

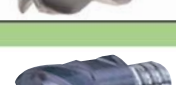
**SWISS &
LIVE TOOLING
MILLING**





MILLING



	Diameter	D.O.C.	Description	Series	Page
	T05, T06, T08, T10	—	CHIP•SURFER Integral ER Adaptor	ER	6
	T05, T06, T08, T10, T12	—	CHIP•SURFER Shanks	SO	7-9
	T05, T06, T08, T10, T12	—	CHIP•SURFER Extensions	T0	10
	.375-.750"	.220"	CHIP•SURFER 90° Lead End Mill	12J1D	11
	.750-2.00"	.220"	HI•POS 0° End Mill	12J1D	12-14
	.312-.750"	.200- .620"	CHIP•SURFER Rough-Fin	47C, 47D	15
	.312-.750"	.200- .620"	CHIP•SURFER Solid Carbide Serrated Roughing Tip	47C, 48C	17
	.312-.500"	.200- .370"	CHIP•SURFER Solid Carbide Center Cutting End Mill Tip	46J, 46D	17
	.250- .750"	.200- .620"	CHIP•SURFER Solid Carbide Center Cutting End Mill Tip	47J, 47D	18, 19
	.312- .750"	.200- .620"	CHIP•SURFER Solid Carbide Variable Pitch End Mill Tip	47C	20
	.312-.625"	.200- .620"	CHIP•SURFER Solid Carbide Finishing End Mill Tip	48D, 48J, 49D, 49J	21
	.312-.750"	.200- .500"	CHIP•SURFER 0° Lead, 45° Helix, Polished Sharp for Aluminum	45D, 45J, 46D, 46J	22

	Diameter	D.O.C.	Description	Series	Page
	.375-.625"	.380-.600"	CHIP•SURFER Drill-Mill Tip	45D	23
	.375-.625"	.380-.600"	CHIP•SURFER Flat Bottom Plunge Center	45V	24
	.250-.750"	.200-.620"	CHIP•SURFER High Precision Helical Ball Nose Tip	45B, 47B	25, 26
	.312-.750"	.200-.500"	CHIP•SURFER High Precision Helical Ball Nose Tip for Aluminum	45B	27
	.390-.625"	.140-.290"	CHIP•SURFER Chamfer and Spotting Tip	45N, 45M, 45P	28
	.394-.630"	.425-.560"	CHIP•SURFER Solid Carbide Corner Rounding	45R	29
	.125-.250"	.161-.322"	CHIP•SURFER Center Drill	45Z	30
	.394-.630"	.252-.500"	CHIP•SURFER Thread Mill	47Y	31
	.50-1.00"	.056-.375"	CHIP•SURFER Precision T-Slot Milling Tip	18T	32
	.625"	.030"	CHIP•SURFER Front/Back Chamfer, V-Form Tip	18T	33

Product Worksheet Quote Request	34, 35
Indexing CHIP•SURFER Tip Guidelines	36
Milling Tip Operating Guidelines	37, 38
T-Slotter Tip Operating Guidelines	39
Center Drill Operating Guidelines	40, 41
Thread Mill Operating Guidelines	43
HI•POS Micro 0° End Mill Ramping Data	42, 43



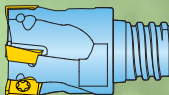
Swiss Milling with Chip-Surfer

- $\pm .0005$ axial & radial repeatability with a true simultaneous fit
- Change tips right in the machine in seconds
- Dozens of tip styles fit on a single master shank
- Reduced shanks – No more grinding solid carbide end mills
- New integral ER collet shanks add rigidity.

Swiss Milling with Indexable Hi-PosMicro

- .375"-.750" diameter cutters are equipped with modular Chip-Surfer adaptations.
- .750"-2.000" diameter cutters are offered with cylindrical shanks for ER collets.
- High-shear double-positive geometry for low cutting forces.

Hi-PosMicro
Indexable



Rough-Fin



Serrated
Roughing



0° Lead 45° Helix
Center Cutting



Variable Pitch
0° Lead 38° Helix
Center Cutting



Polished for
Aluminum



Finishing
0° Lead, 45° Helix
Non-Center Cutting



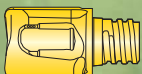
High Precision
Helical Ball Nose



Flat Bottom
Plunger



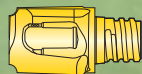
Drill-Mill



Chamfer &
Spotting



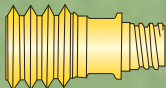
Corner
Rounding



Precision T-Slot



Thread Mill



Center Drill



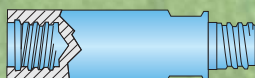
CHIP SURFER™

Modular Milling System for Swiss and Live Tooling Applications

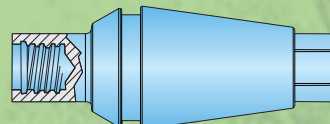
Connection Chart

End Mill Size	Connection Size
.250/.312	T05
.375	T06
.500	T08
.625	T10
.750	T12

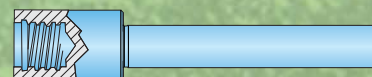
Extensions



Solid Integral ER Collet Shanks



Reduced Diameter Shanks



Straight Shanks



Necked-Down Straight Shanks





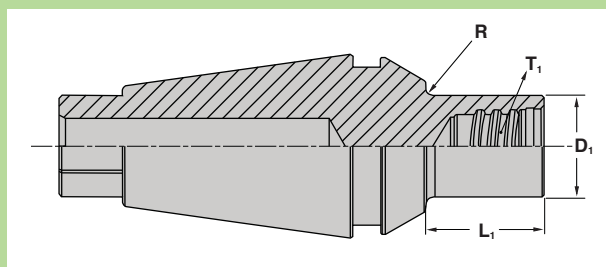
INTEGRAL ER-ADAPTOR

Thread Connections

T05, T06, T08, T10, T12 & T15

Shank Materials

Steel



Part Number	ER Size	TS Thread Size (End Mill Dia)	L ₁ Length	D ₁ Diameter	Hex	R	Coolant
ER11T05SA-02	11	T05 (.250, .312)	0.157	.25 & .31	0.312	—	—
ER11T05SA-05	11	T05 (.250, .312)	0.413	.25 & .31	0.312	—	—
ER16T05SA-02	16	T05 (.250, .312)	0.157	.25 & .31	0.312	0.03	—
ER16T05SA-05	16	T05 (.250, .312)	0.413	.25 & .31	0.312	0.03	—
ER16T06SA-02	16	T06 (.375)	0.157	0.38	0.312	0.03	—
ER16T06SA-05	16	T06 (.375)	0.413	0.38	0.312	0.03	—
ER16T08SA-02	16	T08 (.500)	0.157	0.50	0.312	—	—
ER16T08SA-06	16	T08 (.500)	0.512	0.50	0.312	—	—
ER20T05SA-02	20	T05 (.250, .312)	0.157	.25 & .31	0.437	0.03	—
ER20T05SA-05	20	T05 (.250, .312)	0.413	.25 & .31	0.437	0.03	—
ER20T06SA-02	20	T06 (.375)	0.157	0.38	0.437	0.03	—
ER20T06SA-05	20	T06 (.375)	0.413	0.38	0.437	0.03	—
ER20T08SA-02	20	T08 (.500)	0.157	0.50	0.437	0.03	—
ER20T08SA-06	20	T08 (.500)	0.512	0.50	0.437	0.03	—
ER20T10SA-02	20	T10 (.625)	0.157	0.62	0.437	—	—
ER20T10SA-07	20	T10 (.625)	0.630	0.62	0.437	—	—
ER32T05SA-10	32	T05 (.250, .312)	0.984	.25 & .31	0.750	0.20	Yes
ER32T05SA-20	32	T05 (.250, .312)	1.968	.25 & .31	0.750	0.32	Yes
ER32T06SA-10	32	T06 (.375)	0.984	0.38	0.750	0.20	Yes
ER32T06SA-20	32	T06 (.375)	1.968	0.38	0.750	0.24	Yes
ER32T08SA-10	32	T08 (.500)	0.984	0.50	0.750	0.08	Yes
ER32T08SA-20	32	T08 (.500)	1.968	0.50	0.750	0.20	Yes
ER32T10SA-10	32	T10 (.625)	0.984	0.62	0.750	0.08	Yes
ER32T10SA-20	32	T10 (.625)	1.968	0.62	0.750	0.12	Yes
ER32T12SA-10	32	T12 (.750)	0.984	0.75	0.750	0.12	Yes
ER32T12SA-20	32	T12 (.750)	1.968	0.75	0.750	0.12	Yes
ER32T15SA-10	32	T15 (1.000)	0.984	1.00	0.750	0.03	Yes
ER32T15SA-20	32	T15 (1.000)	1.968	1.00	0.750	0.03	Yes

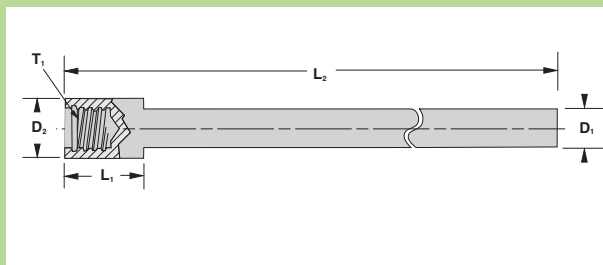
When assembling, be sure the carbide tip is seated firmly on the shank with no gap.

Note: DO NOT apply lubricant to the thread connection.

Ingersoll

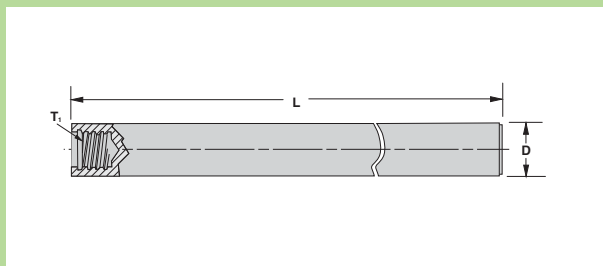
CHIP[®]SURFER™ SHANKS FOR ER11 AND ER16 COLLETS

REDUCED DIAMETER SHANKS FOR ER11 AND ER16 COLLETS



T ₁ Thread Size (End Mill Dia)	Part Number	L ₁ Extension Length	L ₂ Overall Length	D ₁ Shank Diameter	D ₂ Neck Diameter	Material
T05 (.250, .312)	S025T05SA-05	0.50	2.00	0.250	0.312	Steel
T06 (.375)	S025T06SA-05	0.50	2.00	0.250	0.375	Steel
T08 (.500)	S037T08SA-06	0.63	2.13	0.375	0.500	Steel
T10 (.625)	S037T10SA-070	0.70	2.20	0.375	0.625	Steel

STRAIGHT SHANKS WITH NO NECK FOR ER11 AND ER16 COLLETS



T ₁ Thread Size (End Mill Dia)	Part Number	L Overall Length	D Shank Diameter	Material
T05 (.250, .312)	S031T05SA-27	2.75	0.312	Steel
T06 (.375)	S037T06SA-21	2.13	0.375	Steel
T06 (.375)	S037T06SA-32	3.25	0.375	Steel



For information about **Standard Collets**, see the Ingersoll Toolholder Catalog



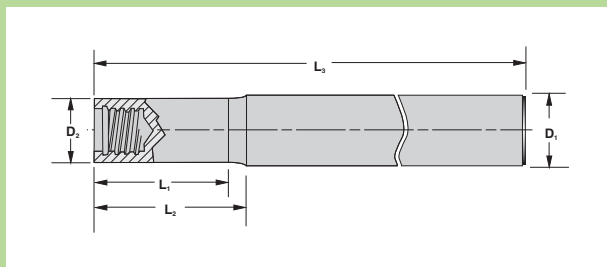
When assembling, be sure carbide tip is seated firmly on shank with no gap.
Note: DO NOT apply lubricant to the thread connection.



CHIP SURFER™ NECKED DOWN STRAIGHT SHANKS

Thread Connections
T05, T06, T08, R10 and T12

Shank Materials
Steel or Carbide



T ₁ Thread Size (End Mill Dia)	Part Number	L ₁ Projection Length	L ₂ Extension Length	L ₃ Overall Length	D ₁ Shank Diameter	D ₂ Mating Diameter
---	----------------	--	---------------------------------------	-------------------------------------	-------------------------------------	--------------------------------------

STEEL SHANKS

T05 (.250, .312)	S031T05SA-05	.51	.59	2.50	.312	.300
T06 (.375)	S037T06SA-06	.50	.60	3.00	.375	.364
T08 (.500)	S050T08SA-06	.53	.63	3.50	.500	.480
T10 (.625)	S075T10SA-00	-	.13	2.75	.750	.750
T10 (.625)	S062T10SA-06	.68	.78	4.00	.625	.600
T12 (.750)	S075T12SA-08	.88	1.00	5.00	.750	.720
T12 (.750)	WB100T12SA-00	-	.24	3.00	1.000	.720

CARBIDE SHANKS

T05 (.250, .312)	S031T05CA-09	.95	1.00	3.00	.312	.300
T05 (.250, .312)	S031T05CA-19	1.95	2.00	4.00	.312	.300
T06 (.375)	S037T06CA-12	1.20	1.25	4.00	.375	.364
T06 (.375)	S037T06CA-20	1.95	2.00	4.75	.375	.364
T08 (.500)	S012T08CA040	1.52	1.57	3.54	12mm	.455
T08 (.500)	S012T08CA080	3.10	3.15	5.12	12mm	.455
T08 (.500)	S050T08CA-15	1.45	1.50	4.00	.500	.480
T08 (.500)	S050T08CA-25	2.45	2.50	5.50	.500	.480
T10 (.625)	S062T10CA-34	3.43	3.50	5.50	.625	.600
T10 (.625)	S062T10CA-49	4.93	5.00	7.00	.625	.600
T12 (.750)	S075T12CA-14	1.43	1.50	4.00	.750	.720
T12 (.750)	S075T12CA-29	2.93	3.00	5.50	.750	.720
T12 (.750)	S075T12CA-44	4.43	4.50	8.00	.750	.720

When assembling, be sure carbide tip is seated firmly on shank with no gap.
Note: DO NOT apply lubricant to the thread connection.

Thread Connections

T05, T06, T08, T10 and T12

Shank Materials

Carbide, Steel, Heavy Metal



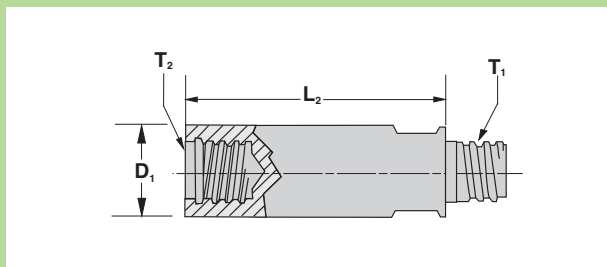
Due to tolerance, Shank Diameter will be slightly larger than tip diameter.

T ₁ Thread Size (End Mill Dia)	Part Number	L Length	D Shank Diameter
CARBIDE SHANKS			
T05 (.250, .312)	S031T05CA-40	4.00	.312
T05 (.250, .312)	S031T05CA-65	6.50	.312
T06 (.375)	S037T06CA-40	4.00	.375
T06 (.375)	S037T06CA-70	7.00	.375
T08 (.500)	S050T08CA-40	4.00	.500
T08 (.500)	S050T08CA-75	7.50	.500
T10 (.625)	S062T10CA-40	4.00	.625
T10 (.625)	S062T10CA-80	8.00	.625
T12 (.750)	S075T12CA-40	4.00	.750
T12 (.750)	S075T12CA-80	8.00	.750
STEEL SHANKS			
T05 (.250, .312)	S031T05SA-27	2.75	.312
T06 (.375)	S037T06SA-32	3.25	.375
T08 (.500)	S050T08SA-37	3.75	.500
T10 (.625)	S062T10SA-40	4.00	.625
HEAVY METAL SHANKS W/COOLANT			
T05 (.250, .312)	S031T05HA-35	3.50	.312
T06 (.375)	S037T06HA-45	4.50	.375
T08 (.500)	S050T08HA-55	5.50	.500
T10 (.625)	S062T10HA-65	6.50	.625
T12 (.750)	S075T12HA-75	7.50	.750

When assembling, be sure carbide tip is seated firmly on shank with no gap.

Note: DO NOT apply lubricant to the thread connection.

Thread Size
T05, T06, T08, T10 and T12



Wrench (Not included with carbide tip or shank purchase).

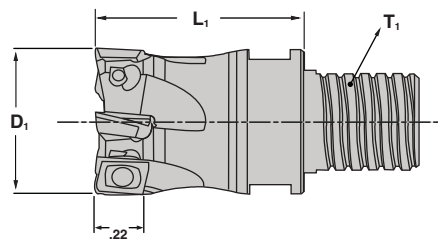
Thread Size	Wrench Part No.	Optional Torque Wrench	Torque Value (in. lbs.)
T05	WS-0043	DT-60-06	60
T06	WS-0029	DT-90-08	90
T08	WS-0030	DT-130-10	130
T10	WS-0044	DT-250-13	250
T12	WS-0059	DT-250-16	250

When assembling, be sure carbide tip is seated firmly on shank with no gap.
Note: DO NOT apply lubricant to the thread connection.

Diameters
.375 to .750

Max. Depth of Cut
0.22"

Insert Corner
0.008", 0.015", 0.031", 0.062"

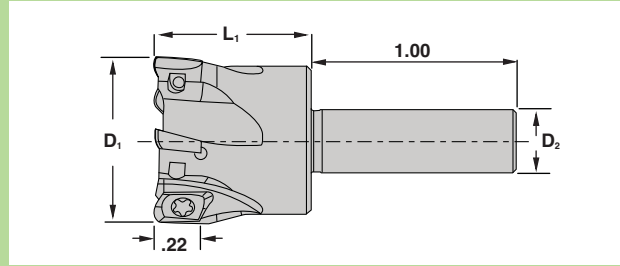
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Wrench (Not included with carbide tip or shank purchase).

Thread Size	Wrench Part No.	Optional Torque Wrench	Torque Value (in. lbs.)
T06	WS-0029	DT-90-08	90
T08	WS-0030	DT-130-10	130
T10	WS-0044	DT-250-13	250
T12	WS-0059	DT-250-16	250

See Page 14 for inserts.

Shoulder Channeling Ramping Corkscrew Pocketing Facing



12

Diameters
.375"-1.00"

Cutting Edge Length
.22"

Insert Corner
.008" and .015"R



Shoulder



Channeling



Ramping



Corkscrew



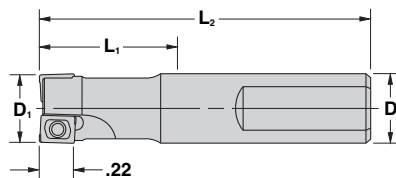
Pocketing



Facing

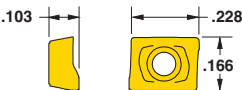
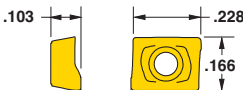


Coolant Thru

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INSERTS

			
AOMT0602_R	AOCT060204FR-P		
			

Insert Number	Application	Corner	Grades					
			IN	2005	2030	1030	05S	2505
AOMT060202R	Multi-Purpose	.008R		■	■	■		
AOMT060204R	Multi-Purpose	.015R		■	■			
AOMT060208R	Multi-Purpose	.031R		■	■			
AOMT060216R*	Multi-Purpose	.062R		■	■			
AOCT060204FR-P	Ground/Polished (for Alu.)	.015R					■	

* Cutter body should be relieved to accept .062"R insert.

HARDWARE

Insert Screw		Driver		Preset Torque Driver	Bit for Torque Driver
Part No.	Torque	Part No.		Part No.	Part No.
SM18-041-00	5 in. lbs.	DS-TP06S (Tx Plus 06)		DTN005S	DS-TP06TB

For technical information, see page 42.

Diameters
.312" to .750"

Grade
IN2005

Corner Chamfer & Radius



Shoulder



Channeling



Ramping



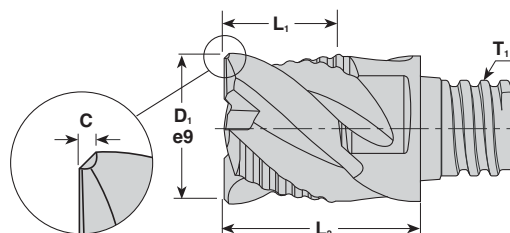
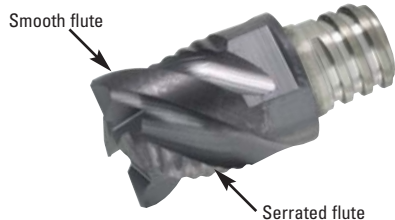
Corkscrew



Pocketing



Facing

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Wrench (Not included with carbide tip or shank purchase).

Thread Size	Wrench Part No.	Optional Torque Wrench	Torque Value (in. lbs.)
T05	WS-0043	DT-60-06	60
T06	WS-0029	DT-90-08	90
T08	WS-0030	DT-130-10	130
T10	WS-0044	DT-250-13	250
T12	WS-0059	DT-250-16	250

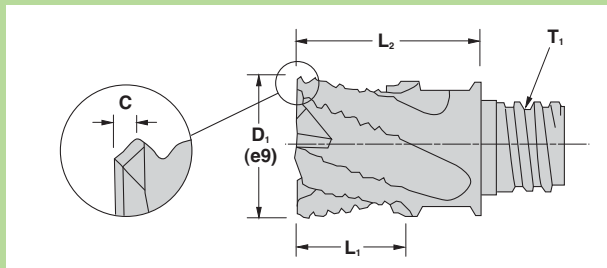
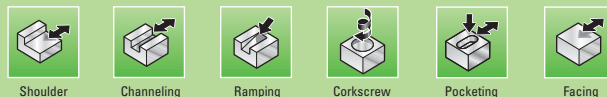
When assembling, be sure carbide tip is seated firmly on shank with no gap. For technical information, see page 38.

Note: DO NOT apply lubricant to the thread connection.



SOLID CARBIDE SERRATED ROUGHING TIP SERIES 47C, 48C (0° LEAD, 45° HELIX, CENTER CUTTING)

Diameters .312" to .750"	Grade IN2005	Corner Chamfer & Radius
-----------------------------	-----------------	----------------------------



Cutter Number	Eff.	D ₁ Nominal Diameter	L ₁ Cutting Edge Length	T ₁ Thread Size	L ₂ Extension Length	C Corner	Ramp Angle
47C-3120TQRN01	4	.312	.20	T05	.39	.010 x 45	90
47C-3727T6RN01	4	.375	.27	T06	.50	.013 x 45	90
47D-3727T6RN03	4	.375	.27	T06	.50	.031R	90
47C-5037T8RN01	4	.500	.37	T08	.65	.012 x 45	90
47D-5037T8RN03	4	.500	.37	T08	.65	.031R	90
47D-5037T8RN06	4	.500	.37	T08	.65	.062R	90
47C-6247TRRN01	5	.625	.47	T10	.80	.014 x 45	7
48C-7562TSRN01	6	.750	.62	T12	1.00	.016 x 45	3
48D-7562TSRN06	6	.750	.62	T12	1.00	.062R	3

Wrench (Not included with carbide tip or shank purchase).

Thread Size	Wrench Part No.	Optional Torque Wrench	Torque Value (in. lbs.)
T05	WS-0043	DT-60-06	60
T06	WS-0029	DT-90-08	90
T08	WS-0030	DT-130-10	130
T10	WS-0044	DT-250-13	250
T12	WS-0059	DT-250-16	250

When assembling, be sure carbide tip is seated firmly on shank with no gap. For technical information, see page 38.

Note: DO NOT apply lubricant to the thread connection.

Diameters
.312" to .500"

Grade
IN2005

Corner
Sharp, .015", .031" and
.062"R



Shoulder



Channeling



Ramping



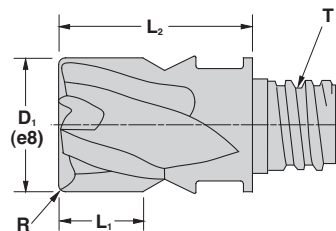
Corkscrew



Pocketing



Facing

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Wrench (Not included with carbide tip or shank purchase).

Thread Size	Wrench Part No.	Optional Torque Wrench	Torque Value (in. lbs.)
T05	WS-0043	DT-60-06	60
T06	WS-0029	DT-90-08	90
T08	WS-0030	DT-130-10	130

When assembling, be sure carbide tip is seated firmly on shank with no gap. For technical information, see page 38.
Note: DO NOT apply lubricant to the thread connection.

Diameters
.312" to .750"

Grade
IN2005

Corner
Sharp, .015", .031" and
.062"R



Shoulder



Channeling



Ramping



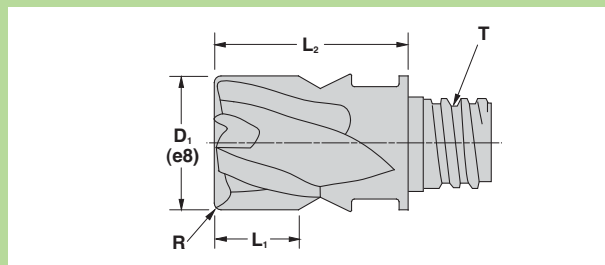
Corkscrew



Pocketing



Facing



Cutter Number	Eff.	D ₁ Nominal Diameter	L ₁ Cutting Edge Length	T ₁ Thread Size	L ₂ Extension Length	R Corner Radius
4-FLUTE END MILL HEADS						
47J-3120TQRD04	4	.312	.20	T05	.39	SHARP
47D-3120TQRD01	4	.312	.20	T05	.39	.015
47D-3120TQRD03	4	.312	.20	T05	.39	.031
47D-3120TQRD06	4	.312	.20	T05	.39	.062
47J-3727T6RD05	4	.375	.27	T06	.50	SHARP
47D-3727T6RD01	4	.375	.27	T06	.50	.015
47D-3727T6RD03	4	.375	.27	T06	.50	.031
47D-3727T6RD06	4	.375	.27	T06	.50	.062
47J-5037T8RD06	4	.500	.37	T08	.65	SHARP
47D-5037T8RD01	4	.500	.37	T08	.65	.015
47D-5037T8RD03	4	.500	.37	T08	.65	.031
47D-5037T8RD06	4	.500	.37	T08	.65	.062
47J-6247TRRD08	4	.625	.47	T10	.80	SHARP
47D-6247TRRD03	4	.625	.47	T10	.80	.031
47D-6247TRRB06	4	.625	.47	T10	.80	.062
47D-7562TSRD03	4	.750	.62	T12	1.00	.031

Wrench (Not included with carbide tip or shank purchase).

Thread Size	Wrench Part No.	Optional Torque Wrench	Torque Value (in. lbs.)
T05	WS-0043	DT-60-06	60
T06	WS-0029	DT-90-08	90
T08	WS-0030	DT-130-10	130
T10	WS-0044	DT-250-13	250
T12	WS-0059	DT-250-16	250

When assembling, be sure carbide tip is seated firmly on shank with no gap. For technical information, see page 38.

Note: DO NOT apply lubricant to the thread connection.



SOLID CARBIDE END MILL TIP-VARIABLE PITCH (0° LEAD, 38° HELIX, CENTER CUTTING)

Diameters	Grade	Insert Corner
0.312"-0.750"	IN2005	SC, Chamfer & Radius



Channelling



Shoulder



Pocketing



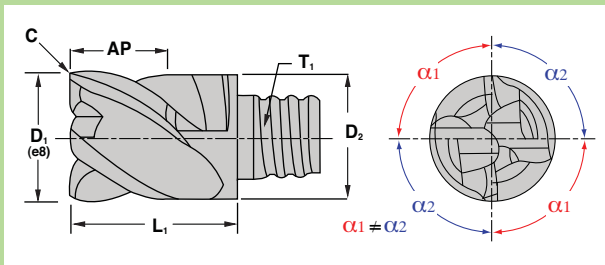
Ramping



Corkscrew



Facing



Part Number	D ₁ Nominal Diameter	# Effective	AP Length of cut	T ₁ Thread Size	L ₁ Extension Length	D ₂ Neck Diameter	Ch Chamfer
47J-3120TQRQ04	0.312	4	0.200	T5	0.390	0.300	SC
47D-3120TQRQ01	0.312	4	0.200	T5	0.390	0.300	R 0.015
47C-3120TQRQ01	0.312	4	0.200	T5	0.390	0.300	.012 x 45
47J-3727T6RQ05	0.375	4	0.270	T6	0.510	0.364	SC
47D-3727T6RQ01	0.375	4	0.270	T6	0.510	0.364	R 0.015
47C-3727T6RQ01	0.375	4	0.270	T6	0.510	0.364	.016 x 45
47J-5037T8RQ06	0.500	4	0.370	T8	0.650	0.480	SC
47D-5037T8RQ03	0.500	4	0.370	T8	0.650	0.480	R 0.031
47C-5037T8RQ02	0.500	4	0.370	T8	0.650	0.480	.020 x 45
47D-6247TRRQ03	0.625	4	0.470	T10	0.810	0.600	R 0.031
47C-6247TRRQ02	0.625	4	0.470	T10	0.810	0.600	.024 x 45
47D-7562TSRQ03	0.750	4	0.620	T12	1.000	.720	R 0.031
47C-7562TSRQ02	0.750	4	0.620	T12	1.000	.720	.024 x 45

Wrench (Not included with carbide tip or shank purchase).

Thread Size	Wrench Part No.	Optional Torque Wrench	Torque Value (in. lbs.)
T05	WS-0043	DT-60-06	60
T06	WS-0029	DT-90-08	90
T08	WS-0030	DT-130-10	130
T10	WS-0044	DT-250-13	250
T12	WS-0059	DT-250-16	250

When assembling, be sure carbide tip is seated firmly on shank with no gap. For technical information, see page 38.
Note: DO NOT apply lubricant to the thread connection.

Diameters
.312" to .625"

Grade
IN2005

Corner
Sharp, .015", .031" and .062"R



Shoulder



Channeling



Ramping



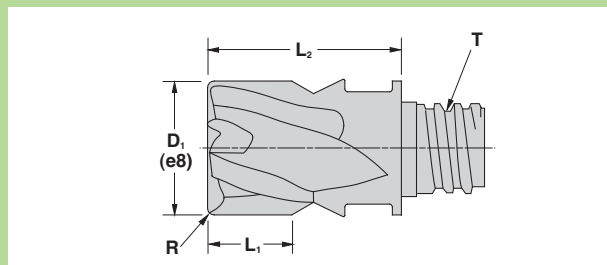
Corkscrew



Pocketing



Facing



Cutter Number	Eff.	D ₁ Nominal Diameter	L ₁ Cutting Edge Length	T ₁ Thread Size	L ₂ Extension Length	R Corner Radius	Ramp Angle
48J-3120TQRD04	6	.312	.20	T05	.39	SHARP	3
48D-3120TQRD03	6	.312	.20	T05	.39	.031	3
48J-3727T6RD05	6	.375	.27	T06	.50	SHARP	5
48D-3727T6RD01	6	.375	.27	T06	.50	.015	5
48D-3727T6RD03	6	.375	.27	T06	.50	.031	5
48D-3727T6RD06	6	.375	.27	T06	.50	.062	5
48J-5037T8RD06	6	.500	.37	T08	.65	SHARP	5
48D-5037T8RD01	6	.500	.37	T08	.65	.015	5
48D-5037T8RD03	6	.500	.37	T08	.65	.031	5
48D-5037T8RD06	6	.500	.37	T08	.65	.062	5
49J-6247TRRD08	8	.625	.47	T10	.80	SHARP	5
49D-6247TRRD03	8	.625	.47	T10	.80	.031	5
49D-6247TRRD06	8	.625	.47	T10	.80	.062	5
49D-7562TSRD03	10	.750	.62	T12	1.00	.031	3
49D-7562TSRD06	10	.750	.62	T12	1.00	.062	3

Wrench (Not included with carbide tip or shank purchase).

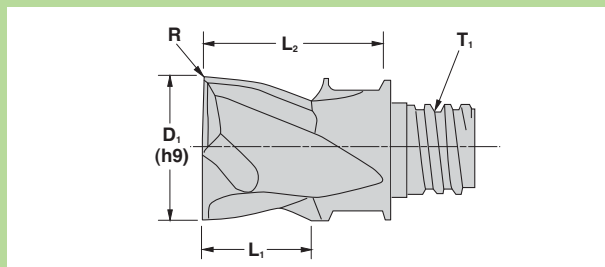
Size	Part No.	Optional Torque Wrench	Torque Value (in. lbs.)
T05	WS-0043	DT-60-06	60
T06	WS-0029	DT-90-08	90
T08	WS-0030	DT-130-10	130
T10	WS-0044	DT-250-13	250
T12	WS-0059	DT-250-16	250

When assembling, be sure carbide tip is seated firmly on shank with no gap. For technical information, see page 38.
Note: DO NOT apply lubricant to the thread connection.



CHIP SURFER™ 0° LEAD, 45° HELIX, POLISHED, SHARP, FOR ALUMINUM SERIES 45D, 45J, 46D, 46J
(CENTER CUTTING)

Diameters .312" to .750"	Grade IN05S	Corner Sharp, .020", .031", .062", .094" & .125"R
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Cutter Number	Eff.	D ₁ Nominal Diameter	L ₁ Cutting Edge Length	T ₁ Thread Size	L ₂ Extension Length	R Corner Radius
46D-3120TQRD02-P	3	.312	.20	T05	.39	.020
45J-3727T6RD05-P	2	.375	.27	T06	.50	SHARP
45D-3727T6RD02-P	2	.375	.27	T06	.50	.020
46D-3727T6RD03-P	3	.375	.27	T06	.50	.031
46D-3727T6RD06-P	3	.375	.27	T06	.50	.062
45J-5037T8RD06-P	2	.500	.37	T08	.65	SHARP
45D-5037T8RD02-P	2	.500	.37	T08	.65	.020
46D-5037T8RD03-P	3	.500	.37	T08	.65	.031
46D-5037T8RD06-P	3	.500	.37	T08	.65	.062
46D-5037T8RD09-P	3	.500	.37	T08	.65	.094
46D-5037T8RD12-P	3	.500	.37	T08	.65	.125
46J-6239TRRD08-P	3	.625	.39	T10	.80	SHARP
46D-6239TRRD03-P	3	.625	.39	T10	.80	.031
46D-6239TRRD06-P	3	.625	.39	T10	.80	.062
46D-6239TRRD09-P	3	.625	.39	T10	.80	.094
46D-6239TRRD12-P	3	.625	.39	T10	.80	.125
46D-7550TSRD02-P	3	.750	.50	T12	1.00	.020
46D-7550TSRD06-P	3	.750	.50	T12	1.00	.062
46D-7550TSRD09-P	3	.750	.50	T12	1.00	.094
46D-7550TSRD12-P	3	.750	.50	T12	1.00	.125

Wrench (Not included with carbide tip or shank purchase).

Thread Size	Wrench Part No.	Optional Torque Wrench	Torque Value (in. lbs.)
T05	WS-0043	DT-60-06	60
T06	WS-0029	DT-90-08	90
T08	WS-0030	DT-130-10	130
T10	WS-0044	DT-250-13	250
T12	WS-0059	DT-250-14	250

When assembling, be sure carbide tip is seated firmly on shank with no gap. For technical information, see page 38.
Note: DO NOT apply lubricant to the thread connection.

Diameters
.375" to .625"

Grade
IN2005

Corner
.015"R



Drill



Std. Bottom



Shoulder



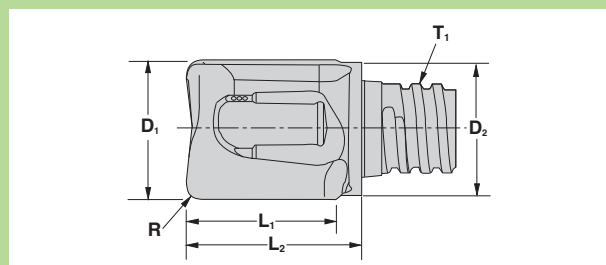
Pocketing



Ramping



Channeling



Cutter Number	Eff.	D ₁ Nominal Diameter	D ₂ Flange Diameter	T ₁ Thread Size	L ₁ Edge Length	L ₂ Extension Length	R Corner Radius
45D-3738T6RA01	2	.375	.35	T06	.38	.48	.015
45D-5045T8RA01	2	.500	.48	T08	.45	.60	.015
45D-6263T10RA01	2	.625	.60	T10	.60	.75	.015

*Drill depth not to exceed 2/3 edge length.

Wrench (Not included with carbide tip or shank purchase).

Thread Size	Wrench Part No.	Optional Torque Wrench	Torque Value (in. lbs.)
T06	WS-0029	DT-90-05	90
T08	WS-0030	DT-130-07	130
T10	WS-0044	DT-250-08	250

When assembling, be sure carbide tip is seated firmly on shank with no gap. For technical information, see page 38.

Note: DO NOT apply lubricant to the thread connection.



CHIP•SURFER™ FLAT BOTTOM PLUNGE CUTTER SERIES 45V

Diameters
.375" - .625"
Grade
IN2005
Corner
.031"



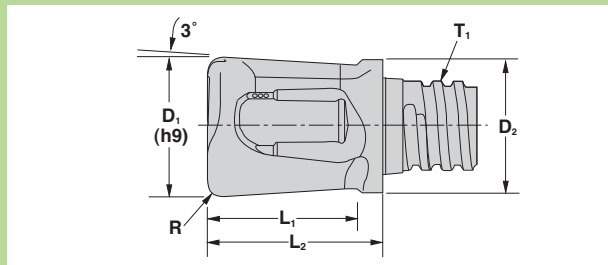
Drill



Flat Bottom



Plunge



Cutter Number	Eff.	D ₁ Nominal Diameter	D ₂ Flange Diameter	T ₁ Thread Size	* L ₁ Edge Length	L ₂ Extension Length	R Corner Radius
45V-3738T6RA03	2	.375	.35	T06	.38	.48	.031
45V-5045T8RA03	2	.500	.48	T08	.45	.60	.031
45V-6260T8RA03	2	.625	.60	T10	.60	.75	.031

*If used for spot facing, drilling or boring, drill depth not to exceed 2/3 edge length.

Wrench (Not included with carbide tip or shank purchase).

Thread Size	Wrench Part No.	Optional Torque Wrench	Torque Value (in. lbs.)
T06	WS-0029	DT-90-05	90
T08	WS-0030	DT-130-07	130
T10	WS-0044	DT-250-08	250

When assembling, be sure carbide tip is seated firmly on shank with no gap. For technical information, see page 38.

Note: DO NOT apply lubricant to the thread connection.

HIGH PRECISION HELICAL BALL NOSE TIP SERIES 47B

Diameters
0.250"

Max. Depth of Cut
0.20"

Insert Corner
.125



Contouring



Pocketing



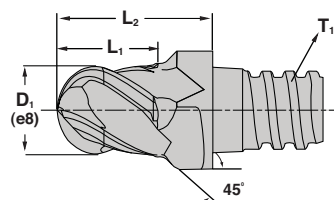
Corkscrew



Channeling



Ramping



Wrench (Not included with carbide tip or shank purchase).

When assembling, be sure carbide tip is seated firmly on shank with no gap. For technical information, see page 38.
Note: DO NOT apply lubricant to the thread connection.



HIGH PRECISION HELICAL BALL NOSE TIP SERIES 45B, 47B

Diameters
.312" to .750"

Grade
IN2005

Corner
.156", .187", .250", .312" and
.374"R



Contouring



Pocketing



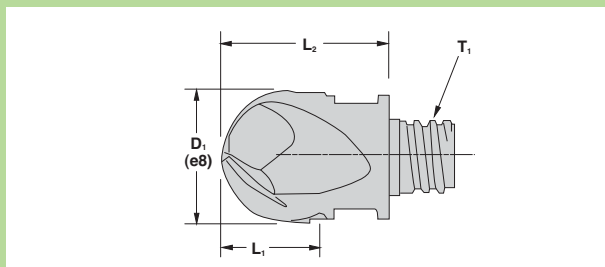
Corkscrew



Channelling



Ramping



Cutter Number	Eff.	D ₁ Nominal Diameter	L ₁ Cutting Edge Length	T ₁ Thread Size	L ₂ Extension Length	R Corner Radius	Tolerance
45B-3120QRB03	2	.312	.20	T05	.39	.156	.0004
47B-3120QRB03	4	.312	.20	T05	.39	.156	.0004
45B-3727T6RB05	2	.375	.27	T06	.51	.187	.0004
47B-3727T6RB05	4	.375	.27	T06	.51	.187	.0004
45B-5037T8RB06	2	.500	.37	T08	.65	.250	.0005
47B-5037T8RB06	4	.500	.37	T08	.65	.250	.0005
45B-6235TRRB08	2	.625	.35	T10	.80	.312	.0005
47B-6247TRRB08	4	.625	.47	T10	.80	.312	.0005
45B-7550TSRB10	2	.750	.50	T12	1.00	.374	.0005
47B-7562TSRB10	4	.750	.62	T12	1.00	.374	.0005

Wrench (Not included with carbide tip or shank purchase).

Thread Size	Wrench Part No.	Optional Torque Wrench	Torque Value (in. lbs.)
T05	WS-0043	DT-60-06	60
T06	WS-0029	DT-90-08	90
T08	WS-0030	DT-130-10	130
T10	WS-0044	DT-250-13	250
T12	WS-0059	DT-250-16	250

When assembling, be sure carbide tip is seated firmly on shank with no gap. For technical information, see page 38.

Diameters
.312" to .750"

Grade
IN05S

Corner
.156", .187", .250", .312" and
.374"_R



Contouring



Pocketing



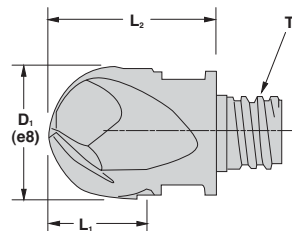
Corkscrew



Channeling



Ramping

[illegible]

Wrench (Not included with carbide tip or shank purchase).

Thread Size	Wrench Part No.	Optional Torque Wrench	Torque Value (in. lbs.)
T05	WS-0043	DT-60-06	60
T06	WS-0029	DT-90-08	90
T08	WS-0030	DT-130-10	130
T10	WS-0044	DT-250-13	250
T12	WS-0059	DT-250-16	250

When assembling, be sure carbide tip is seated firmly on shank with no gap. For technical information, see page 38.

Note: DO NOT apply lubricant to the thread connection.



CHIP SURFER™ CHAMFER AND SPOTTING TIP SERIES 45N, 45M, 45P

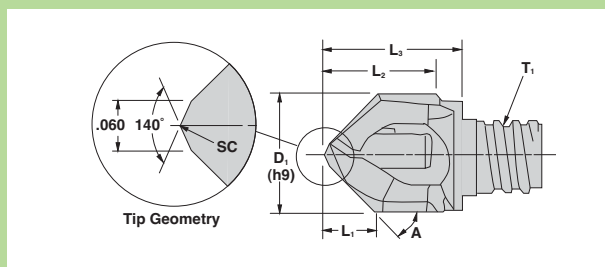
Diameter	Grades	Nominal Chamfer Angle
.390" and .625"	IN2005	30°, 45°, 60° and 72°



Spot Drilling



Chamfering



Cutter Number	A Nominal Chamfer Angle	Eff.	D ₁ Nominal Diameter	L ₁ Cutting Edge Length	T ₁ Thread Size	L ₂ Depth	L ₃ Extension Length
45N08007TQRA45	45°	2	.315	.14	T05	.27	.38
45N10009T6RA45	45°	2	.390	.18	T06	.35	.50
45N10009T6RA72	72°	2	.390	.06	T06	.35	.50
45M10009T6RA30	30°	2	.390	.26	T06	.37	.50
45P10009T6RA60	60°	2	.390	.10	T06	.39	.50
45N16015TRRA45	45°	2	.625	.29	T10	.59	.75

Wrench (Not included with carbide tip or shank purchase).

Thread Size	Wrench Part No.	Optional Torque Wrench	Torque Value (in. lbs.)
T05	WS-0043	DT-60-04	60
T06	WS-0029	DT-90-05	90
T10	WS-0044	DT-250-08	250

When assembling, be sure carbide tip is seated firmly on shank with no gap. For technical information, see page 38.

Note: DO NOT apply lubricant to the thread connection.

Diameters
.394" to .630"

Grade
IN2005

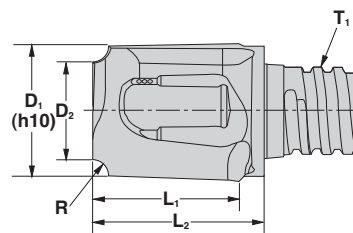
Corner
.062", .094", .125", .156" and
.187"R (O.D. Radius)



Corner Rounding



Plunging

[illegible]

Wrench (Not included with carbide tip or shank purchase).

Thread Size	Wrench Part No.	Optional Torque Wrench	Torque Value (in. lbs.)
T06	WS-0029	DT-90-05	90
T08	WS-0030	DT-130-07	130
T10	WS-0044	DT-250-08	250

When assembling, be sure carbide tip is seated firmly on shank with no gap. For technical information, see page 38.

Note: DO NOT apply lubricant to the thread connection.

Diameters
.125"-.250"

Grade
IN2005

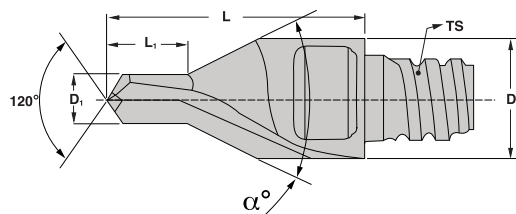
Geometry
120° included point angle
10°-15° helical flute



Drill



Counter Sink



Cutter Number	Size Designation (ANSI B94)	D ₁	D ₂	TS Thread Size	L Extension Length	L ₁	α
45Z-1221TQRA06	#4	0.125	0.312	T5	0.59	0.161	60
45Z-1851T8RA09	#5	0.187	0.500*	T8	0.90	0.242	60
45Z-2152T8RA09	#6	0.218	0.500	T8	0.90	0.281	60
45Z-2564TRRA11	#7	0.250	0.625	T10	1.10	0.322	60
* Diameter is larger than ANSI standard							

Wrench (Not included with carbide tip or shank purchase).

Thread Size	Wrench Part No.	Optional Torque Wrench	Torque Value (in. lbs.)
T5	WS-0043	DT-60-06	60
T8	WS-0030	DT-130-10	130
T10	WS-0044	DT-250-13	250

When assembling, be sure carbide tip is seated firmly on shank with no gap. For technical information, see page 38.

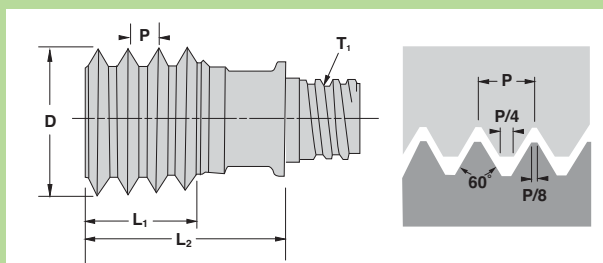
Note: DO NOT apply lubricant to the thread connection.

Diameters
.394" to .630"

Grade
IN2005



Threading



INCH

Cutter Number	P Pitch (TPI)	UNC	UNF	UNEF	D Nominal Diameter	# Eff.	T ₁ Thread Size	L ₁ Length of Cut	L ₂ Extension length
47Y-24UNTQRA13	24	-	-	9/16 & 5/8	.394	4	T05	.252	.526
47Y-20UNTQRA13	20	-	1/2	-	.394	4	T05	.252	.526
47Y-18UNTQRA13	18	-	9/16 & 5/8	1-1/8 & 1-5/8	.394	4	T05	.220	.526
47Y-16UNT6RA17	16	-	3/4	-	.472	4	T06	.315	.671
47Y-14UNT8RA21	14	-	7/8	-	.630	5	T08	.500	.821
47Y-12UNT8RA21	12	-	1 & 1-1/2	-	.630	5	T08	.500	.821
47Y-10UNT8RA21	10	3/4	-	-	.602	4	T08	.500	.821
47Y-09UNT8RA21	9	7/8	-	-	.630	3	T08	.445	.821

METRIC

Cutter Number	P Pitch (mm)	M Coarse	M Fine	D Nominal Diameter	# Eff.	T ₁ Thread Size	L ₁ Length of Cut	L ₂ Extension length
47Y075ISTQRA13	.75		Ø≥12	.394	4	T05	.236	.526
47Y100ISTQRA13	1.0		Ø≥12	.394	4	T05	.236	.526
47Y150ISTQRA13	1.5		Ø≥14	.394	4	T05	.236	.526
47Y150IST6RA17	1.5		Ø≥16	.472	4	T06	.295	.671
48Y150IST8RA21	1.5		Ø≥20	.630	6	T08	.472	.821
47Y200IST6RA17	2.0	M16	Ø≥17	.472	4	T06	.315	.671
47Y200IST8RA21	2.0		Ø≥19	.630	5	T08	.472	.821
47Y250IST8RA20	2.5	M20	Ø≥22	.606	5	T08	.492	.821
47Y300IST8RA21	3.0	M24	Ø≥25	.630	3	T08	.472	.821

Wrench (Not included with carbide tip or shank purchase).

Thread Size	Wrench Part No.	Optional Torque Wrench	Torque Value (in. lbs.)
T05	WS-0043	DT-60-06	60
T06	WS-0029	DT-90-08	90
T08	WS-0030	DT-130-10	130

When assembling, be sure carbide tip is seated firmly on shank with no gap. For technical information, see page 38.

Note: DO NOT apply lubricant to the thread connection.

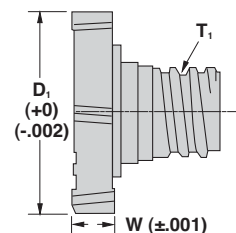
PRECISION T-SLOT MILLING TIP SERIES 18T

SERIES 18T

Corner
.015"R and .006 x 45° chamfer

Slotting

T-Slotting



18T-5006TQRN00	6	.500	.062	.09	T05	.006 x 45°	1 / 60
18T-5012TQRN00	6	.500	.125	.09	T05	.015	1 / 60
18T-6205T6RN02	6	.625	.056	.10	T06	.015	1 / 90
18T-6206T6RN01	6	.625	.062	.13	T06	.015	1 / 90
18T-6206T6RN02	6	.625	.068	.11	T06	.015	1 / 90
18T-6208T6RN01	6	.625	.078	.13	T06	.015	1 / 90
18T-6208T6RN02	6	.625	.086	.12	T06	.015	1 / 90
18T-6210T6RN01	6	.625	.105	.13	T06	.015	1 / 90
18T-6212T6RN01	6	.625	.125	.13	T06	.015	2 / 90
18T-6216T6RN01	6	.625	.156	.13	T06	.015	2 / 90
18T-7516T8RN01	6	.750	.156	.13	T08	.015	3 / 130
18T-7519T8RN01	6	.750	.187	.13	T08	.015	3 / 130
18T-7525T8RN01	6	.750	.250	.13	T08	.015	3 / 130
18T-8718T8RN01	6	.875	.187	.19	T08	.015	4 / 130
18T-8725T8RN01	6	.875	.250	.19	T08	.015	4 / 130
18T-8731T8RN01	6	.875	.312	.19	T08	.015	4 / 130
18T-10018TRRN02	6	1.00	.187	.19	T10	.015	5 / 250
18T-10025TRRN02	6	1.00	.250	.19	T10	.015	5 / 250
18T-10037TRRN02	6	1.00	.375	.19	T10	.015	5 / 250

Wrench (Not included with carbide tip or shank purchase).

Torx Driver	Torx Driver Part No.	Optional Torque Bit / Hex Drive
1	DS-T20T	DS-T20B /.250"
2	DS-T25T	DS-T25B /.250"
3	DS-T30T	DS-T30B /.250"
4	DS-T40T	DS-T40B /.250"
5	DS-T50L	DS-T50B /.312"

Note: DO NOT apply lubricant to the thread connection.

Diameter
.625"

Grade
IN2005

Corner
.062" x 45°



Chamfering



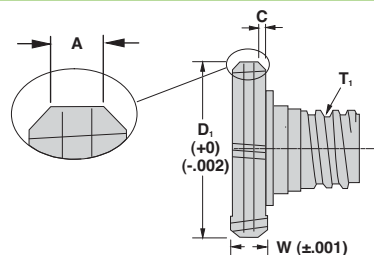
Slotting



T-Slotting



Counter-Sink

[illegible]

Wrench (Not included with carbide tip or shank purchase).

Thread Size	Wrench Part No.	Optional Torque Wrench	Torque Value (in. lbs.)
T06	DS-T20T	DS-T20B	90

When assembling, be sure carbide tip is seated firmly on shank with no gap. For technical information, see page 41.
Note: DO NOT apply lubricant to the thread connection.

SPECIFICATIONS

NEW

Diameter (D)	
Diameter Tolerance	(e8)
Extension Length (L)	
Cutting Length (a)	
Number of Flutes	
Neck Diameter (D1)	(D-.02)
Helix Angle	(45)
Radial Rake Angle	(10)
Chamfer (C)	
Radius (R)	
Grade	IN05S(uncoated), IN2005(TiAlN)
Adaption (Ts)	

ADDITIONAL INFORMATION

Reference Catalog Part #	
Quantity (min. Of 6)	6,
Material to Machine	
Application	Circle one: (Milling) (Boring)
	() Indicates Default

Circle one of these:



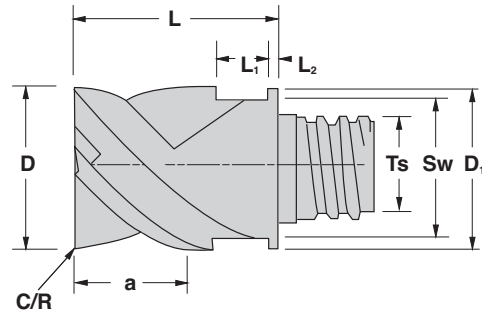
Center
Cut



Cut Past
Center

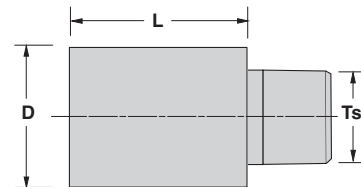


Not Center
Cutting



Part Number	D	L	Ts	Sw	L1	L2
4RJ08000TQ-S100	0.315	0.407	5	0.212	0.14	0.02
4RJ10000T6-S140	0.394	0.525	6	0.311	0.17	0.02
4RJ-5000T8-S060	0.501	0.670	8	0.390	0.21	0.02
4RJ16000TR-S210	0.630	0.820	10	0.508	0.24	0.03
4RJ20000TS-S260	0.787	1.025	12	0.626	0.24	0.05

BLANK INFORMATION



Customer

Customer No.

Street

City

State

Zip

Contact Person

Phone

Fax

Email

Quantity

Annual Quantity

Sales Engineer

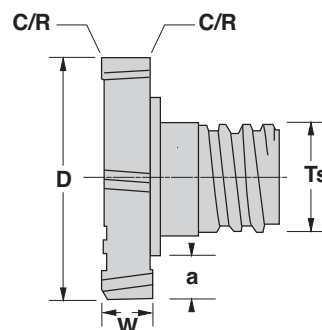
SPECIFICATIONS

NEW

Diameter (D)	
Width of Cut (W)	
Number of Flutes	(6)
Depth of Cut (a)	[(D-D ₁)/2]
Axial Rake	(3)
Chamfer (C)	
Radius (R)	
Grade	IN30M(uncoated), IN2030(TiAlN)
Tolerance	(D-.002 / W±.002)
Adaption (Ts)	

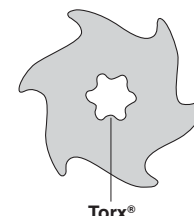
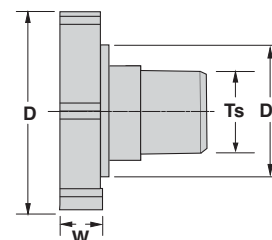
ADDITIONAL INFORMATION

Reference Catalog Part #	
Quantity (min. of 6)	6,
Material to Machine	
Application	Circle one: (Milling) (Boring)
	() Indicates Default



Part Number	D	W	Ts	D ₁	Torx®	# Teeth
18T14019TQRS000	0.552	0.074	T5	0.320	T20	6
18T14028TQRS000	0.552	0.110	T5	0.320	T20	6
18T14033TQRS000	0.552	0.130	T5	0.320	T20	6
18T14043TQRS000	0.552	0.169	T5	0.320	T20	6
18T16323T6RS000	0.641	0.091	T6	0.364	T20	6
18T16333T6RS000	0.641	0.130	T6	0.364	T25	6
18T16343T6RS000	0.641	0.169	T6	0.364	T25	6
18T19439T8RS000	0.762	0.149	T8	0.480	T30	6
18T19444T8RS000	0.762	0.173	T8	0.480	T30	6
18T19451T8RS000	0.762	0.200	T8	0.480	T30	6
18T19467T8RS000	0.762	0.263	T8	0.480	T30	6
18T19844T8RS000	0.781	0.173	T8	0.480	T30	6
18T19854T8RS000	0.781	0.213	T8	0.480	T30	6
18T19863T8RS000	0.781	0.252	T8	0.480	T30	6
18T23453T8RS000	0.919	0.209	T8	0.480	T40	6
18T23463T8RS000	0.919	0.248	T8	0.480	T40	6
18T23483T8RS000	0.919	0.327	T8	0.480	T40	6
18T23499T8RS000	0.919	0.390	T8	0.480	T40	6
18T25826TRRS000	1.014	0.102	T10	0.630	T50	6
18T25840TRRS000	1.014	0.157	T10	0.630	T50	6
18T25850TRRS000	1.014	0.197	T10	0.630	T50	6
18T25866TRRS000	1.014	0.260	T10	0.630	T50	6
18T25883TRRS000	1.014	0.327	T10	0.630	T50	6
18T25899TRRS000	1.014	0.390	T10	0.630	T50	6
18T28628TRRS000	1.125	0.110	T10	0.630	T40	6
18T28636TRRS000	1.125	0.141	T10	0.630	T40	6
18T28656TRRS000	1.125	0.220	T10	0.630	T40	6
18T28610TRRS000	1.125	0.405	T10	0.630	T40	6

BLANK INFORMATION



Customer

Customer No.

Street

City

State

Zip

Contact Person

Phone

Fax

Email

Quantity

Annual Quantity

Sales Engineer



INDEXING **CHIP SURFER**™ TIP GUIDELINES

- Step 1: Screw tip into shank until finger tight (Figure 1a). Note a .010" gap (Figure 1b).
Step 2: Use wrench to torque approximately 1/4 turn, creating a simultaneous fit (Figure 2).
Step 3: Use .001" shim stock to check the simultaneous fit at the intersection of the tip and the shank.
The shim should not be able to enter the intersection (Figure 3a).
If it does, tighten further with the wrench until there is no gap (Figure 3b).

Note: Pre-set torque wrenches (series DT- . . .) can be purchased.

Figure 1a. Finger tight



Figure 1b. .010" gap



Figure 2. 1/4 turn



Figure 3a. Shim should NOT enter intersection



Figure 3b. Proper fit



Series DT- . . . Optional Torque Wrench



MILLING TIP OPERATING GUIDELINES



Material	Specifications	Hardness Brinell	Coolant?	SFM	Diameter	IPT Based on Diameter
Aluminum Alloys	7075 - T6 6061 - T6 2024	-	Yes	1000-5000	0.312	.003
					0.375	.004
					0.500	.005
					0.625	.006
					0.750	.008
Magnesium	Die Cast, Extruded	-	?	800-1500	0.312	.002
					0.375	.003
					0.500	.004
					0.625	.006
					0.750	.008
Copper	Yellow Brass, High Lead Brass, Red Brass	-	?	800-1000	0.312	.002
					0.375	.0025
					0.500	.003
					0.625	.004
					0.750	.004
Copper Alloys	Aluminum/Bronze, Low Silicon Bronze	-	?	750-1000	0.312	.002
					0.375	.0025
					0.500	.003
					0.625	.004
					0.750	.004
Plastics, Acrylics, Phenolics	Polysulfone, G10, G11	-	?	200-500	0.312	.003
					0.375	.004
					0.500	.006
					0.625	.008
					0.750	.010
Cast Iron	Ductile Cast Iron	150-250	No	600-650	0.312	.0015
					0.375	.002
					0.500	.0022
					0.625	.003
					0.750	.004
Cast Iron	Gray Cast Iron	150-250	No	600-650	0.312	.002
					0.375	.003
					0.500	.004
					0.625	.005
					0.750	.006
Steel	Low Alloy Steels 10xx, 11xx, 13xx	100-250	No	600-800	0.312	.0012
					0.375	.002
					0.500	.003
					0.625	.004
					0.750	.005
Steel	High Strength Steels 4140, 4340, 6150, H13	150-300	No	600-800	0.312	.001
					0.375	.0015
					0.500	.002
					0.625	.0025
					0.750	.003
Steel	High Alloy Steels A2, A6, P20	Up to 300	No	500-650	0.312	.001
					0.375	.0015
					0.500	.0015
					0.625	.0025
					0.750	.003

MILLING TIP OPERATING GUIDELINES



Material	Specifications	Hardness Brinell	Coolant?	SFM	Diameter	IPT Based on Diameter
Steel	Medium Alloy Steels 200, 250, 300	250-400	No	500-750	0.312	.001
					0.375	.002
					0.500	.0025
					0.625	.0035
					0.750	.004
Stainless Steel	13/8, 15/5, AM-350/355	-	Yes*	200-275	0.312	.001
					0.375	.0015
					0.500	.002
					0.625	.003
					0.750	.004
Stainless Steel	200 Series, 302, 303, 304L, 316L	-	Yes*	225-300	0.312	.002
					0.375	.0025
					0.500	.003
					0.625	.0035
					0.750	.0035
Stainless Steel	403, 410, 416	-	Yes*	250-325	0.312	.0005
					0.375	.001
					0.500	.0015
					0.625	.0025
					0.750	.003
High Temperature Alloys	Nickel Base: Inconel, Hastelloy, Waspalloy	-	Yes	100-200	0.312	.0008
					0.375	.001
					0.500	.002
					0.625	.0025
					0.750	.003
High Temperature Alloys	Cobalt Base: Stellite, Haynes, X-40, L-605	-	Yes	100-200	0.312	.001
					0.375	.001
					0.500	.0012
					0.625	.0015
					0.750	.002
High Temperature Alloys	Iron Base: Incoloy, Multimet, Timken	-	Yes	125-225	0.312	.001
					0.375	.0015
					0.500	.002
					0.625	.0025
					0.750	.003
Titanium	Titanium Alloys: 6AL-4V, etc.	-	Yes	100-250	0.312	.0005
					0.375	.001
					0.500	.0015
					0.625	.0025
					0.750	.003
Carbon, Graphites	Carbon, Graphites	-	?	200-500	0.312	.006
					0.375	.008
					0.500	.010
					0.625	.010
					0.750	.015

T-SLOTTER TIP OPERATING GUIDELINES



T-SLOTTER

Material	Spec	Hardness Brinell	SFM	IPT	Coolant
Aluminum	7075 - T6, 6061 - T6, 2024	-	1650-2500	.0025-.0035	Yes
Cast Iron	Gray	150-250	350-550	.0025-.0035	No
	Nodular	150-250	425-650	.0030-.0040	
Steel	Low Carbon 1018, 8620	150-250	450-750	.0025-.0035	No
	High Carbon F-6180	250-400	250-450	.0030-.0040	
	Alloyed Steel 4140, 4340	150-300	350-550		
	Tool Steel A-6, D-1, D-2	Up to 300	350-450		
Stainless Steel	300 Series, 304, 316	-	300-500 at high speeds	.0025-.0035	may not be required
	400 Series 15-5 PH	Up to 320	250-400	.0030-.0040	may not be required at high speeds
	13-8 PH	-	200-350		Yes
Nickel Alloys	Inconel, Hastelloy, Waspalloy	-	100-200	.0025-.0035	Yes
Titanium	6AL-4V	-	150-200	.0025-.0035	Yes

Please see Ingersoll's Milling Products Catalog (CAT-001) for chip thinning factor application at various depths of cut



SOLID CARBIDE DRILLS OPERATING GUIDELINES

ISO	Material Number	Cutting Speed (SFM)	Feed (in/rev) Ø.118 - Ø.185	Feed (in/rev) Ø.189 - Ø.292	Feed (in/rev) Ø.295 - Ø.396	Feed (in/rev) Ø.397 - Ø.500
P	1	250 - 450	.002" - .006"	.003" - .007"	.005" - .010"	.006" - .012"
	2	250 - 450	.002" - .006"	.003" - .007"	.005" - .010"	.006" - .012"
	3	150 - 400	.002" - .004"	.003" - .005"	.005" - .008"	.006" - .010"
	4	150 - 400	.002" - .004"	.003" - .005"	.005" - .008"	.006" - .010"
	5	150 - 400	.002" - .004"	.003" - .005"	.005" - .008"	.006" - .010"
	6	120 - 250	.002" - .004"	.002" - .005"	.004" - .007"	.005" - .009"
	7	120 - 250	.002" - .004"	.002" - .005"	.004" - .007"	.005" - .009"
	8	120 - 250	.002" - .004"	.002" - .005"	.004" - .007"	.005" - .009"
	9	120 - 250	.002" - .004"	.002" - .005"	.004" - .007"	.005" - .009"
	10	100 - 240	.002" - .004"	.002" - .004"	.004" - .006"	.005" - .009"
	11	100 - 240	.002" - .004"	.002" - .004"	.004" - .006"	.005" - .009"
M	12	190 - 230	.002" - .004"	.002" - .004"	.003" - .006"	.005" - .008"
	13	160 - 200	.002" - .004"	.002" - .005"	.004" - .007"	.006" - .009"
	14	110 - 200	.002" - .004"	.002" - .004"	.003" - .006"	.005" - .008"
K	15	230 - 300	.005" - .008"	.007" - .011"	.009" - .015"	.012" - .020"
	16	230 - 300	.005" - .008"	.007" - .011"	.009" - .015"	.012" - .020"
	17	260 - 330	.006" - .010"	.008" - .013"	.011" - .017"	.013" - .024"
	18	260 - 330	.006" - .010"	.008" - .013"	.011" - .017"	.013" - .024"
	19	260 - 330	.006" - .010"	.008" - .013"	.011" - .017"	.013" - .024"
N	20	260 - 330	.006" - .010"	.008" - .013"	.011" - .017"	.013" - .024"
	21	300 - 400	.004" - .010"	.007" - .014"	.009" - .017"	.012" - .020"
	22	300 - 400	.004" - .010"	.007" - .014"	.009" - .017"	.012" - .020"
	23	300 - 400	.004" - .010"	.007" - .014"	.009" - .017"	.012" - .020"
	24	300 - 400	.004" - .010"	.007" - .014"	.009" - .017"	.012" - .020"
	25	300 - 400	.004" - .010"	.007" - .014"	.009" - .017"	.012" - .020"
	26	300 - 400	.003" - .007"	.007" - .014"	.009" - .017"	.012" - .020"
	27	300 - 400	.003" - .007"	.007" - .014"	.009" - .017"	.012" - .020"
	28	300 - 400	.003" - .007"	.007" - .014"	.009" - .017"	.012" - .020"
	29					
	30					
S	31	30 - 80	.001" - .003"	.002" - .003"	.003" - .004"	.004" - .005"
	32	30 - 80	.001" - .003"	.002" - .003"	.003" - .004"	.004" - .005"
	33	30 - 80	.001" - .003"	.002" - .003"	.003" - .004"	.004" - .005"
	34	30 - 80	.001" - .003"	.002" - .003"	.003" - .004"	.004" - .005"
	35	30 - 80	.001" - .003"	.002" - .003"	.003" - .004"	.004" - .005"
	36	70 - 140	.001" - .003"	.002" - .004"	.003" - .006"	.004" - .008"
	37	70 - 140	.001" - .003"	.002" - .004"	.003" - .006"	.004" - .008"
H	38	50 - 100	.001" - .002"	.001" - .003"	.001" - .003"	.002" - .004"
	39	50 - 100	.001" - .002"	.001" - .003"	.001" - .003"	.002" - .004"
	40	50 - 100	.001" - .002"	.001" - .003"	.001" - .003"	.002" - .004"
	41	50 - 100	.001" - .002"	.001" - .003"	.001" - .003"	.002" - .004"

● = P ● = M ● = K ● = N ● = S ● = H



INGERSOLL ISO MATERIAL GROUPS

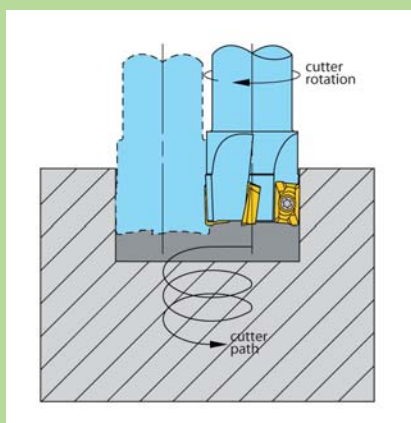
ISO	Material	Condition	Tensile Strength (Kpsi)	Hardness HB	Material Number
P	Non - Alloy Steels <0.25% C	Annealed	61	125	1
	Steel Castings =>0.25% C	Annealed	94	190	2
	Free Machining Steel <0.55% C =>0.55% C =>0.55% C	Quenched & Tempered	123	250	3
		Annealed	109	220	4
		Quenched & Tempered	145	300	5
	Low - Alloy Steels and Steel Castings (less than 5% of alloying elements)	Annealed	87	200	6
		Quenched & Tempered	135	275	7
			145	300	8
			174	350	9
	High - Alloy Steels, Steel Castings & Tool Steels	Annealed	99	200	10
		Quenched & Tempered	160	325	11
M	Stainless Steels and Stainless Steel Castings	Ferritic/Martensitic	99	200	12
		Martensitic	119	240	13
		Austenitic & P.H.	87	180	14
K	Nodular Cast Iron (GGG)	Ferritic / Pearlitic		180	15
		Pearlitic		260	16
	Grey Cast Iron (GG)	Ferritic		160	17
		Pearlitic		250	18
	Malleable Cast Iron	Ferritic		130	19
		Pearlitic		230	20
N	Aluminum wrought alloy	As cast		60	21
		Forged		100	22
	Cast Aluminum alloyed <=12% Si	As cast		75	23
		Forged		90	24
		High Temperature		130	25
	Copper Alloys > 12% Si	Free Cutting		110	26
		Brass		90	27
		Electrolitic Copper		100	28
	Non Metallic	Duroplastics & Fiberplastics			29
		Hard Rubber			30
S	High Temp Alloys	Fe Based Annealed		200	31
		Cured		280	32
		Ni or Co Based Annealed		250	33
		Cured		350	34
		Cast		320	35
	Titanium and Ti Alloys		58		36
		Alpha+Beta alloys cured	152		37
H	Hardened Steel			55 HRc	38
				60 HRc	39
	Chilled Cast Iron	Cast		400	40
	Cast Iron	Hardened		55 HRc	41

●=P ●=M ●=K ●=N ●=S ○=H

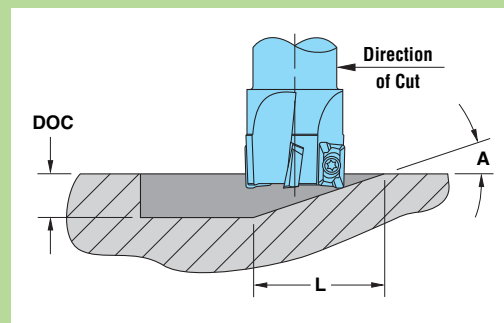


Hi-POS[®] 0° END MILL RAMPING DATA SERIES 12J1D

End Mill Using AOMT0602 Insert w/ .008"R	Cutter Diameter	Min. Dia. Milled Hole	Min. Advance Per Cutter Path Rev. (APCPR)	Max. Dia. Milled Hole	Max Advance Per Cutter Path Rev. (APCPR)
12J1D	0.375	0.495	0.050	0.73	0.175
	0.500	0.735	0.063	0.98	0.150
	0.625	0.985	0.067	1.23	0.130
	0.750	1.220	0.059	1.47	0.102



12J1D End Mills Using AOMT0602 Insert			
Cutter Diameter	A ² Ramp Angle	L	DOC
0.375	9.6	1.3	0.22
0.500	6.0	2.1	0.22
0.625	4.0	3.1	0.22
0.750	2.6	4.8	0.22



Series 12J1D					Grades*				Coolant
Material		Brinell Hardness	SFM	Feed per Insert	IN30M (2055)	IN2005 (804)	IN1030 (J05)	IN2030 (805S)	
Aluminum	6061 T-6, 7075 T-6, 2024	-	1000-8000	.003-.008	1	2			Yes
Cast Iron	Gray	150-250	500-1200	.002-.004		1	2	1	No
	Nodular		400-800						
Steel	Low Carbon 1018-8620	150-250	600-1200	.002-.004		3	1	2	No
	High Carbon F-6180, Nitr alloy 52100	250-400	400-600	.002-.004					
	Alloyed Steel 4140, 4340, 6150	150-300	400-800		3	2	1		
	Tool Steel A-6, D-1, D-2, P-20	Up to 300							
Stainless Steel	300 Series, 304, 316	-	400-800	.002-.004		1	3	2	May not be required at high speeds Yes
	400 Series 15-5 PH, 17-4 PH	Up to 320	500-1000						
	13-8 PH	-	200-400						
Nickel Alloys	Inconel, Hastelloy, Waspalloy	-	75-120	.002-.003		2	3	1	Yes
Titanium	6AL-4V	-	80-150	.002-.003		1	3	2	Yes

Series 45Z Thread Mill		Feed (Inches per Tooth)		
Material	Speed (FPM)	Cutter Diameter (Inch)		
		.250 – .350	.500	.750
Aluminum & Magnesium	800 – Up	.001 – .004	.003 – .006	.004 – .008
Brass	500 – 800	.001 – .003	.003 – .005	.004 – .008
Bronze	400 – 600	.001 – .003	.003 – .006	.005 – .007
Hard Bronze	220 – 280	.0005 – .002	.002 – .003	.004 – .006
Cast Iron – Soft	200 – 280	.0005 – .002	.002 – .004	.003 – .006
Cast Iron – Hard	180 – 250	.0005 – .002	.002 – .003	.003 – .004
Steel – Soft	230 – 400	.001 – .003	.002 – .004	.003 – .005
Steel – Medium	200 – 350	.0005 – .003	.001 – .003	.002 – .004
Steel – Hard	120 – 220	.0005 – .002	.001 – .003	.002 – .004
Stainless Steel	120 – 220	.0005 – .002	.001 – .003	.002 – .004

The success of any cutter application is a function of many variables. Our initial preference of grade is based on applying a more tough grade.