















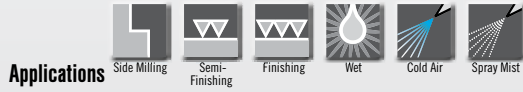
Multiple Application Tools

NR / MNR 204/303/404	2, 3 and 4 Flute Nominal Plus Diameter Tolerance		102
TS / MTS 201/301/401	2, 3 and 4 Flute		94
TR 303/404/606	3, 4 and 6 Flute		96
T6 200/202/400/402	2 and 4 Flute Double End		89
C8 201/203	2 Flute		93
C8 301/303	3 Flute		93
T12 201/203	2 Flute		91
T12 403/405	2 and 4 Flute		92
SB / MSB 201 B / MB 203	2 Flute Ball End		98
SB / MSB 301 B / MB 333	3 Flute Ball End		100
EX 204/206	2 Flute Extended Reach		105
TL / MTL 303	3 Flute Extra Long Cutting Length		88
ET	Engraving Tools		106
ACH / MAH Accuhold	Extension Holder		107

TL/MTL Tuffy Grade Carbide End Mills



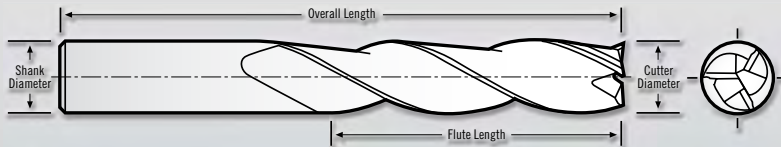
Characteristics



Applications



Materials



TL Series Tolerances

Cutting Dia. = $+0.01/-0.000$ "
 LOC = $+0.060/-0.000$ "
 Shank Dia. = $-0.0001/-0.0002$ "
 L = ± 0.060 "

MTL Tolerances

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



Multiple Applications

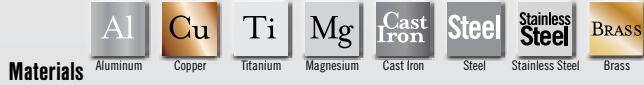
2 Flute Tuffy Grade Carbide End Mills **T6**



Characteristics



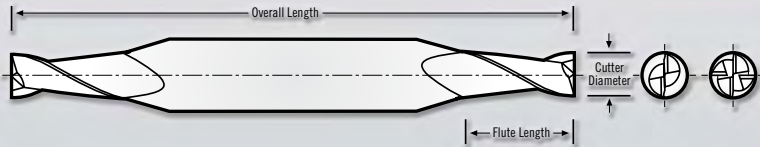
Applications



Materials



Coatings



T6 Series Tolerances

Cutting Dia. = ± 0.005 "

OAL = ± 0.060 "

Shank Dia. = $-0.001/-0.002$ "

LOC = $+0.030/-0.000$ "



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

Multiple Applications

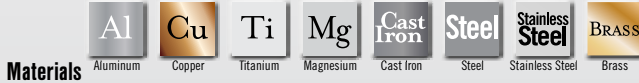
T6 4 Flute Tuffy Grade Carbide End Mills



Characteristics



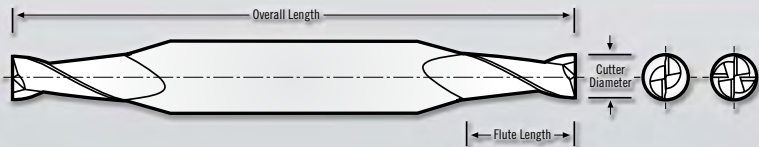
Applications



Materials



Coatings



T6 Series Tolerances

Cutting Dia. = ± 0.005 "
 OAL = ± 0.060 "
 Shank Dia. = $-0.0001/-0.0002$ "
 LOC = $+0.030/-0.000$ "



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

Multiple Applications

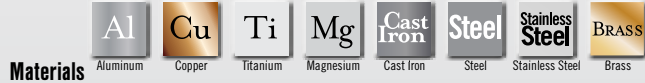
2 Flute Tuffy Grade Carbide End Mills T12



Characteristics



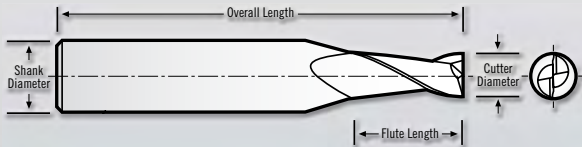
Applications



Materials



Coatings



T12 Series Tolerances

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

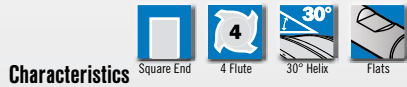
T12-203 2 Flute Tuffy Grade Standard Length



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

Multiple Applications

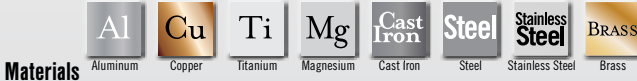
T12 4 Flute Tuffy Grade Carbide End Mills



Characteristics



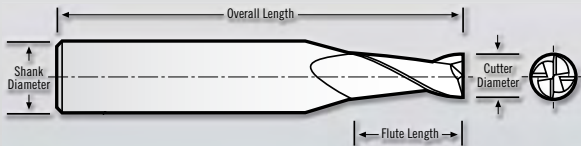
Applications



Materials



Coatings



T12 Series Tolerances

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



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

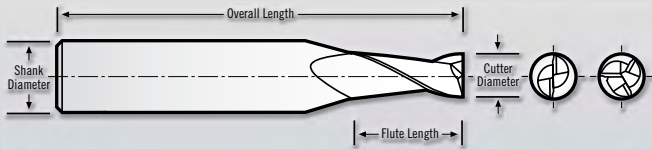
T12-405 4 Flute Tuffy Grade Standard Length



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

Multiple Applications

C-2 Grade Carbide End Mills C8



C8 Series Tolerances
 Cutting Dia. = $+0.000/-0.002$ "
 LOC = $+0.030/-0.000$ "
 Shank Dia. = $-0.001/-0.0002$ "
 OAL = ± 0.060 "



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

Multiple Applications

TS Tuffy Grade Carbide End Mills

Characteristics

- Square End
- 2 Flute
- 3 Flute
- 4 Flute
- 30° Helix

Applications

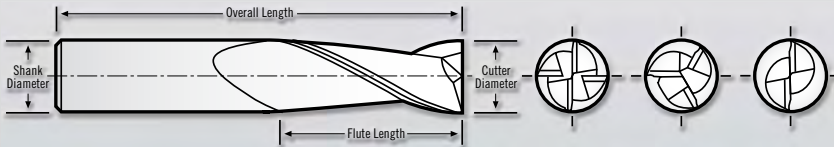
- Slotting
- Side Milling
- Helical Interpolation
- High Performance
- Roughing
- Semi-Finishing
- Finishing
- Dry
- Wet
- Cold Air
- Spray Mist

Materials

- Aluminum
- Copper
- Titanium
- Magnesium
- Cast Iron
- Steel
- BRASS

Coatings

- Titanium Nitride
- Titanium Carbo-Nitride
- Aluminum Titan. Nitride
- Diamond-Like Carbon (DLC)

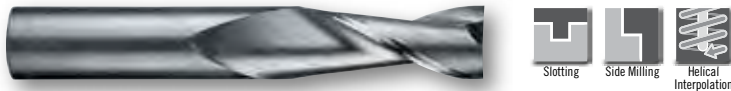


TS Tolerances

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

MTS Tolerances

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



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

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



Side Milling

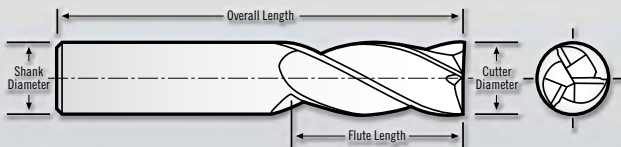
TS-401 4 Flute Tuffy Grade Stub Length

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



TR-303 Tolerances
 Cutting Dia. = $+0.001/-0.000$ "
 LOC (1/8" to 5/16") = $+0.030/-0.000$ "
 (3/8" to 3/4") = $+0.060/-0.000$ "
 Shank Dia. = $-0.001/-0.0002$ "
 OAL = ± 0.060 "



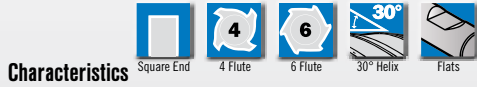
TR-303 3 Flute Tuffy Grade Standard Length

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**



Characteristics



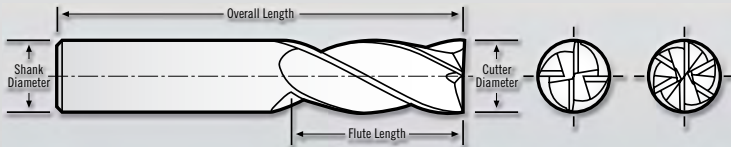
Applications



Materials



Coatings

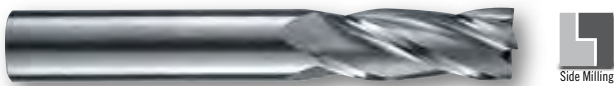


TR-404 Tolerances

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

TR-606 Tolerances

Cutting Dia. = $+0.001/-0.000$ "
 LOC = $+0.060/-0.000$ "
 Shank Dia. = $-0.0001/-0.0002$ "
 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

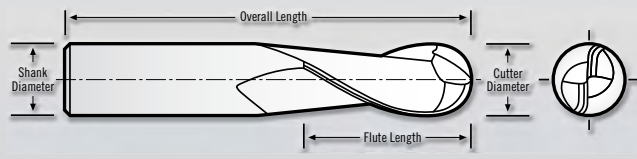
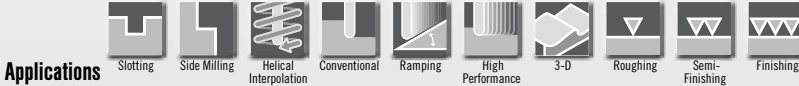


TR-606 6 Flute Tuffy Grade Standard Length

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

Multiple Applications

SB/MSB 2 Flute Tuffy Grade Carbide Ball End Mills



SB Series Tolerances
 Cutting Dia. (1/16" to 1/4") = +.000/- .002"
 (9/32" to 3/4") = +.000/- .003"
 LOC (1/16" to 5/16") = +.030/- .000"
 (3/8" to 3/4") = +.060/- .000"
 Shank Dia. = -.0001/- .0002"
 OAL = ±.060"

MSB Tolerances
 Cutting Dia. = +.000/- .075mm
 Shank Dia. = -.002/- .005mm
 OAL = ±1.000mm
 LOC = +0.500/+1.500mm



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

Multiple Applications

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



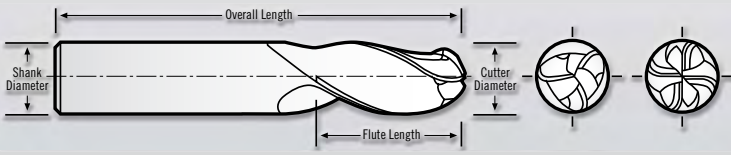
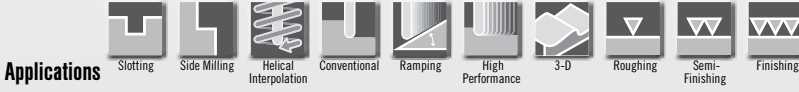
B-203 2 Flute Tuffy Ball End Standard Length

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/- .002"
 (9/32" to 3/4") = +.000/- .003"
 LOC (1/16" to 5/16") = +.030/- .000"
 (3/8" to 1") = +.060/- .000"
 Shank Dia. = -.0001/- .0002"
 OAL = ±.060"

MB Tolerances
 Cutting Dia. = +.000/- .075mm
 Shank Dia. = -.002/- .005mm
 OAL = ±1.000mm
 LOC = +0.500/+1.500mm



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 **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	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

Multiple Applications

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



Characteristics



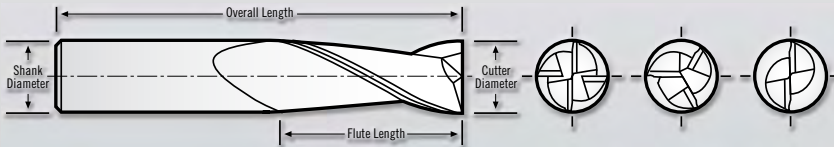
Applications



Materials



Coatings



NR Series Tolerances

Cutting Dia. = +.001/-0.000"
 Shank Dia. = -.0001/-0.002"
 LOC (1/16" to 5/16") = +.030/-0.000"
 (21/64" to 1") = +.060/-0.000"
 OAL = ±.060"

MNR Tolerances

Cutting Dia. = +.025/-0.000mm
 Shank Dia. = -.002/-0.005mm
 LOC = +0.500/+1.500mm
 OAL = ±1.000mm



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

Multiple Applications

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.



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"	—	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.

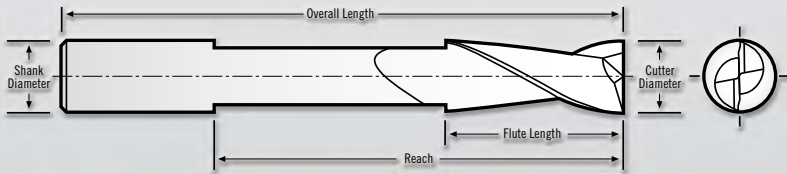
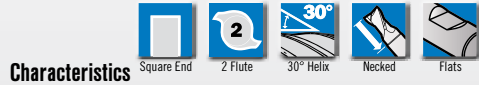
NR C-2 Grade Carbide End Mills



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



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"	3-1/4"	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

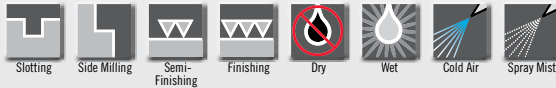


Multiple Applications

ET Engraving Tools



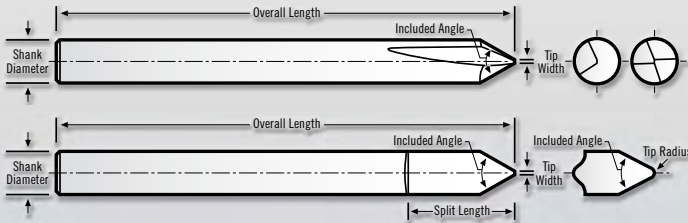
Characteristics



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.



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.



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

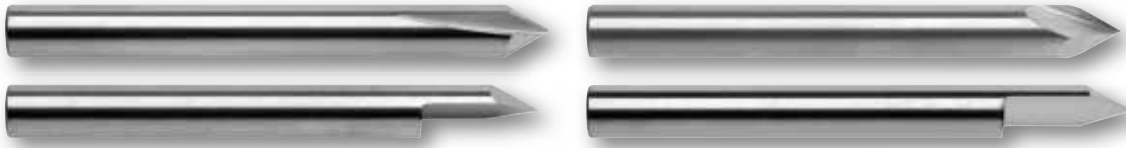


ET4 Standard Engraving Tool for Most Applications

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.

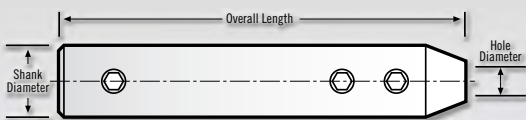
Multiple Applications



ET SPEED & FEED

Material	5000 RPM	7500 RPM	1000 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. = +.00015/-0.00000"
 Shank Dia. = -.0001/-0.0003"
 OAL = ±.060"

MAH Tolerances

Hole Dia. = +.004/-0.000 mm
 Shank Dia. = +.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

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