120	.118	.006			88809201500	888092H0150
.078	2,0	1-1/2	.160	.118	.008			88809202000	888092H0200
.098	2,5	1-1/2	.195	.118	.010			88809202500	888092H0250
.118	3	2	.240	.157	.012			88809203000	888092H0300
.157	4	2	.315	.197	.016			88809204000	888092H0400
.197	5	2	.395	.236	.020			88809205000	888092H0500
.236	6	2-3/8	.475	.315	.023	88809506000	888095H0600	88809206000	888092H0600
.315	8	2-3/4	.630	.394	.031	88809508000	888095H0800	88809208000	888092H0800
.394	10	2-3/4	.710	.472	.039	88809510000	888095H1000	88809210000	888092H1000
.472	12	2-3/4	.790	.472	.047	88809512000	888095H1200	88809212000	888092H1200
.630	16	3-1/8	1.025	.630	.063	88809516000	888095H1600	88809216000	888092H1600
.787	20	4	1.260	.787	.079			88809220000	888092H2000

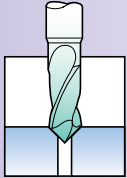
T\* = web thickness of split point



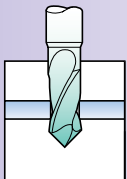
## Performance RECOMMENDATIONS OF USING



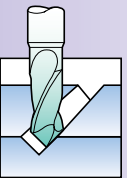
**90°-120°**  
CENTERING - SPOTTING



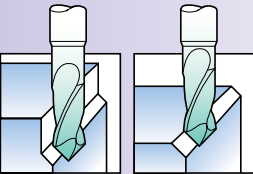
**60°-90°-120°**  
CHAMFERING  
DIRECT CHAMFERING



**90°-120°**  
DRILLING



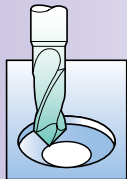
**90°-120°**  
V - GROOVING



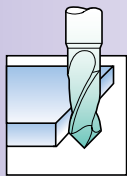
**60°-90°-120°**  
LONGITUDINAL CHAMFERS



**40°-60°**  
ENGRAVING



**90°-120°**  
INTERPOLATION  
MILLING



**60°-90°-120°**  
CONTOURING  
SIDE MILLING

MATERIAL	SPEED SFM		diameter			FEED inches/rev.		
			3mm-3/16"	5mm-1/4"	10mm-5/16"	12mm-1/2"	16mm-5/8"	20mm
Steel < 81 HRB (B)	230-247	RPM	6400	4000	2500	1900	1500	1300
		IPM	12.6	12.6	13.8	14.2	14.2	14.3
Steel < 24 Rc (C)	132-197	inch/tooth	.002	.0031	.0055	.0075	.0094	.0110
		RPM	4000	2600	1600	1200	900	850
Steels 24-32 Rc Cast Iron ≤ 180 HB (Grey Cast Iron)	115-132	IPM	7.9	8.2	8.8	9.4	8.9	9.4
		inch/tooth	.002	.0031	.0055	.0075	.0094	.0110
Steels 32-41 Rc Cast Iron > 180 HB Stainless Steels	99-115	RPM	3200	2200	1400	1000	850	680
		IPM	5.7	6.1	6.6	7.1	7.4	7.5
Titanium Alloys	82-99	inch/tooth	.0018	.0028	.0047	.0071	.0087	.0110
		RPM	2800	1800	1100	800	650	550
Ni Co Alloys Inconel-Nimonic-Waspaloy	66	IPM	5.0	5.0	5.2	5.4	5.6	5.6
		inch/tooth	.0018	.0028	.0047	.0067	.0087	.0102
Copper alloys Bronze	165-395	RPM	2200	1600	900	660	500	480
		IPM	3.5	3.8	3.9	4.1	4.3	4.7
Aluminum	494	inch/tooth	.0016	.0024	.0043	.0063	.0087	.0098
		RPM	1800	1100	700	500	400	320
Thermoplastics	494	IPM	2.8	2.6	3.0	3.1	3.1	3.1
		inch/tooth	.0016	.0024	.0043	.0063	.0079	.0098
Copper alloys Bronze	165-395	RPM	5000	3500	2200	1900	1700	1400
		IPM	19.7	20.7	21.7	22.4	23.4	24.8
Aluminum	494	inch/tooth	.0039	.0059	.0098	.0118	.0138	.0177
		RPM	10000	6300	4000	3200	2500	2000
Thermoplastics	494	IPM	19.7	22.3	23.6	25.2	26.6	27.6
		inch/tooth	.0020	.0035	.0059	.0079	.0106	.0138

MATERIAL	SPEED SFM		diameter			FEED inches/rev.		
			3mm-3/16"	5mm-1/4"	10mm-5/16"	12mm-1/2"	16mm-5/8"	20mm
Steel < 81 HRB (B)	230-247	RPM	6800	4300	2650	2000	1500	1200
		IPM	2.6	2.6	2.8	3.0	3.0	3.0
Steel < 24 Rc (C)	132-197	inch/tooth	.0002	.0003	.0006	.0007	.0010	.0012
		RPM	5400	3500	2100	1600	1200	1000
Steels 24-32 Rc Cast Iron ≤ 180 HB (Grey Cast Iron)	115-132	IPM	2.2	2.2	2.3	2.4	2.4	2.4
		inch/tooth	.0002	.0003	.0006	.0007	.0010	.0012
Steels 32-41 Rc Cast Iron > 180 HB Stainless Steels	99-115	RPM	3600	2300	1400	1000	800	630
		IPM	1.1	1.1	1.3	1.4	1.4	1.4
Titanium Alloys	82-99	inch/tooth	.0002	.0002	.0005	.0007	.0008	.0011
		RPM	3000	2000	1200	900	700	550
Ni Co Alloys Inconel-Nimonic-Waspaloy	66	IPM	1.0	1.0	1.2	1.2	1.2	1.2
		inch/tooth	.0002	.0002	.0005	.0006	.0008	.0011
Copper alloys Bronze	165-395	RPM	2200	1600	1000	760	600	400
		IPM	0.7	0.8	0.8	0.8	0.9	0.9
Aluminum	494	inch/tooth	.0002	.0002	.0004	.0005	.0007	.0011
		RPM	1800	1100	700	500	400	320
Thermoplastics	494	IPM	0.4	0.5	0.6	0.6	0.6	0.6
		inch/tooth	.0001	.0002	.0004	.0005	.0007	.0010
Copper alloys Bronze	165-395	RPM	7000	6000	3500	3200	2200	1750
		IPM	4.4	4.7	4.7	5.0	5.2	5.5
Aluminum	494	inch/tooth	.0003	.0004	.0007	.0008	.0012	.0016
		RPM	13000	8600	5300	4000	3000	2400
Thermoplastics	494	IPM	7.9	8.7	9.4	9.4	9.8	9.8
		inch/tooth	.0003	.0005	.0009	.0012	.0017	.0020
Copper alloys Bronze	165-395	RPM	13000	8600	5300	4000	3000	2400
		IPM	10.2	10.2	10.4	10.6	10.6	10.6
Thermoplastics	494	inch/tooth	.0004	.0006	.0010	.0013	.0018	.0022

MATERIAL	SPEED SFM		diameter			FEED inches/rev.		
			3mm-3/16"	5mm-1/4"	10mm-5/16"	12mm-1/2"	16mm-5/8"	20mm
Steel < 81 HRB (B)	230-247	RPM	6800	4300	2650	2000	1500	1200
		IPM	4.3	4.7	5.1	5.9	6.1	6.1
Steel < 24 Rc (C)	132-197	inch/tooth	.0003	.0006	.0010	.0016	.0020	.0026
		RPM	5400	3500	2100	1600	1200	1000
Steels < 24-32 Rc Cast Iron ≤ 180 HB (Grey Cast Iron)	115-132	IPM	3.3	3.5	4.1	4.7	4.9	4.9
		inch/tooth	.0003	.0005	.0010	.0016	.0020	.0024
Steels < 24-32 Rc Cast Iron ≤ 180 HB (Grey Cast Iron)	115-132	RPM	3600	2300	1400	1000	800	630
		IPM	2.3	2.4	2.8	3.1	3.1	3.1
Steels 32-41 Rc Cast Iron > 180 HB Stainless Steels	99-115	inch/tooth	.0003	.0005	.0010	.0016	.0020	.0024
		RPM	3000	2000	1200	900	700	550
Titanium Alloys	82-99	IPM	1.8	2.0	2.4	2.6	2.6	2.6
		inch/tooth	.0003	.0005	.0010	.0014	.0020	.0024
Ni Co Alloys Inconel-Nimonic-Waspaloy	66	RPM	2200	1600	1000	760	600	400
		IPM	1.4	1.6	2.0	2.2	2.2	2.2
Copper alloys Bronze	165-395	inch/tooth	.0003	.0005	.0010	.0014	.0018	.0028
		RPM	1800	1100	700	500	400	320
Aluminum	494	IPM	1.0	1.0	1.4	1.4	1.6	1.6
		inch/tooth	.0003	.0004	.0010	.0014	.0020	.0024
Thermoplastics	494	RPM	10000	7000	3600	2500	2300	1800
		IPM	7.9	8.3	8.5	8.9	9.1	9.2
Copper alloys Bronze	165-395	inch/tooth	.0004	.0006	.0012	.0018	.0020	.0026
		RPM	13000	8600	5300	4000	3000	2400
Aluminum	494	IPM	8.3	8.9	12.6	14.2	11.8	12.2
		inch/tooth	.0003	.0005	.0012	.0018	.0020	.0026
Thermoplastics	494	RPM	13000	8600	5300	4000	3000	2400
		IPM	12.2	10.2	14.6	15.7	12.6	13.0
Thermoplastics	494	inch/tooth	.0005	.0006	.0014	.0020	.0020	.0028



## BI-FACE ADVANTAGES

Special design = positive cut + relieving profile

- Unequalled surface finish
- Impressive performance
- Extended tools profile life

**Hard-X**  
AlTiN Latuma

Tolerances	D	tolerance	L	$\alpha$
$\emptyset$ .040~.197	0 - .002	$\pm$ .040	$\pm 1^\circ$	
$\emptyset$ .236~.630	0 - .004	$\pm$ .040	$\pm 1^\circ$	

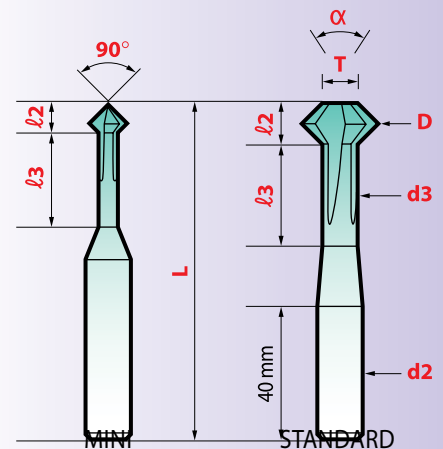
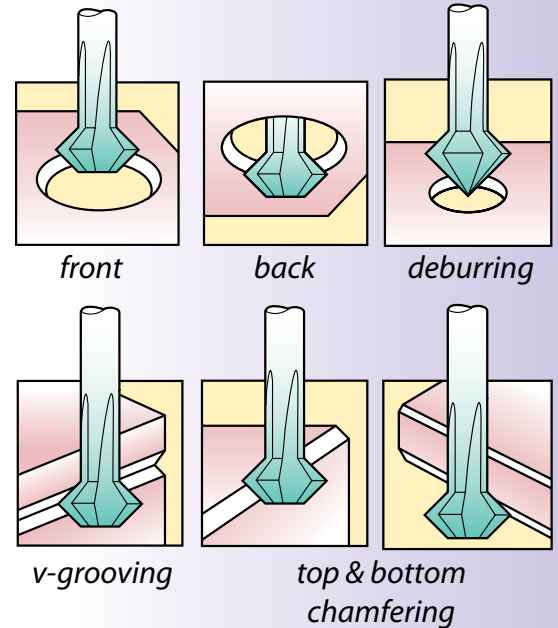
K15 CARBIDE

Angle 90° MINI								3 FLUTES	
Diameter	d3	T	L					Bi-face	Hard'X
inch mm	d2 max	max	min	$\ell_2$	$\ell_3$			8480	8480-H
.040 1,0	.118 .028	.012	2-3/8	.020	.197			88848001000	888480H0100
.059 1,5	.118 .043	.018	2-3/8	.029	.236			88848001500	888480H0150
.079 2,0	.118 .059	.024	2-3/8	.037	.315			88848002000	888480H0200
.118 3,0	.118 .087	.035	2-3/8	.059	.394			88848003000	888480H0300

Angle 90° STANDARD								4 FLUTES	
Diameter	d3	T	L					Bi-face	Hard'X
inch mm	d2 max	max	min	$\ell_2$	$\ell_3$			8490	8490-H
.118 3,0	.236 .087	.047	4	.051	.394			88849003000	888490H0300
.157 4,0	.236 .114	.063	4	.069	.472			88849004000	888490H0400
.197 5,0	.236 .134	.079	4	.091	.591			88849005000	888490H0500
.236 6,0	.236 .154	.094	4	.114	.709			88849006000	888490H0600
.315 8,0	.236 .193	.193	4	.118	1.339			88849008000	888490H0800
.394 10,0	.236 .232	.232	4	.157	1.339			88849010000	888490H1000
.472 12,0	.236 .232	.232	4	.236	1.339			88849012000	888490H1200
.630 16,0	.394 .311	.311	4	.315	1.339			88849016000	888490H1600

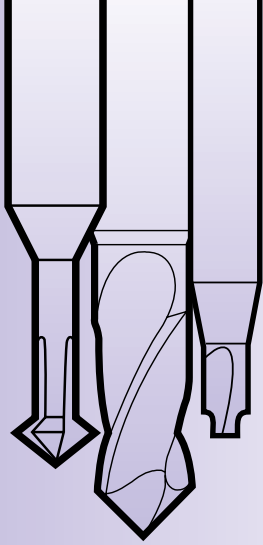
Angle 60° STANDARD								4 FLUTES	
Diameter	d3	T	L					Bi-face	Hard'X
inch mm	d2 max	max	min	$\ell_2$	$\ell_3$			8460	8460-H
.197 5,0	.236 .134	.134	4	.110	1.339			88846005000	888460H0500
.315 8,0	.236 .193	.232	4	.213	1.339			88846008000	888460H0800
.472 12,0	.394 .232	.232	4	.417	1.339			88846012000	888460H1200

## FRONT AND BACK CHAMFERING BICONICAL CUTTERS



For super finish operations, **Bi-face** has a constant relieved profile. Longitudinal or interpolated work for front and back chamfering of edges and holes.



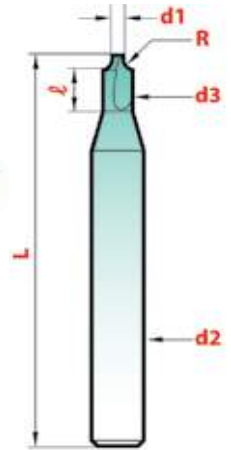
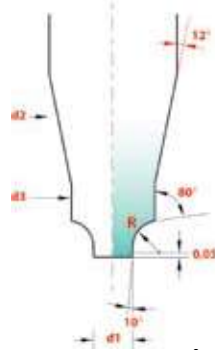
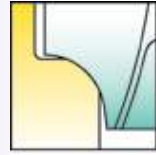


# MULTI-FUNCTION TOOLS



## CARBIDE MINIATURE CORNER ROUNDING END-MILLS

The radius is positioned in relation to the small  $\varnothing$  d1:-  
so it is possible to machine compound forms,  
small slots and holes from 0,5 mm.



Radius		d1	d2	d3	Δx	l	L	Carbide 8550	Hard'X 8550-H
Inch	mm								
.0039	0,10	.020	.118	.031	0,35	.098	2	88855000100	888550H0010
.0059	0,15	.020	.118	.035	0,40	.098	2	88855000150	888550H0015
.0079	0,20	.020	.118	.040	0,45	.098	2	88855000200	888550H0020
.0098	0,25	.020	.118	.040	0,50	.098	2	88855000250	888550H0025
.0118	0,30	.020	.118	.047	0,55	.098	2	88855000300	888550H0030
.0157	0,40	.020	.118	.055	0,65	.098	2	88855000400	888550H0040
.0197	0,50	.020	.118	.063	0,75	.098	2	88855000500	888550H0050
.0236	0,60	.020	.118	.071	0,85	.118	2	88855000600	888550H0060
.0276	0,70	.020	.118	.083	0,95	.118	2	88855000700	888550H0070
.0295	0,75	.020	.118	.083	1,00	.118	2	88855000750	888550H0075
.0315	0,80	.031	.118	.098	1,20	.157	2	88855000800	888550H0080
.0354	0,90	.031	.118	.114	1,30	.157	2	88855000900	888550H0090
.0394	1,00	.031	.118	.114	1,40	.157	2	88855001000	888550H0100
.0492	1,25	.031	.157	.134	1,65	.157	2	88855001250	888550H0125
.0591	1,50	.059	.197	.181	2,25	.236	2	88855001500	888550H0150
.0689	1,75	.059	.236	.220	2,50	.236	2	88855001750	888550H0175
.0787	2,00	.059	.236	.220	2,75	.315	2	88855002000	888550H0200
.0886	2,25	.059	.315	.260	3,00	.394	2	88855002250	888550H0225
.0984	2,50	.059	.315	.260	3,25	.394	2	88855002500	888550H0250
.1181	3,00	.059	.315	.299	3,75	.394	2	88855003000	888550H0300
.1575	4,00	.075	.394	.394	4,95	-	2-3/16	88855004000	888550H0400
.1969	5,00	.075	.472	.472	5,95	-	2-1/2	88855005000	888550H0500

Coating is available

### Tolerances

R	d1	d2	L
± .0008	± .00039	h6	± .0040

These cutters are designed for CNC machine.  
They allow machining even very thin materials.  
Many easy regrinds.

See these tools at work!



www.hassay-savage.com/  
resource-center/product-videos

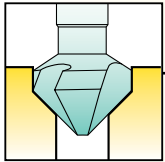
# COUNTERSINKS



Hand Countersinks  
Page 88

- Chamfering
- Deburring

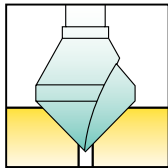
## TRIDENT THREE FLUTES



		Angle					
		30°	60°	82°	90°	100°	120°
Page	88	Page	88	Page	89	Pages	89-90
Page	88	Page	88	Page	88	Page	88

- ADVANTAGES:** *Self-centering (3 flutes)*
- Designed for 82° capscrew countersinking
  - Hand using
  - Longitudinal chamfers and contouring
  - Works without vibrations

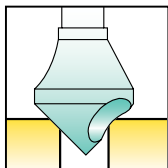
## SINGLE FLUTE



		Angle					
		60°	82°	90°	100°	120°	
Page	92	Page	92	Page	93	Page	93
Page	92	Page	92	Page	93	Page	93

- ADVANTAGES:**
- For wood and hard plastics
  - Can drill in sheet materials
  - Easy to sharpen
  - Works without vibrations

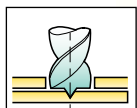
## ZERO FLUTE WITH HOLE



		Angle					
		60°	82°	90°	100°	120°	
Page	91	Page	91	Page	91	Page	91
Page	91	Page	91	Page	91	Page	91

- ADVANTAGES:**
- For light metals and plastics
  - For deburring and small chamfers
  - Best surface finish
  - Works without vibrations

## AUTO BODY SPOT WELD DRILL BITS

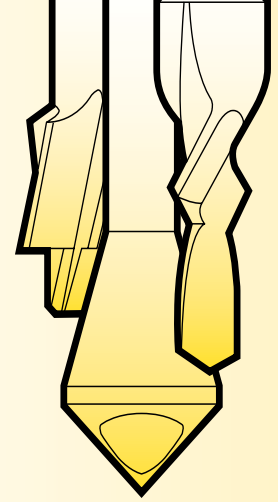


• Disconnect sheet metal spot weld

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**magafor, The choice!**

Material	HSS	HSS-Co	Hss-Co + TIN	HSS 8% Co	HSS 8% Co + Red'X	CARBIDE	CARBIDE + Hard'X
Hardness	63 HRC	65 HRC	65 HRC +2300 HV	67 HRC	67 HRC + 3500 HV	1800 HV	1800 HV + 3500
Use	Small Series	Production intensive		Hard and abrasive alloys		Treated steels	



COUNTERSINKING

See these tools at work!



[www.hassay-savage.com/resource-center/product-videos](http://www.hassay-savage.com/resource-center/product-videos)

# TRI-DENT HAND COUNTERSINKS



METRIC		Angle	82°	90°
Diameter inch	mm	Capacity min/max	Cobalt 438	Cobalt 430
.488	12,4	.118 - .488	84438124000	84430124000
.650	16,5	.157 - .650	84438165000	84430165000
.807	20,5	.157 - .807	84438205000	84430205000
.984	25,0	.197 - .984	84438250000	84430250000
1.220	31,0	.197 - 1.220	84438310000	84430310000

## UNIVERSAL AUTO-LOCK CHUCK



Ergonomic Handle Capacity 3/64 - 8 mm	magafor 84400200000
Large Handle Capacity 3/64 - 1/2	magafor 84400100000

To hold any straight shank tool, for use by hand.



### 3 FLUTE COUNTERSINK SETS

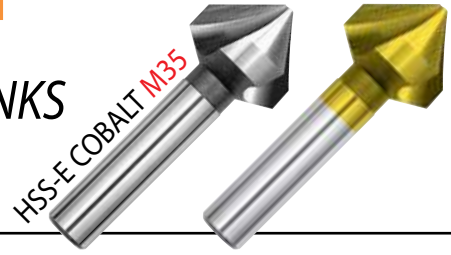
Angle	Cobalt	COMPOSITION / mm
60°	84432000000	10,4
	84483200000 TIN	16,5
82°	84434000000	20,5
	84483400000 TIN	25
100°	84435000000	31
120°	84433000000	

See these tools at work!

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## TRI-DENT Three flute COUNTERSINKS

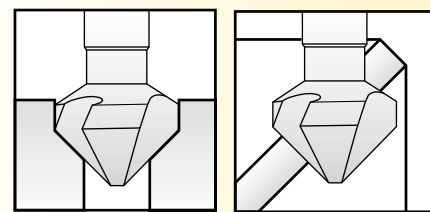
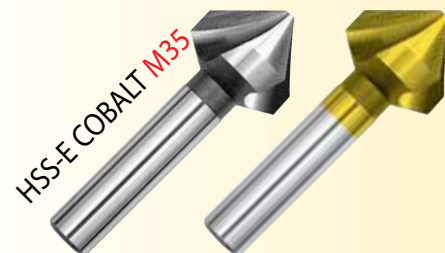


### METRIC

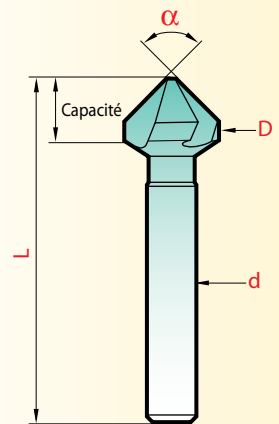
Angle	Diameter inch	mm	Capacity min/max	d	L	Cobalt	Angle	M35/TIN
30°	.248	6,3	.079 - .248	.197	2	84439063000	30°	84483906300
	.488	12,4	.012 - .488	.315	2-1/2	84439124000		84483912400
439	.650	16,5	.157 - .650	.394	3	84439165000	4839	84483916500
	.984	25,0	.236 - .984	.394	3-1/2	84439250000		84483925000
60°	.248	6,3	.051 - .248	.197	1-7/8	84432063000	60°	84483206300
	.327	8,3	.071 - .327	.236	2	84432083000		84483208300
432	.410	10,4	.091 - .410	.236	2	84432104000	4832	84483210400
	.488	12,4	.098 - .488	.315	2-3/8	84432124000		84483212400
60°	.650	16,5	.110 - .650	.394	2-1/2	84432165000	60°	84483216500
	.807	20,5	.118 - .807	.394	2-3/4	84432205000		84483220500
82°	.984	25,0	.126 - .984	.394	3	84432250000	82°	84483225000
	1.22	31,0	.138 - 1.22	.472	3-1/8	84432310000		84483231000
434	.248	6,3	.051 - .248	.197	1-3/4	84434063000	434	84483406300
	1/4	6,35	.050 - .250	1/4	1-3/4	84434063500		84483406350
82°	5/16	7,94	.070 - .312	1/4	1-3/4	84434079300	82°	84483407930
	.327	8,3	.070 - .327	.236	2	84434083000		84483408300
434	3/8	9,52	.085 - .375	1/4	2	84434095200	434	84483409520
	.410	10,4	.087 - .410	.236	2	84434104000		84483410400
82°	.488	12,4	.098 - .488	.315	2-1/4	84434124000	82°	84483412400
	1/2	12,7	.100 - .500	1/4	2	84434127000		84483412700
100°	5/8	15,87	.110 - .625	3/8	2-3/8	84434158700	100°	84483415870
	.650	16,5	.110 - .650	.394	2-3/8	84434165000		84483416500
435	3/4	19,05	.120 - .750	3/8	2-3/8	84434190500	435	84483419050
	.807	20,5	.118 - .807	.394	2-1/2	84434205000		84483420500
100°	.984	25,0	.126 - .984	.394	2-11/16	84434250000	100°	84483425000
	1.00	25,4	.125 - 1.00	3/8	2-3/4	84434254000		84483425400
120°	1.22	31,0	.138 - 1.22	.472	2-7/8	84434310000	120°	84483431000
	.248	6,3	.051 - .248	.197	1-3/4	84435063000		84483506300
100°	.327	8,3	.070 - .327	.236	2	84435083000	100°	84483508300
	.410	10,4	.087 - .410	.236	2	84435104000		84483510400
435	.488	12,4	.098 - .488	.315	2-3/16	84435124000	435	84483512400
	.650	16,5	.110 - .650	.394	2-5/16	84435165000		84483516500
120°	.807	20,5	.118 - .807	.394	2-7/16	84435205000	120°	84483520500
	.984	25,0	.126 - .984	.394	2-1/2	84435250000		84483525000
433	1.22	31,0	.138 - 1.22	.472	2-11/16	84435310000	433	84483531000
	.248	6,3	.051 - .248	.197	1-3/4	84433063000		84483306300
120°	.327	8,3	.070 - .327	.236	2	84433083000	120°	84483308300
	.410	10,4	.087 - .410	.236	2	84433104000		84483310400
433	.488	12,4	.098 - .488	.315	2-1/8	84433124000	433	84483312400
	.650	16,5	.110 - .650	.394	2-1/4	84433165000		84483316500
120°	.807	20,5	.118 - .807	.394	2-5/16	84433205000	120°	84483320500
	.984	25,0	.126 - .984	.394	2-1/2	84433250000		84483325000
433	1.22	31,0	.138 - 1.22	.472	2-1/2	84433310000	433	84483331000

# TRI-DENT 90° Three flute COUNTERSINKS

90° THREE FLUTE COUNTERSINKS					Angle 90°	
Diameter inch	mm	Capacity min/max	d	L	Cobalt 431	M35/TIN 4831
.158	4,0	.051 - .158	.158	1-5/8	84431040000	84483104000
.170	4,3	.051 - .170	.158	1-5/8	84431043000	84483104300
.197	5,0	.051 - .197	.158	1-5/8	84431050000	84483105000
.209	5,3	.051 - .209	.197	1-3/4	84431053000	84483105300
.229	5,8	.051 - .229	.197	1-3/4	84431058000	84483105800
.236	6,0	.051 - .236	.197	1-3/4	84431060000	84483106000
.248	6,3	.051 - .248	.197	1-3/4	84431063000	84483106300
1/4	6,35	.050-.250	1/4	1-3/4	84431063500	84483106350
.276	7,0	.063 - .276	.236	2	84431070000	84483107000
.288	7,3	.063 - .288	.236	2	84431073000	84483107300
5/16	7,94	.070-.312	1/4	1-3/4	84431079300	84483107930
.315	8,0	.071 - .315	.236	2	84431080000	84483108000
.327	8,3	.071 - .327	.236	2	84431083000	84483108300
.354	9,0	.079 - .354	.236	2	84431090000	84483109000
.370	9,4	.079 - .370	.236	2	84431094000	84483109400
3/8	9,52	.085-.375	1/4	2	84431095200	84483109520
.394	10,0	.087 - .394	.236	2	84431100000	84483110000
.410	10,4	.087 - .410	.236	2	84431104000	84483110400
.453	11,5	.098 - .453	.315	2-1/4	84431115000	84483111500
.472	12,0	.098 - .472	.315	2-1/4	84431120000	84483112000
.488	12,4	.098 - .488	.315	2-1/4	84431124000	84483112400
1/2	12,70	.100-.500	1/4	2	84431127000	84483112700
.528	13,4	.098 - .528	.315	2-1/4	84431134000	84483113400
.567	14,4	.098 - .567	.315	2-1/4	84431144000	84483114400
.590	15,0	.110 - .590	.394	2-3/8	84431150000	84483115000
5/8	15,87	.110-.625	3/8	2-3/8	84431158700	84483115870
.650	16,5	.110 - .650	.394	2-3/8	84431165000	84483116500
.748	19,0	.118 - .748	.394	2-1/2	84431190000	84483119000
3/4	19,05	.120-.750	3/8	2-3/8	84431190500	84483119050
.807	20,5	.118 - .807	.394	2-1/2	84431205000	84483120500
.906	23,0	.126 - .906	.394	2-5/8	84431230000	84483123000
.984	25,0	.126 - .984	.394	2-5/8	84431250000	84483125000
1	25,40	.125-1.00	3/8	2-3/4	84431254000	84483125400
1.024	26,0	.126 - 1.024	.394	2-5/8	84431260000	84483126000
1.102	28,0	.138 - 1.102	.472	2-3/4	84431280000	84483128000
1.181	30,0	.138 - 1.181	.472	2-3/4	84431300000	84483130000
1.220	31,0	.138 - 1.220	.472	2-3/4	84431310000	84483131000



COUNTERSINK CHAMFER



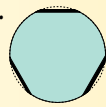
D	Angle	d	L
± 0.05	- 1°	h9	± 1mm

Tolerances

This highly productive countersinking cutter is a much improved version of the traditional multiflute milling cutter

- grooves opened wide to allow for greater chip removal,
- high positive cut,
- constant profile relief (a great many regrinds),
- self centering countersink,
- work without vibration.

Tool dimensions are adapted to countersink the 82° and 90° capscrews. Lubrication is recommended.



WITH 3 FLATTED SHANKS*						
Diameter inch	mm	Capacity min/max	d	L	Cobalt 437	TIN 4837
.488	12,4	.098 - .488	.315	2-1/4	84437124000	84483712400
.567	14,4	.098 - .567	.315	2-1/4	84437144000	84483714400
.650	16,5	.110 - .650	.394	2-3/8	84437165000	84483716500
.807	20,5	.118 - .807	.394	2-1/2	84437205000	84483720500
.984	25,0	.126 - .984	.394	2-5/8	84437250000	84483725000
1.220	31,0	.138 - 1.220	.472	2-3/4	84437310000	84483731000
1.339	34,0	.177 - 1.339	.630	4	84437340000	84483734000
1.378	35,0	.177 - 1.378	.630	4	84437350000	84483735000
1.457	37,0	.177 - 1.457	.630	4-5/8	84437370000	84483737000
1.575	40,0	.177 - 1.575	.630	4-5/8	84437400000	84483740000
1.969	50,0	.197 - 1.969	.630	5	84437500000	84483750000
2.480	63,0	.394 - 2.480	.630	5-1/2	84437630000	84483763000
3.150	80,0	.551 - 3.150	.630	6-1/2	84437800000	84483780000

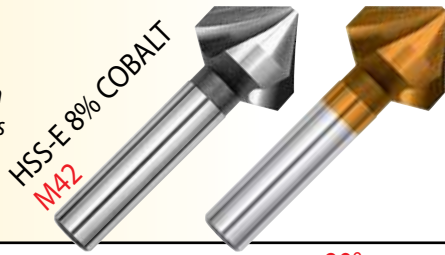
\* Effective holding thanks to the three flats on shank



# TRI-DENT 90° Three flute COUNTERSINKS

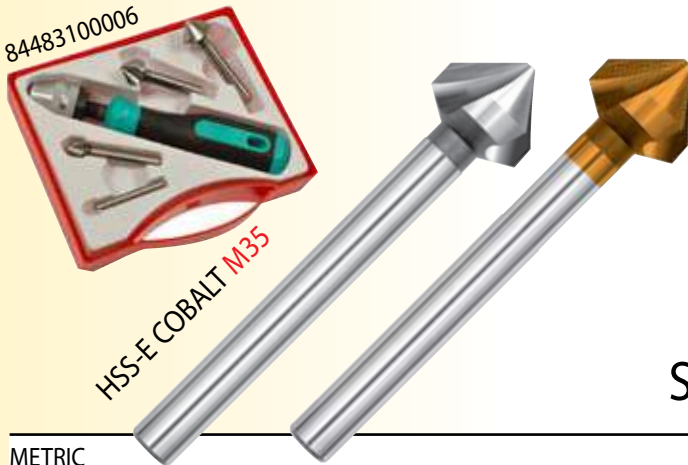
Code 4936

• Special for abrasion resistant hard alloys



METRIC		Angle 90°					
Diameter inch mm	Capacity min/max	d	L	Cobalt + 436	M42/RedX 4936		
.248	6,3	.051 - .248	.197	1-3/4	84436063000	84493606300	
.327	8,3	.071 - .327	.236	1-3/4	84436083000	84493608300	
.410	10,4	.087 - .410	.236	1-3/4	84436104000	84493610400	
.488	12,4	.098 - .488	.315	2-1/4	84436124000	84493612400	
.650	16,5	.110 - .650	.394	2-3/8	84436165000	84493616500	
.807	20,5	.118 - .807	.394	2-1/2	84436205000	84493620500	
.984	25,0	.126 - .984	.394	2-5/8	84436250000	84493625000	
1.220	31,0	.138 - 1.220	.472	2-3/4	84436310000	84493631000	
1.969	50,0*	.197 - 1.969	.630	5	84436500000	84493650000	

\* 3 flatted shanks



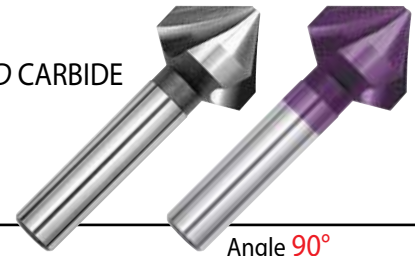
## LONG SERIES

METRIC		Angle 90°						
Diameter inch mm	Capacity min/max	d	L	Cobalt 4303	M35/RedX 4933	Carbide 8431-L		
.248	6,3	.051 - .248	.236	3-5/16	84430306300	84493306300	888431L0630	
.327	8,3	.071 - .327	.315	3-3/8	84430308300	84493308300	888431L0830	
.410	10,4	.087 - .410	.394	3-1/2	84430310400	84493310400	888431L1040	
.488	12,4	.098 - .488	.394	4-1/4	84430312400	84493312400	888431L1240	
.650	16,5	.110 - .650	.630	4-7/16	84430316500	84493316500	888431L1650	
.807	20,5	.118 - .807	.630	4-1/2	84430320500	84493320500	888431L2050	
.984	25,0	.126 - .984	.788	4-11/16	84430325000	84493325000		

**NOTE :**

All these metric sizes are available within 2 weeks.  
Call for information.

K15  
SOLID CARBIDE



METRIC		Angle 90°					
Diameter inch mm	Capacity min/max	d	L	Carbide 8431	K15/Hard'X 8431-H		
.170	4,3	.051 - .170	.157	1-9/16	88843104300	888431H0430+	
.209	5,3	.051 - .209	.157	1-9/16	88843105300	888431H0530+	
.248	6,3	.051 - .248	.197	1-3/4	88843106300	888431H0630+	
.327	8,3	.071 - .327	.236	1-3/4	88843108300	888431H0830+	
.410	10,4	.087 - .410	.236	1-3/4	88843110400	888431H1040	
.488	12,4*	.098 - .488	.315	2-1/4	88843112400	888431H1240	
.650	16,5*	.110 - .650	.394	2-3/8	88843116500	888431H1650	
.807	20,5*	.118 - .807	.394	2-1/2	88843120500	888431H2050	
.984	25,0*	.126 - .984	.394	2-5/8	88843125000	888431H2500	
1.220	31,0*	.138 - 1.220	.472	2-3/4	88843131000	888431H3100	

\* Ø 12,4 - 31,0 = 3 flatted shanks



### TRIDENT COUNTERSINK SETS

Angle	M35/Cobalt	COMPOSITION / mm
60°	84432000000	Ø 10.4-16.5 20.5-25-31
	84483200000	
82°	84434000000	
	84483400000	
100°	84435000000	
120°	84433000000	

### 3 FLUTE COUNTERSINK SETS ANGLE 90°

magafor	Diameter/COMPOSITION
84431000000-M	Ø 10 - 15 - 20,5 mm
84431000000-M-TIN	
84431000007	1/4" - 3/8" - 1/2" - 3/4"
84483100007 TIN	
84431000000	10,4 - 16,5 - 20,5 - 25,0 - 31,0 mm
84483100000 TIN	
84436000000	
84431000002	
84483100002 TIN	6,3 - 8,3 - 10,4 - 12,4 - 16,5 - 20,5 mm
84436000002	
88843100002	6,3 - 8,3 - 10,4 - 12,4 - 16,5 - 20,5 - 25 mm
84431000003 <sup>1</sup>	
84431000004 <sup>1</sup>	4,3 - 5,3 - 6,3 - 8,3 - 10,4 - 12,4 - 16,5 - 20,5 - 25 - 31 mm
88843100000	
84431000006 <sup>2</sup>	10,4 - 16,5 - 20,5 - 25 - 31 mm carbide
84483100006 TIN <sup>2</sup>	
84431000008 <sup>2</sup>	6,3 - 12,4 - 16,5 - 20,5 mm
84483100008 TIN <sup>2</sup>	
84431000008 <sup>2</sup>	1/4" - 3/8" - 1/2" - 3/4"
84483100008 TIN <sup>2</sup>	

<sup>1</sup> Set supplied with 1 auto-lock chuck handle Code 4001.

<sup>2</sup> Set supplied with 8mm auto-lock chuck handle Code 4002.

# ZERO FLUTE DEBURRING TOOL With Hole

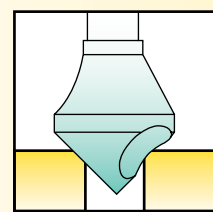
Angle 90°

TYPE	Right hand						
	#	Diameter inch mm	Capacity min/max	d	L	Cobalt 411	M35/TIN 4811
0	1/4 <sup>1</sup>		5/64 - 3/16	1/4	1-3/4	84411063500	84481106350
	.394	10	5/32 - 11/32	.236	1-3/4	84411100000	84481110000
1	7/16		7/32 - 13/32	1/4	1-3/4	84411112000	84481111200
2	9/16		1/4 - 1/2	1/4	2	84411140000	84481114000
	.590	15	1/4 - 9/16	.315	2-1/4	84411150000	84481115000
	.787	20	5/16 - 11/16	.394	2-1/2	84411200000	84481120000
	3	13/16	5/16 - 11/16	1/2	2-5/8	84411204000	84481120400
	.984	25	3/8 - 7/8	.472	3	84411250000	84481125000
	1.102	28	7/16 - 1	.472	3-3/8	84411280000	84481128000
	1.181	30	1/2 - 1-1/8	.472	3-1/2	84411300000	84481130000
	4	1-3/16	1/2 - 1-1/8	1/2	3-1/2	84411301000	84481130100
	1.378	35	9/16 - 1-5/16	.630 <sup>2</sup>	4	84411350000	84481135000
	1.575	40	5/8 - 1-1/2	.630 <sup>2</sup>	4-5/8	84411400000	84481140000
	1.969	50	3/4 - 1-7/8	.630 <sup>2</sup>	5	84411500000	84481150000

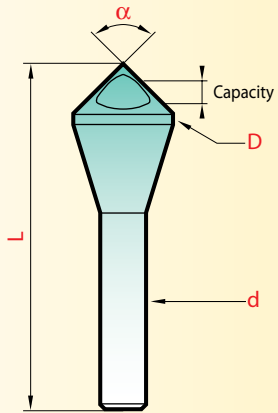
<sup>1</sup> Double end cutter

<sup>2</sup> Shanks with 3 flats for better holding

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SEE THESE TOOLS AT WORK!



Angle	#	Diameter inch mm	Capacity min/max	d	L	Cobalt	
60° 412	0	1/4 <sup>1</sup>	7/64 - 3/16	1/4	1-3/4	84412063500	
		.394	3/16 - 11/32	.236	2	84412100000	
	1	7/16	3/16 - 3/8	1/4	1-3/4	84412112000	
	2	9/16		9/32 - 1/2	1/4	2	84412140000
		.590	15	5/16 - 9/16	.315	2-3/8	84412150000
		.787	20	3/8 - 11/16	.394	2-7/8	84412200000
	3	13/16		3/8 - 11/16	1/2	2-5/8	84412204000
		.984	25	1/2 - 7/8	.472	3-3/8	84412250000
		1.181	30	9/16 - 1-1/8	.472	3-5/8	84412300000
	4	1-3/16		9/16 - 1-1/8	1/2	3-1/2	84412301000
1.378		35	11/16 - 1-5/16	.630 <sup>2</sup>	4-1/2	84412350000	
82° 414	0	1/4 <sup>1</sup>	5/64 - 3/16	1/4	1-3/4	84414063500	
		.394	5/32 - 11/32	.236	1-3/4	84414100000	
	1	7/16	7/32 - 13/32	1/4	1-3/4	84414112000	
	2	9/16		1/4 - 1/2	1/4	2	84414140000
		.590	15	1/4 - 9/16	.315	2-1/4	84414150000
		.787	20	5/16 - 11/16	.394	2-1/2	84414200000
	3	13/16		5/16 - 11/16	1/2	2-5/8	84414204000
		.984	25	3/8 - 7/8	.472	3	84414250000
		1.181	30	1/2 - 1-1/8	.472	3-1/2	84414300000
	4	1-3/16		1/2 - 1-1/8	1/2	3-1/2	84414301000
1.378		35	9/16 - 1-5/16	.630 <sup>2</sup>	4	84414350000	
100° 415		.394	5/32 - 11/32	.236	1-3/4	84415100000	
		.590	1/4 - 9/16	.315	2-1/8	84415150000	
		.787	9/32 - 11/16	.394	2-1/2	84415200000	
		.984	25	11/32 - 7/8	.472	3	84415250000
		1.181	30	7/16 - 1-1/16	.472	3-3/8	84415300000
120° 413		1.378	35	1/2 - 1-5/16	.630 <sup>2</sup>	4	84415350000
		.394	10	5/32 - 11/32	.236	1-3/4	84413100000
		.590	15	1/4 - 9/16	.315	2	84413150000
		.787	20	9/32 - 11/16	.394	2-3/8	84413200000
		.984	25	11/32 - 7/8	.472	2-7/8	84413250000
	1.181	30	7/16 - 1-1/16	.472	3-1/4	84413300000	
	1.378	35	1/2 - 1-5/16	.630 <sup>2</sup>	3-3/4	84413350000	

<sup>1</sup> Double end cutter

<sup>2</sup> 3 flatted shanks



D	Angle	d	L
+0.3	-1°	h9	±1mm

Tolerances

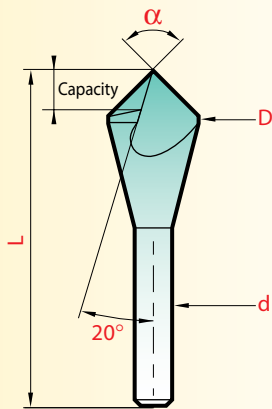
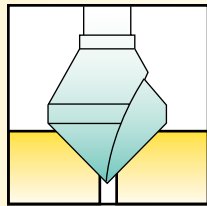
The deburring tool "with hole" is more particularly designed for countersinking and chamfering light metals and plastics. The surface obtained is smooth and without burrs. We recommend lubricating.



## SETS OF 5 ZERO FLUTE CUTTERS

Angle	magafor EDP#	COMPOSITION
60°	84412000000	Ø 10-15-20-25-30 mm
	84412000005	# 0-1-2-3-4
82°	84414000000	Ø 10-15-20-25-30 mm
	84414000005	# 0-1-2-3-4
90°	84411000000	Ø 10-15-20-25-30 mm
	84481100000-TIN	Ø 10-15-20-25-30 mm
	84411000002	Ø 10-15-20-28-35 mm
	84411000005	# 0-1-2-3-4
	84481100005-TIN	# 0-1-2-3-4
100°	84415000000	Ø 10-15-20-25-30 mm
120°	84413000000	Ø 10-15-20-25-30 mm

# Single flute CHAMFERING CUTTERS



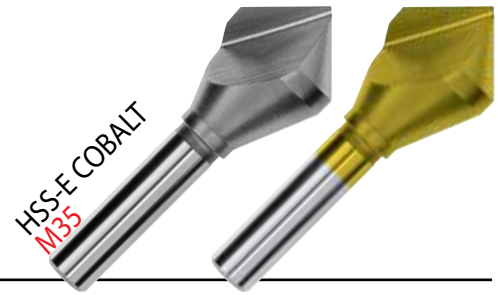
D	Angle	d	L
+0.3	-1°	h9	±1mm

Tolerances

The characteristics of the single flute chamfering cutters are similar to those of the deburring tools "with hole". They do vary on the following points :

- greater countersinking capacity, from the point to the outside diameter (up to Ø 30 mm),
- simultaneous drilling and countersinking on thin elements (laminates, aluminium, wood).

Constant finish-grind profile makes it possible to obtain many easy regrinds : a mere touch of the grinder to the tooth is sufficient. We recommend lubricating.

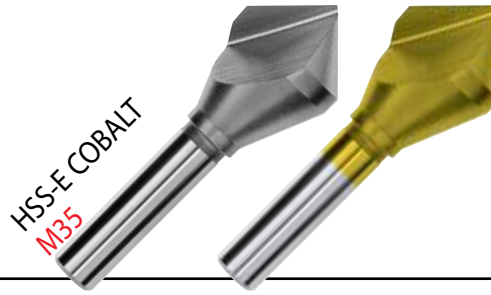


Angle	Diameter		Capacity min/max	d	L	Cobalt 422	M35/TIN 4822
	inch	mm					
60°	1/8		1/32 - 1/8	1/8	1-1/4	84422031700	84482203170
	3/16		3/64 - 3/16	3/16	1-3/8	84422047600	84482204760
	.236	6	3/64 - .236	.236	1-5/8	84422060000	84482206000
	1/4		3/64 - 1/4	1/4	1-1/2	84422063500	84482206350
	5/16		3/64 - 5/16	1/4	1-5/8	84422079300	84482207930
	3/8		3/64 - 3/8	1/4	1-3/4	84422095200	84482209520
	.394	10	3/64 - .394	.236	1-7/8	84422100000	84482210000
	.472	12	5/64 - .472	.315	2-1/8	84422120000	84482212000
	1/2		5/64 - 1/2	1/4	2	84422127000	84482212700
	.590	15	5/64 - .590	.315	2-3/8	84422150000	84482215000
	5/8		5/64 - 5/8	3/8	2-1/4	84422158700	84482215870
	3/4		5/64 - 3/4	1/2	2-5/8	84422190500	84482219050
	.787	20	5/64 - .787	.394	2-7/8	84422200000	84482220000
	7/8		7/64 - 7/8	1/2	2-3/4	84422222200	84482222220
	.984	25	1/8 - .984	.472	3-3/8	84422250000	84482225000
	1		1/8 - 1	1/2	2-3/4	84422254000	84482225400
	1.181	30	1/8 - 1.181	.472	3-5/8	84422300000	84482230000
	1-1/4		1/8 - 1-1/4	1/2	3	84422317500	84482231750

Angle	Diameter		Capacity min/max	d	L	Cobalt 424	M35/TIN 4824
	inch	mm					
82°	1/8		1/32 - 1/8	1/8	1-1/4	84424031700	84482403170
	3/16		3/64 - 3/16	3/16	1-3/8	84424047600	84482404760
	.236	6	3/64 - .236	.236	1-5/8	84424060000	84482406000
	1/4		3/64 - 1/4	1/4	1-1/2	84424063500	84482406350
	5/16		3/64 - 5/16	1/4	1-5/8	84424079300	84482407930
	3/8		3/64 - 3/8	1/4	1-3/4	84424095200	84482409520
	.394	10	3/64 - .394	.236	1-3/4	84424100000	84482410000
	.472	12	5/64 - .472	.315	2	84424120000	84482412000
	1/2		5/64 - 1/2	1/4	2	84424127000	84482412700
	.590	15	5/64 - .590	.315	2-1/4	84424150000	84482415000
	5/8		5/64 - 5/8	3/8	2-1/4	84424158700	84482415870
	3/4		5/64 - 3/4	1/2	2-5/8	84424190500	84482419050
	.787	20	5/64 - .787	.394	2-5/8	84424200000	84482420000
	7/8		7/64 - 7/8	1/2	2-3/4	84424222200	84482422220
	.984	25	1/8 - .984	.472	3	84424250000	84482425000
	1		1/8 - 1	1/2	2-3/4	84424254000	84482425400
	1.181	30	1/8 - 1.181	.472	3-1/2	84424300000	84482430000
	1-1/4		1/8 - 1-1/4	1/2	2-3/4	84424317500	84482431750

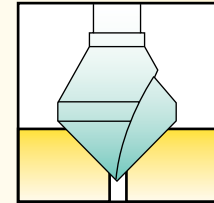
NOTE : 30 and 45 degree angles are metric standard. Call for information.

# Single flute CHAMFERING CUTTERS



Angle	Diameter		Capacity min/max	d	L	Cobalt 421	M35/TIN 4821
	inch	mm					
90°	1/8		1/32 - 1/8	1/8	1-1/4	84421031700	84482103170
	.157	4	3/64 - .157	.157	1-1/2	84421040000	84482104000
	3/16		3/64 - 3/16	3/16	1-3/8	84421047600	84482104760
	.197	5	3/64 - .197	.197	1-1/2	84421050000	84482105000
	.236	6	3/64 - .236	.236	1-1/2	84421060000	84482106000
	1/4		3/64 - 1/4	1/4	1-1/2	84421063500	84482106350
	5/16		3/64 - 5/16	1/4	1-5/8	84421079300	84482107930
	.315	8	3/64 - .315	.236	1-1/2	84421080000	84482108000
	3/8		3/64 - 3/8	1/4	1-3/4	84421095200	84482109520
	.394	10	3/64 - .394	.236	1-3/4	84421100000	84482110000
	.472	12	5/64 - .472	.315	2	84421120000	84482112000
	1/2		5/64 - 1/2	1/4	2	84421127000	84482112700
	.590	15	5/64 - .590	.315	2-1/8	84421150000	84482115000
	5/8		5/64 - 5/8	3/8	2-1/4	84421158700	84482115870
	3/4		5/64 - 3/4	1/2	2-5/8	84421190500	84482119050
	.787	20	5/64 - .787	.394	2-5/8	84421200000	84482120000
	7/8		7/64 - 7/8	1/2	2-3/4	84421222200	84482122220
	.984	25	1/8 - .984	.472	3	84421250000	84482125000
	1		1/8 - 1	1/2	2-3/4	84421254000	84482125400
	1.181	30	1/8 - 1.181	.472	3-1/2	84421300000	84482130000
1-1/4		1/8 - 1-1/4	1/2	2-3/4	84421317500	84482131750	
1.378	35	5/32 - 1.378	.630 <sup>1</sup>	4	84421350000	84482135000	
1.575	40	7/32 - 1.575	.630 <sup>1</sup>	4-5/8	84421400000	84482140000	
2	50	15/32 - 2	.630 <sup>1</sup>	5	84421500000	84482150000	

<sup>1</sup>Shank with 3 flats for better holding



## SETS OF 5 PIECES SINGLE FLUTE COUNTERSINKS METRIC

Angle	Cobalt	M35/TIN
60°	84422000000	84482200000
82°	84424000000	84482400000
90°	84421000000	84482100000
100°	84425000000	84482500000
120°	84423000000	84482300000

Angle	Diameter		Capacity min/max	d	L	Cobalt 425	M35/TIN 4825
	inch	mm					
100°	.394	10	3/64 - .394	.236	1-3/4	84425100000	84482510000
	.472	12	5/64 - .472	.315	1-7/8	84425120000	84482512000
	.590	15	5/64 - .590	.315	2-1/8	84425150000	84482515000
	.787	20	5/64 - .787	.394	2-1/2	84425200000	84482520000
	.984	25	1/8 - .984	.472	3	84425250000	84482525000
	1.181	30	1/8 - 1.181	.472	3-3/8	84425300000	84482530000

## SETS OF 6 PIECE SINGLE FLUTE COUNTERSINKS

Angle	Cobalt	M35/TIN
60°	84422000006	84482200006
82°	84424000006	84482400006
90°	84421000006	84482100006

Angle	Diameter		Capacity min/max	d	L	Cobalt 423	M35/TIN 4823
	inch	mm					
120°	.394	10	3/64 - .394	.236	1-3/4	84423100000	84482310000
	.472	12	5/64 - .472	.315	1-7/8	84423120000	84482312000
	.590	15	5/64 - .590	.315	2	84423150000	84482315000
	.787	20	5/64 - .787	.394	2-3/8	84423200000	84482320000
	.984	25	1/8 - .984	.472	2-7/8	84423250000	84482325000
	1.181	30	1/8 - 1.181	.472	3-1/4	84423300000	84482330000



# DEBURRING COUNTERSINKING



Recommendation N° 1



Recommendation N° 2

**SEE THESE TOOLS  
AT WORK!**



www.hassay-savage.com  
/resource-center  
/product-videos

## Performance

CONDITIONS  
USING RECOMMENDATIONS

SFM = Speed : Surface Feet Per Minute

IPM = Feed : Inches Per Minute

$$RPM = \frac{SFM \times 12}{3.14 \times Diameter}$$

Example:

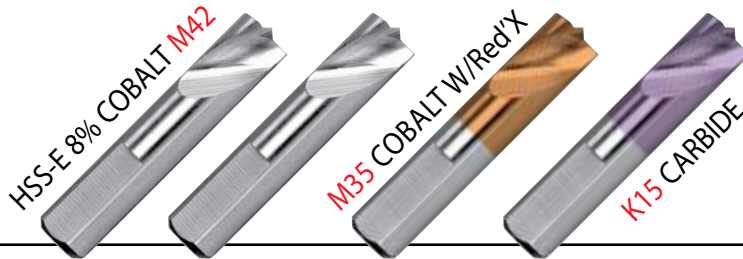
3/4" - .750 Diameter 3 Flute to Countersink 304 SS

$$RPM = \frac{45 \times 12}{3.14 \times .750} = \frac{540}{2.35} = 230 \text{ RPM}$$

		DEBURRING - COUNTERSINKING								CONTOURING							
MATERIAL		HSS.Co		HSS.Co		HSS.Co		HSS.8%Co		Carbure/Carbide		HSS.Co		HSS.8%Co		Carbure/Carbide	
		+TiN	+TiN	+TiN	+TiN	+TiN	+Red'X	+Hard'X	+TiN	+TiN	+Red'X	+Red'X	+TiN	+TiN	+Red'X	+Red'X	+Hard'X
Steel < 81 HRB (B)	SFM	115-148	115-148	115-148	115-148	55-70	55-70	112-145	112-145	128-256	128-256	55-70	55-70	112-145	112-145	128-256	128-256
	Ø10 IPM	6.5	6.5	6.5	6.5	3.4	3.4	6.5	6.5	10	10	3.4	3.4	6.5	6.5	10	10
	Ø20 IPM	3.4	3.4	3.4	3.4	1.8	1.8	3.4	3.4	5	5	1.8	1.8	3.4	3.4	5	5
Steel < 24 Rc	SFM	65-95	65-95	65-95	65-95	32-48	32-48	65-95	65-95	95-160	95-160	32-48	32-48	65-95	65-95	95-160	95-160
	Ø10 IPM	4.3	4.3	4.3	4.3	2.4	2.4	4.3	4.3	6.6	6.6	2.4	2.4	4.3	4.3	6.6	6.6
	Ø20 IPM	2	2	2	2	1.2	1.2	2	2	3.4	3.4	1.2	1.2	2	2	3.4	3.4
Steel 24 - 32 Rc	SFM	48-64	48-64	48-64	48-64	25-38	25-38	48-64	48-64	64-128	64-128	25-38	25-38	48-64	48-64	64-128	64-128
	Ø10 IPM	2	2	2	2	1.4	1.4	2	2	4	4	1.4	1.4	2	2	4	4
	Ø20 IPM	1.4	1.4	1.4	1.4	1	1	1.4	1.4	2.4	2.4	1	1	1.4	1.4	2.4	2.4
Stainless steel 32 - 41 Rc	SFM	38-48	38-48	38-48	38-48	20-32	20-32	38-48	38-48	64-128	64-128	20-32	20-32	38-48	38-48	64-128	64-128
	Ø10 IPM	1.8	1.8	1.8	1.8	1.2	1.2	1.8	1.8	4	4	1.2	1.2	1.8	1.8	4	4
	Ø20 IPM	1	1	1	1	0.6	0.6	1	1	2.4	2.4	0.6	0.6	1	1	2.4	2.4
Abrasion resistant steel	SFM							38-48	38-48	48-64	48-64			38-48	38-48	48-64	48-64
	Ø10 IPM							1.6	1.6	2	2			1.6	1.6	2	2
	Ø20 IPM							1.2	1.2	1.4	1.4			1.2	1.2	1.4	1.4
Inconel	SFM							13-20	13-20	32-38	32-38			13-20	13-20	32-38	32-38
	Ø10 IPM							0.6	0.6	1.2	1.2			0.6	0.6	1.2	1.2
	Ø20 IPM							0.3	0.3	0.6	0.6			0.3	0.3	0.6	0.6
Cast iron	SFM	64-128	64-128	64-128	64-128	48-80	48-80	64-128	64-128	128-256	128-256	48-80	48-80	64-128	64-128	128-256	128-256
	Ø10 IPM	5	5	5	5	2.8	2.8	5	5	0.3	0.3	2.8	2.8	5	5	0.3	0.3
	Ø20 IPM	3	3	3	3	1.6	1.6	3	3	6	6	1.6	1.6	3	3	6	6
Aluminium	SFM	160-190	160-190	160-190	160-190	112-145	112-145	160-190	160-190	128-320	128-320	112-145	112-145	160-190	160-190	128-320	128-320
	Ø10 IPM	10	10	10	10	7.8	7.8	10	10	13.8	13.8	7.8	7.8	10	10	13.8	13.8
	Ø20 IPM	7	7	7	7	5.2	5.2	7	7	9	9	5.2	5.2	7	7	9	9
Bronze Brass	SFM	96-128	96-128	96-128	96-128	65-95	65-95	96-128	96-128			65-95	65-95	96-128	96-128		
	Ø10 IPM	6	6	6	6	4.7	4.7	6	6			4.7	4.7	6	6		
	Ø20 IPM	4.3	4.3	4.3	4.3	3.4	3.4	4.3	4.3			3.4	3.4	4.3	4.3		
Copper	SFM	65-95	65-95	65-95	65-95	48-80	48-80	65-95	65-95	160-256	160-256	48-80	48-80	65-95	65-95	160-256	160-256
	Ø10 IPM	4.7	4.7	4.7	4.7	3.75	3.75	4.7	4.7	12	12	3.75	3.75	4.7	4.7	12	12
	Ø20 IPM	3	3	3	3	2.4	2.4	3	3	7.8	7.8	2.4	2.4	3	3	7.8	7.8
Laminated	SFM	160-320	160-320	160-320	160-320	112-224	112-224	112-224	112-224			112-224	112-224	112-224	112-224		
	Ø10 IPM	16	16	16	16	12	12	12	12			12	12	12	12		
	Ø20 IPM	12	12	12	12	7.8	7.8	7.8	7.8			7.8	7.8	7.8	7.8		
Nylon, PVC Plastics	SFM	160-320	160-320	160-320	160-320	112-224	112-224	112-224	112-224			112-224	112-224	112-224	112-224		
	Ø10 IPM	18	18	18	18	16	16	16	16			16	16	16	16		
	Ø20 IPM	13.8	13.8	13.8	13.8	12	12	12	12			12	12	12	12		

The machining of hard sheets has to be done with coated tools.

The high performance series **8203-H** is made from **Hard'X** coated carbide.



Short series

Diameter		L	ℓ	Cobalt		M35/Red'X	K15/Hard'X
inch	mm			202	203	2903	8203-H
.236	6	1-3/4	.590			82203060000	
5/16	8	1-1/2	.590	82202080000			
5/16	8	1-3/4	.590		82203080000	82290308000	888203H0800

- Easy to start
- Long lasting
- Will spot and drill one panel only, without walking

These short drills are specially designed to be used with the two types of hand type pneumatic disconnecter tools :

- with swan-neck = magafor 202
- with revolver-handle = magafor 203

Flatted shanks with 60° taper for a good location in the disconnecter.



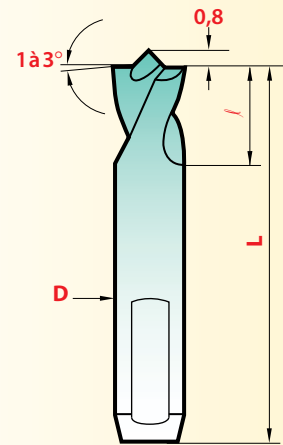
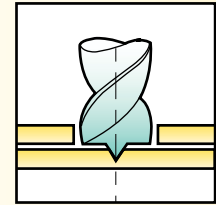
Long series

Diameter		L	ℓ	Cobalt		M35/Red'X	Brazed Carbide
inch	mm			201	2901	8201	
.236	6	2-5/8	1.100	82201060000	82290106000		
.275	7	2-7/8	1.340	82201070000	82290107000		
.314	8					88820108000	
5/16		3-1/8	1.450	82201080000	82290108000		
.394	10	3-1/2	1.690	82201100000	82290110000		

To be used with standard drilling machines.

K15 CARBIDE — 6.5 - 7% Cobalt (0,006 - 0,008mm grain size)

# AUTO BODY DRILL BITS TO DISCONNECT SPOT WELDS



Tolerances

D	L	ℓ
h8	± 1	+1

The centering point grants perfect drilling without any drifting or walking.

Thanks to the special sharpening the first sheet will be bored without damage to the second one.

This design allows for excellent penetration, a high resistance to wear and a great many regrinds.

The carbide spotweld drills are designed to machine the new very-high elastic limit sheet metal (VHEL).

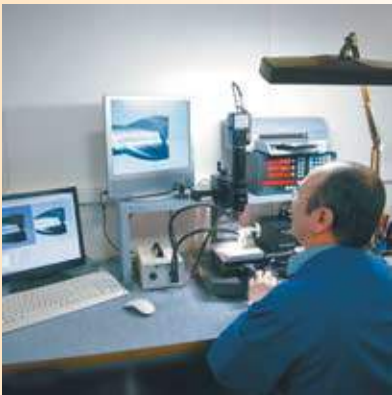
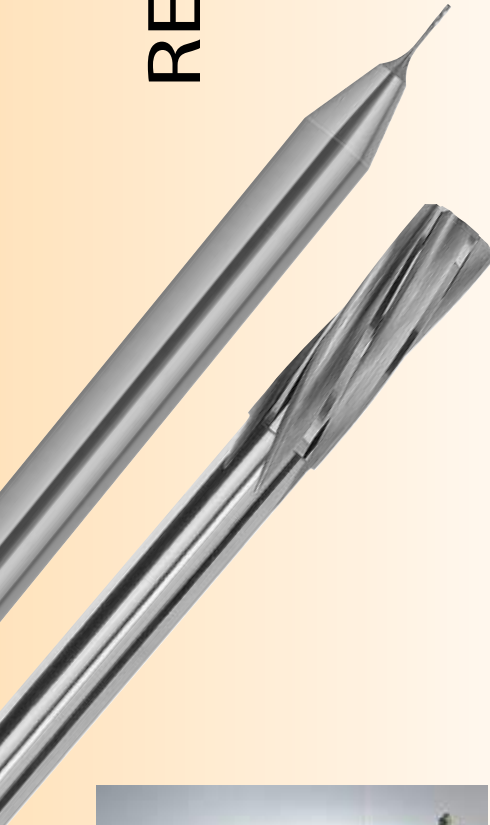


# HIGH PRECISION



# REAMERS

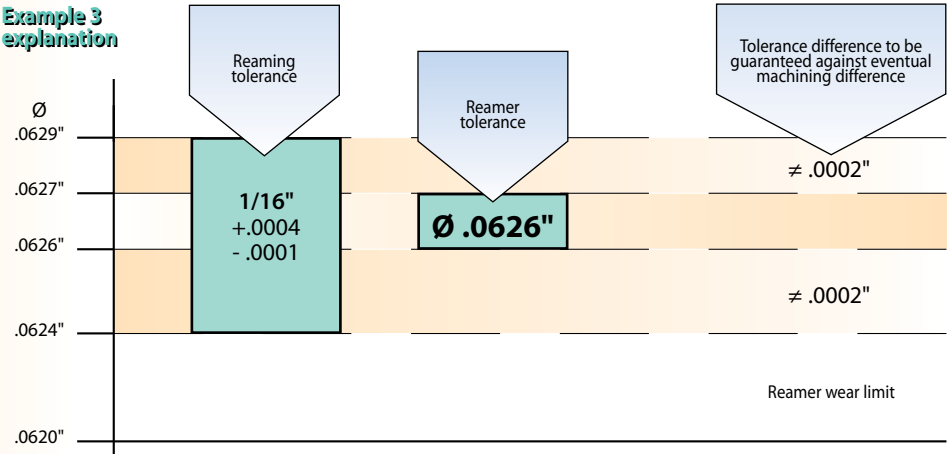
# REAMERS



## 1 - HOW TO CHOOSE STANDARD INCH REAMERS

Examples	REAMING (Hole)		REAMER (Tool)	
	Ø	Tolerance	Ø	Tolerance
1	1/64" +.00006 -.00012	.01568" .01550"	EDP # 861000395 <b>.01551"</b>	.01559" .01551"
2	1/32" +.0001 -.0002	.03135" .03105"	EDP # 86000079 <b>.03110"</b>	.03122" .03110"
3	1/16" +.0004 -.0001	.0629" .0624"	EDP # 86000159 <b>.0626"</b>	.06272" .06260"

### Example 3 explanation



## 2 - HOW TO CHOOSE METRIC REAMERS

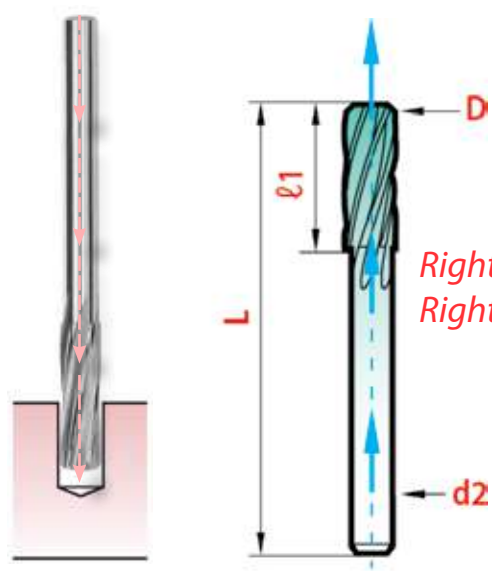
Code 8610 - 8600 : pages 91-97

Tolerance	Ø 2	Ø 3	Ø 4	Ø 5	Ø 6	Ø 8	Ø 10	Ø 12	Ø 14
D10	2,04	3,04	4,05	5,06	6,06	8,07	10,08	12,10	14,10
E 8	2,02	<b>3,02</b>	4,03	5,03	6,03	8,03	10,03	12,04	14,04
E 9	2,03	3,03	4,04	5,04	6,04	8,05	10,05	12,06	14,06
F 7	2,01	3,01	4,01	5,01	6,01	8,02	10,02	12,02	14,02
F 8	2,01	3,01	4,02	5,02	5,02	8,02	10,02	12,03	14,03
G 7	2,00	3,00	4,01	5,02	5,02	8,01	10,01	12,01	14,01
H 6	2,00	3,00	4,00	5,00	6,00	8,00	10,00	12,00	14,00
H 8	2,01	3,01	4,01	<b>5,01</b>	6,01	8,01	10,01	12,01	14,01
H 9	2,01	3,01	4,02	5,02	6,02	8,02	10,02	12,03	14,03
M 7	1,99	2,99	3,99	4,99	5,99	7,99	9,99	11,99	13,99
N 7	1,99	2,99	3,99	4,99	5,99	7,98	9,98	11,98	13,98
P 7	1,99	2,99	3,98	4,98	5,98	7,98	<b>9,98</b>	11,97	13,97
R 7	1,98	2,98	3,98	4,98	5,98	7,98	9,98	11,97	13,97



**NEW Item  
for 2017**

# 8670 Series REAMERS with COOLANT for Blind Holes



*Right Hand Spiral  
Right Hand Cut for Blind Holes*

- Central oil feeding: the lubricant is fed directly into the hole to ream.
- Right hand spiral - improved removal of swarf and coolant flow.

## EDP 8670 Series

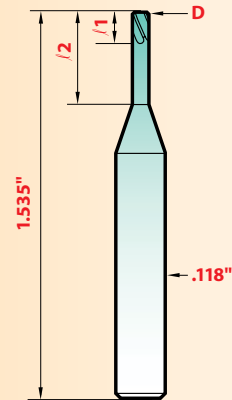
#	D mm	D inch	L	l1 Flute Length	Shank d2	Wire/Frac
88867003900	3.90	.1535"	2.05	0.787	0.1575	
88867004000	4.00	.1575"	2.05	0.787	0.1575	
88867004100	4.10	.1614"	2.05	0.787	0.1575	
88867004200	4.20	.1654"	2.05	0.787	0.1575	
88867004300	4.30	.1693"	2.05	0.787	0.1575	
88867004400	4.40	.1732"	2.05	0.787	0.1575	
88867004500	4.50	.1772"	2.05	0.787	0.1575	
88867004600	4.60	.1811"	2.05	0.787	0.1575	
88867004700	4.70	.1850"	2.05	0.787	0.1575	
88867004762	4.762	.1875"	2.05	0.787	0.1575	3/16"
88867004800	4.80	.1890"	2.48	0.866	0.1575	
88867004900	4.90	.1929"	2.48	0.866	0.1575	
88867005000	5.00	.1969"	2.48	0.866	0.1575	
88867005100	5.10	.2008"	2.48	0.866	0.1575	
88867005200	5.20	.2047"	2.48	0.866	0.1575	
88867005300	5.30	.2087"	2.48	0.866	0.1575	
88867005400	5.40	.2126"	2.48	0.866	0.1575	
88867005500	5.50	.2165"	2.48	0.866	0.1575	
88867005600	5.60	.2205"	2.48	0.866	0.1575	
88867005700	5.70	.2244"	2.48	0.866	0.1575	
88867005800	5.80	.2284"	2.48	0.866	0.1575	
88867005900	5.90	.2323"	2.48	0.866	0.1969	
88867006000	6.00	.2362"	2.48	0.866	0.1969	
88867006100	6.10	.2402"	2.48	0.866	0.1969	
88867006200	6.20	.2441"	2.48	0.866	0.1969	
88867006300	6.30	.2480"	2.48	0.866	0.1969	
88867006350	6.35	.2500"	2.48	0.866	0.1969	E / 1/4"
88867006400	6.40	.2520"	2.48	0.866	0.1969	
88867006500	6.50	.2559"	2.48	0.866	0.1969	
88867006600	6.60	.2598"	2.48	0.866	0.1969	
88867006700	6.70	.2638"	2.80	0.984	0.248	
88867006800	6.80	.2677"	2.80	0.984	0.248	
88867006900	6.90	.2717"	2.80	0.984	0.248	
88867007000	7.00	.2756"	2.80	0.984	0.248	
88867007100	7.10	.2795"	2.80	0.984	0.248	
88867007200	7.20	.2835"	2.80	0.984	0.248	
88867007300	7.30	.2874"	2.80	0.984	0.248	
88867007400	7.40	.2913"	2.80	0.984	0.248	
88867007500	7.50	.2956"	2.80	0.984	0.248	
88867007600	7.60	.2992"	2.80	0.984	0.248	
88867007700	7.70	.3031"	2.80	0.984	0.248	
88867007800	7.80	.3071"	2.80	0.984	0.248	
88867007900	7.90	.3110"	2.80	0.984	0.248	
88867007937	7.937	.3125"	2.80	0.984	0.248	5/16"

#	D mm	D inch	L	l1 Flute Length	Shank d2	Wire/Frac
88867008000	8.00	.3150"	2.80	0.984	0.248	
88867008100	8.10	.3189"	2.80	0.984	0.248	
88867008200	8.20	.3228"	2.80	0.984	0.248	
88867008300	8.30	.3268"	2.80	0.984	0.248	
88867008400	8.40	.3307"	2.80	0.984	0.248	
88867008500	8.50	.3346"	2.80	0.984	0.248	
88867008600	8.60	.3386"	2.80	0.984	0.315	
88867008700	8.70	.3425"	2.80	0.984	0.315	
88867008800	8.80	.3465"	2.80	0.984	0.315	
88867008900	8.90	.3504"	2.80	0.984	0.315	
88867009000	9.00	.3543"	2.80	0.984	0.315	
88867009100	9.10	.3583"	2.80	0.984	0.315	
88867009200	9.20	.3543"	2.80	0.984	0.315	
88867009300	9.30	.3661"	2.80	0.984	0.315	
88867009400	9.40	.3701"	2.80	0.984	0.315	
88867009500	9.50	.3740"	2.80	0.984	0.315	
88867009525	9.525	.3750"	2.80	0.984	0.315	3/8"
88867009600	9.60	.3780"	2.80	0.984	0.315	
88867009700	9.70	.3819"	2.80	0.984	0.315	
88867009800	9.80	.3858"	2.80	0.984	0.315	
88867009900	9.90	.3897"	2.80	0.984	0.315	
88867010000	10.00	.3937"	2.80	0.984	0.315	
88867010100	10.10	.3976"	2.80	0.984	0.315	
88867010200	10.20	.4016"	2.80	0.984	0.315	
88867010300	10.30	.4055"	2.80	0.984	0.315	
88867010400	10.40	.4094"	2.80	0.984	0.315	
88867010500	10.50	.4134"	2.80	0.984	0.315	
88867010600	10.60	.4173"	2.80	0.984	0.315	
88867010700	10.70	.4213"	3.15	1.102	0.394	
88867010800	10.80	.4252"	3.15	1.102	0.394	
88867010900	10.90	.4291"	3.15	1.102	0.394	
88867011000	11.00	.4331"	3.15	1.102	0.394	
88867011100	11.10	.4370"	3.15	1.102	0.394	
88867011112	11.112	.4375"	3.15	1.102	0.394	7/16"
88867011200	11.20	.4409"	3.15	1.102	0.394	
88867011300	11.30	.4449"	3.15	1.102	0.394	
88867011400	11.40	.4488"	3.15	1.102	0.394	
88867011500	11.50	.4528"	3.15	1.102	0.394	
88867011600	11.60	.4567"	3.15	1.102	0.394	
88867011700	11.70	.4606"	3.15	1.102	0.394	
88867011800	11.80	.4646"	3.15	1.102	0.394	
88867011900	11.90	.4685"	3.15	1.102	0.394	15/32
88867012000	12.00	.4724"	3.15	1.102	0.394	
88867012700	12.70	.5000"	3.15	1.102	0.394	1/2"





# HIGH PRECISION CARBIDE MICRO-REAMERS



**H4 TOLERANCE ± .00004"**

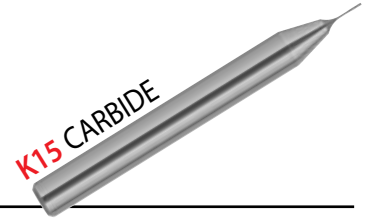
K15 CARBIDE — 6.5 - 7% Cobalt (0,006 - 0,008mm grain size)

EDP 8610				SIZE
#	mm	Decimal	Wire	
88861000200	0.200	.0079	92	
88861000205	0.205	.0081		
88861000210	0.210	.0083	91	
88861000215	0.215	.0085		
88861000220	0.220	.0087	90	
88861000225	0.225	.0089		
88861000230	0.230	.0091	89	
88861000235	0.235	.0093		
88861000240	0.240	.0094	88	
88861000245	0.245	.0096		
88861000250	0.250	.0098		
88861000255	0.255	.0100	87	
88861000260	0.260	.0102		
88861000265	0.265	.0104	86	
88861000270	0.270	.0106		
88861000275	0.275	.0108		
88861000280	0.280	.0110	85	
88861000285	0.285	.0112		
88861000290	0.290	.0114	84	
88861000295	0.295	.0116		
88861000300	0.300	.0118		
88861000305	0.305	.0120	83	
88861000310	0.310	.0122		
88861000315	0.315	.0124	82	
88861000320	0.320	.0126		
88861000325	0.325	.0128		
88861000330	0.330	.0130	81	

EDP 8610				SIZE
#	mm	Decimal	Wire	
88861000335	0.335	.0132		
88861000340	0.340	.0134	80	
88861000345	0.345	.0136		
88861000350	0.350	.0138		
88861000355	0.355	.0140		
88861000360	0.360	.0142		
88861000365	0.365	.0144	79	
88861000370	0.370	.0146		
88861000375	0.375	.0148		
88861000380	0.380	.0150		
88861000385	0.385	.0152		
88861000390	0.390	.0154		
88861000395	0.395	.0156		
88861000400	0.400	.0157		
88861000405	0.405	.0159	78	
88861000410	0.410	.0161		
88861000415	0.415	.0163		
88861000420	0.420	.0165		
88861000425	0.425	.0167		
88861000430	0.430	.0169		
88861000435	0.435	.0171		
88861000440	0.440	.0173		
88861000445	0.445	.0175		
88861000450	0.450	.0177		
88861000455	0.455	.0179	77	
88861000460	0.460	.0181		
88861000465	0.465	.0183		

EDP 8610				SIZE
#	mm	Decimal	Wire	
88861000470	0.470	.0185		
88861000475	0.475	.0187		
88861000480	0.480	.0189		
88861000485	0.485	.0191		
88861000490	0.490	.0193		
88861000495	0.495	.0195		
88861000500	0.500	.0197		
88861000505	0.505	.0199	76	
88861000510	0.510	.0201		
88861000515	0.515	.0203		
88861000520	0.520	.0205		
88861000525	0.525	.0207		
88861000530	0.530	.0209	75	
88861000535	0.535	.0211		
88861000540	0.540	.0213		
88861000545	0.545	.0215		
88861000550	0.550	.0217		
88861000555	0.555	.0219		
88861000560	0.560	.0220		
88861000565	0.565	.0222		
88861000570	0.570	.0224	74	
88861000575	0.575	.0226		
88861000580	0.580	.0228		
88861000585	0.585	.0230		
88861000590	0.590	.0232		
88861000595	0.595	.0234		

Left Hand Spiral - Right Hand Cut for Through Holes



**MICRO-PRECISION**

D .0002" increment	.1	.2	magaforce 8610
.0079 to .0096	.036	.079	EDP # SEE BELOW
.0098 to .0116	.043	.098	
.0118 to .0136	.055	.118	
.0138 to .0156	.067	.138	
.0157 to .0195	.079	.157	
.0197 to .0234	.091	.197	

Micro-reamers manufactured and stocked in all diameters at every .0002" increment. Their reinforced shank offers a greater stability necessary for these high precision tools.

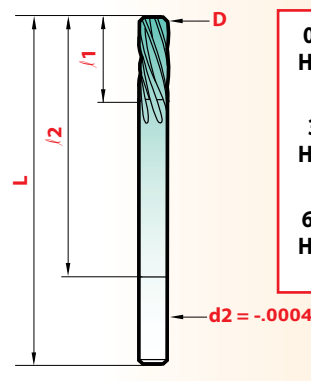
4 flutes, 20 degree left spiral, right hand cut.

Left Hand Spiral - Right Hand Cut for Through Holes

MICRO-PRECISION

D .0004" increment	r1	r2	L	d2	magaforce 8600
.0236 to .0413	.275	.393	1.30	D	EDP # SEE BELOW
.0417 to .0610	.393	.944	1.58	D	
.0614 to .0929	.433	1.220	1.97	D	
.0933 to .1476	.590	1.500	2.25	D	
.1480 to .1673	.748	1.930	2.95	.158	
.1677 to .1870	.827	2"	3.15	.177	
.1874 to .2087	.906	2.32	3.39	.197	
.2091 to .2284	1.024	2.559	3.66	.217	
.2288 to .2638	1.102	2.795	3.98	.236	
.2642 to .2972	1.220	3.071	4.29	.276	
.2976 to .3366	1.299	3.307	4.61	.315	
.3370 to .3760	1.417	3.465	4.92	.354	
.3763 to .3957	1.496	3.819	5.236	.394	
.3961 to .4350	1.496	3.819	5.236	.394	
.4354 to .4744	1.732	4.331	5.945	.472	
.4748 to .5138	1.732	4.331	5.945	.472	
.5535 to .5890	1.969	4.409	6.378	.551	
.5929 to .7500	2.047	4.606	6.693	0.630	
.7468 to .7500	2.283	5.354	7.441	0.630	

# HIGH PRECISION 8600 MINIATURE REAMERS



0,60 - 3,00mm  
H7 TOLERANCE  
0 + .00012"

3,00-6,00mm  
H8 TOLERANCE  
0 + .00016"

6,00-19,05mm  
H9 TOLERANCE  
0 + .00020"



K15 CARBIDE

REAMING

All reamers have a 45° chamfer lead  
 Ø .0236" to .0929" = 4 flutes, Ø .0933" to .5138" = 6 flutes,  
 10 degree left spiral/right hand cut for through holes.

EDP 8600				SIZE				EDP 8600				SIZE				EDP 8600				SIZE				EDP 8600				SIZE							
#	mm	Decimal	Wire	#	mm	Decimal	Wire	#	mm	Decimal	Wire	#	mm	Decimal	Wire	#	mm	Decimal	Wire	#	mm	Decimal	Wire	#	mm	Decimal	Wire	#	mm	Decimal	Wire	#	mm	Decimal	Wire
8886000600	0.60	.0236		8886000910	0.91	.0358	64	88860001220	1.22	.0480		88860001530	1.53	.0602																					
8886000610	0.61	.0240	73	8886000920	0.92	.0362		88860001230	1.23	.0484		88860001540	1.54	.0606																					
8886000620	0.62	.0244		8886000930	0.93	.0366		88860001240	1.24	.0488		88860001550	1.55	.0610																					
8886000630	0.63	.0248	72	8886000940	0.94	.0370	63	88860001250	1.25	.0492		88860001560	1.56	.0614																					
8886000640	0.64	.0252		8886000950	0.95	.0374		88860001260	1.26	.0496		88860001570	1.57	.0618																					
8886000650	0.65	.0256		8886000960	0.96	.0378	62	88860001270	1.27	.0500		88860001580	1.58	.0622																					
8886000660	0.66	.0260	71	8886000970	0.97	.0382		88860001280	1.28	.0504		88860001590	1.59	.0626																					
8886000670	0.67	.0264		8886000980	0.98	.0386		88860001290	1.29	.0508		88860001600	1.60	.0630																					
8886000680	0.68	.0268		8886000990	0.99	.0390	61	88860001300	1.30	.0512		88860001610	1.61	.0634	52																				
8886000690	0.69	.0272		8886001000	1.00	.0394		88860001310	1.31	.0516		88860001620	1.62	.0638																					
8886000700	0.70	.0276		8886001010	1.01	.0398	60	88860001320	1.32	.0520	55	88860001630	1.63	.0642																					
8886000710	0.71	.0280	70	8886001020	1.02	.0402		88860001330	1.33	.0524		88860001640	1.64	.0646																					
8886000720	0.72	.0283		8886001030	1.03	.0406		88860001340	1.34	.0528		88860001650	1.65	.0650																					
8886000730	0.73	.0287		8886001040	1.04	.0409	59	88860001350	1.35	.0531		88860001660	1.66	.0654																					
8886000740	0.74	.0291	69	8886001050	1.05	.0413		88860001360	1.36	.0535		88860001670	1.67	.0657																					
8886000750	0.75	.0295		8886001060	1.06	.0417		88860001370	1.37	.0539		88860001680	1.68	.0661																					
8886000760	0.76	.0299		8886001070	1.07	.0421	58	88860001380	1.38	.0543		88860001690	1.69	.0665																					
8886000770	0.77	.0303		8886001080	1.08	.0425		88860001390	1.39	.0547		88860001700	1.70	.0669	51																				
8886000780	0.78	.0307		8886001090	1.09	.0429	57	88860001400	1.40	.0551	54	88860001710	1.71	.0673																					
8886000790	0.79	.0311	68	8886001100	1.10	.0433		88860001410	1.41	.0555		88860001720	1.72	.0677																					
8886000800	0.80	.0315		8886001110	1.11	.0437		88860001420	1.42	.0559		88860001730	1.73	.0681																					
8886000810	0.81	.0319	67	8886001120	1.12	.0441		88860001430	1.43	.0563		88860001740	1.74	.0685																					
8886000820	0.82	.0323		8886001130	1.13	.0445		88860001440	1.44	.0567		88860001750	1.75	.0689																					
8886000830	0.83	.0327		8886001140	1.14	.0449		88860001450	1.45	.0571		88860001760	1.76	.0693																					
8886000840	0.84	.0331	66	8886001150	1.15	.0453		88860001460	1.46	.0575		88860001770	1.77	.0697																					
8886000850	0.85	.0335		8886001160	1.16	.0457		88860001470	1.47	.0579		88860001780	1.78	.0701	50																				
8886000860	0.86	.0339		8886001170	1.17	.0461		88860001480	1.48	.0583		88860001790	1.79	.0705																					
8886000870	0.87	.0343		8886001180	1.18	.0465	56	88860001490	1.49	.0587		88860001800	1.80	.0709																					
8886000880	0.88	.0346		8886001190	1.19	.0469		88860001500	1.50	.0590		88860001810	1.81	.0713																					
8886000890	0.89	.0350	65	8886001200	1.20	.0472		88860001510	1.51	.0594	53	88860001820	1.82	.0717																					
8886000900	0.90	.0354		8886001210	1.21	.0476		88860001520	1.52	.0598		88860001830	1.83	.0720																					

Note: larger sizes up to .790" Code 8600 and/or HSS-CO M35 Code 600 are available within 2 weeks. Call for information.

EDP 8600			SIZE	
#	mm	Decimal	Wire	
88860001840	1.84	.0724		
88860001850	1.85	.0728	49	
88860001860	1.86	.0732		
88860001870	1.87	.0736		
88860001880	1.88	.0740		
88860001890	1.89	.0744		
88860001900	1.90	.0748		
88860001910	1.91	.0752		
88860001920	1.92	.0756		
88860001930	1.93	.0760	48	
88860001940	1.94	.0764		
88860001950	1.95	.0768		
88860001960	1.96	.0772		
88860001970	1.97	.0776		
88860001980	1.98	.0780		
88860001990	1.99	.0783	47	
88860002000	2.00	.0787		
88860002010	2.01	.0791		
88860002020	2.02	.0795		
88860002030	2.03	.0799		
88860002040	2.04	.0803		
88860002050	2.05	.0807		
88860002060	2.06	.0811	46	
88860002070	2.07	.0815		
88860002080	2.08	.0819	45	
88860002090	2.09	.0823		
88860002100	2.10	.0827		
88860002110	2.11	.0831		
88860002120	2.12	.0835		
88860002130	2.13	.0839		
88860002140	2.14	.0843		
88860002150	2.15	.0846		
88860002160	2.16	.0850		
88860002170	2.17	.0854		
88860002180	2.18	.0858	44	
88860002190	2.19	.0862		
88860002200	2.20	.0866		
88860002210	2.21	.0870		
88860002220	2.22	.0874		
88860002230	2.23	.0878		
88860002240	2.24	.0882		
88860002250	2.25	.0886		
88860002260	2.26	.0890	43	
88860002270	2.27	.0894		
88860002280	2.28	.0898		
88860002290	2.29	.0902		

EDP 8600			SIZE	
#	mm	Decimal	Wire	
88860002300	2.30	.0906		
88860002310	2.31	.0909		
88860002320	2.32	.0913		
88860002330	2.33	.0917		
88860002340	2.34	.0921		
88860002350	2.35	.0925		
88860002360	2.36	.0929		
88860002370	2.37	.0933	42	
88860002380	2.38	.0937		
88860002390	2.39	.0941		
88860002400	2.40	.0945		
88860002410	2.41	.0949		
88860002420	2.42	.0953		
88860002430	2.43	.0957		
88860002440	2.44	.0961	41	
88860002450	2.45	.0965		
88860002460	2.46	.0969		
88860002470	2.47	.0972		
88860002480	2.48	.0976		
88860002490	2.49	.0980	40	
88860002500	2.50	.0984		
88860002510	2.51	.0988		
88860002520	2.52	.0992		
88860002530	2.53	.0996	39	
88860002540	2.54	.1000		
88860002550	2.55	.1004		
88860002560	2.56	.1008		
88860002570	2.57	.1012		
88860002580	2.58	.1016	38	
88860002590	2.59	.1020		
88860002600	2.60	.1024		
88860002610	2.61	.1028		
88860002620	2.62	.1031		
88860002630	2.63	.1035		
88860002640	2.64	.1039	37	
88860002650	2.65	.1043		
88860002660	2.66	.1047		
88860002670	2.67	.1051		
88860002680	2.68	.1055		
88860002690	2.69	.1059		
88860002700	2.70	.1063	36	
88860002710	2.71	.1067		
88860002720	2.72	.1071		
88860002730	2.73	.1075		
88860002740	2.74	.1079		
88860002750	2.75	.1083		

EDP 8600			SIZE	
#	mm	Decimal	Wire	
88860002760	2.76	.1087		
88860002770	2.77	.1091		
88860002780	2.78	.1094		
88860002790	2.79	.1098	35	
88860002800	2.80	.1102		
88860002810	2.81	.1106		
88860002820	2.82	.1110	34	
88860002830	2.83	.1114		
88860002840	2.84	.1118		
88860002850	2.85	.1122		
88860002860	2.86	.1126		
88860002870	2.87	.1130	33	
88860002880	2.88	.1134		
88860002890	2.89	.1138		
88860002900	2.90	.1142		
88860002910	2.91	.1146		
88860002920	2.92	.1150		
88860002930	2.93	.1154		
88860002940	2.94	.1157		
88860002950	2.95	.1161	32	
88860002960	2.96	.1165		
88860002970	2.97	.1169		
88860002980	2.98	.1173		
88860002990	2.99	.1177		
88860003000	3.00	.1181		
88860003010	3.01	.1185		
88860003020	3.02	.1189		
88860003030	3.03	.1193		
88860003040	3.04	.1197		
88860003050	3.05	.1201	31	
88860003060	3.06	.1205		
88860003070	3.07	.1209		
88860003080	3.08	.1213		
88860003090	3.09	.1217		
88860003100	3.10	.1220		
88860003110	3.11	.1224		
88860003120	3.12	.1228		
88860003130	3.13	.1232		
88860003140	3.14	.1236		
88860003150	3.15	.1240		
88860003160	3.16	.1244		
88860003170	3.17	.1248		
88860003175	3.175	.1250		
88860003180	3.18	.1252		
88860003190	3.19	.1256		
88860003200	3.20	.1260		

EDP 8600			SIZE	
#	mm	Decimal	Wire	
88860003210	3.21	.1264		
88860003220	3.22	.1268		
88860003230	3.23	.1272		
88860003240	3.24	.1276		
88860003250	3.25	.1280		
88860003260	3.26	.1283	30	
88860003270	3.27	.1287		
88860003280	3.28	.1291		
88860003290	3.29	.1295		
88860003300	3.30	.1299		
88860003310	3.31	.1303		
88860003320	3.32	.1308		
88860003330	3.33	.1311		
88860003340	3.34	.1315		
88860003350	3.35	.1319		
88860003360	3.36	.1323		
88860003370	3.37	.1327		
88860003380	3.38	.1331		
88860003390	3.39	.1335		
88860003400	3.40	.1339		
88860003410	3.41	.1343		
88860003420	3.42	.1346		
88860003430	3.43	.1350		
88860003440	3.44	.1354		
88860003450	3.45	.1358	29	
88860003460	3.46	.1362		
88860003470	3.47	.1366		
88860003480	3.48	.1370		
88860003490	3.49	.1374		
88860003500	3.50	.1378		
88860003510	3.51	.1382		
88860003520	3.52	.1386		
88860003530	3.53	.1390		
88860003540	3.54	.1394		
88860003550	3.55	.1398		
88860003560	3.56	.1402		
88860003570	3.57	.1406	28	
88860003580	3.58	.1409		
88860003590	3.59	.1413		
88860003600	3.60	.1417		
88860003610	3.61	.1421		
88860003620	3.62	.1425		
88860003630	3.63	.1429		
88860003640	3.64	.1433		
88860003650	3.65	.1437		
88860003660	3.66	.1441	27	

K15 CARBIDE — 6.5 - 7% Cobalt (0,006 - 0,008mm grain size)

EDP 8600				EDP 8600				EDP 8600				EDP 8600			
			SIZE				SIZE				SIZE				SIZE
#	mm	Decimal	Wire	#	mm	Decimal	Wire	#	mm	Decimal	Wire	#	mm	Decimal	Wire
88860003670	3.67	.1445		88860004130	4.13	.1626		88860004590	4.59	.1807		88860005040	5.04	.1984	
88860003680	3.68	.1449		88860004140	4.14	.1630		88860004600	4.60	.1811		88860005050	5.05	.1988	8
88860003690	3.69	.1453		88860004150	4.15	.1634		88860004610	4.61	.1815		88860005060	5.06	.1992	
88860003700	3.70	.1457		88860004160	4.16	.1638		88860004620	4.62	.1819	14	88860005070	5.07	.1996	
88860003710	3.71	.1461		88860004170	4.17	.1642		88860004630	4.63	.1823		88860005080	5.08	.2000	
88860003720	3.72	.1465		88860004180	4.18	.1646		88860004640	4.64	.1827		88860005090	5.09	.2004	
88860003730	3.73	.1469	26	88860004190	4.19	.1650		88860004650	4.65	.1831		88860005100	5.10	.2008	7
88860003740	3.74	.1472		88860004200	4.20	.1654		88860004660	4.66	.1835		88860005110	5.11	.2012	
88860003750	3.75	.1476		88860004210	4.21	.1657		88860004670	4.67	.1839		88860005120	5.12	.2016	
88860003760	3.76	.1480		88860004220	4.22	.1661	19	88860004680	4.68	.1843		88860005130	5.13	.2020	
88860003770	3.77	.1484		88860004230	4.23	.1665		88860004690	4.69	.1846		88860005140	5.14	.2024	
88860003780	3.78	.1488		88860004240	4.24	.1669		88860004700	4.70	.1850	13	88860005150	5.15	.2028	
88860003790	3.79	.1492		88860004250	4.25	.1673		88860004710	4.71	.1854		88860005160	5.16	.2031	
88860003800	3.80	.1496	25	88860004260	4.26	.1677		88860004720	4.72	.1858		88860005170	5.17	.2035	
88860003810	3.81	.1500		88860004270	4.27	.1681		88860004730	4.73	.1862		88860005180	5.18	.2039	6
88860003820	3.82	.1504		88860004280	4.28	.1685		88860004740	4.74	.1866		88860005190	5.19	.2043	
88860003830	3.83	.1508		88860004290	4.29	.1689		88860004750	4.75	.1870		88860005200	5.20	.2047	
88860003840	3.84	.1512		88860004300	4.30	.1693	18	88860004760	4.76	.1874		88860005210	5.21	.2051	
88860003850	3.85	.1516		88860004310	4.31	.1697		88865004762	4.763	.1875		88860005220	5.22	.2055	5
88860003860	3.86	.1520	24	88860004320	4.32	.1701		88860004770	4.77	.1878		88860005230	5.23	.2059	
88860003870	3.87	.1524		88860004330	4.33	.1705		88860004780	4.78	.1882		88860005240	5.24	.2063	
88860003880	3.88	.1528		88860004340	4.34	.1709		88860004790	4.79	.1886		88860005250	5.25	.2067	
88860003890	3.89	.1531		88860004350	4.35	.1713		88860004800	4.80	.1890	12	88860005260	5.26	.2071	
88860003900	3.90	.1535		88860004360	4.36	.1717		88860004810	4.81	.1894		88860005270	5.27	.2075	
88860003910	3.91	.1539	23	88860004370	4.37	.1720		88860004820	4.82	.1898		88860005280	5.28	.2079	
88860003920	3.92	.1543		88860004380	4.38	.1724		88860004830	4.83	.1902		88860005290	5.29	.2083	
88860003930	3.93	.1547		88860004390	4.39	.1728	17	88860004840	4.84	.1906		88860005300	5.30	.2087	
88860003940	3.94	.1551		88860004400	4.40	.1732		88860004850	4.85	.1909	11	88860005310	5.31	.2091	4
88860003950	3.95	.1555		88860004410	4.41	.1736		88860004860	4.86	.1913		88860005320	5.32	.2094	
88860003960	3.96	.1559		88860004420	4.42	.1740		88860004870	4.87	.1917		88860005330	5.33	.2098	
88860003970	3.97	.1563		88860004430	4.43	.1744		88860004880	4.88	.1921		88860005340	5.34	.2102	
88860003980	3.98	.1567		88860004440	4.44	.1748		88860004890	4.89	.1925		88860005350	5.35	.2106	
88860003990	3.99	.1571	22	88860004450	4.45	.1752		88860004900	4.90	.1929		88860005360	5.36	.2110	
88860004000	4.00	.1575		88860004460	4.46	.1756		88860004910	4.91	.1933	10	88860005370	5.37	.2114	
88860004010	4.01	.1579		88860004470	4.47	.1760		88860004920	4.92	.1937		88860005380	5.38	.2118	
88860004020	4.02	.1583		88860004480	4.48	.1764		88860004930	4.93	.1941		88860005390	5.39	.2122	
88860004030	4.03	.1587		88860004490	4.49	.1768	16	88860004940	4.94	.1945		88860005400	5.40	.2126	
88860004040	4.04	.1591	21	88860004500	4.50	.1772		88860004950	4.95	.1949		88860005410	5.41	.2130	3
88860004050	4.05	.1594		88860004510	4.51	.1776		88860004960	4.96	.1953		88860005420	5.42	.2134	
88860004060	4.06	.1598		88860004520	4.52	.1780		88860004970	4.97	.1957		88860005430	5.43	.2138	
88860004070	4.07	.1602		88860004530	4.53	.1783		88860004980	4.98	.1961	9	88860005440	5.44	.2142	
88860004080	4.08	.1606		88860004540	4.54	.1787		88860004990	4.99	.1965		88860005450	5.45	.2146	
88860004090	4.09	.1610	20	88860004550	4.55	.1791		88860005000	5.00	.1969		88860005460	5.46	.2150	
88860004100	4.10	.1614		88860004560	4.56	.1795		88860005010	5.01	.1972		88860005470	5.47	.2154	
88860004110	4.11	.1618		88860004570	4.57	.1799	15	88860005020	5.02	.1976		88860005480	5.48	.2158	
88860004120	4.12	.1622		88860004580	4.58	.1803		88860005030	5.03	.1980		88860005490	5.49	.2161	



EDP 8600				EDP 8600				EDP 8600				EDP 8600			
			SIZE				SIZE				SIZE				SIZE
#	mm	Decimal	Wire	#	mm	Decimal	Wire	#	mm	Decimal	Wire	#	mm	Decimal	Wire
88860005500	5.50	.2165		88860005960	5.96	.2347		88860006420	6.42	.2528		88860006880	6.88	.2709	
88860005510	5.51	.2169		88860005970	5.97	.2350		88860006430	6.43	.2531		88860006890	6.89	.2713	
88860005520	5.52	.2173		88860005980	5.98	.2354		88860006440	6.44	.2535		88860006900	6.90	.2717	
88860005530	5.53	.2177		88860005990	5.99	.2358		88860006450	6.45	.2539		88860006910	6.91	.2720	I
88860005540	5.54	.2181		88860006000	6.00	.2362		88860006460	6.46	.2543		88860006920	6.92	.2724	
88860005550	5.55	.2185		88860006010	6.01	.2366		88860006470	6.47	.2547		88860006930	6.93	.2728	
88860005560	5.56	.2189		88860006020	6.02	.2370		88860006480	6.48	.2551		88860006940	6.94	.2732	
88860005570	5.57	.2193		88860006030	6.03	.2374		88860006490	6.49	.2555		88860006950	6.95	.2736	
88860005580	5.58	.2197		88860006040	6.04	.2378		88860006500	6.50	.2559		88860006960	6.96	.2740	
88860005590	5.59	.2201		88860006050	6.05	.2382	B	88860006510	6.51	.2563		88860006970	6.97	.2744	
88860005600	5.60	.2205		88860006060	6.06	.2386		88860006520	6.52	.2567		88860006980	6.98	.2748	
88860005610	5.61	.2209	2	88860006070	6.07	.2390		88860006530	6.53	.2571	F	88860006990	6.99	.2752	
88860005620	5.62	.2213		88860006080	6.08	.2394		88860006540	6.54	.2575		88860007000	7.00	.2756	
88860005630	5.63	.2217		88860006090	6.09	.2398		88860006550	6.55	.2579		88860007010	7.01	.2760	
88860005640	5.64	.2220		88860006100	6.10	.2402		88860006560	6.56	.2583		88860007020	7.02	.2764	
88860005650	5.65	.2224		88860006110	6.11	.2406		88860006570	6.57	.2587		88860007030	7.03	.2768	J
88860005660	5.66	.2228		88860006120	6.12	.2410		88860006580	6.58	.2591		88860007040	7.04	.2772	
88860005670	5.67	.2232		88860006130	6.13	.2413		88860006590	6.59	.2594		88860007050	7.05	.2776	
88860005680	5.68	.2236		88860006140	6.14	.2417		88860006600	6.60	.2598		88860007060	7.06	.2780	
88860005690	5.69	.2240		88860006150	6.15	.2421	C	88860006610	6.61	.2602		88860007070	7.07	.2783	
88860005700	5.70	.2244		88860006160	6.16	.2425		88860006620	6.62	.2606		88860007080	7.08	.2787	
88860005710	5.71	.2248		88860006170	6.17	.2429		88860006630	6.63	.2610	G	88860007090	7.09	.2791	
88860005720	5.72	.2252		88860006180	6.18	.2433		88860006640	6.64	.2614		88860007100	7.10	.2795	
88860005730	5.73	.2256		88860006190	6.19	.2437		88860006650	6.65	.2618		88860007110	7.11	.2799	
88860005740	5.74	.2260		88860006200	6.20	.2441		88860006660	6.66	.2622		88860007120	7.12	.2803	
88860005750	5.75	.2264		88860006210	6.21	.2445		88860006670	6.67	.2626		88860007130	7.13	.2807	
88860005760	5.76	.2268		88860006220	6.22	.2449		88860006680	6.68	.2630		88860007140	7.14	.2811	K
88860005770	5.77	.2272		88860006230	6.23	.2453		88860006690	6.69	.2634		88860007150	7.15	.2815	
88860005780	5.78	.2276		88860006240	6.24	.2457		88860006700	6.70	.2638		88860007160	7.16	.2819	
88860005790	5.79	.2280	1	88860006250	6.25	.2461	D	88860006710	6.71	.2642		88860007170	7.17	.2823	
88860005800	5.80	.2284		88860006260	6.26	.2465		88860006720	6.72	.2646		88860007180	7.18	.2827	
88860005810	5.81	.2288		88860006270	6.27	.2468		88860006730	6.73	.2650		88860007190	7.19	.2831	
88860005820	5.82	.2291		88860006280	6.28	.2472		88860006740	6.74	.2654		88860007200	7.20	.2835	
88860005830	5.83	.2295		88860006290	6.29	.2476		88860006750	6.75	.2657		88860007210	7.21	.2839	
88860005840	5.84	.2299		88860006300	6.30	.2480		88860006760	6.76	.2661	H	88860007220	7.22	.2843	
88860005850	5.85	.2303		88860006310	6.31	.2484		88860006770	6.77	.2665		88860007230	7.23	.2846	
88860005860	5.86	.2307		88860006320	6.32	.2488		88860006780	6.78	.2669		88860007240	7.24	.2850	
88860005870	5.87	.2311		88860006330	6.33	.2492		88860006790	6.79	.2673		88860007250	7.25	.2854	
88860005880	5.88	.2315		88860006340	6.34	.2496		88860006800	6.80	.2677		88860007260	7.26	.2858	
88860005890	5.89	.2319		88860006350	6.35	.2500	E	88860006810	6.81	.2681		88860007270	7.27	.2862	
88860005900	5.90	.2323		88860006360	6.36	.2504		88860006820	6.82	.2685		88860007280	7.28	.2866	
88860005910	5.91	.2327		88860006370	6.37	.2508		88860006830	6.83	.2689		88860007290	7.29	.2870	
88860005920	5.92	.2331		88860006380	6.38	.2512		88860006840	6.84	.2693		88860007300	7.30	.2874	
88860005930	5.93	.2335		88860006390	6.39	.2517		88860006850	6.85	.2697		88860007310	7.31	.2878	
88860005940	5.94	.2339	A	88860006400	6.40	.2520		88860006860	6.86	.2701		88860007320	7.32	.2882	
88860005950	5.95	.2343		88860006410	6.41	.2524		88860006870	6.87	.2705		88860007330	7.33	.2886	

EDP 8600				SIZE	EDP 8600				SIZE	EDP 8600				SIZE	EDP 8600				SIZE										
#	mm	Decimal	Wire		#	mm	Decimal	Wire		#	mm	Decimal	Wire		#	mm	Decimal	Wire		#	mm	Decimal	Wire						
88860007340	7.34	.2890			88860007800	7.80	.3071			88860008250	8.25	.3248			88860008710	8.71	.3429			88860008260	8.26	.3252			88860008720	8.72	.3433		
88860007350	7.35	.2894			88860007810	7.81	.3075			88860008270	8.27	.3256			88860008730	8.73	.3437			88860008280	8.28	.3260			88860008740	8.74	.3441		
88860007360	7.36	.2898	L		88860007820	7.82	.3079			88860008290	8.29	.3264			88860008750	8.75	.3445			88860008300	8.30	.3268			88860008760	8.76	.3449		
88860007370	7.37	.2902			88860007830	7.83	.3083			88860008310	8.31	.3272			88860008770	8.77	.3453			88860008320	8.32	.3276			88860008780	8.78	.3457		
88860007380	7.38	.2906			88860007840	7.84	.3087			88860008330	8.33	.3280			88860008790	8.79	.3461			88860008340	8.34	.3283			88860008800	8.80	.3465		
88860007390	7.39	.2909			88860007850	7.85	.3091			88860008350	8.35	.3287			88860008810	8.81	.3469			88860008360	8.36	.3291			88860008820	8.82	.3472		
88860007400	7.40	.2913			88860007860	7.86	.3094			88860008370	8.37	.3295			88860008830	8.83	.3476			88860008380	8.38	.3299			88860008840	8.84	.3480	S	
88860007410	7.41	.2917			88860007870	7.87	.3098			88860008390	8.39	.3303			88860008850	8.85	.3484			88860008410	8.41	.3311			88860008860	8.86	.3488		
88860007420	7.42	.2921			88860007880	7.88	.3102			88860008420	8.42	.3315			88860008870	8.87	.3492			88860008430	8.43	.3319	Q		88860008880	8.88	.3496		
88860007430	7.43	.2925			88860007890	7.89	.3106			88860008440	8.44	.3323			88860008890	8.89	.3500			88860008450	8.45	.3327			88860008900	8.90	.3504		
88860007440	7.44	.2929			88860007900	7.90	.3110			88860008460	8.46	.3331			88860008910	8.91	.3508			88860008470	8.47	.3335			88860008920	8.92	.3512		
88860007450	7.45	.2933			88860007910	7.91	.3114			88860008480	8.48	.3339			88860008930	8.93	.3516			88860008490	8.49	.3343			88860008940	8.94	.3520		
88860007460	7.46	.2937			88860007920	7.92	.3118			88860008500	8.50	.3346			88860008950	8.95	.3524			88860008510	8.51	.3350			88860008960	8.96	.3528		
88860007470	7.47	.2941			88860007930	7.93	.3122			88860008520	8.52	.3354			88860008970	8.97	.3531			88860008530	8.53	.3358			88860008980	8.98	.3535		
88860007480	7.48	.2945			88865007937	7.938	.3125			88860008540	8.54	.3362			88860008990	8.99	.3539			88860008540	8.54	.3362			88860009000	9.00	.3543		
88860007490	7.49	.2949	M		88860007940	7.94	.3126			88860008550	8.55	.3366			88860009010	9.01	.3547			88860008550	8.55	.3366			88860009020	9.02	.3551		
88860007500	7.50	.2953			88860007950	7.95	.3130			88860008560	8.56	.3370			88860009030	9.03	.3555			88860008560	8.56	.3370			88860009040	9.04	.3559		
88860007510	7.51	.2957			88860007960	7.96	.3134			88860008570	8.57	.3374			88860009050	9.05	.3563			88860008570	8.57	.3374			88860009060	9.06	.3567		
88860007520	7.52	.2961			88860007970	7.97	.3138			88860008580	8.58	.3378			88860009070	9.07	.3571			88860008580	8.58	.3378			88860009080	9.08	.3575		
88860007530	7.53	.2965			88860007980	7.98	.3142			88860008590	8.59	.3382			88860009090	9.09	.3579	T		88860008590	8.59	.3382			88860009100	9.10	.3583		
88860007540	7.54	.2969			88860007990	7.99	.3146			88860008600	8.60	.3386			88860009110	9.11	.3587			88860008600	8.60	.3386			88860009120	9.12	.3591		
88860007550	7.55	.2972			88860008000	8.00	.3150			88860008610	8.61	.3390	R		88860009130	9.13	.3594			88860008610	8.61	.3390	R		88860009140	9.14	.3598		
88860007560	7.56	.2976			88860008010	8.01	.3154			88860008620	8.62	.3394			88860009150	9.15	.3602			88860008620	8.62	.3394			88860009160	9.16	.3606		
88860007570	7.57	.2980			88860008020	8.02	.3157			88860008630	8.63	.3398								88860008630	8.63	.3398							
88860007580	7.58	.2984			88860008030	8.03	.3161	O		88860008640	8.64	.3402								88860008640	8.64	.3402							
88860007590	7.59	.2988			88860008040	8.04	.3165			88860008650	8.65	.3406								88860008650	8.65	.3406							
88860007600	7.60	.2992			88860008050	8.05	.3169			88860008660	8.66	.3409								88860008660	8.66	.3409							
88860007610	7.61	.2996			88860008060	8.06	.3173			88860008670	8.67	.3413								88860008670	8.67	.3413							
88860007620	7.62	.3000			88860008070	8.07	.3177			88860008680	8.68	.3417								88860008680	8.68	.3417							
88860007630	7.63	.3004			88860008080	8.08	.3181			88860008690	8.69	.3421								88860008690	8.69	.3421							
88860007640	7.64	.3008			88860008090	8.09	.3185			88860008700	8.70	.3425								88860008700	8.70	.3425							
88860007650	7.65	.3012			88860008100	8.10	.3189																						
88860007660	7.66	.3016			88860008110	8.11	.3193																						
88860007670	7.67	.3020	N		88860008120	8.12	.3197																						
88860007680	7.68	.3024			88860008130	8.13	.3201																						
88860007690	7.69	.3028			88860008140	8.14	.3205																						
88860007700	7.70	.3031			88860008150	8.15	.3209																						
88860007710	7.71	.3035			88860008160	8.16	.3213																						
88860007720	7.72	.3039			88860008170	8.17	.3217																						
88860007730	7.73	.3043			88860008180	8.18	.3220																						
88860007740	7.74	.3047			88860008190	8.19	.3224																						
88860007750	7.75	.3051			88860008200	8.20	.3228	P																					
88860007760	7.76	.3055			88860008210	8.21	.3232																						
88860007770	7.77	.3059			88860008220	8.22	.3236																						
88860007780	7.78	.3063			88860008230	8.23	.3240																						
88860007790	7.79	.3067			88860008240	8.24	.3244																						

EDP 8600			SIZE
#	mm	Decimal	Wire
88860009170	9.17	.3610	
88860009180	9.18	.3614	
88860009190	9.19	.3618	
88860009200	9.20	.3622	
88860009210	9.21	.3626	
88860009220	9.22	.3630	
88860009230	9.23	.3634	
88860009240	9.24	.3638	
88860009250	9.25	.3642	
88860009260	9.26	.3646	
88860009270	9.27	.3650	
88860009280	9.28	.3654	
88860009290	9.29	.3657	
88860009300	9.30	.3661	
88860009310	9.31	.3665	
88860009320	9.32	.3669	
88860009330	9.33	.3673	
88860009340	9.34	.3677	
88860009350	9.35	.3681	U
88860009360	9.36	.3685	
88860009370	9.37	.3689	
88860009380	9.38	.3693	
88860009390	9.39	.3697	
88860009400	9.40	.3701	
88860009410	9.41	.3705	
88860009420	9.42	.3709	
88860009430	9.43	.3713	
88860009440	9.44	.3717	
88860009450	9.45	.3720	
88860009460	9.46	.3724	
88860009470	9.47	.3728	
88860009480	9.48	.3732	
88860009490	9.49	.3736	
88860009500	9.50	.3740	
88860009510	9.51	.3744	
88860009520	9.52	.3748	
88865009525	9.525	.3750	
88860009530	9.53	.3752	
88860009540	9.54	.3756	
88860009550	9.55	.3760	
88860009560	9.56	.3763	
88860009570	9.57	.3767	
88860009650	9.65	.	
88860009730	9.73	.	

EDP 8600			SIZE
#	mm	Decimal	Wire
<b>25/64" Range</b>			
88860009870	9.87	.3886	
88860009880	9.88	.3889	
88860009890	9.89	.3893	
88860009900	9.90	.3897	
88860009910	9.91	.3901	
88860009920	9.92	.3905	
88860009930	9.93	.3909	
88860009940	9.94	.3913	
88860009950	9.95	.3917	
88860009960	9.96	.3921	
<b>10mm Range</b>			
88860009970	9.97	.3925	
88860009980	9.98	.3929	
88860009990	9.99	.3933	
88860010000	10.00	.3937	
88860010010	10.01	.3941	
88860010020	10.02	.3945	
88860010030	10.03	.3949	
88860010040	10.04	.3953	
88860010050	10.05	.3957	
<b>27/64" Range</b>			
88860010660	10.66	.4197	
88860010670	10.67	.4201	
88860010680	10.68	.4205	
88860010690	10.69	.4209	
88860010700	10.70	.4213	
88860010710	10.71	.4217	
88860010720	10.72	.4220	
88860010730	10.73	.4224	
88860010740	10.74	.4228	
88860010750	10.75	.4232	
88860010760	10.76	.4236	
<b>11 mm Range</b>			
88860010950	10.95	.4311	
88860010960	10.96	.4315	
88860010970	10.97	.4319	
88860010980	10.98	.4323	
88860010990	10.99	.4327	
88860011000	11.00	.4331	
88860011010	11.01	.4335	
88860011020	11.02	.4339	
88860011030	11.03	.4343	
88860011040	11.04	.4346	
88860011050	11.05	.4350	

EDP 8600			SIZE
#	mm	Decimal	Wire
<b>7/16" Range</b>			
88860011060	11.06	.4354	
88860011070	11.07	.4358	
88860011080	11.08	.4362	
88860011090	11.09	.4366	
88860011100	11.10	.4370	
88860011110	11.11	.4374	
88865011112	11.113	.4375	
88860011120	11.12	.4378	
88860011130	11.13	.4382	
88860011140	11.14	.4386	
88860011150	11.15	.4390	
88860011160	11.16	.4394	
88860011170	11.17		
<b>29/64" &amp; 11.5 mm Range</b>			
88860011450	11.45	.4508	
88860011460	11.46	.4512	
88860011470	11.47	.4516	
88860011480	11.48	.4520	
88860011490	11.49	.4524	
88860011500	11.50	.4528	
88860011510	11.51	.4531	
88860011520	11.52	.4535	
88860011530	11.53	.4539	
88860011540	11.54	.4543	
88860011550	11.55	.4547	
<b>5/32" Range</b>			
88860011850	11.85	.4665	
88860011860	11.86	.4669	
88860011870	11.87	.4673	
88860011880	11.88	.4677	
88860011890	11.89	.4681	
88860011900	11.90	.4685	
88860011910	11.91	.4689	
88860011920	11.92	.4693	
88860011930	11.93	.4697	
<b>12 mm Range</b>			
88860011940	11.94	.4701	
88860011950	11.95	.4705	
88860011960	11.96	.4709	
88860011970	11.97	.4713	
88860011980	11.98	.4717	
88860011990	11.99	.4720	
88860012000	12.00	.4724	
88860012010	12.01	.4728	

EDP 8600			SIZE
#	mm	Decimal	Wire
88860012020	12.02	.4732	
88860012030	12.03	.4736	
88860012040	12.04	.4740	
88860012050	12.05	.4744	
<b>31/64" Range</b>			
88860012250	12.25	.4823	
88860012260	12.26	.4827	
88860012270	12.27	.4831	
88860012280	12.28	.4835	
88860012290	12.29	.4839	
88860012300	12.30	.4843	
88860012310	12.31	.4846	
88860012320	12.32	.4850	
88860012330	12.33	.4854	
88860012340	12.34	.4858	
88860012350	12.35	.4862	
<b>1/2" Range</b>			
88860012650	12.65	.4980	
88860012660	12.66	.4984	
88860012670	12.67	.4988	
88860012680	12.68	.4992	
88860012690	12.69	.4996	
88860012700	12.70	.5000	
88860012710	12.71	.5004	
88860012720	12.72	.5008	
88860012730	12.73	.5012	
88860012740	12.74	.5016	
88860012750	12.75	.5020	
88860012940	12.94	.5094	
88860012950	12.95	.5098	
88860012960	12.96	.5102	
88860012970	12.97	.5106	
88860012980	12.98	.5110	
88860012990	12.99	.5114	
<b>13 mm Range</b>			
88860013000	13.00	.5118	
88860013010	13.01	.5122	
88860013020	13.02	.5126	
88860013030	13.03	.5130	
88860013040	13.04	.5134	
88860013050	13.05	.5138	
88865014287	14.287	.5625	
88865015875	15.875	.6250	
88865019050	19.050	.7500	

K15 CARBIDE — 6.5 - 7% Cobalt (0,006 - 0,008mm grain size)

# HIGH PRECISION MICRO REAMERS

**Correct Hole Sizes  
For Best Reamer Results!**

Over 1,108 Standard Sizes.  
Starting at .0078 in .0002" increments to .0236"  
In .0004" increments to .5020"

All Magafor Micro & Miniature Solid Carbide Reamers are left hand spiral – right hand cut with a 45° Lead.

Designed for through holes or holes with enough room to accommodate a small amount of waste material.

The left hand spiral acts like an Archimedean Screw, Coolant is directly led to the cutting edges for better lubrication & cooling! Chips are pushed forward with no scratches & outstanding surface finishes!

## Final Hole Size to Drilled Hole Size Chart

FINAL HOLE REAMER SIZE mm / inch	Reduce Drill Hole Size By....INCH MIN / MAX	Reduce Drill Hole Size By....MM MIN / MAX
0.20 / .00787	-0.00157" / -0.00236"	-0.04mm / -0.06mm
0.30 / .01181	-0.00197" / -0.00315"	-0.05mm / -0.08mm
0.40 / .01575	-0.00197" / -0.00394"	-0.05mm / -0.10mm
0.50 / .01969	-0.00197" / -0.00472"	-0.05mm / -0.12mm
0.60 / .02362	-0.00197" / -0.00472"	-0.05mm / -0.12mm
2.00 / .07874	-0.00197" / -0.00472"	-0.05mm / -0.12mm
6.00 / .23622	-0.00591" / -0.00787"	-0.15mm / -0.20mm
10.00 / .39370	-0.00591" / -0.00787"	-0.15mm / -0.20mm
15.00 / .59055	-0.01181" / -0.01575"	-0.30mm / -0.40mm
20.00 / .78740	-0.01181" / -0.01575"	-0.30mm / -0.40mm
25.00 / .98425	-0.01181" / -0.01969"	-0.30mm / -0.50mm
15.00 / .59055	-0.01181" / -0.01575"	-0.30mm / -0.40mm
20.00 / .78740	-0.01181" / -0.01575"	-0.30mm / -0.40mm
25.00 / .98425	-0.01181" / -0.01969"	-0.30mm / -0.50mm

## Ultra Precision FLOATING REAMER HOLDERS

Complete Orbital Float for True Alignment

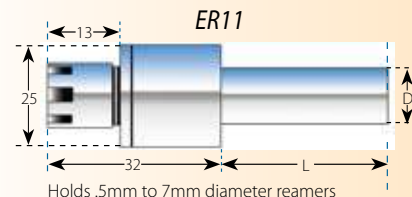
Designed with "True Orbital Float" capability, the micro reamer holder aligns the reamer perfectly to the drilled hole enabling better size control, reduces "bell-mouthing", and increases tool life.

**True  
Orbital Float!**



### ER11 Floating Reamer Holder with Mini-Nut Assembly

Item No.	D	L
HSP-11-010-042	10mm	42
HSP-11-190-042	3/4"	2.75
HSP-11-200-042	20mm	41.5
HSP-11-220-042	22mm	41.5



### Accessory Components

Item No.	Description
HSP-04621	ER11 Mini Wrench
HSP-ER11-MNS	ER11 Mini Nut



### Collet Sets

Item No.	Description
HSP-11R-S7-ISP	7pc ER11 Inch Bore Collet Set Size Range 1/16, 3/32, 1/8, 5/32, 3/16, 7/32, 1/4"
HSP-11R-S13-MSP	13pc ER11 Metric Bore Collet Set Size Range .5 - 7mm in .5mm increments
HSP-11R-S13-MUP	13pc ULTRA PRECISION Metric Bore Collet Set (.0002" TIR) Size Range .5 - 7mm in .5mm increments
HSP-11R-S13-IUP	3pc ULTRA PRECISION Inch Bore Collet Set (.0002" TIR) Size Range 1/8, 5/32, 1/2"





# REAMER FORMULAS FOR SPEEDS & FEEDS

The parameters below are based on using a carbide reamer at the highest SFM

- SFM:** Surface Feet per Minute  
**RPM:** Revolutions per Minute  
**IPT:** Inches per Tooth (chip load)  
**IPM:** Inches per Minute  
**IPR:** Inches per Revolution

## Speed Formula:

$$\text{RPM} = 3.82 \times (\text{SFM} \div \text{Diameter})$$

$$\text{Feed: IPM} = \text{IPT} \times \# \text{ of Flutes} \times \text{RPM}$$

$$\text{IPR} = \text{IPM} \div \text{RPM}$$

$$\text{SFM} = \text{RPM} \times \text{Diameter} \div 3.82$$

**Example:** using a Carbide 2mm Reamer  
in Steel < 81 HRB

$$\text{RPM} = 3.82 \times (132 \div .0787) = 6407 \text{ RPM}$$

$$\text{IPM} = .0015 \times 4 \times 6407 = 38.4 \text{ IPM}$$

$$\text{IPR} = 38.4 \div 6407 = .0059 \text{ IPR}$$

See these tools at work!



[www.hassay-savage.com/resource-center/product-videos](http://www.hassay-savage.com/resource-center/product-videos)

This chart has listed general reference parameters for a starting point.

Below are a couple of tips for fine-tuning the desired size.

**To increase the hole diameter:** Slow down the feed rate and/or decrease RPM

**To decrease the hole diameter:** Increase the feed rate and/or increase the RPM

MATERIAL	SPEED / SFM			Diameter mm					
	CARBIDE	COBALT		2	4	6	10	15	20
Steel < 81 HRB	82-132	49-72	IPR	.006	.006	.006	.0098	.0098	.0118
			IPM	38.4	19.2	12.8	12.3	8.2	7.7
			RPM	6400	3200	2130	1300	850	640
Steel < 24 Rc.	66-82	39-56	IPR	.0039	.0039	.0047	.0071	.0071	.0098
			IPM	14.3	8.4	6.4	5.7	3.8	3.8
			RPM	4000	2000	1300	800	500	400
Steel 24-32 Rc.	39-59	25-33	IPR	.0031	.0031	.0039	.0071	.0059	.0087
			IPM	8.6	4.3	3.4	4.1	2.3	2.4
			RPM	2800	1430	1000	600	400	280
Steel 32-41 Rc.	33-49	16-23	IPR	.0031	.0031	.0035	.0059	.0079	.0098
			IPM	7.1	3.6	2.9	2.9	2.5	2.3
			RPM	2400	1200	800	500	300	240
Stainless Steel	23-39	10-16	IPR	.0028	.0028	.0039	.0047	.0059	.0079
			IPM	5.7	2.8	2.3	1.8	1.5	1.5
			RPM	1900	950	630	400	250	240
Inconel/Waspaloy	20-33	7-10	IPR	.0028	.0028	.0039	.0047	.0059	.0079
			IPM	4.8	2.4	1.9	1.5	1.3	1.2
			RPM	1600	800	540	320	200	200
Cast Iron ≤180 HB (Grey)	99-132	20-49	IPR	.0039	.0039	.0047	.0079	.0098	.0098
			IPM	23.1	11.5	10.2	10	8.2	6.1
			RPM	6400	3200	2130	1300	850	640
Cast Iron > 180 HB	26-49	13-16	IPR	.0028	.0028	.0039	.0059	.0071	.0079
			IPM	7.1	3.6	2.9	2.9	2.3	1.9
			RPM	2400	1200	800	480	300	240
Copper	82-99	39-66	IPR	.0047	.0047	.0071	.0079	.0098	.0118
			IPM	23.1	11.5	11.5	7.5	6.1	5.8
			RPM	4800	2400	1600	960	640	480
Brass	115-132	66-99	IPR	.0079	.0079	.0087	.0118	.0138	.0157
			IPM	50	25	17.9	15.4	11.8	10
			RPM	6400	3200	2130	1300	850	640
Bronze	66-82	39-56	IPR	.0059	.0059	.0071	.0087	.0138	.0146
			IPM	21.5	11.9	9.5	7.2	7.3	5.7
			RPM	4000	2000	1320	800	530	400
Aluminum	132-197	82-115	IPR	.0059	.0059	.0071	.0098	.0118	.0138
			IPM	57.3	28.7	22.9	18.3	15.3	13.2
			RPM	9500	4800	3200	1900	1300	950
Recommended drill hole diameter:				1,90	3,90	5,85	9,80	14,70	19,70

L = 39 mm  
d2 = 3mm  
l = 1,5 x D



d2 = .118 / 3 mm

BALL END SERIES

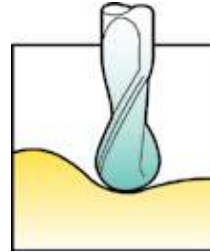
inch	D mm	l	r	Magafor 8527	Hard'X 8527-H
.0039	0.10	.0039	.0020	88852700100	
.0059	0.15	.0079	.0030	88852700150	
.0079	0.20	.0118	.0039	88852700200	
.0098	0.25	.0138	.0049	88852700250	
.0118	0.30	.0177	.0059	88852700300	888527H0030
.0157	0.40	.0236	.0079	88852700400	888527H0040
.0197	0.50	.0295	.0098	88852700500	888527H0050
.0236	0.60	.0354	.0118	88852700600	888527H0060
.0276	0.70	.0413	.0138	88852700700	888527H0070
.0315	0.80	.0472	.0157	88852700800	888527H0080
.0354	0.90	.0531	.0177	88852700900	888527H0090
.0394	1.00	.0591	.0197	88852701000	888527H0100
.0472	1.20	.0709	.0236	88852701200	888527H0120
.0591	1.50	.0886	.0295	88852701500	888527H0150
.0787	2.00	.1181	.0394	88852702000	888527H0200

L = 39 mm  
d2 = 3mm  
l = 1,5 x D

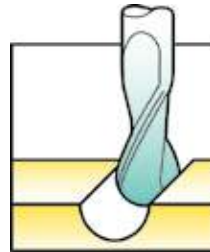


SQUARE END SERIES

inch	D mm	l	Magafor 8507	Hard'X 8507-H
.0039	0.10	.0039	88850700100	
.0059	0.15	.0079	88850700150	
.0079	0.20	.0118	88850700200	
.0098	0.25	.0138	88850700250	
.0118	0.30	.0177	88850700300	888507H0030
.0157	0.40	.0236	88850700400	888507H0040
.0197	0.50	.0295	88850700500	888507H0050
.0236	0.60	.0354	88850700600	888507H0060
.0276	0.70	.0413	88850700700	888507H0070
.0315	0.80	.0472	88850700800	888507H0080
.0354	0.90	.0531	88850700900	888507H0090
.0394	1.00	.0591	88850701000	888507H0100
.0433	1.10	.0650	88850701100	888507H0110
.0472	1.20	.0709	88850701200	888507H0120
.0512	1.30	.0768	88850701300	888507H0130
.0551	1.40	.0827	88850701400	888507H0140
.0591	1.50	.0886	88850701500	888507H0150
.0630	1.60	.0945	88850701600	888507H0160
.0669	1.70	.1004	88850701700	888507H0170
.0709	1.80	.1063	88850701800	888507H0180
.0748	1.90	.1122	88850701900	888507H0190
.0787	2.00	.1181	88850702000	888507H0200



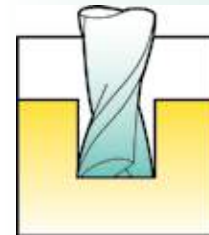
COPYING



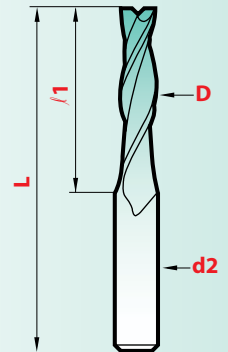
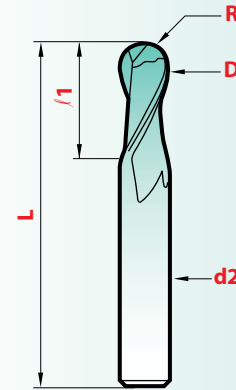
PRECISE GROOVING  
R +/- 0,01mm



PRECISE GROOVING  
0 - 0,01mm



FLAT BOTTOM BORING



# MICRO-MILLING

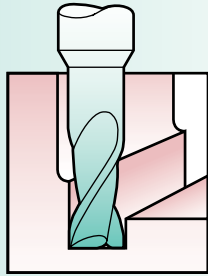
MICRO-MILLING

Engaged right from the start in the process aspiring to excellence, in addition to our Futura and TiN coatings, MAGAFOR offers three new "X" coatings, sprung from multi-layer nano technology.

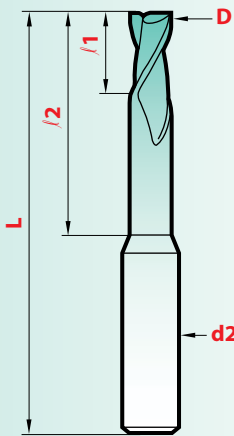
**Red'X**: cobalt tool coating with higher hardness of (3700 HV) like TiAlN in a multi-layer coating. This coating can be used for dry machining. Using coolant will add lubricity.

**Hard'X**: carbide tool coating with a high hardness (3500 HV) this coating shows a high thermic stability and an excellent protection against heat and wear. Ideal for dry machining-high speed cut-in treated steels and dies up to 67 Rc.

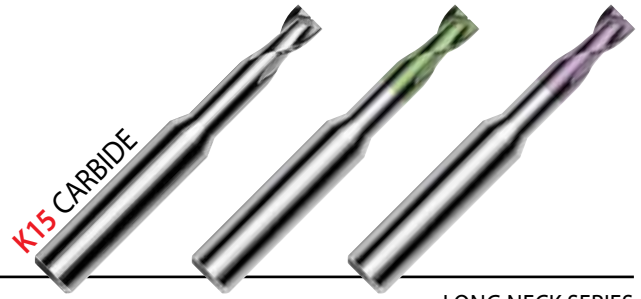
# MINIATURE END-MILLS WITH BACK CLEARANCE



HARD TO REACH MACHINING



$$l = 1,5 \times D$$



d2 = .118 / 3 mm

LONG NECK SERIES

Diameter x L2		/1	L	magaforce	K15/Graph'X	k15/Hard'X
inch	mm			8507-D	8507-DG	8507-DH
.0157 x .078	0,4 x 2	.024	1-1/2	888507D0042	888507DG0042	888507DH0042
.0197 x .078	0,5 x 2	.027	1-1/2	888507D0052	888507DG0052	888507DH0052
.0197 x .157	0,5 x 4	.027	1-1/2	888507D0054	888507DG0054	888507DH0054
.0197 x .236	0,5 x 6	.027	2-3/8	888507D0056	888507DG0056	888507DH0056
.0236 x .157	0,6 x 4	.029	1-1/2	888507D0064	888507DG0064	888507DH0064
.0276 x .157	0,7 x 4	.035	1-1/2	888507D0074	888507DG0074	888507DH0074
.0315 x .157	0,8 x 4	.041	1-1/2	888507D0084	888507DG0084	888507DH0084
.0315 x .236	0,8 x 6	.041	1-1/2	888507D0086	888507DG0086	888507DH0086
.0315 x .354	0,8 x 9	.041	2-3/8	888507D0089	888507DG0089	888507DH0089
.0354 x .236	0,9 x 6	.053	1-1/2	888507D0096	888507DG0096	888507DH0096
.0394 x .157	1,0 x 4	.059	1-1/2	888507D0140	888507DG0140	888507DH0140
.0394 x .236	1,0 x 6	.059	1-1/2	888507D0160	888507DG0160	888507DH0160
.0394 x .354	1,0 x 9	.059	1-1/2	888507D0190	888507DG0190	888507DH0190
.0394 x .472	1,0 x 12	.059	2-3/8	888507D0112	888507DG0112	888507DH0112
.0472 x .236	1,2 x 6	.071	1-1/2	888507D0126	888507DG0126	888507DH0126
.0472 x .354	1,2 x 9	.071	1-1/2	888507D0129	888507DG0129	888507DH0129
.0551 x .236	1,4 x 6	.083	1-1/2	888507D0146	888507DG0146	888507DH0146
.0551 x .354	1,4 x 9	.083	1-1/2	888507D0149	888507DG0149	888507DH0149
.0591 x .236	1,5 x 6	.089	1-1/2	888507D0156	888507DG0156	888507DH0156
.0591 x .354	1,5 x 9	.089	1-1/2	888507D0159	888507DG0159	888507DH0159
.0591 x .472	1,5 x 12	.089	2-3/8	888507D01512	888507DG01512	888507DH01512
.0709 x .354	1,8 x 9	.106	1-1/2	888507D0189	888507DG0189	888507DH0189
.0709 x .472	1,8 x 12	.106	1-1/2	888507D01812	888507DG01812	888507DH01812
.0787 x .354	2,0 x 9	.118	1-1/2	888507D0290	888507DG0290	888507DH0290
.0787 x .472	2,0 x 12	.118	1-1/2	888507D0212	888507DG0212	888507DH0212
.0787 x .590	2,0 x 15	.118	2-3/8	888507D0215	888507DG0215	888507DH0215
.0984 x .590	2,5 x 15	.148	2-3/8	888507D02515	888507DG02515	888507DH02515

/2-: tolerance - .0008 - .0020  
\*Call for pricing

## MINIATURE END MILLS *Speeds & Feeds* **Performance** RECOMMENDATIONS OF USING

- Endmills with long neck, extra long neck, and deep machining: Reduce the speed, while maintaining the suggested feed.
- Superficial work: Increase the speed, while maintaining the suggested feed.

This chart has listed general reference parameters for a starting point.

- SFM:** Surface Feet per Minute
- RPM:** Revolutions per Minute
- IPT:** Inches per Tooth (chip load)
- IPM:** Inches per Minute
- IPR:** Inches per Revolution

**Speed Formula:**

$$RPM = 3.82 \times (SFM \div \text{Diameter})$$

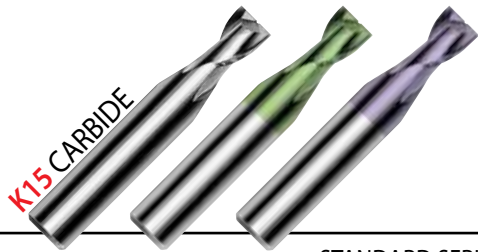
$$\text{Feed: } IPM = IPT \times \# \text{ of Flutes} \times RPM$$

$$IPR = IPM \div RPM$$

$$SFM = RPM \times \text{Diameter} \div 3.82$$

Material	Diameter(mm)	SFM	RPM	Inch/tooth	IPM	Material	Diameter(mm)	SFM	RPM	Inch/tooth	IPM
Steels 24-40Rc	0,5	132	25615	.00004	2.0	Plastics with glass or carbon filters	0,5	263	51040	.00004	4.1
	1	132	12808	.0001	2.5		1	263	25520	.0002	10.2
	1,5	132	8538	.0001	1.7		1,5	263	17010	.0006	20.4
	2	132	6404	.0002	2.5		2	263	12760	.0008	20.4
Steel 41Rc- 45Rc	3	132	4270	.0002	1.7	3	263	8500	.0012	20.4	
	0,5	82	15920	.00004	1.3	Aluminum and other plastics	0,5	494	95860	.0002	38.3
	1	82	7960	.0001	1.6		1	658	63840	.0005	63.8
	1,5	82	5310	.0001	1.1		1,5	658	42560	.0007	60.0
2	82	3980	.0002	1.6	2		658	31920	.0009	57.5	
Steels >45Rc TiAlN coated tools only	3	82	2650	.0002	1.1	3	658	21280	.0014	60.0	
	0,5	132	25615	.00004	2.0	Copper Brass Bronze and Steels <24 Rc	0,5	263	51000	.0002	20.4
	1	132	12808	.0001	2.5		1	263	25520	.0005	25.5
	1,5	132	8538	.0001	1.7		1,5	263	17000	.0007	24.0
2	132	6404	.0002	2.5	2		263	12750	.0009	23.0	
3	132	4270	.0002	1.7	3	263	8500	.0014	24.0		

$l \approx 2-3 \times D$



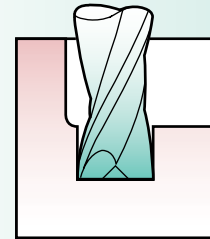
# STANDARD LENGTH MINIATURE END-MILLS

MICRO-MILLING

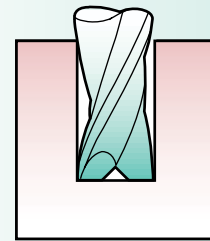
**TOLERANCE 0 - .0004"**

STANDARD SERIES

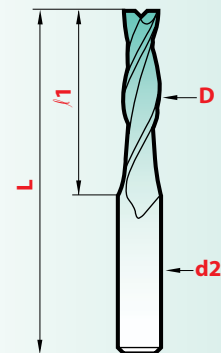
Diameter		r1	L	d2	magaforce	Graph'X	Hard'X
inch	mm				8500	8500-G	8500-H
.0020	0,05	.004	1-1/2	.118 3 mm	88850000050		
.0024	0,06	.005			88850000060		
.0031	0,08	.006			88850000080		
.0039	0,10	.008			88850000100		
.0047	0,12	.009			88850000120		
.0059	0,15	.012			88850000150		
.0079	0,20	.020			88850000200		
.0098	0,25	.020			88850000250		
.0118	0,30	.039			88850000300	888500G0030	888500H0030
.0138	0,35	.039			88850000350	888500G0035	888500H0035
.0157	0,40	.039			88850000400	888500G0040	888500H0040
.0177	0,45	.039			88850000450	888500G0045	888500H0045
.0197	0,50	.059			88850000500	888500G0050	888500H0050
.0216	0,55	.059			88850000550	888500G0055	888500H0055
.0236	0,60	.059			88850000600	888500G0060	888500H0060
.0256	0,65	.059			88850000650	888500G0065	888500H0065
.0276	0,70	.079			88850000700	888500G0070	888500H0070
.0295	0,75	.079			88850000750	888500G0075	888500H0075
.0315	0,80	.079	88850000800	888500G0080	888500H0080		
.0335	0,85	.079	88850000850	888500G0085	888500H0085		
.0354	0,90	.098	88850000900	888500G0090	888500H0090		
.0374	0,95	.098	88850000950	888500G0095	888500H0095		
.0394	1,00	0,12	88850001000	888500G0100	888500H0100		
.0413	1,05	0,12	88850001050	888500G0105	888500H0105		
.0433	1,10	0,12	88850001100	888500G0110	888500H0110		
.0452	1,15	0,12	88850001150	888500G0115	888500H0115		
.0472	1,20	0,16	88850001200	888500G0120	888500H0120		
.0492	1,25	0,16	88850001250	888500G0125	888500H0125		
.0512	1,30	0,16	88850001300	888500G0130	888500H0130		
.0551	1,40	0,16	88850001400	888500G0140	888500H0140		
.0591	1,50	0,16	88850001500	888500G0150	888500H0150		
.0630	1,60	0,20	88850001600	888500G0160	888500H0160		
.0669	1,70	0,20	88850001700	888500G0170	888500H0170		
.0709	1,80	0,20	88850001800	888500G0180	888500H0180		
.0748	1,90	0,20	88850001900	888500G0190	888500H0190		
.0787	2,00	0,20	88850002000	888500G0200	888500H0200		
.0827	2,10	0,24	88850002100	888500G0210	888500H0210		
.0866	2,20	0,24	88850002200	888500G0220	888500H0220		



SLOTING  
ENGRAVING



FLAT BOTTOM  
BORING



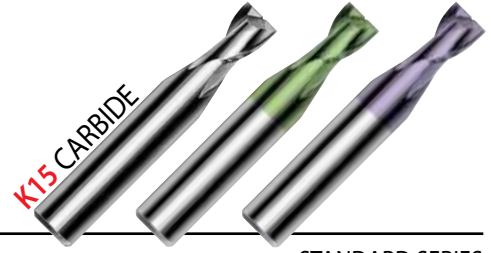
K15 CARBIDE — 6.5 - 7% Cobalt  
(0,006 - 0,008mm grain size)



# STANDARD LENGTH MINIATURE END-MILLS

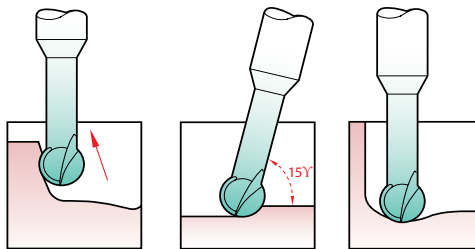
STANDARD SERIES												
Diameter		f1	L	d2	magaforce	Graph'X	Hard'X					
inch	mm				8500	8500-G	8500-H					
.1575	4,00	0.47	2-3/16	.197 5 mm	88850004000	888500G0400	888500H0400					
.1614	4,10	0.47			88850004100	888500G0410	888500H0410					
.1654	4,20	0.47			88850004200	888500G0420	888500H0420					
.1693	4,30	0.47			88850004300	888500G0430	888500H0430					
.1732	4,40	0.47			88850004400	888500G0440	888500H0440					
.1772	4,50	0.47			88850004500	888500G0450	888500H0450					
.1811	4,60	0.47			88850004600	888500G0460	888500H0460					
.1850	4,70	0.47			88850004700	888500G0470	888500H0470					
.1890	4,80	0.47			88850004800	888500G0480	888500H0480					
.1929	4,90	0.47			88850004900	888500G0490	888500H0490					
.1969	5,00	0.55			2-3/16	.236 6 mm	88850005000	888500G0500	888500H0500			
.2008	5,10	0.55					88850005100	888500G0510	888500H0510			
.2047	5,20	0.55					88850005200	888500G0520	888500H0520			
.2087	5,30	0.55					88850005300	888500G0530	888500H0530			
.2126	5,40	0.55					88850005400	888500G0540	888500H0540			
.2165	5,50	0.55	88850005500	888500G0550			888500H0550					
.2205	5,60	0.55	88850005600	888500G0560			888500H0560					
.2244	5,70	0.55	88850005700	888500G0570			888500H0570					
.2283	5,80	0.55	88850005800	888500G0580			888500H0580					
.2323	5,90	0.55	88850005900	888500G0590			888500H0590					

$l \approx 2-3 \times D$

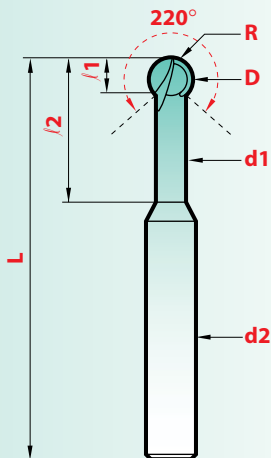
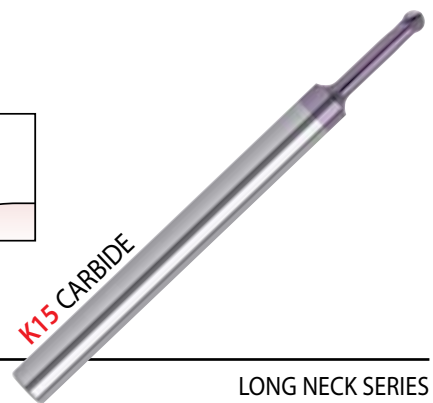


STANDARD SERIES												
Diameter		f1	L	d2	magaforce	Graph'X	Hard'X					
inch	mm				8500	8500-G	8500-H					
.0906	2,30	0.24	1-1/2	.118 3 mm	88850002300	888500G0230	888500H0230					
.0945	2,40	0.24			88850002400	888500G0240	888500H0240					
.0984	2,50	0.28			88850002500	888500G0250	888500H0250					
.1024	2,60	0.28			88850002600	888500G0260	888500H0260					
.1063	2,70	0.28			88850002700	888500G0270	888500H0270					
.1102	2,80	0.28			88850002800	888500G0280	888500H0280					
.1142	2,90	0.28			88850002900	888500G0290	888500H0290					
.1181	3,00	0.39			1-3/4	.157 4 mm	88850003000	888500G0300	888500H0300			
.1220	3,10	0.39					88850003100	888500G0310	888500H0310			
.1260	3,20	0.39					88850003200	888500G0320	888500H0320			
.1299	3,30	0.39					88850003300	888500G0330	888500H0330			
.1339	3,40	0.39					88850003400	888500G0340	888500H0340			
.1378	3,50	0.39					88850003500	888500G0350	888500H0350			
.1417	3,60	0.39					88850003600	888500G0360	888500H0360			
.1457	3,70	0.39					88850003700	888500G0370	888500H0370			
.1496	3,80	0.39	88850003800	888500G0380			888500H0380					
.1535	3,90	0.39	88850003900	888500G0390			888500H0390					

## 220° ball-end MINIATURE END-MILLS with back clearance



$l2 = 5 \times D$



METRIC							LONG NECK SERIES	
Diameter		d1	d2	L	f1	f2	R	Hard'X
inch	mm							8522-H
.0315	0,8	0,70	3	60	0,55	4,0	0,4	888522H0080
.0394	1,0	0,85	3	60	0,70	5,0	0,5	888522H0100
.0472	1,2	1,00	3	60	0,80	6,0	0,6	888522H0120
.0590	1,5	1,30	3	60	1,00	7,5	0,75	888522H0150
.0787	2,0	1,70	3	60	1,35	10,0	1,0	888522H0200
.1180	3,0	2,60	6	75	2,00	15,0	1,5	888522H0300
.1575	4,0	3,45	6	75	2,70	20,0	2,0	888522H0400
.1969	5,0	4,30	6	75	3,40	25,0	2,5	888522H0500

\*Call for pricing

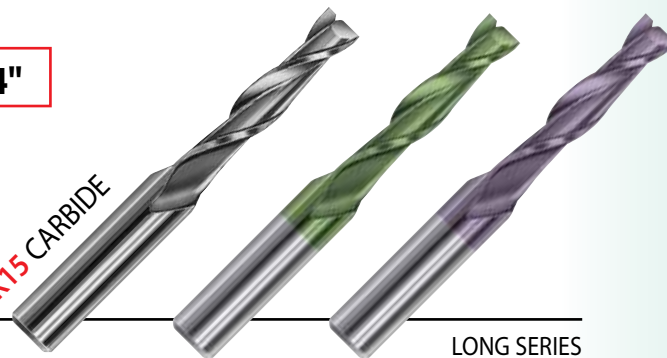
# LONG MINIATURE END-MILLS

**TOLERANCE 0 - .0004"**

**L = 39 mm**  
**l = 5 x D**



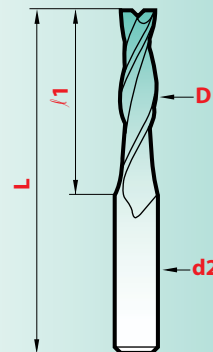
**K15 CARBIDE**



d2 = .118 / 3 mm

LONG SERIES

Diameter		l1	magaforce 8509	Graph'X 8509-G	Hard'X 8509-H
inch	mm				
.0157	0,4	.078	88850900400	888509G0040	888509H0040
.0197	0,5	.098	88850900500	888509G0050	888509H0050
.0236	0,6	.118	88850900600	888509G0060	888509H0060
.0276	0,7	.137	88850900700	888509G0070	888509H0070
.0315	0,8	.157	88850900800	888509G0080	888509H0080
.0354	0,9	.177	88850900900	888509G0090	888509H0090
.0394	1,0	.197	88850901000	888509G0100	888509H0100
.0472	1,2	.236	88850901200	888509G0120	888509H0120
.0591	1,5	.295	88850901500	888509G0150	888509H0150
.0787	2,0	.394	88850902000	888509G0200	888509H0200



\*Call for pricing

**TOLERANCE 0 - .0004"**

**l = 8 x D**



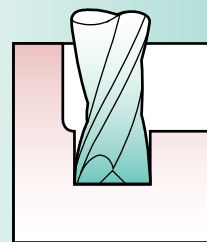
**K15 CARBIDE**



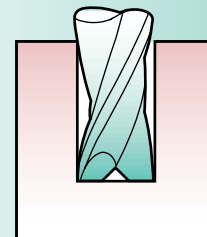
EXTRA LONG SERIES

Diameter		l1	L	d2	magaforce 8510	Graph'X 8510-G	Hard'X 8510-H
inch	mm						
.0197	0,5	.157	1-1/2	.118 3 mm	88851000500	888510G0050	888510H0050
.0236	0,6	.197			88851000600	888510G0060	888510H0060
.0315	0,8	.236			88851000800	888510G0080	888510H0080
.0394	1,0	.315			88851001000	888510G0100	888510H0100
.0472	1,2	.354	1-3/4	.157 4 mm	88851001200	888510G0120	888510H0120
.0591	1,5	.472			88851001500	888510G0150	888510H0150
.0787	2,0	.630			88851002000	888510G0200	888510H0200
.0984	2,5	.788	2-3/8	.197 5 mm	88851002500	888510G0250	888510H0250
.1181	3,0	.945			88851003000	888510G0300	888510H0300

# EXTRA-LONG MINIATURE END-MILLS



SLOTting ENGRAVING



FLAT BOTTOM BORING

\*Call for pricing

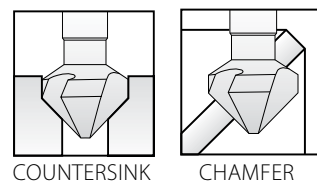
# VALUE PACKED KITS & PROMOTION ITEMS

Versatile, Broad Application Range, Business Building!

## TRIDENT 90° Three flute COUNTERSINKS

3 FLUTE COUNTERSINK SETS ANGLE 90°

magafor	COMPOSITION M35 Cobalt
84431000000-M	Ø 10 - 15 - 20,5 mm
84431000000-M-TIN	
84431000007	1/4" - 3/8" - 1/2" - 3/4"
84483100007 TIN	
84431000000	
84483100000	Ø 10,4 - 16,5 - 20,5 - 25,0 - 31,0 mm
84436000000	
84431000002	
84483100002 TIN	Ø 6,3 - 8,3 - 10,4 - 12,4 - 16,5 - 20,5 mm
84436000002	
88843100002	
84431000003 (1)	Ø 6,3 - 8,3 - 10,4 - 12,4 - 16,5 - 20,5 - 25 mm
84431000004 (1)	Ø 4,3 - 5,3 - 6,3 - 8,3 - 10,4 - 12,4 - 16,5 - 20,5 - 25 - 31
88843100000	Ø 10,4 - 16,5 - 20,5 - 25 - 31 mm
84431000006 (2)	
84483100006 TIN (2)	Ø 6,3 - 12,4 - 16,5 - 20,5 mm
84431000008 (2)	
84483100008 TIN (2)	1/4" - 3/8" - 1/2" - 3/4"



COUNTERSINK CHAMFER



### TRIDENT COUNTERSINK SETS

Angle	M35/Cobalt	COMPOSITION / mm
60°	84432000000	Ø 10,4-16,5-20,5-25-31
	84483200000	
82°	84434000000	
	84483400000	
100°	84435000000	
120°	84433000000	

(1) Set supplied with 1 auto-lock chuck handle Code 4001.

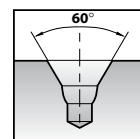
(2) Set supplied with an 8 mm auto-lock chuck handle Code 4002.

### M2 HSS SPOT DRILL Value SETS

4 PIECES American Standard

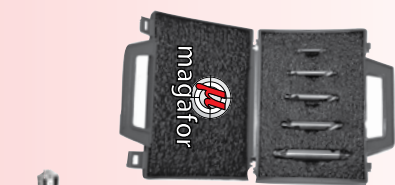
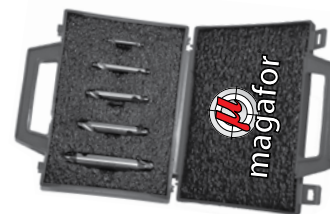
COMPOSITION: 1/4" x 2 5/8" - 3/8" x 3 1/8"  
1/2" x 3 3/4" - 5/8" x 4 1/2"

TYPE	M2 HSS
90° Spot Drill Kit	8119C000004
120° Spot Drill Kit	8119D000004



### "UNIQUE" CENTER DRILLS

With reinforcing bulge



### PLAIN TYPE 60° CENTER DRILLS

Sizes in inches

Value SETS American Standard 5 PIECES

81154000000	1 piece each #1, #2, #3, #4, #5
81115000000	1 piece each #1, #2, #3, #4, #5
S1055 (Cobalt)	1 piece each #1, #2, #3, #4, #5



### Duo Mag SETS American Standard

4 PIECE

COMPOSITION	Cobalt
Quantity	80019000004
4 piece each Duo Mag	3/16"
	1/4"
	3/8"
	1/2"

### Form W SETS

American Standard 81145000000

5 PIECES  
COMPOSITION  
Quantity

1 piece each Bulge	# 1-W
	# 2-W
	# 3-W
	# 4-W
	# 5-W

