

TOOLS FOR Multiple Applications

Multiple Application Tools

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TL/MTL Tuffy Grade Carbide End Mills

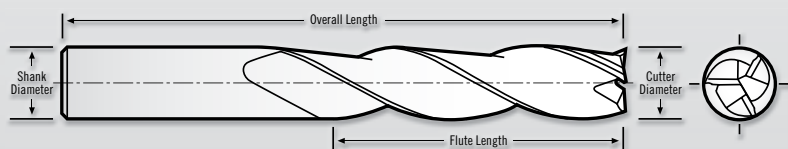
Characteristics



Applications



Materials



TL Series Tolerances

Cutting Dia. = $+0.001/-0.000$ "
 Shank Dia. = $-0.0001/-0.0002$ "
 Flute Length = $+0.060/-0.000$ "
 OAL = ± 0.060 "

MTL Tolerances

Cutting Dia. = $+0.025/-0.000$ mm
 Shank Dia. = $-0.002/-0.005$ mm
 Flute Length = $+0.500/+1.500$ mm
 OAL = ± 1.000 mm



TL-303 3 Flute Tuffy Grade Extra Length

Cutting Diameter	Shank Diameter	Flute Length	Overall Length	Tool Number
1/8"	1/8"	1"	3"	TL-303-04*
3/16"	3/16"	1-1/8"	3"	TL-303-06*
1/4"	1/4"	1-1/4"	3"	TL-303-08*
5/16"	5/16"	1-3/8"	3-1/8"	TL-303-10*
3/8"	3/8"	1-1/2"	3-1/4"	TL-303-12
7/16"	7/16"	1-3/4"	3-3/4"	TL-303-14*
1/2"	1/2"	2"	4"	TL-303-16
5/8"	5/8"	2-1/2"	4-5/8"	TL-303-20
3/4"	3/4"	3"	5"	TL-303-24

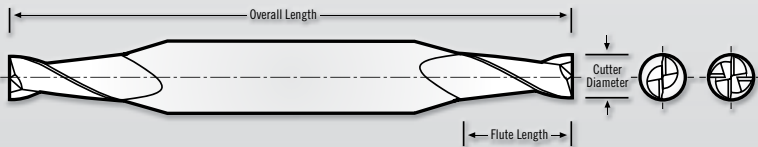
*Does not come with flats.

MTL-303 Metric 3 Flute Tuffy Grade Extra Length METRIC

Cutting Diameter	Shank Diameter	Flute Length	Overall Length	Tool Number
3mm	3mm	25mm	75mm	MTL-303-03
4mm	4mm	26mm	75mm	MTL-303-04
5mm	5mm	28mm	75mm	MTL-303-05
6mm	6mm	32mm	75mm	MTL-303-06
8mm	8mm	35mm	80mm	MTL-303-08
10mm	10mm	38mm	82mm	MTL-303-10
12mm	12mm	50mm	100mm	MTL-303-12
16mm	16mm	63mm	110mm	MTL-303-16
20mm	20mm	75mm	130mm	MTL-303-20

NOTE: Metric tools do not have flats.

2 Flute Tuffy Grade Carbide End Mills **T6**



T6 Series Tolerances
 Cutting Dia. = $\pm .0005"$
 Shank Dia. = $-.0001/- .0002"$
 Flute Length = $+.030/- .000"$
 OAL = $\pm .060"$



T6-200 2 Flute Tuffy Grade Stub Length



Cutting Diameter	Shank Diameter	Flute Length	Overall Length	Tool Number Uncoated	Tool Number TiN Coated	Tool Number TiCN Coated	Tool Number AlTiN Coated	Tool Number DLC Coated
1/16"	3/16"	1/8"	2-1/2"	T6-200-02	T6-200-02-T	T6-200-02-C	T6-200-02-A	T6-200-02-DLC
5/64"	3/16"	5/32"	2-1/2"	T6-200-02.5	T6-200-02.5-T	T6-200-02.5-C	T6-200-02.5-A	T6-200-02.5-DLC
3/32"	3/16"	5/32"	2-1/2"	T6-200-03	T6-200-03-T	T6-200-03-C	T6-200-03-A	T6-200-03-DLC
7/64"	3/16"	3/16"	2-1/2"	T6-200-03.5	T6-200-03.5-T	T6-200-03.5-C	T6-200-03.5-A	T6-200-03.5-DLC
1/8"	3/16"	3/16"	2-1/2"	T6-200-04	T6-200-04-T	T6-200-04-C	T6-200-04-A	T6-200-04-DLC
9/64"	3/16"	7/32"	2-1/2"	T6-200-04.5	T6-200-04.5-T	T6-200-04.5-C	T6-200-04.5-A	T6-200-04.5-DLC
5/32"	3/16"	9/32"	2-1/2"	T6-200-05	T6-200-05-T	T6-200-05-C	T6-200-05-A	T6-200-05-DLC
11/64"	3/16"	9/32"	2-1/2"	T6-200-05.5	T6-200-05.5-T	T6-200-05.5-C	T6-200-05.5-A	T6-200-05.5-DLC
3/16"	3/16"	3/8"	2"	T6-200-06*	T6-200-06-T*	T6-200-06-C*	T6-200-06-A*	T6-200-06-DLC*

*Single End only to allow plus/minus tolerance



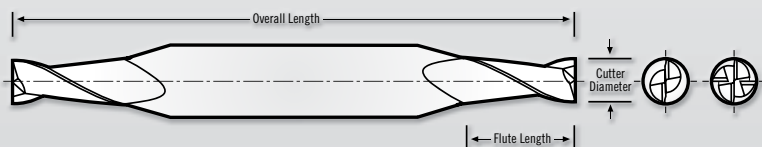
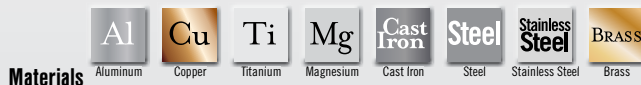
T6-202 2 Flute Tuffy Grade Standard Length



Cutting Diameter	Shank Diameter	Flute Length	Overall Length	Tool Number Uncoated	Tool Number TiN Coated	Tool Number TiCN Coated	Tool Number AlTiN Coated	Tool Number DLC Coated
1/16"	3/16"	3/16"	2-1/2"	T6-202-02	T6-202-02-T	T6-202-02-C	T6-202-02-A	T6-202-02-DLC
5/64"	3/16"	5/16"	2-1/2"	T6-202-02.5	T6-202-02.5-T	T6-202-02.5-C	T6-202-02.5-A	T6-202-02.5-DLC
3/32"	3/16"	3/8"	2-1/2"	T6-202-03	T6-202-03-T	T6-202-03-C	T6-202-03-A	T6-202-03-DLC
7/64"	3/16"	3/8"	2-1/2"	T6-202-03.5	T6-202-03.5-T	T6-202-03.5-C	T6-202-03.5-A	T6-202-03.5-DLC
1/8"	3/16"	3/8"	2-1/2"	T6-202-04	T6-202-04-T	T6-202-04-C	T6-202-04-A	T6-202-04-DLC
9/64"	3/16"	7/16"	2-1/2"	T6-202-04.5	T6-202-04.5-T	T6-202-04.5-C	T6-202-04.5-A	T6-202-04.5-DLC
5/32"	3/16"	7/16"	2-1/2"	T6-202-05	T6-202-05-T	T6-202-05-C	T6-202-05-A	T6-202-05-DLC
11/64"	3/16"	7/16"	2-1/2"	T6-202-05.5	T6-202-05.5-T	T6-202-05.5-C	T6-202-05.5-A	T6-202-05.5-DLC
3/16"	3/16"	1/2"	2"	T6-202-06*	T6-202-06-T*	T6-202-06-C*	T6-202-06-A*	T6-202-06-DLC*

*Single End only to allow plus/minus tolerance

T6 4 Flute Tuffy Grade Carbide End Mills



T6 Series Tolerances
 Cutting Dia. = $\pm .0005"$
 Shank Dia. = $-.0001/- .0002"$
 Flute Length = $+.030/- .000"$
 OAL = $\pm .060"$



All Sizes on 3/16" Shanks for Strength



T6-400 4 Flute Tuffy Grade Stub Length



Cutting Diameter	Shank Diameter	Flute Length	Overall Length	Tool Number Uncoated	Tool Number TiN Coated	Tool Number TiCN Coated	Tool Number AlTiN Coated	Tool Number DLC Coated
1/16"	3/16"	1/8"	2-1/2"	T6-400-02	T6-400-02-T	T6-400-02-C	T6-400-02-A	T6-400-02-DLC
5/64"	3/16"	5/32"	2-1/2"	T6-400-02.5	T6-400-02.5-T	T6-400-02.5-C	T6-400-02.5-A	T6-400-02.5-DLC
3/32"	3/16"	5/32"	2-1/2"	T6-400-03	T6-400-03-T	T6-400-03-C	T6-400-03-A	T6-400-03-DLC
7/64"	3/16"	3/16"	2-1/2"	T6-400-03.5	T6-400-03.5-T	T6-400-03.5-C	T6-400-03.5-A	T6-400-03.5-DLC
1/8"	3/16"	3/16"	2-1/2"	T6-400-04	T6-400-04-T	T6-400-04-C	T6-400-04-A	T6-400-04-DLC
9/64"	3/16"	7/32"	2-1/2"	T6-400-04.5	T6-400-04.5-T	T6-400-04.5-C	T6-400-04.5-A	T6-400-04.5-DLC
5/32"	3/16"	9/32"	2-1/2"	T6-400-05	T6-400-05-T	T6-400-05-C	T6-400-05-A	T6-400-05-DLC
11/64"	3/16"	9/32"	2-1/2"	T6-400-05.5	T6-400-05.5-T	T6-400-05.5-C	T6-400-05.5-A	T6-400-05.5-DLC
3/16"	3/16"	3/8"	2"	T6-400-06*	T6-400-06-T*	T6-400-06-C*	T6-400-06-A*	T6-400-06-DLC*

*Single End only to allow plus/minus tolerance



T6-402 4 Flute Tuffy Grade Standard Length



Cutting Diameter	Shank Diameter	Flute Length	Overall Length	Tool Number Uncoated	Tool Number TiN Coated	Tool Number TiCN Coated	Tool Number AlTiN Coated	Tool Number DLC Coated
1/16"	3/16"	3/16"	2-1/2"	T6-402-02	T6-402-02-T	T6-402-02-C	T6-402-02-A	T6-402-02-DLC
5/64"	3/16"	5/16"	2-1/2"	T6-402-02.5	T6-402-02.5-T	T6-402-02.5-C	T6-402-02.5-A	T6-402-02.5-DLC
3/32"	3/16"	3/8"	2-1/2"	T6-402-03	T6-402-03-T	T6-402-03-C	T6-402-03-A	T6-402-03-DLC
7/64"	3/16"	3/8"	2-1/2"	T6-402-03.5	T6-402-03.5-T	T6-402-03.5-C	T6-402-03.5-A	T6-402-03.5-DLC
1/8"	3/16"	3/8"	2-1/2"	T6-402-04	T6-402-04-T	T6-402-04-C	T6-402-04-A	T6-402-04-DLC
9/64"	3/16"	7/16"	2-1/2"	T6-402-04.5	T6-402-04.5-T	T6-402-04.5-C	T6-402-04.5-A	T6-402-04.5-DLC
5/32"	3/16"	7/16"	2-1/2"	T6-402-05	T6-402-05-T	T6-402-05-C	T6-402-05-A	T6-402-05-DLC
11/64"	3/16"	7/16"	2-1/2"	T6-402-05.5	T6-402-05.5-T	T6-402-05.5-C	T6-402-05.5-A	T6-402-05.5-DLC
3/16"	3/16"	1/2"	2"	T6-402-06*	T6-402-06-T*	T6-402-06-C*	T6-402-06-A*	T6-402-06-DLC*

*Single End only to allow plus/minus tolerance

2 Flute Tuffy Grade Carbide End Mills T12

Characteristics



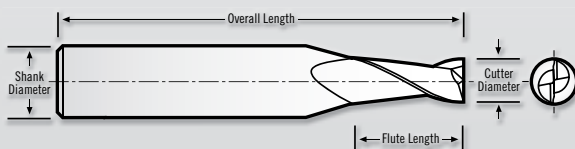
Applications



Materials



Coatings



T12 Series Tolerances

Cutting Dia. = $+0.001/-0.000$ "
 Shank Dia. = $-0.0001/-0.0002$ "
 Flute Length (1/8" to 5/16") = $+0.030/-0.000$ "
 (21/64" to 3/4") = $+0.060/-0.000$ "
 OAL = ± 0.060 "



T12-201 2 Flute Tuffy Grade Stub Length



Cutting Diameter	Shank Diameter	Flute Length	Overall Length	Tool Number Uncoated	Tool Number TiN Coated	Tool Number TiCN Coated	Tool Number AlTiN Coated	Tool Number DLC Coated
1/8"	3/8"	1/4"	2-1/2"	T12-201-04	T12-201-04-T	T12-201-04-C	T12-201-04-A	T12-201-04-DLC
5/32"	3/8"	1/4"	2-1/2"	T12-201-05	T12-201-05-T	T12-201-05-C	T12-201-05-A	T12-201-05-DLC
3/16"	3/8"	5/16"	2-1/2"	T12-201-06	T12-201-06-T	T12-201-06-C	T12-201-06-A	T12-201-06-DLC
7/32"	3/8"	5/16"	2-1/2"	T12-201-07	T12-201-07-T	T12-201-07-C	T12-201-07-A	T12-201-07-DLC
1/4"	3/8"	5/16"	2-1/2"	T12-201-08	T12-201-08-T	T12-201-08-C	T12-201-08-A	T12-201-08-DLC
9/32"	3/8"	7/16"	2-1/2"	T12-201-09	T12-201-09-T	T12-201-09-C	T12-201-09-A	T12-201-09-DLC
5/16"	3/8"	7/16"	2-1/2"	T12-201-10	T12-201-10-T	T12-201-10-C	T12-201-10-A	T12-201-10-DLC
3/8"	3/8"	1/2"	2-1/2"	T12-201-12	T12-201-12-T	T12-201-12-C	T12-201-12-A	T12-201-12-DLC
7/16"	1/2"	5/8"	3"	T12-201-14	T12-201-14-T	T12-201-14-C	T12-201-14-A	T12-201-14-DLC
1/2"	1/2"	5/8"	3"	T12-201-16	T12-201-16-T	T12-201-16-C	T12-201-16-A	T12-201-16-DLC
5/8"	5/8"	7/8"	3-1/4"	T12-201-20	T12-201-20-T	T12-201-20-C	T12-201-20-A	T12-201-20-DLC
3/4"	3/4"	1"	3-1/2"	T12-201-24	T12-201-24-T	T12-201-24-C	T12-201-24-A	T12-201-24-DLC

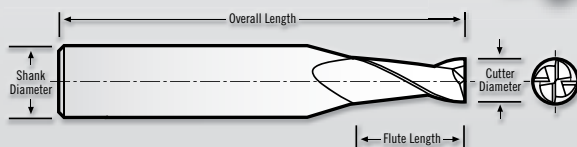
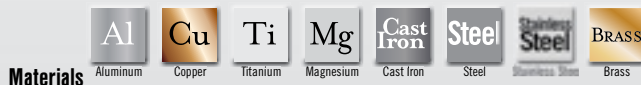


T12-203 2 Flute Tuffy Grade Standard Length



Cutting Diameter	Shank Diameter	Flute Length	Overall Length	Tool Number Uncoated	Tool Number TiN Coated	Tool Number TiCN Coated	Tool Number AlTiN Coated	Tool Number DLC Coated
1/8"	3/8"	1/2"	2-1/2"	T12-203-04	T12-203-04-T	T12-203-04-C	T12-203-04-A	T12-203-04-DLC
9/64"	3/8"	1/2"	2-1/2"	T12-203-04.5	T12-203-04.5-T	T12-203-04.5-C	T12-203-04.5-A	T12-203-04.5-DLC
5/32"	3/8"	9/16"	2-1/2"	T12-203-05	T12-203-05-T	T12-203-05-C	T12-203-05-A	T12-203-05-DLC
11/64"	3/8"	9/16"	2-1/2"	T12-203-05.5	T12-203-05.5-T	T12-203-05.5-C	T12-203-05.5-A	T12-203-05.5-DLC
3/16"	3/8"	5/8"	2-1/2"	T12-203-06	T12-203-06-T	T12-203-06-C	T12-203-06-A	T12-203-06-DLC
13/64"	3/8"	5/8"	2-1/2"	T12-203-06.5	T12-203-06.5-T	T12-203-06.5-C	T12-203-06.5-A	T12-203-06.5-DLC
7/32"	3/8"	5/8"	2-1/2"	T12-203-07	T12-203-07-T	T12-203-07-C	T12-203-07-A	T12-203-07-DLC
15/64"	3/8"	5/8"	2-1/2"	T12-203-07.5	T12-203-07.5-T	T12-203-07.5-C	T12-203-07.5-A	T12-203-07.5-DLC
1/4"	3/8"	3/4"	2-1/2"	T12-203-08	T12-203-08-T	T12-203-08-C	T12-203-08-A	T12-203-08-DLC
17/64"	3/8"	3/4"	2-1/2"	T12-203-08.5	T12-203-08.5-T	T12-203-08.5-C	T12-203-08.5-A	T12-203-08.5-DLC
9/32"	3/8"	3/4"	2-1/2"	T12-203-09	T12-203-09-T	T12-203-09-C	T12-203-09-A	T12-203-09-DLC
19/64"	3/8"	3/4"	2-1/2"	T12-203-09.5	T12-203-09.5-T	T12-203-09.5-C	T12-203-09.5-A	T12-203-09.5-DLC
5/16"	3/8"	13/16"	2-1/2"	T12-203-10	T12-203-10-T	T12-203-10-C	T12-203-10-A	T12-203-10-DLC
21/64"	3/8"	13/16"	2-1/2"	T12-203-10.5	T12-203-10.5-T	T12-203-10.5-C	T12-203-10.5-A	T12-203-10.5-DLC
11/32"	3/8"	13/16"	2-1/2"	T12-203-11	T12-203-11-T	T12-203-11-C	T12-203-11-A	T12-203-11-DLC
23/64"	3/8"	13/16"	2-1/2"	T12-203-11.5	T12-203-11.5-T	T12-203-11.5-C	T12-203-11.5-A	T12-203-11.5-DLC
3/8"	3/8"	7/8"	2-1/2"	T12-203-12	T12-203-12-T	T12-203-12-C	T12-203-12-A	T12-203-12-DLC
13/32"	1/2"	1"	3"	T12-203-13	T12-203-13-T	T12-203-13-C	T12-203-13-A	T12-203-13-DLC
7/16"	1/2"	1"	3"	T12-203-14	T12-203-14-T	T12-203-14-C	T12-203-14-A	T12-203-14-DLC
15/32"	1/2"	1"	3"	T12-203-15	T12-203-15-T	T12-203-15-C	T12-203-15-A	T12-203-15-DLC
1/2"	1/2"	1"	3"	T12-203-16	T12-203-16-T	T12-203-16-C	T12-203-16-A	T12-203-16-DLC

T12 4 Flute Tuffy Grade Carbide End Mills



T12 Series Tolerances

Cutting Dia. = $\pm .001/- .000$ "

Shank Dia. = $\pm .0001/- .0002$ "

Flute Length (1/8" to 5/16") = $\pm .030/- .000$ "
(21/64" to 3/4") = $\pm .060/- .000$ "

OAL = $\pm .060$ "



T12-403 4 Flute Tuffy Grade Stub Length



Cutting Diameter	Shank Diameter	Flute Length	Overall Length	Tool Number Uncoated	Tool Number TiN Coated	Tool Number TiCN Coated	Tool Number AlTiN Coated	Tool Number DLC Coated
1/8"	3/8"	1/4"	2-1/2"	T12-403-04	T12-403-04-T	T12-403-04-C	T12-403-04-A	T12-403-04-DLC
5/32"	3/8"	1/4"	2-1/2"	T12-403-05	T12-403-05-T	T12-403-05-C	T12-403-05-A	T12-403-05-DLC
3/16"	3/8"	5/16"	2-1/2"	T12-403-06	T12-403-06-T	T12-403-06-C	T12-403-06-A	T12-403-06-DLC
7/32"	3/8"	5/16"	2-1/2"	T12-403-07	T12-403-07-T	T12-403-07-C	T12-403-07-A	T12-403-07-DLC
1/4"	3/8"	5/16"	2-1/2"	T12-403-08	T12-403-08-T	T12-403-08-C	T12-403-08-A	T12-403-08-DLC
9/32"	3/8"	7/16"	2-1/2"	T12-403-09	T12-403-09-T	T12-403-09-C	T12-403-09-A	T12-403-09-DLC
5/16"	3/8"	7/16"	2-1/2"	T12-403-10	T12-403-10-T	T12-403-10-C	T12-403-10-A	T12-403-10-DLC
3/8"	3/8"	1/2"	2-1/2"	T12-403-12	T12-403-12-T	T12-403-12-C	T12-403-12-A	T12-403-12-DLC
7/16"	1/2"	5/8"	3"	T12-403-14	T12-403-14-T	T12-403-14-C	T12-403-14-A	T12-403-14-DLC
1/2"	1/2"	5/8"	3"	T12-403-16	T12-403-16-T	T12-403-16-C	T12-403-16-A	T12-403-16-DLC
5/8"	5/8"	7/8"	3-1/2"	T12-403-20	T12-403-20-T	T12-403-20-C	T12-403-20-A	T12-403-20-DLC
3/4"	3/4"	1"	3-1/2"	T12-403-24	T12-403-24-T	T12-403-24-C	T12-403-24-A	T12-403-24-DLC

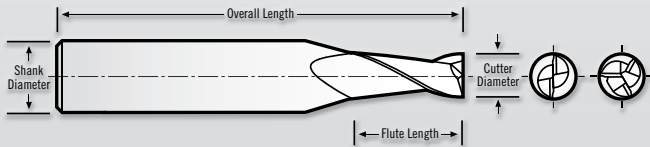


T12-405 4 Flute Tuffy Grade Standard Length



Cutting Diameter	Shank Diameter	Flute Length	Overall Length	Tool Number Uncoated	Tool Number TiN Coated	Tool Number TiCN Coated	Tool Number AlTiN Coated	Tool Number DLC Coated
1/8"	3/8"	1/2"	2-1/2"	T12-405-04	T12-405-04-T	T12-405-04-C	T12-405-04-A	T12-405-04-DLC
9/64"	3/8"	1/2"	2-1/2"	T12-405-04.5	T12-405-04.5-T	T12-405-04.5-C	T12-405-04.5-A	T12-405-04.5-DLC
5/32"	3/8"	9/16"	2-1/2"	T12-405-05	T12-405-05-T	T12-405-05-C	T12-405-05-A	T12-405-05-DLC
11/64"	3/8"	9/16"	2-1/2"	T12-405-05.5	T12-405-05.5-T	T12-405-05.5-C	T12-405-05.5-A	T12-405-05.5-DLC
3/16"	3/8"	5/8"	2-1/2"	T12-405-06	T12-405-06-T	T12-405-06-C	T12-405-06-A	T12-405-06-DLC
13/64"	3/8"	5/8"	2-1/2"	T12-405-06.5	T12-405-06.5-T	T12-405-06.5-C	T12-405-06.5-A	T12-405-06.5-DLC
7/32"	3/8"	5/8"	2-1/2"	T12-405-07	T12-405-07-T	T12-405-07-C	T12-405-07-A	T12-405-07-DLC
15/64"	3/8"	5/8"	2-1/2"	T12-405-07.5	T12-405-07.5-T	T12-405-07.5-C	T12-405-07.5-A	T12-405-07.5-DLC
1/4"	3/8"	3/4"	2-1/2"	T12-405-08	T12-405-08-T	T12-405-08-C	T12-405-08-A	T12-405-08-DLC
17/64"	3/8"	3/4"	2-1/2"	T12-405-08.5	T12-405-08.5-T	T12-405-08.5-C	T12-405-08.5-A	T12-405-08.5-DLC
9/32"	3/8"	3/4"	2-1/2"	T12-405-09	T12-405-09-T	T12-405-09-C	T12-405-09-A	T12-405-09-DLC
19/64"	3/8"	3/4"	2-1/2"	T12-405-09.5	T12-405-09.5-T	T12-405-09.5-C	T12-405-09.5-A	T12-405-09.5-DLC
5/16"	3/8"	13/16"	2-1/2"	T12-405-10	T12-405-10-T	T12-405-10-C	T12-405-10-A	T12-405-10-DLC
21/64"	3/8"	13/16"	2-1/2"	T12-405-10.5	T12-405-10.5-T	T12-405-10.5-C	T12-405-10.5-A	T12-405-10.5-DLC
11/32"	3/8"	13/16"	2-1/2"	T12-405-11	T12-405-11-T	T12-405-11-C	T12-405-11-A	T12-405-11-DLC
23/64"	3/8"	13/16"	2-1/2"	T12-405-11.5	T12-405-11.5-T	T12-405-11.5-C	T12-405-11.5-A	T12-405-11.5-DLC
3/8"	3/8"	7/8"	2-1/2"	T12-405-12	T12-405-12-T	T12-405-12-C	T12-405-12-A	T12-405-12-DLC
13/32"	1/2"	1"	3"	T12-405-13	T12-405-13-T	T12-405-13-C	T12-405-13-A	T12-405-13-DLC
7/16"	1/2"	1"	3"	T12-405-14	T12-405-14-T	T12-405-14-C	T12-405-14-A	T12-405-14-DLC
15/32"	1/2"	1"	3"	T12-405-15	T12-405-15-T	T12-405-15-C	T12-405-15-A	T12-405-15-DLC
1/2"	1/2"	1"	3"	T12-405-16	T12-405-16-T	T12-405-16-C	T12-405-16-A	T12-405-16-DLC

C-2 Grade Carbide End Mills C8



C8 Series Tolerances
 Cutting Dia. = $+0.000/-0.002$ "
 Shank Dia. = $-0.0001/-0.0002$ "
 Flute Length = $+0.030/-0.000$ "
 OAL = ± 0.060 "

*All Sizes on
1/4"
Shanks
for Strength*



C8-201 2 Flute C-2 Grade Stub Length



Cutting Diameter	Shank Diameter	Flute Length	Overall Length	Tool Number Uncoated	Tool Number DLC Coated
1/16"	1/4"	1/8"	2"	C8-201-02	C8-201-02-DLC
1/8"	1/4"	1/4"	2"	C8-201-04	C8-201-04-DLC
3/16"	1/4"	3/8"	2"	C8-201-06	C8-201-06-DLC
1/4"	1/4"	1/2"	2"	C8-201-08	C8-201-08-DLC



C8-203 2 Flute C-2 Grade Standard Length



Cutting Diameter	Shank Diameter	Flute Length	Overall Length	Tool Number Uncoated	Tool Number DLC Coated
1/16"	1/4"	1/4"	2-1/2"	C8-203-02	C8-203-02-DLC
1/8"	1/4"	1/2"	2-1/2"	C8-203-04	C8-203-04-DLC
3/16"	1/4"	5/8"	2-1/2"	C8-203-06	C8-203-06-DLC
1/4"	1/4"	3/4"	2-1/2"	C8-203-08	C8-203-08-DLC



C8-301 3 Flute C-2 Grade Stub Length



Cutting Diameter	Shank Diameter	Flute Length	Overall Length	Tool Number Uncoated	Tool Number DLC Coated
1/8"	1/4"	1/4"	2"	C8-301-04	C8-301-04-DLC
3/16"	1/4"	3/8"	2"	C8-301-06	C8-301-06-DLC
1/4"	1/4"	1/2"	2"	C8-301-08	C8-301-08-DLC

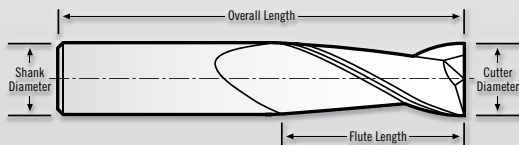
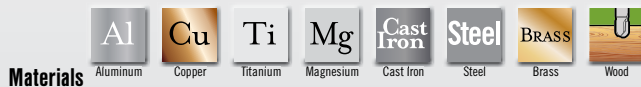


C8-303 3 Flute C-2 Grade Standard Length



Cutting Diameter	Shank Diameter	Flute Length	Overall Length	Tool Number Uncoated	Tool Number DLC Coated
1/8"	1/4"	1/2"	2-1/2"	C8-303-04	C8-303-04-DLC
3/16"	1/4"	5/8"	2-1/2"	C8-303-06	C8-303-06-DLC
1/4"	1/4"	3/4"	2-1/2"	C8-303-08	C8-303-08-DLC

TS 2 & 3 Flute Tuffy Grade Carbide End Mills



TS Tolerances

Cutting Dia. (1/16" to 1/4") = $+0.000/-0.002$ "
 (5/16" to 3/4") = $+0.000/-0.003$ "
 Shank Dia. = $-0.0001/-0.0002$ "
 Flute Length (1/16" to 5/16") = $+0.030/-0.000$ "
 (3/8" to 3/4") = $+0.060/-0.000$ "
 OAL = ± 0.060 "

MTS Tolerances

Cutting Dia. = $+0.000/-0.075$ mm
 Shank Dia. = $-0.002/-0.005$ mm
 Flute Length = $+0.500/+1.500$ mm
 OAL = ± 1.000 mm



TS-201 2 Flute Tuffy Grade Stub Length

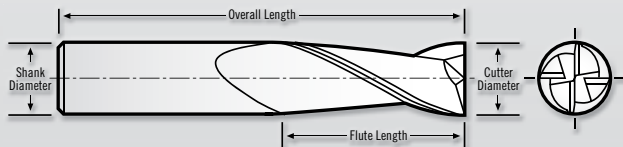
Cutting Diameter	Shank Diameter	Flute Length	Overall Length	Tool Number Uncoated	Tool Number TiN Coated	Tool Number TiCN Coated	Tool Number AlTiN Coated	Tool Number DLC Coated
1/16"	1/8"	1/8"	1-1/2"	TS-201-02	TS-201-02-T	TS-201-02-C	TS-201-02-A	TS-201-02-DLC
3/32"	1/8"	3/16"	1-1/2"	TS-201-03	TS-201-03-T	TS-201-03-C	TS-201-03-A	TS-201-03-DLC
1/8"	1/8"	1/4"	1-1/2"	TS-201-04	TS-201-04-T	TS-201-04-C	TS-201-04-A	TS-201-04-DLC
3/16"	3/16"	3/8"	2"	TS-201-06	TS-201-06-T	TS-201-06-C	TS-201-06-A	TS-201-06-DLC
1/4"	1/4"	1/2"	2"	TS-201-08	TS-201-08-T	TS-201-08-C	TS-201-08-A	TS-201-08-DLC
5/16"	5/16"	1/2"	2-1/2"	TS-201-10	TS-201-10-T	TS-201-10-C	TS-201-10-A	TS-201-10-DLC
3/8"	3/8"	5/8"	2-1/2"	TS-201-12	TS-201-12-T	TS-201-12-C	TS-201-12-A	TS-201-12-DLC
7/16"	7/16"	5/8"	2-3/4"	TS-201-14	TS-201-14-T	TS-201-14-C	TS-201-14-A	TS-201-14-DLC
1/2"	1/2"	5/8"	3"	TS-201-16	TS-201-16-T	TS-201-16-C	TS-201-16-A	TS-201-16-DLC
5/8"	5/8"	7/8"	3-1/2"	TS-201-20	TS-201-20-T	TS-201-20-C	TS-201-20-A	TS-201-20-DLC
3/4"	3/4"	1"	3-1/2"	TS-201-24	TS-201-24-T	TS-201-24-C	TS-201-24-A	TS-201-24-DLC



TS-301 3 Flute Tuffy Grade Stub Length

Cutting Diameter	Shank Diameter	Flute Length	Overall Length	Tool Number Uncoated	Tool Number TiN Coated	Tool Number TiCN Coated	Tool Number AlTiN Coated	Tool Number DLC Coated
1/16"	1/8"	1/8"	1-1/2"	TS-301-02	TS-301-02-T	TS-301-02-C	TS-301-02-A	TS-301-02-DLC
3/32"	1/8"	3/16"	1-1/2"	TS-301-03	TS-301-03-T	TS-301-03-C	TS-301-03-A	TS-301-03-DLC
1/8"	1/8"	1/4"	1-1/2"	TS-301-04	TS-301-04-T	TS-301-04-C	TS-301-04-A	TS-301-04-DLC
3/16"	3/16"	3/8"	2"	TS-301-06	TS-301-06-T	TS-301-06-C	TS-301-06-A	TS-301-06-DLC
1/4"	1/4"	1/2"	2"	TS-301-08	TS-301-08-T	TS-301-08-C	TS-301-08-A	TS-301-08-DLC
5/16"	5/16"	1/2"	2-1/2"	TS-301-10	TS-301-10-T	TS-301-10-C	TS-301-10-A	TS-301-10-DLC
3/8"	3/8"	5/8"	2-1/2"	TS-301-12	TS-301-12-T	TS-301-12-C	TS-301-12-A	TS-301-12-DLC
7/16"	7/16"	5/8"	2-3/4"	TS-301-14	TS-301-14-T	TS-301-14-C	TS-301-14-A	TS-301-14-DLC
1/2"	1/2"	5/8"	3"	TS-301-16	TS-301-16-T	TS-301-16-C	TS-301-16-A	TS-301-16-DLC

4 Flute Tuffy Grade Carbide End Mills **TS/MTS**



TS Tolerances

Cutting Dia. (1/16" to 1/4") = $+0.000/-0.002$ "
 (5/16" to 3/4") = $+0.000/-0.003$ "
 Shank Dia. = $-0.0001/-0.0002$ "
 Flute Length (1/16" to 5/16") = $+0.030/-0.000$ "
 (3/8" to 3/4") = $+0.060/-0.000$ "
 OAL = ± 0.060 "

MTS Tolerances

Cutting Dia. = $+0.000/-0.075$ mm
 Shank Dia. = $-0.002/-0.005$ mm
 Flute Length = $+0.500/+1.500$ mm
 OAL = ± 1.000 mm



TS-401 4 Flute Tuffy Grade Stub Length



Cutting Diameter	Shank Diameter	Flute Length	Overall Length	Tool Number Uncoated	Tool Number TiN Coated	Tool Number TiCN Coated	Tool Number AlTiN Coated	Tool Number DLC Coated
1/16"	1/8"	1/8"	1-1/2"	TS-401-02	TS-401-02-T	TS-401-02-C	TS-401-02-A	TS-401-02-DLC
3/32"	1/8"	3/16"	1-1/2"	TS-401-03	TS-401-03-T	TS-401-03-C	TS-401-03-A	TS-401-03-DLC
1/8"	1/8"	1/4"	1-1/2"	TS-401-04	TS-401-04-T	TS-401-04-C	TS-401-04-A	TS-401-04-DLC
3/16"	3/16"	3/8"	2"	TS-401-06	TS-401-06-T	TS-401-06-C	TS-401-06-A	TS-401-06-DLC
1/4"	1/4"	1/2"	2"	TS-401-08	TS-401-08-T	TS-401-08-C	TS-401-08-A	TS-401-08-DLC
5/16"	5/16"	1/2"	2-1/2"	TS-401-10	TS-401-10-T	TS-401-10-C	TS-401-10-A	TS-401-10-DLC
3/8"	3/8"	5/8"	2-1/2"	TS-401-12	TS-401-12-T	TS-401-12-C	TS-401-12-A	TS-401-12-DLC
7/16"	7/16"	5/8"	2-3/4"	TS-401-14	TS-401-14-T	TS-401-14-C	TS-401-14-A	TS-401-14-DLC
1/2"	1/2"	5/8"	3"	TS-401-16	TS-401-16-T	TS-401-16-C	TS-401-16-A	TS-401-16-DLC
5/8"	5/8"	7/8"	3-1/2"	TS-401-20	TS-401-20-T	TS-401-20-C	TS-401-20-A	TS-401-20-DLC
3/4"	3/4"	1"	3-1/2"	TS-401-24	TS-401-24-T	TS-401-24-C	TS-401-24-A	TS-401-24-DLC



MTS-401 Metric 4 Flute Tuffy Grade Stub Length **METRIC**



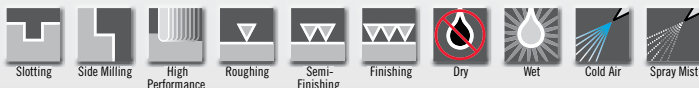
Cutting Diameter	Shank Diameter	Flute Length	Overall Length	Tool Number Uncoated	Tool Number TiN Coated	Tool Number TiCN Coated	Tool Number AlTiN Coated	Tool Number DLC Coated
2mm	3mm	5mm	38mm	MTS-401-02	MTS-401-02-T	MTS-401-02-C	MTS-401-02-A	MTS-401-02-DLC
3mm	3mm	6mm	38mm	MTS-401-03	MTS-401-03-T	MTS-401-03-C	MTS-401-03-A	MTS-401-03-DLC
4mm	4mm	8mm	50mm	MTS-401-04	MTS-401-04-T	MTS-401-04-C	MTS-401-04-A	MTS-401-04-DLC
5mm	5mm	8mm	50mm	MTS-401-05	MTS-401-05-T	MTS-401-05-C	MTS-401-05-A	MTS-401-05-DLC
6mm	6mm	8mm	50mm	MTS-401-06	MTS-401-06-T	MTS-401-06-C	MTS-401-06-A	MTS-401-06-DLC
8mm	8mm	12mm	58mm	MTS-401-08	MTS-401-08-T	MTS-401-08-C	MTS-401-08-A	MTS-401-08-DLC
10mm	10mm	14mm	66mm	MTS-401-10	MTS-401-10-T	MTS-401-10-C	MTS-401-10-A	MTS-401-10-DLC
12mm	12mm	16mm	73mm	MTS-401-12	MTS-401-12-T	MTS-401-12-C	MTS-401-12-A	MTS-401-12-DLC
16mm	16mm	20mm	82mm	MTS-401-16	MTS-401-16-T	MTS-401-16-C	MTS-401-16-A	MTS-401-16-DLC
20mm	20mm	25mm	92mm	MTS-401-20	MTS-401-20-T	MTS-401-20-C	MTS-401-20-A	MTS-401-20-DLC

TR 3 Flute Tuffy Grade Carbide End Mills

Characteristics



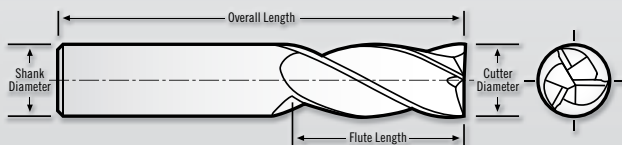
Applications



Materials



Coatings



TR-303 Tolerances

Cutting Dia. = $+0.001/-0.000$ "
 Shank Dia. = $-0.0001/-0.0002$ "
 Flute Length (1/8" to 5/16") = $+0.030/-0.000$ "
 (3/8" to 3/4") = $+0.060/-0.000$ "
 OAL = ± 0.060 "



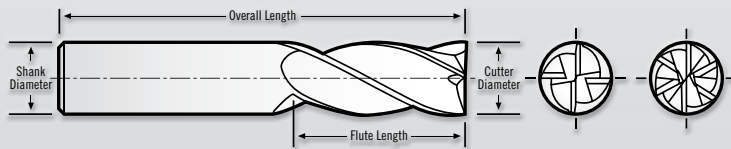
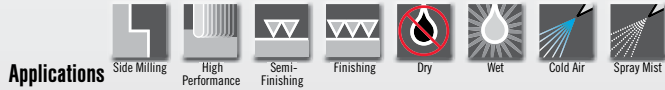
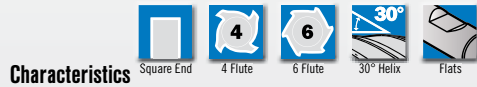
TR-303 3 Flute Tuffy Grade Standard Length

Cutting Diameter	Shank Diameter	Flute Length	Overall Length	Tool Number Uncoated	Tool Number TiN Coated	Tool Number TiCN Coated	Tool Number AlTiN Coated	Tool Number DLC Coated
1/8"	1/8"	1/2"	1-1/2"	TR-303-04*	TR-303-04-T*	TR-303-04-C*	TR-303-04-A*	TR-303-04-DLC*
5/32"	3/16"	9/16"	2"	TR-303-05*	TR-303-05-T*	TR-303-05-C*	TR-303-05-A*	TR-303-05-DLC*
3/16"	3/16"	5/8"	2"	TR-303-06*	TR-303-06-T*	TR-303-06-C*	TR-303-06-A*	TR-303-06-DLC*
7/32"	1/4"	5/8"	2-1/2"	TR-303-07*	TR-303-07-T*	TR-303-07-C*	TR-303-07-A*	TR-303-07-DLC*
1/4"	1/4"	3/4"	2-1/2"	TR-303-08*	TR-303-08-T*	TR-303-08-C*	TR-303-08-A*	TR-303-08-DLC*
9/32"	5/16"	3/4"	2-1/2"	TR-303-09*	TR-303-09-T*	TR-303-09-C*	TR-303-09-A*	TR-303-09-DLC*
5/16"	5/16"	13/16"	2-1/2"	TR-303-10*	TR-303-10-T*	TR-303-10-C*	TR-303-10-A*	TR-303-10-DLC*
3/8"	3/8"	7/8"	2-1/2"	TR-303-12	TR-303-12-T	TR-303-12-C	TR-303-12-A	TR-303-12-DLC
7/16"	7/16"	1"	2-3/4"	TR-303-14*	TR-303-14-T*	TR-303-14-C*	TR-303-14-A*	TR-303-14-DLC*
1/2"	1/2"	1"	3"	TR-303-16	TR-303-16-T	TR-303-16-C	TR-303-16-A	TR-303-16-DLC
9/16"	9/16"	1-1/4"	3-1/2"	TR-303-18*	TR-303-18-T*	TR-303-18-C*	TR-303-18-A*	TR-303-18-DLC*
5/8"	5/8"	1-1/4"	3-1/2"	TR-303-20	TR-303-20-T	TR-303-20-C	TR-303-20-A	TR-303-20-DLC
3/4"	3/4"	1-1/2"	4"	TR-303-24	TR-303-24-T	TR-303-24-C	TR-303-24-A	TR-303-24-DLC

*Does not come with flats.



4/6 Flute Tuffy Grade Carbide End Mills **TR**



TR-404 Tolerances

Cutting Dia. = $+0.001/-0.000$ "
 Shank Dia. = $-0.0001/-0.0002$ "
 Flute Length (1/8" to 5/16") = $+0.030/-0.000$ "
 (3/8" to 3/4") = $+0.060/-0.000$ "
 OAL = ± 0.060 "

TR-606 Tolerances

Cutting Dia. = $+0.001/-0.000$ "
 Shank Dia. = $-0.0001/-0.0002$ "
 Flute Length = $+0.060/-0.000$ "
 OAL = ± 0.060 "



TR-404 4 Flute Tuffy Grade Standard Length

Cutting Diameter	Shank Diameter	Flute Length	Overall Length	Tool Number Uncoated	Tool Number TiN Coated	Tool Number TiCN Coated	Tool Number AlTiN Coated	Tool Number DLC Coated
1/8"	1/8"	1/2"	1-1/2"	TR-404-04*	TR-404-04-T*	TR-404-04-C*	TR-404-04-A*	TR-404-04-DLC*
5/32"	3/16"	9/16"	2"	TR-404-05*	TR-404-05-T*	TR-404-05-C*	TR-404-05-A*	TR-404-05-DLC*
3/16"	3/16"	5/8"	2"	TR-404-06*	TR-404-06-T*	TR-404-06-C*	TR-404-06-A*	TR-404-06-DLC*
7/32"	1/4"	5/8"	2-1/2"	TR-404-07*	TR-404-07-T*	TR-404-07-C*	TR-404-07-A*	TR-404-07-DLC*
1/4"	1/4"	3/4"	2-1/2"	TR-404-08*	TR-404-08-T*	TR-404-08-C*	TR-404-08-A*	TR-404-08-DLC*
9/32"	5/16"	3/4"	2-1/2"	TR-404-09*	TR-404-09-T*	TR-404-09-C*	TR-404-09-A*	TR-404-09-DLC*
5/16"	5/16"	13/16"	2-1/2"	TR-404-10*	TR-404-10-T*	TR-404-10-C*	TR-404-10-A*	TR-404-10-DLC*
3/8"	3/8"	7/8"	2-1/2"	TR-404-12	TR-404-12-T	TR-404-12-C	TR-404-12-A	TR-404-12-DLC
7/16"	7/16"	1"	2-3/4"	TR-404-14*	TR-404-14-T*	TR-404-14-C*	TR-404-14-A*	TR-404-14-DLC*
1/2"	1/2"	1"	3"	TR-404-16	TR-404-16-T	TR-404-16-C	TR-404-16-A	TR-404-16-DLC
9/16"	9/16"	1-1/4"	3-1/2"	TR-404-18*	TR-404-18-T*	TR-404-18-C*	TR-404-18-A*	TR-404-18-DLC*
5/8"	5/8"	1-1/4"	3-1/2"	TR-404-20	TR-404-20-T	TR-404-20-C	TR-404-20-A	TR-404-20-DLC
3/4"	3/4"	1-1/2"	4"	TR-404-24	TR-404-24-T	TR-404-24-C	TR-404-24-A	TR-404-24-DLC

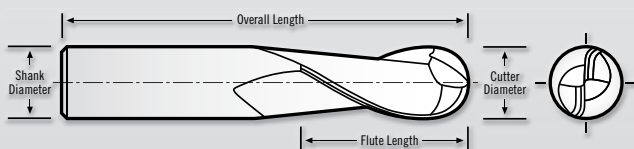
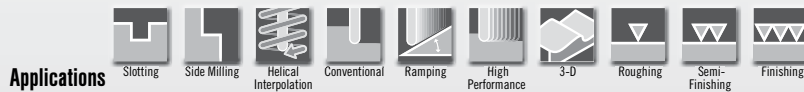
*Does not come with flats.



TR-606 6 Flute Tuffy Grade Standard Length

Cutting Diameter	Shank Diameter	Flute Length	Overall Length	Tool Number Uncoated	Tool Number TiN Coated	Tool Number TiCN Coated	Tool Number AlTiN Coated	Tool Number DLC Coated
1"	1"	2-1/2"	5"	TR-606-32	TR-606-32-T	TR-606-32-C	TR-606-32-A	TR-606-32-DLC

SB/MSB 2 Flute Tuffy Grade Carbide Ball End Mills



SB Series Tolerances

Cutting Dia. (1/16" to 1/4") = $+.000/-0.002$ "
 (9/32" to 3/4") = $+.000/-0.003$ "
 Shank Dia. = $-.0001/-0.0002$ "
 Flute Length (1/16" to 5/16") = $+.030/-0.000$ "
 (3/8" to 3/4") = $+.060/-0.000$ "
 OAL = ± 0.060 "

MSB Tolerances

Cutting Dia. = $+.000/-0.075$ mm
 Shank Dia. = $-.002/-0.005$ mm
 Flute Length = $+0.500/+1.500$ mm
 OAL = ± 1.000 mm



SB-201 2 Flute Tuffy Ball End Stub Length



Cutting Diameter	Shank Diameter	Flute Length	Overall Length	Tool Number Uncoated	Tool Number TiN Coated	Tool Number TiCN Coated	Tool Number AlTiN Coated	Tool Number DLC Coated
1/16"	1/8"	1/8"	1-1/2"	SB-201-02	SB-201-02-T	SB-201-02-C	SB-201-02-A	SB-201-02-DLC
3/32"	1/8"	3/16"	1-1/2"	SB-201-03	SB-201-03-T	SB-201-03-C	SB-201-03-A	SB-201-03-DLC
1/8"	1/8"	1/4"	1-1/2"	SB-201-04	SB-201-04-T	SB-201-04-C	SB-201-04-A	SB-201-04-DLC
5/32"	3/16"	1/4"	2"	SB-201-05	SB-201-05-T	SB-201-05-C	SB-201-05-A	SB-201-05-DLC
3/16"	3/16"	5/16"	2"	SB-201-06	SB-201-06-T	SB-201-06-C	SB-201-06-A	SB-201-06-DLC
7/32"	1/4"	5/16"	2-1/2"	SB-201-07	SB-201-07-T	SB-201-07-C	SB-201-07-A	SB-201-07-DLC
1/4"	1/4"	5/16"	2-1/2"	SB-201-08	SB-201-08-T	SB-201-08-C	SB-201-08-A	SB-201-08-DLC
9/32"	5/16"	7/16"	2-1/2"	SB-201-09	SB-201-09-T	SB-201-09-C	SB-201-09-A	SB-201-09-DLC
5/16"	5/16"	7/16"	2-1/2"	SB-201-10	SB-201-10-T	SB-201-10-C	SB-201-10-A	SB-201-10-DLC
3/8"	3/8"	1/2"	2-1/2"	SB-201-12	SB-201-12-T	SB-201-12-C	SB-201-12-A	SB-201-12-DLC
7/16"	7/16"	5/8"	2-3/4"	SB-201-14	SB-201-14-T	SB-201-14-C	SB-201-14-A	SB-201-14-DLC
1/2"	1/2"	5/8"	3"	SB-201-16	SB-201-16-T	SB-201-16-C	SB-201-16-A	SB-201-16-DLC
5/8"	5/8"	7/8"	3-1/2"	SB-201-20	SB-201-20-T	SB-201-20-C	SB-201-20-A	SB-201-20-DLC
3/4"	3/4"	1"	4"	SB-201-24	SB-201-24-T	SB-201-24-C	SB-201-24-A	SB-201-24-DLC



MSB-201 Metric 2 Flute Tuffy Ball End Mill Stub **METRIC**



Cutting Diameter	Shank Diameter	Flute Length	Overall Length	Tool Number Uncoated	Tool Number TiN Coated	Tool Number TiCN Coated	Tool Number AlTiN Coated	Tool Number DLC Coated
2mm	3mm	5mm	38mm	MSB-201-02	MSB-201-02-T	MSB-201-02-C	MSB-201-02-A	MSB-201-02-DLC
3mm	3mm	6mm	38mm	MSB-201-03	MSB-201-03-T	MSB-201-03-C	MSB-201-03-A	MSB-201-03-DLC
4mm	4mm	8mm	50mm	MSB-201-04	MSB-201-04-T	MSB-201-04-C	MSB-201-04-A	MSB-201-04-DLC
5mm	5mm	8mm	50mm	MSB-201-05	MSB-201-05-T	MSB-201-05-C	MSB-201-05-A	MSB-201-05-DLC
6mm	6mm	8mm	50mm	MSB-201-06	MSB-201-06-T	MSB-201-06-C	MSB-201-06-A	MSB-201-06-DLC
8mm	8mm	12mm	58mm	MSB-201-08	MSB-201-08-T	MSB-201-08-C	MSB-201-08-A	MSB-201-08-DLC
10mm	10mm	14mm	66mm	MSB-201-10	MSB-201-10-T	MSB-201-10-C	MSB-201-10-A	MSB-201-10-DLC
12mm	12mm	16mm	73mm	MSB-201-12	MSB-201-12-T	MSB-201-12-C	MSB-201-12-A	MSB-201-12-DLC
16mm	16mm	20mm	82mm	MSB-201-16	MSB-201-16-T	MSB-201-16-C	MSB-201-16-A	MSB-201-16-DLC
20mm	20mm	25mm	92mm	MSB-201-20	MSB-201-20-T	MSB-201-20-C	MSB-201-20-A	MSB-201-20-DLC

2 Flute Tuffy Grade Carbide Ball End Mills **B/MB**



B-203 2 Flute Tuffy Ball End Standard Length



Cutting Diameter	Shank Diameter	Flute Length	Overall Length	Tool Number Uncoated	Tool Number TiN Coated	Tool Number TiCN Coated	Tool Number AlTiN Coated	Tool Number DLC Coated
1/16"	1/8"	3/16"	1-1/2"	B-203-02	B-203-02-T	B-203-02-C	B-203-02-A	B-203-02-DLC
3/32"	1/8"	3/8"	1-1/2"	B-203-03	B-203-03-T	B-203-03-C	B-203-03-A	B-203-03-DLC
1/8"	1/8"	1/2"	1-1/2"	B-203-04	B-203-04-T	B-203-04-C	B-203-04-A	B-203-04-DLC
5/32"	3/16"	9/16"	2"	B-203-05	B-203-05-T	B-203-05-C	B-203-05-A	B-203-05-DLC
3/16"	3/16"	5/8"	2"	B-203-06	B-203-06-T	B-203-06-C	B-203-06-A	B-203-06-DLC
7/32"	1/4"	5/8"	2-1/2"	B-203-07	B-203-07-T	B-203-07-C	B-203-07-A	B-203-07-DLC
1/4"	1/4"	3/4"	2-1/2"	B-203-08	B-203-08-T	B-203-08-C	B-203-08-A	B-203-08-DLC
9/32"	5/16"	3/4"	2-1/2"	B-203-09	B-203-09-T	B-203-09-C	B-203-09-A	B-203-09-DLC
5/16"	5/16"	13/16"	2-1/2"	B-203-10	B-203-10-T	B-203-10-C	B-203-10-A	B-203-10-DLC
3/8"	3/8"	7/8"	2-1/2"	B-203-12	B-203-12-T	B-203-12-C	B-203-12-A	B-203-12-DLC
7/16"	7/16"	1"	2-3/4"	B-203-14	B-203-14-T	B-203-14-C	B-203-14-A	B-203-14-DLC
1/2"	1/2"	1"	3"	B-203-16	B-203-16-T	B-203-16-C	B-203-16-A	B-203-16-DLC
5/8"	5/8"	1-1/4"	3-1/2"	B-203-20	B-203-20-T	B-203-20-C	B-203-20-A	B-203-20-DLC
3/4"	3/4"	1-1/2"	4"	B-203-24	B-203-24-T	B-203-24-C	B-203-24-A	B-203-24-DLC

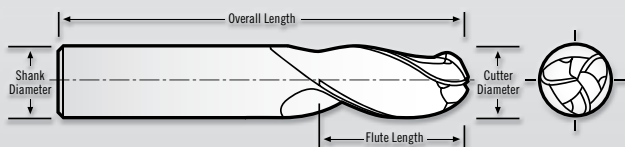
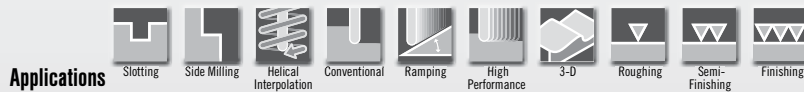


MB-203 Metric 2 Flute Tuffy Ball End Standard Length **METRIC**



Cutting Diameter	Shank Diameter	Flute Length	Overall Length	Tool Number Uncoated	Tool Number TiN Coated	Tool Number TiCN Coated	Tool Number AlTiN Coated	Tool Number DLC Coated
2mm	3mm	8mm	38mm	MB-203-02	MB-203-02-T	MB-203-02-C	MB-203-02-A	MB-203-02-DLC
3mm	3mm	12mm	38mm	MB-203-03	MB-203-03-T	MB-203-03-C	MB-203-03-A	MB-203-03-DLC
4mm	4mm	12mm	50mm	MB-203-04	MB-203-04-T	MB-203-04-C	MB-203-04-A	MB-203-04-DLC
5mm	5mm	14mm	50mm	MB-203-05	MB-203-05-T	MB-203-05-C	MB-203-05-A	MB-203-05-DLC
6mm	6mm	14mm	57mm	MB-203-06	MB-203-06-T	MB-203-06-C	MB-203-06-A	MB-203-06-DLC
8mm	8mm	16mm	63mm	MB-203-08	MB-203-08-T	MB-203-08-C	MB-203-08-A	MB-203-08-DLC
10mm	10mm	20mm	72mm	MB-203-10	MB-203-10-T	MB-203-10-C	MB-203-10-A	MB-203-10-DLC
12mm	12mm	25mm	83mm	MB-203-12	MB-203-12-T	MB-203-12-C	MB-203-12-A	MB-203-12-DLC
16mm	16mm	32mm	92mm	MB-203-16	MB-203-16-T	MB-203-16-C	MB-203-16-A	MB-203-16-DLC
20mm	20mm	38mm	104mm	MB-203-20	MB-203-20-T	MB-203-20-C	MB-203-20-A	MB-203-20-DLC

SB/MSB 3 Flute Tuffy Grade Carbide Ball End Mills



SB/B Series Tolerances

Cutting Dia. (1/16" to 1/4") = $+.000/-0.002$ "
 (9/32" to 3/4") = $+.000/-0.003$ "
 Shank Dia. = $-.0001/-0.0002$ "
 Flute Length (1/16" to 5/16") = $+.030/-0.000$ "
 (3/8" to 1") = $+.060/-0.000$ "
 OAL = ± 0.060 "

MB Tolerances

Cutting Dia. = $+.000/-0.075$ mm
 Shank Dia. = $-.002/-0.005$ mm
 Flute Length = $+0.500/+1.500$ mm
 OAL = ± 1.000 mm



SB-301 3 Flute Tuffy Ball End Stub Length

Cutting Diameter	Shank Diameter	Flute Length	Overall Length	Tool Number Uncoated	Tool Number TiN Coated	Tool Number TiCN Coated	Tool Number AlTiN Coated	Tool Number DLC Coated
1/16"	1/8"	1/8"	1-1/2"	SB-301-02	SB-301-02-T	SB-301-02-C	SB-301-02-A	SB-301-02-DLC
3/32"	1/8"	3/16"	1-1/2"	SB-301-03	SB-301-03-T	SB-301-03-C	SB-301-03-A	SB-301-03-DLC
1/8"	1/8"	1/4"	1-1/2"	SB-301-04	SB-301-04-T	SB-301-04-C	SB-301-04-A	SB-301-04-DLC
5/32"	3/16"	1/4"	2"	SB-301-05	SB-301-05-T	SB-301-05-C	SB-301-05-A	SB-301-05-DLC
3/16"	3/16"	5/16"	2"	SB-301-06	SB-301-06-T	SB-301-06-C	SB-301-06-A	SB-301-06-DLC
7/32"	1/4"	5/16"	2-1/2"	SB-301-07	SB-301-07-T	SB-301-07-C	SB-301-07-A	SB-301-07-DLC
1/4"	1/4"	5/16"	2-1/2"	SB-301-08	SB-301-08-T	SB-301-08-C	SB-301-08-A	SB-301-08-DLC
9/32"	5/16"	7/16"	2-1/2"	SB-301-09	SB-301-09-T	SB-301-09-C	SB-301-09-A	SB-301-09-DLC
5/16"	5/16"	7/16"	2-1/2"	SB-301-10	SB-301-10-T	SB-301-10-C	SB-301-10-A	SB-301-10-DLC
3/8"	3/8"	1/2"	2-1/2"	SB-301-12	SB-301-12-T	SB-301-12-C	SB-301-12-A	SB-301-12-DLC
7/16"	7/16"	5/8"	2-3/4"	SB-301-14	SB-301-14-T	SB-301-14-C	SB-301-14-A	SB-301-14-DLC
1/2"	1/2"	5/8"	3"	SB-301-16	SB-301-16-T	SB-301-16-C	SB-301-16-A	SB-301-16-DLC
5/8"	5/8"	7/8"	3-1/2"	SB-301-20	SB-301-20-T	SB-301-20-C	SB-301-20-A	SB-301-20-DLC
3/4"	3/4"	1"	4"	SB-301-24	SB-301-24-T	SB-301-24-C	SB-301-24-A	SB-301-24-DLC



MSB-301 Metric 3 Flute Tuffy Ball End Stub Length

Cutting Diameter	Shank Diameter	Flute Length	Overall Length	Tool Number Uncoated	Tool Number TiN Coated	Tool Number TiCN Coated	Tool Number AlTiN Coated	Tool Number DLC Coated
1.5mm	3mm	3mm	38mm	MSB-301-1.5	MSB-301-1.5-T	MSB-301-1.5-C	MSB-301-1.5-A	MSB-301-1.5-DLC
2mm	3mm	5mm	38mm	MSB-301-02	MSB-301-02-T	MSB-301-02-C	MSB-301-02-A	MSB-301-02-DLC
3mm	3mm	6mm	38mm	MSB-301-03	MSB-301-03-T	MSB-301-03-C	MSB-301-03-A	MSB-301-03-DLC
4mm	4mm	8mm	50mm	MSB-301-04	MSB-301-04-T	MSB-301-04-C	MSB-301-04-A	MSB-301-04-DLC
5mm	5mm	8mm	50mm	MSB-301-05	MSB-301-05-T	MSB-301-05-C	MSB-301-05-A	MSB-301-05-DLC
6mm	6mm	8mm	50mm	MSB-301-06	MSB-301-06-T	MSB-301-06-C	MSB-301-06-A	MSB-301-06-DLC
8mm	8mm	12mm	58mm	MSB-301-08	MSB-301-08-T	MSB-301-08-C	MSB-301-08-A	MSB-301-08-DLC
10mm	10mm	14mm	66mm	MSB-301-10	MSB-301-10-T	MSB-301-10-C	MSB-301-10-A	MSB-301-10-DLC
12mm	12mm	16mm	73mm	MSB-301-12	MSB-301-12-T	MSB-301-12-C	MSB-301-12-A	MSB-301-12-DLC
16mm	16mm	20mm	82mm	MSB-301-16	MSB-301-16-T	MSB-301-16-C	MSB-301-16-A	MSB-301-16-DLC
20mm	20mm	25mm	92mm	MSB-301-20	MSB-301-20-T	MSB-301-20-C	MSB-301-20-A	MSB-301-20-DLC

3 Flute Tuffy Grade Carbide Ball End Mills **B/MB**



B-333 3 Flute Tuffy Ball End Standard Length

Cutting Diameter	Shank Diameter	Flute Length	Overall Length	Tool Number Uncoated	Tool Number TiN Coated	Tool Number TiCN Coated	Tool Number AlTiN Coated	Tool Number DLC Coated
1/16"	1/8"	3/16"	1-1/2"	B-333-02	B-333-02-T	B-333-02-C	B-333-02-A	B-333-02-DLC
3/32"	1/8"	3/8"	1-1/2"	B-333-03	B-333-03-T	B-333-03-C	B-333-03-A	B-333-03-DLC
1/8"	1/8"	1/2"	1-1/2"	B-333-04	B-333-04-T	B-333-04-C	B-333-04-A	B-333-04-DLC
5/32"	3/16"	9/16"	2"	B-333-05	B-333-05-T	B-333-05-C	B-333-05-A	B-333-05-DLC
3/16"	3/16"	5/8"	2"	B-333-06	B-333-06-T	B-333-06-C	B-333-06-A	B-333-06-DLC
7/32"	1/4"	5/8"	2-1/2"	B-333-07	B-333-07-T	B-333-07-C	B-333-07-A	B-333-07-DLC
1/4"	1/4"	3/4"	2-1/2"	B-333-08	B-333-08-T	B-333-08-C	B-333-08-A	B-333-08-DLC
9/32"	5/16"	3/4"	2-1/2"	B-333-09	B-333-09-T	B-333-09-C	B-333-09-A	B-333-09-DLC
5/16"	5/16"	13/16"	2-1/2"	B-333-10	B-333-10-T	B-333-10-C	B-333-10-A	B-333-10-DLC
3/8"	3/8"	7/8"	2-1/2"	B-333-12	B-333-12-T	B-333-12-C	B-333-12-A	B-333-12-DLC
7/16"	7/16"	1"	2-3/4"	B-333-14	B-333-14-T	B-333-14-C	B-333-14-A	B-333-14-DLC
1/2"	1/2"	1"	3"	B-333-16	B-333-16-T	B-333-16-C	B-333-16-A	B-333-16-DLC
5/8"	5/8"	1-1/4"	3-1/2"	B-333-20	B-333-20-T	B-333-20-C	B-333-20-A	B-333-20-DLC
3/4"	3/4"	1-1/2"	4"	B-333-24	B-333-24-T	B-333-24-C	B-333-24-A	B-333-24-DLC
1"	1"	2"	5"	B-333-32	B-333-32-T	B-333-32-C	B-333-32-A	B-333-32-DLC
1"	1"	2-1/2"	5"	BL-333-32	BL-333-32-T	BL-333-32-C	BL-333-32-A	BL-333-32-DLC
1"	1"	4"	6-1/2"	BX-333-32	BX-333-32-T	BX-333-32-C	BX-333-32-A	BX-333-32-DLC

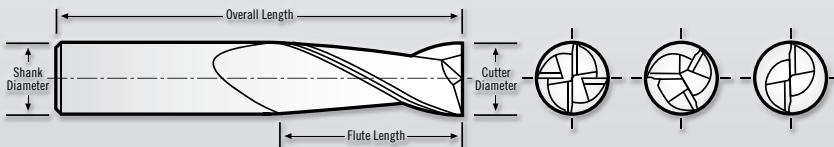
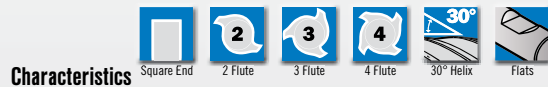


MB-333 Metric 3 Flute Tuffy Ball End Standard Length **METRIC**



Cutting Diameter	Shank Diameter	Flute Length	Overall Length	Tool Number Uncoated	Tool Number TiN Coated	Tool Number TiCN Coated	Tool Number AlTiN Coated	Tool Number DLC Coated
1.5mm	3mm	6mm	38mm	MB-333-1.5	MB-333-1.5-T	MB-333-1.5-C	MB-333-1.5-A	MB-333-1.5-DLC
2mm	3mm	8mm	38mm	MB-333-02	MB-333-02-T	MB-333-02-C	MB-333-02-A	MB-333-02-DLC
3mm	3mm	12mm	38mm	MB-333-03	MB-333-03-T	MB-333-03-C	MB-333-03-A	MB-333-03-DLC
4mm	4mm	12mm	50mm	MB-333-04	MB-333-04-T	MB-333-04-C	MB-333-04-A	MB-333-04-DLC
5mm	5mm	14mm	50mm	MB-333-05	MB-333-05-T	MB-333-05-C	MB-333-05-A	MB-333-05-DLC
6mm	6mm	14mm	57mm	MB-333-06	MB-333-06-T	MB-333-06-C	MB-333-06-A	MB-333-06-DLC
8mm	8mm	16mm	63mm	MB-333-08	MB-333-08-T	MB-333-08-C	MB-333-08-A	MB-333-08-DLC
10mm	10mm	20mm	72mm	MB-333-10	MB-333-10-T	MB-333-10-C	MB-333-10-A	MB-333-10-DLC
12mm	12mm	25mm	83mm	MB-333-12	MB-333-12-T	MB-333-12-C	MB-333-12-A	MB-333-12-DLC
16mm	16mm	32mm	92mm	MB-333-16	MB-333-16-T	MB-333-16-C	MB-333-16-A	MB-333-16-DLC
20mm	20mm	38mm	104mm	MB-333-20	MB-333-20-T	MB-333-20-C	MB-333-20-A	MB-333-20-DLC

NR C-2 Grade Carbide End Mills



NR Series Tolerances

Cutting Dia. = $+0.001/-0.000$ "
 Shank Dia. = $-0.0001/-0.0002$ "
 Flute Length (1/16" to 5/16") = $+0.030/-0.000$ "
 (21/64" to 1") = $+0.060/-0.000$ "
 OAL = ± 0.060 "

MNR Tolerances

Cutting Dia. = $+0.025/-0.000$ mm
 Shank Dia. = $-0.002/-0.005$ mm
 Flute Length = $+0.500/+1.500$ mm
 OAL = ± 1.000 mm



NR-204 2 Flute C-2 Grade Standard Length

Cutting Diameter	Shank Diameter	Flute Length	Overall Length	Tool Number Flats, Uncoated	Tool Number No Flats, Uncoated	Tool Number Flats, DLC Coated	Tool Number No Flats, DLC Coated
1/16"	1/8"	3/16"	1-1/2"	—	NR-204-02	—	NR-204-02-DLC
5/64"	1/8"	1/4"	1-1/2"	—	NR-204-02.5	—	NR-204-02.5-DLC
3/32"	1/8"	3/8"	1-1/2"	—	NR-204-03	—	NR-204-03-DLC
7/64"	1/8"	7/16"	1-1/2"	—	NR-204-03.5	—	NR-204-03.5-DLC
1/8"	1/8"	1/2"	1-1/2"	—	NR-204-04	—	NR-204-04-DLC
9/64"	3/16"	1/2"	2"	—	NR-204-04.5	—	NR-204-04.5-DLC
5/32"	3/16"	9/16"	2"	—	NR-204-05	—	NR-204-05-DLC
11/64"	3/16"	5/8"	2"	—	NR-204-05.5	—	NR-204-05.5-DLC
3/16"	3/16"	5/8"	2"	—	NR-204-06	—	NR-204-06-DLC
13/64"	1/4"	5/8"	2-1/2"	—	NR-204-06.5	—	NR-204-06.5-DLC
7/32"	1/4"	5/8"	2-1/2"	—	NR-204-07	—	NR-204-07-DLC
15/64"	1/4"	5/8"	2-1/2"	—	NR-204-07.5	—	NR-204-07.5-DLC
1/4"	1/4"	3/4"	2-1/2"	—	NR-204-08	—	NR-204-08-DLC
17/64"	5/16"	3/4"	2-1/2"	—	NR-204-08.5	—	NR-204-08.5-DLC
9/32"	5/16"	3/4"	2-1/2"	—	NR-204-09	—	NR-204-09-DLC
19/64"	5/16"	3/4"	2-1/2"	—	NR-204-09.5	—	NR-204-09.5-DLC
5/16"	5/16"	13/16"	2-1/2"	—	NR-204-10	—	NR-204-10-DLC
21/64"	3/8"	13/16"	2-1/2"	NR-204-10.5	NR-204-10.5-NF	NR-204-10.5-DLC	NR-204-10.5-NF-DLC
11/32"	3/8"	13/16"	2-1/2"	NR-204-11	NR-204-11-NF	NR-204-11-DLC	NR-204-11-NF-DLC
23/64"	3/8"	7/8"	2-1/2"	NR-204-11.5	NR-204-11.5-NF	NR-204-11.5-DLC	NR-204-11.5-NF-DLC
3/8"	3/8"	7/8"	2-1/2"	NR-204-12	NR-204-12-NF	NR-204-12-DLC	NR-204-12-NF-DLC
25/64"	7/16"	1"	2-3/4"	—	NR-204-12.5	—	NR-204-12.5-DLC
13/32"	7/16"	1"	2-3/4"	—	NR-204-13	—	NR-204-13-DLC
27/64"	7/16"	1"	2-3/4"	—	NR-204-13.5	—	NR-204-13.5-DLC
7/16"	7/16"	1"	2-3/4"	—	NR-204-14	—	NR-204-14-DLC
29/64"	1/2"	1"	3"	NR-204-14.5	NR-204-14.5-NF	NR-204-14.5-DLC	NR-204-14.5-NF-DLC
15/32"	1/2"	1"	3"	NR-204-15	NR-204-15-NF	NR-204-15-DLC	NR-204-15-NF-DLC
31/64"	1/2"	1"	3"	NR-204-15.5	NR-204-15.5-NF	NR-204-15.5-DLC	NR-204-15.5-NF-DLC
1/2"	1/2"	1"	3"	NR-204-16	NR-204-16-NF	NR-204-16-DLC	NR-204-16-NF-DLC
33/64"	1/2"	1"	3"	NR-204-16.5	NR-204-16.5-NF	NR-204-16.5-DLC	NR-204-16.5-NF-DLC
9/16"	9/16"	1-1/4"	3-1/2"	—	NR-204-18	—	NR-204-18-DLC
5/8"	5/8"	1-1/4"	3-1/2"	NR-204-20	NR-204-20-NF	NR-204-20-DLC	NR-204-20-NF-DLC
3/4"	3/4"	1-1/2"	4"	NR-204-24	NR-204-24-NF	NR-204-24-DLC	NR-204-24-NF-DLC
1"	1"	1-1/2"	4"	NR-204-32	NR-204-32-NF	NR-204-32-DLC	NR-204-32-NF-DLC

C-2 Grade Carbide End Mills **NR/MNR**



MNR-204 Metric 2 Flute C-2 Grade Standard Length **METRIC**

Cutting Diameter	Shank Diameter	Flute Length	Overall Length	Tool Number Flats, Uncoated	Tool Number No Flats, Uncoated	Tool Number Flats, DLC Coated	Tool Number No Flats, DLC Coated
2mm	3mm	8mm	38mm	—	MNR-204-02	—	MNR-204-02-DLC
3mm	3mm	12mm	38mm	—	MNR-204-03	—	MNR-204-03-DLC
4mm	4mm	12mm	50mm	—	MNR-204-04	—	MNR-204-04-DLC
5mm	5mm	14mm	50mm	—	MNR-204-05	—	MNR-204-05-DLC
6mm	6mm	14mm	57mm	—	MNR-204-06	—	MNR-204-06-DLC
8mm	8mm	16mm	63mm	—	MNR-204-08	—	MNR-204-08-DLC
10mm	10mm	20mm	72mm	—	MNR-204-10	—	MNR-204-10-DLC
12mm	12mm	25mm	83mm	—	MNR-204-12	—	MNR-204-12-DLC
16mm	16mm	32mm	92mm	—	MNR-204-16	—	MNR-204-16-DLC
20mm	20mm	38mm	104mm	—	MNR-204-20	—	MNR-204-20-DLC
25mm	25mm	38mm	104mm	—	MNR-204-25	—	MNR-204-25-DLC

NOTE: Metric tools do not have flats.



Flats!



NR-303 3 Flute C-2 Grade Standard Length

Cutting Diameter	Shank Diameter	Flute Length	Overall Length	Tool Number Flats, Uncoated	Tool Number No Flats, Uncoated	Tool Number Flats, DLC Coated	Tool Number No Flats, DLC Coated
1/16"	1/8"	3/16"	1-1/2"	—	NR-303-02	—	NR-303-02-DLC
5/64"	1/8"	1/4"	1-1/2"	Flats!	NR-303-02.5	—	NR-303-02.5-DLC
3/32"	1/8"	3/8"	1-1/2"		NR-303-03	—	NR-303-03-DLC
7/64"	1/8"	7/16"	1-1/2"		NR-303-03.5	—	NR-303-03.5-DLC
1/8"	1/8"	1/2"	1-1/2"	—	NR-303-04	—	NR-303-04-DLC
5/32"	3/16"	9/16"	2"	—	NR-303-05	—	NR-303-05-DLC
3/16"	3/16"	5/8"	2"	—	NR-303-06	—	NR-303-06-DLC
7/32"	1/4"	5/8"	2-1/2"	—	NR-303-07	—	NR-303-07-DLC
1/4"	1/4"	3/4"	2-1/2"	—	NR-303-08	—	NR-303-08-DLC
9/32"	5/16"	3/4"	2-1/2"	—	NR-303-09	—	NR-303-09-DLC
5/16"	5/16"	13/16"	2-1/2"	—	NR-303-10	—	NR-303-10-DLC
3/8"	3/8"	7/8"	2-1/2"	NR-303-12	NR-303-12-NF	NR-303-12-DLC	NR-303-12-NF-DLC
7/16"	7/16"	1"	2-3/4"	—	NR-303-14	—	NR-303-14-DLC
1/2"	1/2"	1"	3"	NR-303-16	NR-303-16-NF	NR-303-16-DLC	NR-303-16-NF-DLC
9/16"	9/16"	1-1/4"	3-1/2"	—	NR-303-18	—	NR-303-18-DLC
5/8"	5/8"	1-1/4"	3-1/2"	NR-303-20	NR-303-20-NF	NR-303-20-DLC	NR-303-20-NF-DLC
3/4"	3/4"	1-1/2"	4"	NR-303-24	NR-303-24-NF	NR-303-24-DLC	NR-303-24-NF-DLC



MNR-303 Metric 3 Flute C-2 Grade Standard Length **METRIC**

Cutting Diameter	Shank Diameter	Flute Length	Overall Length	Tool Number Flats, Uncoated	Tool Number No Flats, Uncoated	Tool Number Flats, DLC Coated	Tool Number No Flats, DLC Coated
2mm	3mm	8mm	38mm	—	MNR-303-02	—	MNR-303-02-DLC
3mm	3mm	12mm	38mm	—	MNR-303-03	—	MNR-303-03-DLC
4mm	4mm	12mm	50mm	—	MNR-303-04	—	MNR-303-04-DLC
5mm	5mm	14mm	50mm	—	MNR-303-05	—	MNR-303-05-DLC
6mm	6mm	14mm	57mm	—	MNR-303-06	—	MNR-303-06-DLC
8mm	8mm	16mm	63mm	—	MNR-303-08	—	MNR-303-08-DLC
10mm	10mm	20mm	72mm	—	MNR-303-10	—	MNR-303-10-DLC
12mm	12mm	25mm	83mm	—	MNR-303-12	—	MNR-303-12-DLC
16mm	16mm	32mm	92mm	—	MNR-303-16	—	MNR-303-16-DLC
20mm	20mm	38mm	104mm	—	MNR-303-20	—	MNR-303-20-DLC
25mm	25mm	38mm	104mm	—	MNR-303-25	—	MNR-303-25-DLC

NOTE: Metric tools do not have flats.

NR C-2 Grade Carbide End Mills



Flats!

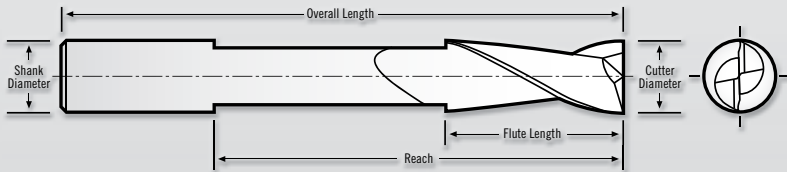
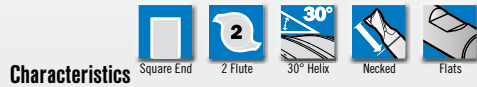
Flats!



NR-404 4 Flute C-2 Grade Standard Length

Cutting Diameter	Shank Diameter	Flute Length	Overall Length	Tool Number Flats, Uncoated	Tool Number No Flats, Uncoated	Tool Number Flats, DLC Coated	Tool Number No Flats, DLC Coated
1/16"	1/8"	3/16"	1-1/2"	—	NR-404-02	—	NR-404-02-DLC
5/64"	1/8"	1/4"	1-1/2"	—	NR-404-02.5	—	NR-404-02.5-DLC
3/32"	1/8"	3/8"	1-1/2"	—	NR-404-03	—	NR-404-03-DLC
7/64"	1/8"	7/16"	1-1/2"	—	NR-404-03.5	—	NR-404-03.5-DLC
1/8"	1/8"	1/2"	1-1/2"	—	NR-404-04	—	NR-404-04-DLC
9/64"	3/16"	1/2"	2"	—	NR-404-04.5	—	NR-404-04.5-DLC
5/32"	3/16"	9/16"	2"	—	NR-404-05	—	NR-404-05-DLC
11/64"	3/16"	5/8"	2"	—	NR-404-05.5	—	NR-404-05.5-DLC
3/16"	3/16"	5/8"	2"	—	NR-404-06	—	NR-404-06-DLC
13/64"	1/4"	5/8"	2-1/2"	—	NR-404-06.5	—	NR-404-06.5-DLC
7/32"	1/4"	5/8"	2-1/2"	—	NR-404-07	—	NR-404-07-DLC
15/64"	1/4"	5/8"	2-1/2"	—	NR-404-07.5	—	NR-404-07.5-DLC
1/4"	1/4"	3/4"	2-1/2"	—	NR-404-08	—	NR-404-08-DLC
17/64"	5/16"	3/4"	2-1/2"	—	NR-404-08.5	—	NR-404-08.5-DLC
9/32"	5/16"	3/4"	2-1/2"	—	NR-404-09	—	NR-404-09-DLC
19/64"	5/16"	3/4"	2-1/2"	—	NR-404-09.5	—	NR-404-09.5-DLC
5/16"	5/16"	13/16"	2-1/2"	—	NR-404-10	—	NR-404-10-DLC
21/64"	3/8"	13/16"	2-1/2"	NR-404-10.5	NR-404-10.5-NF	NR-404-10.5-DLC	NR-404-10.5-NF-DLC
11/32"	3/8"	13/16"	2-1/2"	NR-404-11	NR-404-11-NF	NR-404-11-DLC	NR-404-11-NF-DLC
23/64"	3/8"	7/8"	2-1/2"	NR-404-11.5	NR-404-11.5-NF	NR-404-11.5-DLC	NR-404-11.5-NF-DLC
3/8"	3/8"	7/8"	2-1/2"	NR-404-12	NR-404-12-NF	NR-404-12-DLC	NR-404-12-NF-DLC
25/64"	7/16"	1"	2-3/4"	—	NR-404-12.5	—	NR-404-12.5-DLC
13/32"	7/16"	1"	2-3/4"	—	NR-404-13	—	NR-404-13-DLC
27/64"	7/16"	1"	2-3/4"	—	NR-404-13.5	—	NR-404-13.5-DLC
7/16"	7/16"	1"	2-3/4"	—	NR-404-14	—	NR-404-14-DLC
29/64"	1/2"	1"	3"	NR-404-14.5	NR-404-14.5-NF	NR-404-14.5-DLC	NR-404-14.5-NF-DLC
15/32"	1/2"	1"	3"	NR-404-15	NR-404-15-NF	NR-404-15-DLC	NR-404-15-NF-DLC
31/64"	1/2"	1"	3"	NR-404-15.5	NR-404-15.5-NF	NR-404-15.5-DLC	NR-404-15.5-NF-DLC
1/2"	1/2"	1"	3"	NR-404-16	NR-404-16-NF	NR-404-16-DLC	NR-404-16-NF-DLC
33/64"	1/2"	1"	3"	NR-404-16.5	NR-404-16.5-NF	NR-404-16.5-DLC	NR-404-16.5-NF-DLC
9/16"	9/16"	1-1/4"	3-1/2"	—	NR-404-18	—	NR-404-18-DLC
5/8"	5/8"	1-1/4"	3-1/2"	NR-404-20	NR-404-20-NF	NR-404-20-DLC	NR-404-20-NF-DLC
3/4"	3/4"	1-1/2"	4"	NR-404-24	NR-404-24-NF	NR-404-24-DLC	NR-404-24-NF-DLC
1"	1"	1-1/2"	4"	NR-404-32	NR-404-32-NF	NR-404-32-DLC	NR-404-32-NF-DLC

Tuffy Grade Carbide End Mills **EX**



EX Series Tolerances

Cutting Dia. = $+0.001/-0.000$ "
 Shank Dia. = $-0.001/-0.0002$ "
 Flute Length = $+0.060/-0.000$ "
 OAL = ± 0.060 "



Flats!

EX-204 2 Flute Tuffy Grade Extra Length

Cutting Diameter	Shank Diameter	Flute Length	Reach	Overall Length	Tool Number Flats	Tool Number No Flats
1/8"	1/8"	3/8"	2"	3"	—	EX-204-04
3/16"	3/16"	1/2"	2"	3"	—	EX-204-06
1/4"	1/4"	5/8"	2"	3"	—	EX-204-08
5/16"	5/16"	3/4"	2-1/8"	3-1/8"	—	EX-204-10
3/8"	3/8"	3/4"	2"	3-1/2"	EX-204-12	EX-204-12-NF
7/16"	7/16"	3/4"	2-1/4"	3-3/4"	—	EX-204-14
1/2"	1/2"	1"	2-1/2"	4"	EX-204-16	EX-204-16-NF



EX-206 2 Flute Tuffy Grade Extra Length Extended Reach

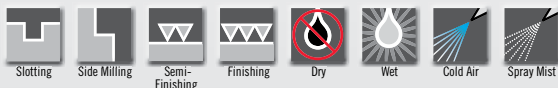
Cutting Diameter	Shank Diameter	Flute Length	Reach	Overall Length	Tool Number
1/2"	1/2"	1"	4"	6"	EX-206-16
5/8"	5/8"	1-3/8"	4"	6"	EX-206-20
3/4"	3/4"	1-5/8"	4"	6"	EX-206-24
1"	1"	2"	4"	6"	EX-206-32



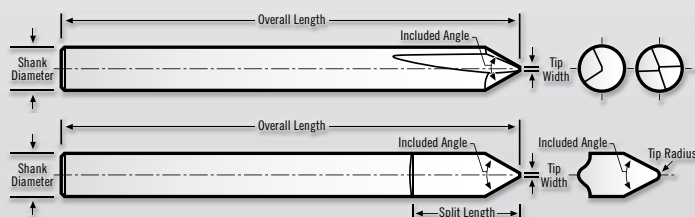
ET Engraving Tools



Applications



Materials



ET1 Double Lip Engraving Tool for Tougher Materials

Tip Width	Shank Diameter	Included Angle	Split Length	Overall Length	Tool Number
.010"	1/4"	30°	—	2"	ET1-01030
.015"	1/4"	30°	—	2"	ET1-01530
.020"	1/4"	30°	—	2"	ET1-02030
.030"	1/4"	30°	—	2"	ET1-03030
.040"	1/4"	30°	—	2"	ET1-04030
.050"	1/4"	30°	—	2"	ET1-05030
.060"	1/4"	30°	—	2"	ET1-06030
.010"	1/4"	45°	—	2"	ET1-01045
.015"	1/4"	45°	—	2"	ET1-01545
.020"	1/4"	45°	—	2"	ET1-02045
.030"	1/4"	45°	—	2"	ET1-03045
.040"	1/4"	45°	—	2"	ET1-04045
.050"	1/4"	45°	—	2"	ET1-05045
.060"	1/4"	45°	—	2"	ET1-06045

NOTE: Specially designed to maximize the tip strength of the tool by removing the minimum amount of material from the end.



ET3 Ball Tip Engraving Tool

Tip Radius	Shank Diameter	Included Angle	Split Length	Overall Length	Tool Number
.005"	1/4"	30°	.650"	2"	ET3-00530
.010"	1/4"	30°	.650"	2"	ET3-01030
.020"	1/4"	30°	.650"	2"	ET3-02030
.030"	1/4"	30°	.650"	2"	ET3-03030
.005"	1/4"	60°	.650"	2"	ET3-00560
.010"	1/4"	60°	.650"	2"	ET3-01060
.020"	1/4"	60°	.650"	2"	ET3-02060
.030"	1/4"	60°	.650"	2"	ET3-03060

NOTE: Ball shaped radius on the tip, excellent results for high speed engraving and 3D engraving applications



ET2 Plunge Tip Engraving Tool for Drill & Engrave

Tip Width	Shank Diameter	Included Angle	Split Length	Overall Length	Tool Number
.010"	1/4"	60°	—	2"	ET2-01060
.020"	1/4"	60°	—	2"	ET2-02060
.010"	1/4"	90°	—	2"	ET2-01090
.020"	1/4"	90°	—	2"	ET2-02090

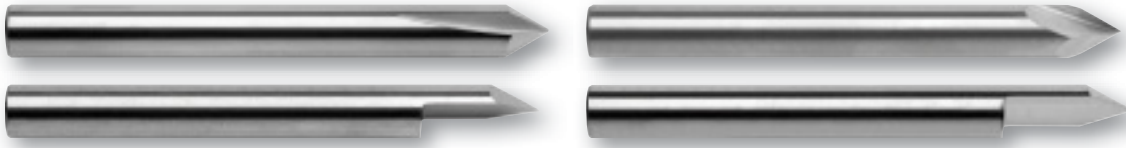
NOTE: Two flute tool serves as a multipurpose tool, which can be used for engraving, chamfering, spot-drilling and countersinking.



ET4 Standard Engraving Tool for Most Applications

Tip Width	Shank Diameter	Included Angle	Split Length	Overall Length	Tool Number
.010"	1/4"	60°	.650"	2"	ET4-01060
.020"	1/4"	60°	.650"	2"	ET4-02060
.030"	1/4"	60°	.650"	2"	ET4-03060
.050"	1/4"	60°	.650"	2"	ET4-05060
.060"	1/4"	60°	.650"	2"	ET4-06060
.010"	1/4"	90°	.650"	2"	ET4-01060
.020"	1/4"	90°	.650"	2"	ET4-02090
.030"	1/4"	90°	.650"	2"	ET4-03090
.050"	1/4"	90°	.650"	2"	ET4-05090
.060"	1/4"	90°	.650"	2"	ET4-06090

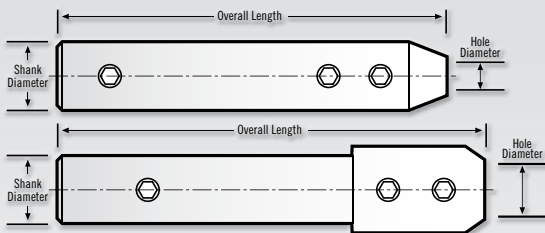
NOTE: Utilized in a wide variety of machines, including top loading engraving machines, CNC milling machines and industrial engraving marking systems.



ET SPEEDS & FEEDS

Material	5000 RPM	7500 RPM	10,000 RPM
	in/min	in/min	in/min
NON-FERROUS METALS			
Aluminum/Aluminum Alloys	10 ipm	15 ipm	20 ipm
Brass/Bronze	10 ipm	15 ipm	20 ipm
Copper/Copper Alloys	10 ipm	15 ipm	20 ipm
Magnesium	10 ipm	15 ipm	20 ipm
COMPOSITES			
G10 Fiberglass	15 ipm	22.5 ipm	30 ipm
Graphite	15 ipm	22.5 ipm	30 ipm
Carbon Fiber	15 ipm	22.5 ipm	30 ipm
Plastics	15 ipm	22.5 ipm	30 ipm
FERROUS METALS			
Cast Iron	5 ipm	7.5 ipm	10 ipm
Steel, Low Carbon	5 ipm	7.5 ipm	10 ipm
Steel, Medium Carbon	7.5 ipm	11.25 ipm	15 ipm
Steel, Hardened	2.5 ipm	3.75 ipm	5 ipm
Stainless Steel, Soft	5 ipm	7.5 ipm	10 ipm
Stainless Steel, Hard	2.5 ipm	3.75 ipm	5 ipm
Inconel	4 ipm	6 ipm	8 ipm
Titanium, Soft	5 ipm	7.5 ipm	10 ipm
Titanium, Hard	2.5 ipm	3.75 ipm	5 ipm

Accuhold End Mill Extension Holder **ACH/MAH**



ACH Tolerances

Hole Dia. = $+0.0015/-0.0000$ "
 Shank Dia. = $-0.0001/-0.0003$ "
 OAL = ± 0.060 "

MAH Tolerances

Hole Dia. = $+0.004/-0.000$ mm
 Shank Dia. = $+0.000/-0.007$ mm
 OAL = ± 1.5 mm



ACH Accuhold - End Mill Extension Holder

Hole Diameter	Shank Diameter	Overall Length	Tool Number
1/8"	3/8"	3-1/4"	ACH-04
3/16"	1/2"	3-1/2"	ACH-06
1/4"	5/8"	4-1/4"	ACH-08
3/8"	3/4"	4-1/2"	ACH-12
* 1/2"	3/4"	4-3/4"	ACH-16
* 1/2"	1"	4-3/4"	ACH-16L

* 1" Diameter x 1.5" Long Head



MAH Accuhold - Metric End Mill Extension Holder **METRIC**

Hole Diameter	Shank Diameter	Overall Length	Tool Number
3mm	10mm	82.5mm	MAH-03
4mm	12mm	110mm	MAH-04
5mm	12mm	110mm	MAH-05
6mm	16mm	125mm	MAH-06
8mm	20mm	135mm	MAH-08
10mm	20mm	135mm	MAH-10
* 12mm	25mm	150mm	MAH-12