BORING

PRECISION MODULAR

AHB

TOOLING & MACHINERY

COMPLETE METALWORKING SOLUTIONS

(800) 991-4225
ISO Certified

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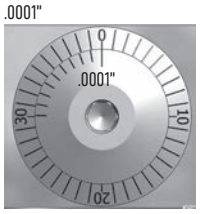
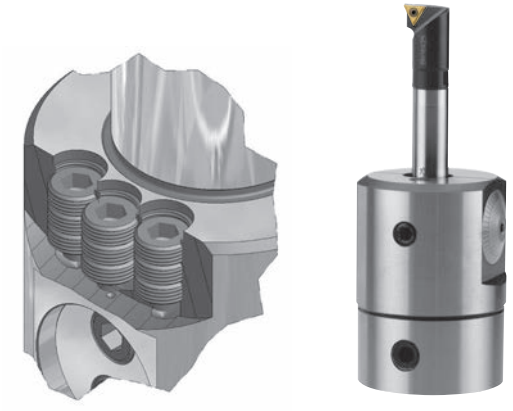
SMALL DIAMETER BORING SYSTEMS

- Boring bar receiver telescopes to minimize overhang.
- Balanced Modular Boring Bars and Noses available as standard combined with the balanceable head for extreme high velocity boring.



A .0001" Vernier is standard on all finish heads



PRECISION FINISH BORING SYSTEMS

Rigidity

- Created by Force – The face to face clamping forces are equal to the axial force Fa. Precision .0002" on Diameter.
- Orientation – The cross pin orientates the PC screw and transmits extreme forces.

Self Tightening

- The torsional cutting forces are primarily transmitted by the friction between the matching faces.
- Any remaining torque will result in an additional wedge action between the locking screw and inner member.
- Due to very small resulting wedge angle, any increased torsional force (Ff) will be transformed into very strong axial clamping force (Fa2)

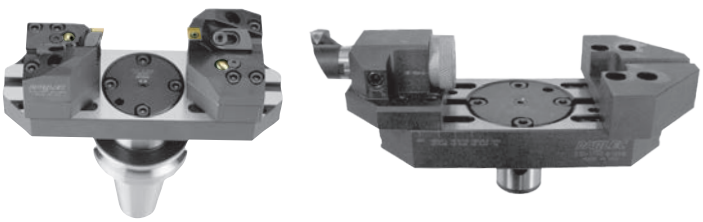
Extended length insert holders allow expansion of the boring range

TWIN BORE FOR HEAVY METAL REMOVAL RATES

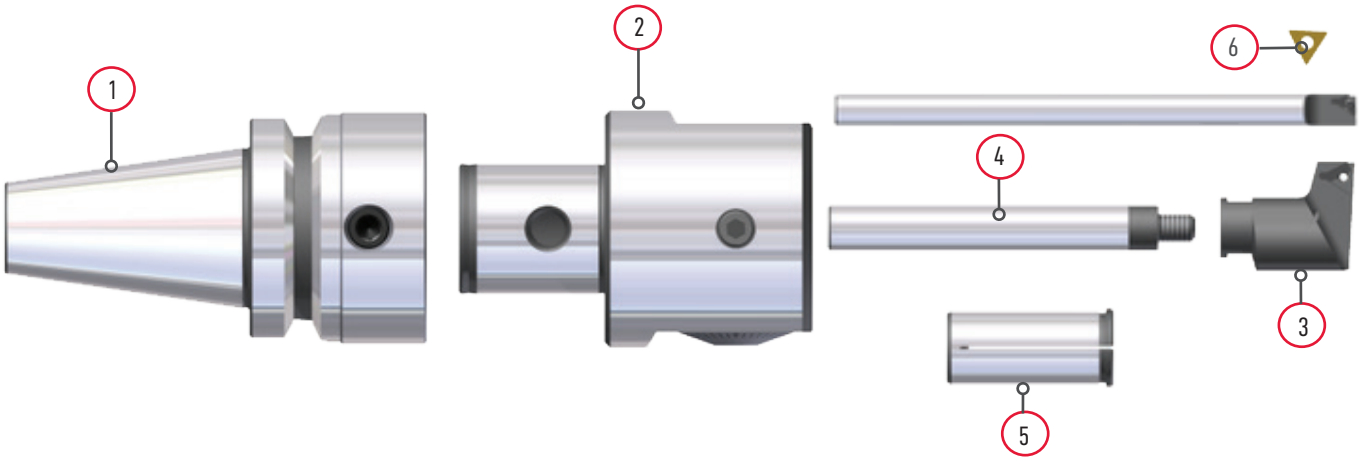
Individually and easily adjusted cutting tips allow for balanced or step cutting from .95" (24 mm) to over 23" (600 mm) resulting in maximum metal removal rates.

LARGE DIAMETER BORING SYSTEM

Inverted assembly allows system to be used to bore OD's utilizing twin bore or precision finish.



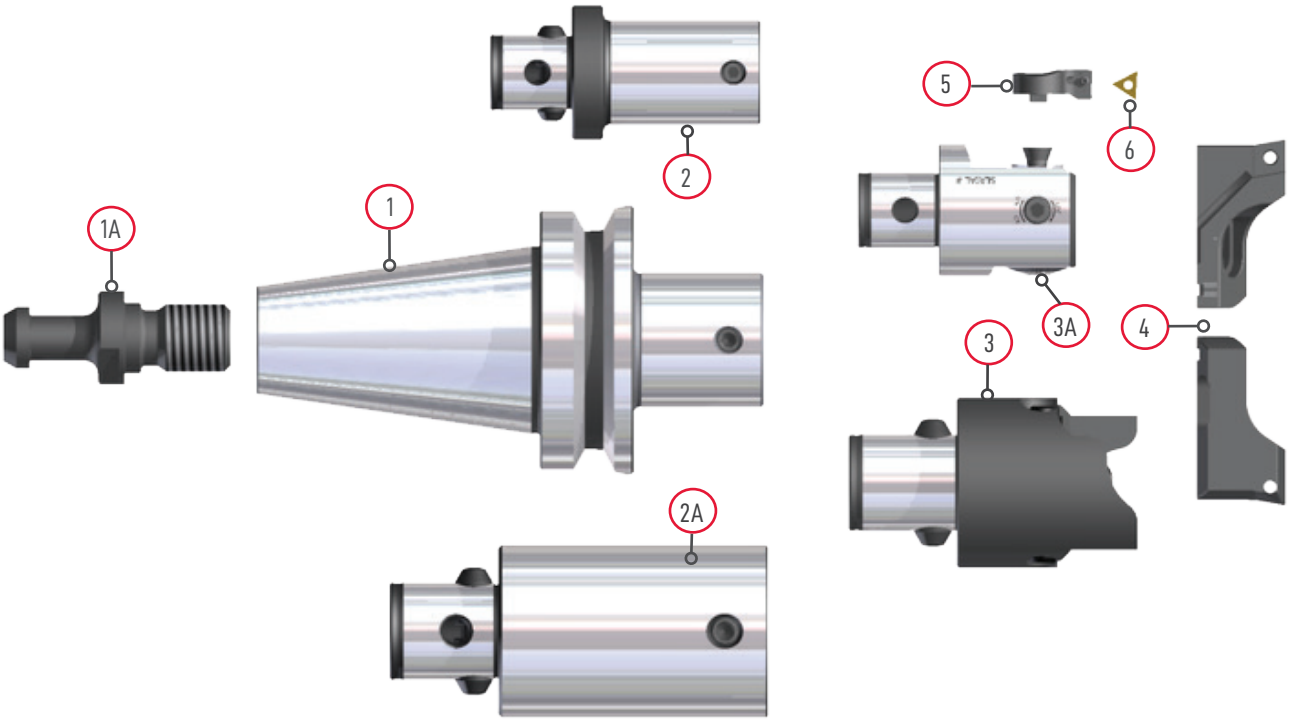
Small Diameter | Product Tree



Small Diameter Boring Range Tree: .078" - 1.89" (1.98 - 48 mm)

Label	Component	Selection Criteria	Catalog Page
1	Modular Shank	Machine tool taper and projection requirement	Pages 134 - 138
2	Small Diameter Finish Head	Telescoping bar and balance capability make is the right choice for boring small diameters	Page 150
3	Modular Boring Noses	Allows the diameter to be extended with less expense in boring bars. All noses are balanced and coolant through	Page 151
4	Boring Bar	Available as modular or solid for smaller diameters. Steel and Carbide with coolant-through standard on all modular style.	Pages 151 - 153
5	Reduction Bushing	Select to reduce the bore through receiver to the appropriate size boring bar	Pages 152 - 153
6	Inserts	Select based on geometry of insert holder, material of bore and radius	Pages 162 - 167

Roughing & Finishing | Product Tree



Rough and Finish Boring Range Tree: .98" - 6.00" (24.89 - 152.4 mm)

Label	Component	Selection Criteria	Catalog Page
1	Modular Shank	Machine tool taper and projection requirement	Pages 134 - 138
1A	Retention Knob	Machine tool specific	Page 252
2	Reducer	Used to extend the reach of a boring assembly	Page 139
2A	Extension	Used to extend the length to diameter ratio when reach and not clearance is the issue	Page 138
3	Twin Rough Boring Head	Select when metal removal is the goal and bore tolerance is larger.	Page 140
3A	Precision Finish Head	Select when much less material removal is required, such as after roughing, precision and ease of adjustment are the main critical requirements.	Page 144
4	Twin Bore Insert Holder (pair)	Select by bore configuration and size.	Page 141
5	Precision Finish Insert Holder	Select by bore size, use size 1 for maximum bar rigidity	Page 145
6	Inserts	Select based on geometry of insert holder, material of bore and radius	Pages 162 - 167

Precision Modular Boring

PC Screws

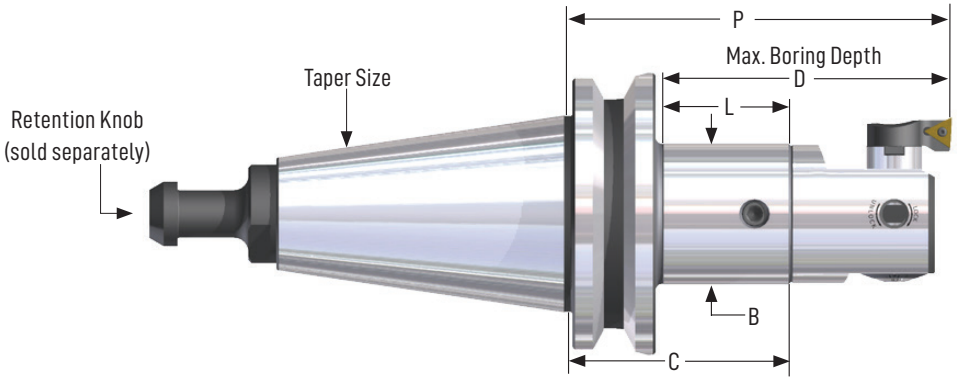
Connection Diameter

PC Size	Diameter - Inch	Diameter - Metric
PC2	.94"	24 mm
PC3	1.22"	31 mm
PC4	1.54"	39 mm
PC5	1.97"	50 mm
PC6	2.52"	64 mm
PC7	3.54"	90 mm

Screws

Part #	Connection Size	Wrench	Tightening Torque
880-002	PC2	018-102	25 in/lbs
880-003	PC3	018-103	42 in/lbs
880-004	PC4	018-104	84 in/lbs
880-005	PC5	018-105	168 in/lbs
880-006	PC6	018-106	336 in/lbs
880-007	PC7	018-107	840 in/lbs

CAT Modular Shanks



CAT 40 Modular Shanks

Part #	Connection Size	B	C	D	L	P*	Weight (lbs)
C40-PC2-2	PC2	.94"	2.07"	2.00"	.56"	3.54"	2.4
C40-PC2-3	PC2	.94"	3.33"	3.15"	1.95"	4.80"	2.5
C40-PC2-4	PC2	.94"	4.11"	3.94"	2.74"	5.59"	2.6
C40-PC3-3	PC3	1.22"	3.15"	3.20"	1.78"	4.76"	2.6
C40-PC3-5	PC3	1.22"	5.12"	5.57"	3.74"	6.3"	3.3
C40-PC4-1	PC4	1.75"	1.50"	1.75"	-	3.23"	2.2
C40-PC4-3	PC4	1.54"	2.87"	3.15"	1.50"	4.72"	2.7
C40-PC4-6	PC4	1.54"	6.02"	6.30"	4.26"	7.78"	4.3
C40-PC5-3	PC5	1.97"	2.48"	3.15"	1.11"	4.72"	2.8
C40-PC5-6	PC5	1.97"	5.53"	6.30"	4.26"	7.87"	5.5
C40-PC6-3**	PC6	2.52"	2.00"	3.42"	.63"	4.80"	3.1
C40-PC6-4	PC6	2.52"	2.72"	3.94"	1.34"	5.51"	3.3
C40-PC6-6	PC6	2.52"	2.52"	6.30"	3.70"	7.87"	6.3

*** Compute "P" dimension by adding all "C" dimensions for all components used. Maximum bore depth "D" may be increased by using extension adapters**

**** Deviates from ANSI B5 1995 - No clearance for some tool changers**

CAT 50 Modular Shanks

Part #	Connection Size	B	C	D	L	P*	Weight (lbs)
C50-PC2-2	PC2	.94"	2.07"	2.00"	.56"	3.54"	6.5
C50-PC2-4	PC2	.94"	4.11"	3.94"	2.74"	5.59"	7.1
C50-PC2-5	PC2	.94"	5.29"	5.12"	3.92"	6.77"	7.7
C50-PC3-4	PC3	1.22"	3.94"	4.39"	2.56"	5.55"	7.1
C50-PC3-5	PC3	1.22"	5.12"	5.57"	3.74"	6.73"	7.4
C50-PC3-6	PC3	1.22"	6.30"	6.13"	4.30"	7.91"	7.7
C50-PC4-4	PC4	1.54"	3.61"	3.94"	2.24"	5.46"	7.4
C50-PC4-6	PC4	1.54"	6.02"	6.30"	4.65"	7.87"	8.5
C50-PC4-8	PC4	1.54"	7.60"	7.88"	6.22"	9.45"	9.2
C50-PC5-4	PC5	1.97"	3.27"	3.94"	1.89"	5.51"	7.6
C50-PC5-6	PC5	1.97"	5.63"	6.30"	4.26"	7.87"	9.2
C50-PC5-8	PC5	1.97"	7.20"	7.88"	5.83"	9.45'	10.6
C50-PC5-10	PC5	1.97"	9.57"	10.24"	8.19"	11.81"	12.5
C50-PC6-4	PC6	2.52"	2.72"	3.94"	1.34"	5.51"	7.7
C50-PC6-6	PC6	2.52"	5.08"	6.30"	3.70"	7.87"	10.5
C50-PC6-8	PC6	2.52"	6.65"	7.88"	5.28"	9.45"	12.5
C50-PC6-10	PC6	2.52"	9.02"	10.24"	7.64"	11.81"	15.4
C50-PC6-12	PC6	2.52"	11.38"	12.60"	10.00"	14.17"	18.4
C50-PC7-6	PC7	3.54"	3.27"	6.30"	1.89"	7.87"	10.0
C50-PC7-8	PC7	3.54"	5.27"	8.30"	3.89"	9.87"	15.4
C50-PC7-10	PC7	3.54"	7.20"	10.24"	5.83"	11.81"	20.5

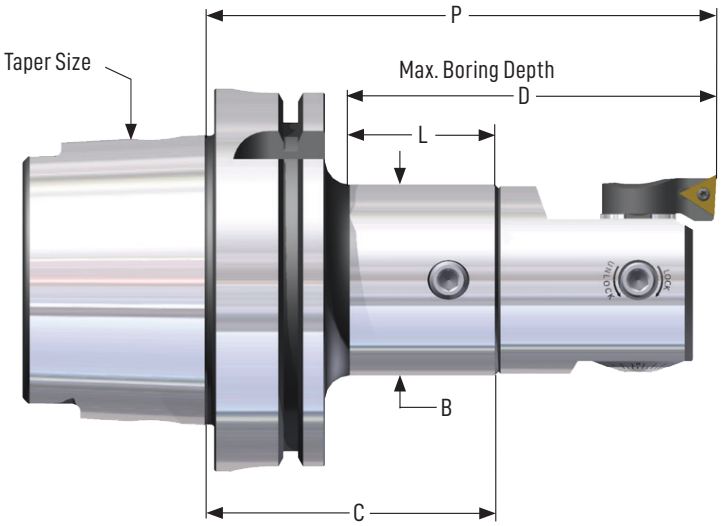
*** Compute "P" dimension by adding all "C" dimensions for all components used. Maximum bore depth "D" may be increased by using extension adapters**

CAT 40/50 Modular Shanks with SIMULFIT®

Part #	Connection Size	B	C	D	L	P*	Weight (lbs)
C40F-PC6-4	PC6	2.52"	2.72"	3.94"	1.34"	5.51"	3.3
C50F-PC2-4	PC2	.94"	4.11"	3.94"	2.74"	5.59"	7.2
C50F-PC2-5	PC2	.94"	5.29"	5.12"	3.92"	6.77"	7.8
C50F-PC3-5	PC3	1.22"	5.12"	5.57"	3.74"	6.73"	7.5
C50F-PC3-6	PC3	1.22"	6.30"	6.13"	4.30"	7.91"	7.8
C50F-PC4-4	PC4	1.54"	3.61"	3.94"	2.24"	5.46"	7.5
C50F-PC4-6	PC4	1.54"	6.02"	6.30"	4.65"	7.87"	8.6
C50F-PC4-8	PC4	1.54"	7.60"	7.88"	6.22"	9.45"	9.3
C50F-PC5-4	PC5	1.97"	3.27"	3.94"	1.89"	5.51"	7.7
C50F-PC5-6	PC5	1.97"	5.63"	6.30"	4.26"	7.87"	9.3
C50F-PC5-8	PC5	1.97"	7.20"	7.88"	5.83"	9.45'	10.7
C50F-PC5-10	PC5	1.97"	9.57"	10.24"	8.19"	11.81"	12.6
C50F-PC6-4	PC6	2.52"	2.72"	3.94"	1.34"	5.51"	7.8
C50F-PC6-6	PC6	2.52"	5.08"	6.30"	3.70"	7.87"	10.6
C50F-PC6-8	PC6	2.52"	6.65"	7.88"	5.28"	9.45"	12.6
C50F-PC6-12	PC6	2.52"	11.38"	12.60"	10.00"	14.17"	18.5
C50F-PC7-10	PC7	3.54"	7.20"	10.24"	5.83"	11.81"	20.6

*** Compute "P" dimension by adding all "C" dimensions for all components used. Maximum bore depth "D" may be increased by using extension adapters**

HSK Modular Shanks



HSK 63A Modular Shanks

Part #	Connection Size	B	C	D	L	P*	Weight (lbs)
H63A-PC2-73	PC2	.94"	3.52"	3.74"	2.26"	5.00"	2.0
H63A-PC3-103	PC3	1.22"	3.94"	4.29"	2.68"	5.55"	2.2
H63A-PC4-65	PC4	1.54"	2.50"	3.09"	1.24"	4.35"	2.3
H63A-PC4-178	PC4	1.54"	6.00"	6.59"	4.74"	7.85"	4.0
H63A-PC5-105	PC5	1.97"	3.26"	4.25"	2.01"	5.50"	3.1
H63A-PC6-100	PC6	2.52"	3.25"	4.78"	1.99"	6.04"	3.4
H63A-PC6-147	PC6	2.52"	5.13"	6.65"	3.86"	7.92"	6.0

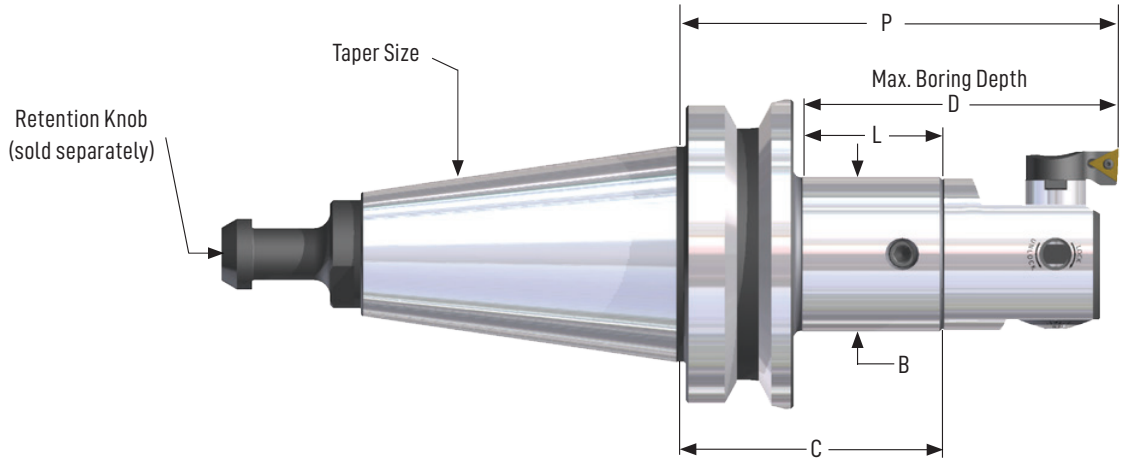
*** Compute "P" dimension by adding all "C" dimensions for all components used.**
Maximum bore depth "D" may be increased by using extension adapters.

HSK 100A Modular Shanks

Part #	Connection Size	B	C	D	L	P*	Weight (lbs)
H100A-PC2-107	PC2	.94"	4.51"	4.61"	3013"	5.98"	6.4
H100A-PC3-122	PC3	1.22"	4.92"	5.16"	3.54"	6.53"	6.8
H100A-PC4-65	PC4	1.54"	2.50"	2097"	1.12"	4.35"	4.9
H100A-PC4-182	PC4	1.54"	7.00"	7.48"	5.63"	8.85"	8.4
H100A-PC5-122	PC5	1.97"	4.25"	5.12"	2.87"	6.49"	7.2
H100A-PC6-100	PC6	2.52"	3.25"	4.67"	1.87"	6.04"	7.7
H100A-PC6-190	PC6	2.52"	6.69"	8.11"	5.31"	9.48"	11.9

*** Compute "P" dimension by adding all "C" dimensions for all components used.**
Maximum bore depth "D" may be increased by using extension adapters.

BT Modular Shanks



BT 30 Modular Shank

Part #	Connection Size	B	C	D	L	P*	Weight (lbs)
B30-PC4-2	PC4	1.54"	1.75"	2.24"	.76"	3.60"	1.0

*** Compute "P" dimension by adding all "C" dimensions for all components used.**
Maximum bore depth "D" may be increased by using extension adapters.

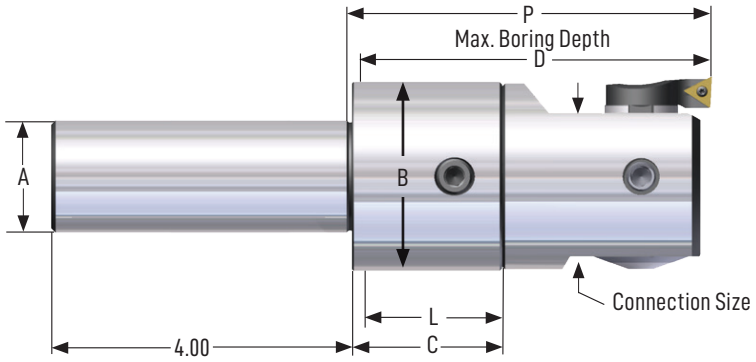
BT 40 Modular Shanks

Part #	Connection Size	B	C	D	L	P*	Weight (lbs)
B40-PC2-4	PC2	.94"	3.80"	4.12"	2.64"	5.28"	2.5
B40-PC3-4	PC3	1.22"	3.70"	4.15"	2.54"	5.31"	2.6
B40-PC3-5	PC3	1.22"	4.80"	5.25"	3.64"	6.41"	3.2
B40-PC4-3	PC4	1.54"	2.56"	3.25"	1.40"	4.41"	2.8
B40-PC4-5	PC4	1.54"	4.53"	5.21"	3.36"	6.38"	3.6
B40-PC5-3	PC5	1.97"	2.16"	3.24"	1.00"	4.40"	2.8
B40-PC5-6	PC5	1.97"	5.31"	6.37"	4.13"	7.55"	5.8
B40-PC6-4	PC6	2.52"	2.40"	3.91"	1.12"	5.19"	3.1
B40-PC6-6	PC6	2.52"	4.76"	6.43"	3.64"	7.55"	6.5

*** Compute "P" dimension by adding all "C" dimensions for all components used.**
Maximum bore depth "D" may be increased by using extension adapters.

Precision Modular Boring

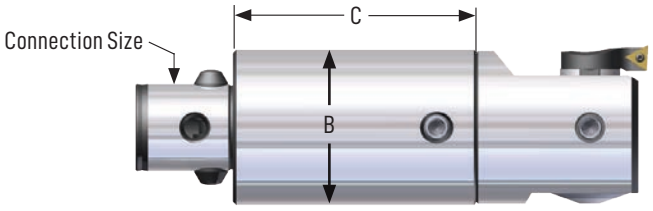
Straight Modular Shanks



Part #	Connection Size	A	B	C	D	L	P*	Weight (lbs)
S12-PC4-3	PC4	1.25"	1.54"	2.00"	3.75"	1.90"	3.85"	2.0
S12-PC6-4	PC6	1.25"	2.52"	2.00"	4.70"	1.90"	4.80"	3.1

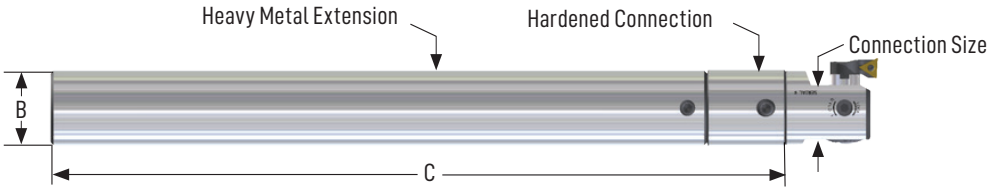
*** Compute "P" dimension by adding all "C" dimensions for all components used.**
Maximum bore depth "D" may be increased by using extension adapters.

Extensions



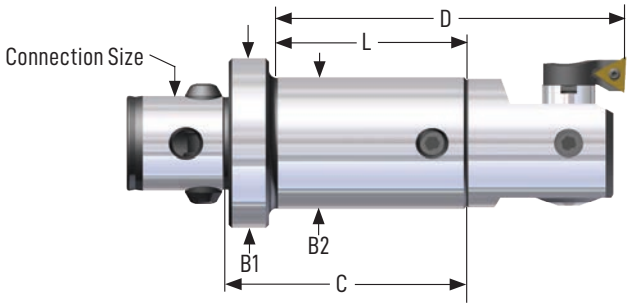
Part #	Connection Size	B	C	Weight (lbs)
PC2-PC2E1	PC2	.94"	1.18"	0.3
PC2-PC2E2	PC2	.94"	1.77"	0.4
PC3-PC3E1	PC3	1.22"	1.18"	0.4
PC3-PC3E2	PC3	1.22"	1.77"	0.5
PC4-PC4E1	PC4	1.54"	1.57"	0.8
PC4-PC4E2	PC4	1.54"	2.36"	1.1
PC5-PC5E2	PC5	1.97"	2.36"	1.9
PC5-PC5E3	PC5	1.97"	3.54"	2.8
PC6-PC6E2	PC6	2.52"	2.36"	3.0
PC6-PC6E4	PC6	2.52"	3.94"	5.0
PC7-PC7E4	PC7	3.54"	3.94"	9.9
PC7-PC7E6	PC7	3.54"	6.30"	17.0

Heavy Metal Extensions



Part #	Connection Size	B	C	Weight (lbs)
PC2-094HM11	PC2	.94"	11.42"	3.9
PC3-125HM14	PC3	1.25"	13.78"	9.0
PC4-150HM15	PC4	1.50"	14.75"	13.0

Reducers



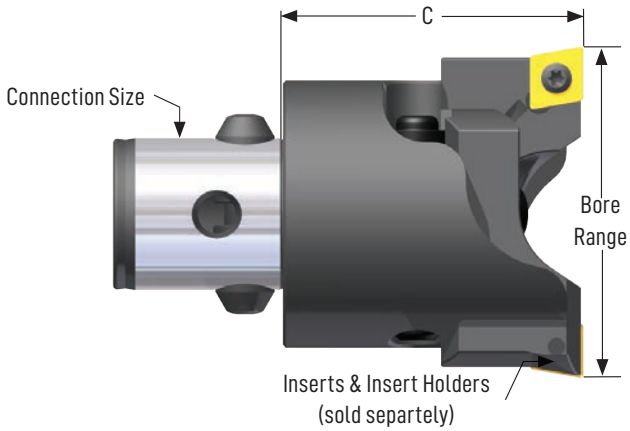
Part #	Connection - In	Connection - Out	B1	B2	C	D	L	Weight (lbs)
PC3-PC2R1	PC3	PC2	1.22"	.95"	1.36"	2.36"	.97"	0.4
PC4-PC2R2	PC4	PC2	1.54"	.95"	2.03"	2.95"	1.56"	0.6
PC4-PC3R2	PC4	PC3	1.54"	1.22"	1.85"	2.95"	1.38"	1.0
PC5-PC2R3	PC5	PC2	1.97"	.95"	3.21"	3.94"	2.54"	1.1
PC5-PC3R3	PC5	PC3	1.97"	1.22"	3.03"	3.94"	2.36"	1.3
PC5-PC4R2	PC5	PC4	1.97"	1.54"	2.76"	3.94"	2.09"	1.6
PC6-PC2R3	PC6	PC2	2.52"	.95"	3.76"	4.53"	3.13"	1.8
PC6-PC3R3	PC6	PC3	2.52"	1.22"	3.58"	4.53"	2.95"	2.1
PC6-PC3R5	PC6	PC3	2.52"	1.22"	5.35"	6.30"	4.72"	2.6
PC6-PC4R1	PC6	PC4	2.52"	1.54"	1.93"	3.15"	1.30"	1.7
PC6-PC4R3	PC6	PC4	2.52"	1.54"	3.31"	4.53"	2.68"	1.3
PC6-PC4R5	PC6	PC4	2.52"	1.54"	5.08"	6.30"	4.45"	3.0
PC6-PC5R3	PC6	PC5	2.52"	1.97"	2.91"	4.53"	2.28"	2.8
PC7-PC6R4	PC7	PC6	3.54"	2.52"	4.18"	6.30"	3.50"	7.0

Twin Bore | Roughing System

Twin Bore Roughing Heads

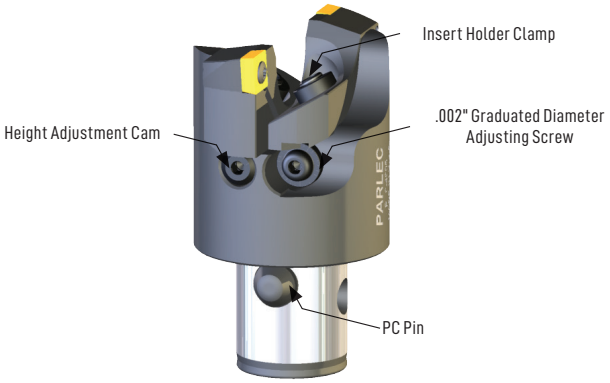
FEATURES

- For balanced or step cutting from .95" to over 23"
- Coolant ports direct coolant to the cutting area
- Two insert holders independently adjust for diameter and height



Part #	Bore Range Min.	Bore Range Max.	Connection Size	Inset Holder Size	Body Diameter	C	Weight (lbs)
PC2-4205	.95"	1.31"	PC2	21	.91"	1.39"	0.2
PC2-4205	1.13"	1.48"	PC2	22	.91"	1.39"	0.2
PC3-4305	1.27"	1.70"	PC3	31	1.18"	1.57"	0.4
PC3-4305	1.50"	1.95"	PC3	32	1.18"	1.57"	0.4
PC4-4405	1.58"	2.17"	PC4	41	1.50"	1.85"	0.7
PC4-4405	2.09"	2.53"	PC4	42	1.50"	1.85"	0.7
PC5-4505	2.06"	2.73"	PC5	51	1.93"	2.24"	1.4
PC5-4505	2.58"	3.30"	PC5	52	1.93"	2.24"	1.4
PC6-4605	2.61"	3.48"	PC6	61	2.48"	2.79"	2.8
PC6-4605	3.36"	4.20"	PC6	62	2.48"	2.79"	2.8
PC6-4605	4.10"	4.86"	PC6	63	2.48"	2.79"	2.8
PC6-4606	3.92"	4.84"	PC6	61	3.54"	2.79"	3.9
PC6-4606	4.68"	5.54"	PC6	62	3.54"	2.79"	3.9
PC6-4606	5.44"	6.20"	PC6	63	3.54"	2.79"	3.9
PC7-4705	3.92"	4.84"	PC7	61	3.54"	4.60"	10.6
PC7-4705	4.68"	5.54"	PC7	62	3.54"	4.60"	10.6
PC7-4705	5.44"	6.20"	PC7	63	3.54"	4.60"	10.6

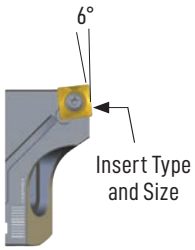
Twin Boring Head Components



Part #	Diameter Adjustment Screw*	Insert Holder Clamp (Pair)*	Height Adjustment Cam (Pair)*	Wrench Kit*	Spare Kit	PC Pin
PC2-4205	4205-11	4205-12	4205-13	4205-14	4205-10	PCP-002
PC3-4305	4305-11	4305-12	4305-13	4305-14	4305-10	PCP-003
PC4-4405	4405-11	4405-12	4405-13	4405-14	4405-10	PCP-004
PC5-4505	4505-11	4505-12	4505-13	4505-14	4505-10	PCP-005
PC6-4605	4605-11	4605-12	4605-13	4605-14	4605-10	PCP-006
PC6-4606	4605-11	4605-12	4605-13	4605-14	4605-10	PCP-006
PC7-4705	4605-11	4605-12	4605-13	4605-14	4605-10	PCP-007

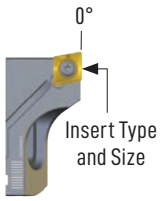
*** Included in spare kit**

Twin Bore Insert Holders



Style 1: For use with SCMT Inserts – Square SCMT insert holders have a 6° lead angle for through-hole boring or extreme core shifts

Part #	Insert Holder Size	Insert Type and Size	Insert Screw	Insert Screw Wrench	Weight (lbs)
4305-31S09	31	SCMT 09	028-906	018-008	0.1
4405-41S09	41	SCMT 09	028-906	018-008	0.2
4505-51S12	51	SCMT 12	028-907	018-009	0.3
4605-61S12	61	SCMT 12	028-907	018-009	0.6
4605-62S12	62	SCMT 12	028-907	018-009	0.8
4606-63S12	63	SCMT 12	028-907	018-009	1.0



Style 2: For use with CCMT Inserts – Diamond CCMT insert holders for boring to a square bottom or deep bore depths

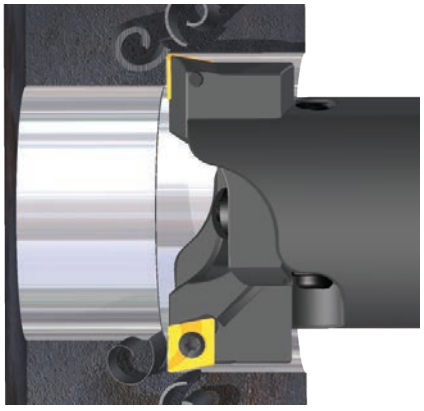
Part #	Insert Holder Size	Insert Type and Size	Insert Screw	Insert Screw Wrench	Weight (lbs)
4205-21C06	21	CCMT 06	028-925	018-007	0.1
4205-22C06	22	CCMT 06	028-905	018-007	0.1
4305-31C06	31	CCMT 06	028-905	018-007	0.1
4305-32C06	32	CCMT 06	028-905	018-007	0.1
4405-41C09	41	CCMT 09	028-905	018-008	0.2
4405-42C09	42	CCMT 09	028-906	018-008	0.2
4505-51C12	51	CCMT 12	028-906	018-009	0.3
4505-52C12	52	CCMT 12	028-907	018-009	0.4
4605-61C12	61	CCMT 12	028-907	018-009	0.6
4605-62C12	62	CCMT 12	028-907	018-009	0.8
4605-63C12	63	CCMT 12	028-907	018-009	1.0

Adjusting | Balanced Cutting

Balanced cutting allows both cutting edges to work simultaneously. A properly balanced twin cutter may be fed at almost four times the rate of a single cutter. Make sure the height cam is located with the reference mark (lowest point) in the vertical position as shown.

1. Loosen the insert holder clamps. Re-tighten enough to put drag on the insert holder.
2. Adjust the diameter by turning the adjusting screw. Always adjust in the clockwise direction.
3. Tighten the insert holder clamps.
4. Repeat for the second insert holder, adjusting both to ± .001" (.025) on the diameter.

Balanced cutting occurs when both inserts are set to exactly the same height. This height balancing is much more important than diametric balancing. A slight difference in height, even that caused by the insert tolerance, can have a dramatic effect upon the tool's performance. This is particularly true in the case of long chipping materials.



EXAMPLE OF UNBALANCED CUT:

- Feed rate .016 IPR (.4mm per rev).
- Insert "A" is .003" (.08) higher than insert "B."(The tolerance on an M style insert is .002"-.004".) (.05-.1)
- The material removed by insert "A" is .008" (.2) + .003" (.08) = .011" (2.8)
- The material removed by insert "B" is .008" (.2) + .003" (.08) = .005" (.12)
- The chip taken by insert "A" is over twice as thick as that taken by insert "B".

Chip A Chip B

The difference in cutting forces caused by the differences in insert height illustrated above can have the following effects on the bar's performance:

1. Possible wobble or chatter; extra load on the machine tool;
2. Generally, the bore diameter becomes larger than the set diameter;
3. Uniform chip formation is not possible, making it difficult to break and clear chips.

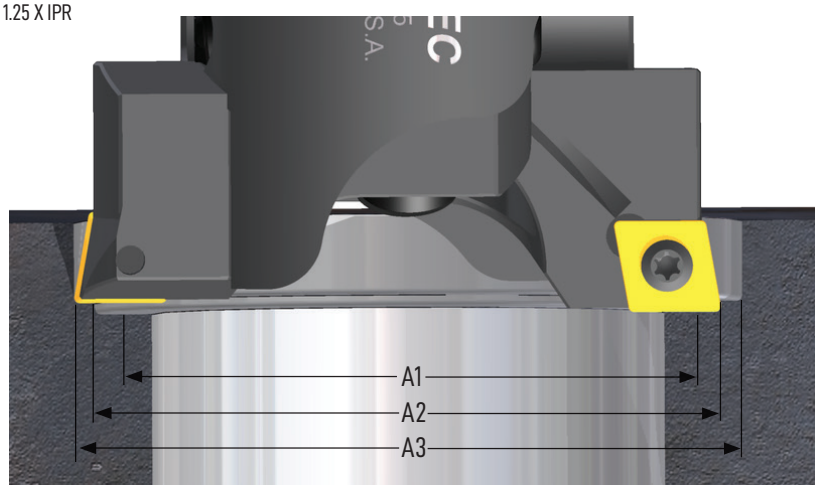
Maximum Allowable Setting Difference - For best performance

Bore Diameter Range (mm)	Insert Height (mm)	Cutting Diameter (mm)
.95 – 1.31" (24.1 - 33.3)	.001 (.025)	.008 (.2)
1.26 – 1.74" 32.3 - 43.2)	.001 (.025)	.012 (.3)
1.58 – 2.17" (40 - 55.1)	.001 (.025)	.012 (.3)
2.06 – 2.83" (52.4 - 69.3)	.002 (.05)	.016 (.4)
2.61 – 6.00" (66.3- 150)	.002 (.05)	.016 (.4)
6.00"+ (150+)	.002 (.05)	.020 (.5)

Adjusting | Stepped Cutting

Stepped cutting is utilized when heavy depth of cut is required. The inserts are set at different diameters. The insert cutting the smaller diameter is given axial lead 1.25 times greater than the feed per revolution over the other insert. Use only insert holders with 0° lead. Stepped cutting allows 1.75 x the depth of cut per tables on page 40. Feed rates must be reduced to .5 x appropriate value.

Lead = 1.25 X IPR



RULES OF STEPPED CUTTING

1. Use insert holders with 0° lead.
2. Set height in inner cutting edge to provide lead 1.25 times greater than the feed per revolution.
3. Feed rate as roughing with a single cutter.
4. Remove half of the material to be removed with each insert. This should be sufficient for most applications.

TO BALANCE CUTTING FORCES, USE THE FORMULA BELOW

$$A2 = .7071\left(\sqrt{A3^2 - A1^2}\right)$$

A1 – Hole starting diameter

A2 – Inside cutter set diameter

A3 – Outside cutter set diameter

Stepped cutting allows removal of more metal since each insert is set at a different diameter.

1. Make sure the height cam is located with the reference mark in the vertical position as shown.
2. Loosen the insert holder clamps. Re-tighten enough to put drag on the insert holder.
3. Adjust the diameter by turning the adjusting screw. Always adjust in the clockwise direction. Set the diameter of each insert to remove approximately one half the material.
4. Using the cam screw, adjust the inner cutting edge so that it has a lead over the outer cutting edge. This lead should be a minimum of 11/2 times the feed per revolution.
5. Tighten the insert holder clamps.

NOTE: When using stepped cutting, the feed rate must be that of a single cutter.

Recommended Tightening Torque - in/lbs.

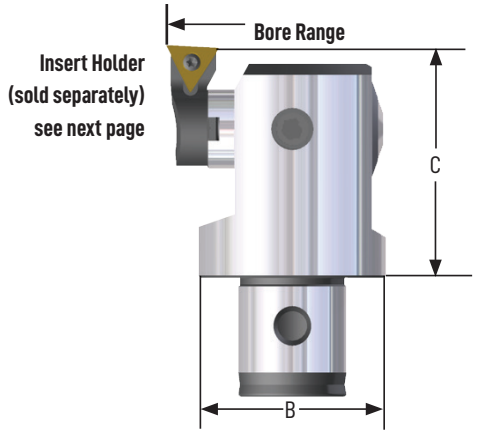
Rough Head	Insert Holder	PC Screw
PC2-4205	12 (1.3 Nm)	36 (4.1 Nm)
PC3-4305	36 (4.1 Nm)	48 (5.5 Nm)
PC4-4405	48 (5.5 Nm)	72 (8.3 Nm)
PC5-4505	72 (8.3 Nm)	96 (11.1 Nm)
PC6-4605	72 (8.3 Nm)	120 (13.9 Nm)

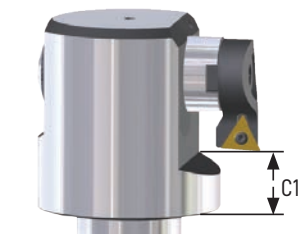
Precision Finish | Boring System

Finish Boring Heads

FEATURES

- Precise, repeatable diamter adjustments to 0.0001"
- Wide work range from .984" to 8.220"
- Coolant port directs coolant to the cutting area





Part #	Insert Holder (Sold Separately)	Bore Range Minimum	Bore Range Maximum	Connection Size	Insert Holder Size	B Diameter	C	C1	Insert Clamp Holder	Insert Type and Size	Weight (lbs)
PC2-3215	321-T06-3	.984"	1.300"	PC2	2	.925"	1.48"	.61"	3215-01	TCMT 06	0.3
PC2-3215	322-T06-3	1.254"	1.570"	PC2	2	.925"	1.48"	.61"	3215-01	TCMT 06	0.3
PC2-3215	323-T06-3	1.534"	1.850"	PC2	2	.925"	1.48"	.61"	3215-01	TCMT 06	0.3
PC3-3315	331-T06-3	1.240"	1.654"	PC3	3	1.201"	1.61"	.54"	3315-01	TCMT 06	0.5
PC3-3315	332-T06-3	1.586"	2.000"	PC3	3	1.201"	1.61"	.54"	3315-01	TCMT 06	0.5
PC3-3315	333-T06-3	1.946"	2.360"	PC3	3	1.201"	1.61"	.54"	3315-01	TCMT 06	0.5
PC4-3415	341-T11-3	1.614"	2.216"	PC4	4	1.496"	1.85"	.51"	3415-01	TCMT 11	0.8
PC4-3415	342-T11-3	1.968"	2.480"	PC4	4	1.496"	1.85"	.51"	3415-01	TCMT 11	0.8
PC4-3415	343-T11-3	2.398"	2.910"	PC4	4	1.496"	1.85"	.51"	3415-01	TCMT 11	0.8
PC5-3515	351-T11-3	2.087"	2.756"	PC5	5	1.929"	2.24"	.62"	3515-01	TCMT-11	1.6
PC5-3515	352-T11-3	2.551"	3.220"	PC5	5	1.929"	2.24"	.62"	3515-01	TCMT-11	1.6
PC5-3515	353-T11-3	3.071"	3.740"	PC5	5	1.929"	2.24"	.62"	3515-01	TCMT-11	1.6
PC6-3615	361-T11-3	2.677"	4.000"	PC6	6	2.480"	2.79"	.90"	3615-01	TCMT-11	4.1
PC6-3615	362-T11-3	3.637"	4.960"	PC6	6	2.480"	2.79"	.90"	3615-01	TCMT-11	4.1
PC6-3615	363-T11-3	4.577"	5.900"	PC6	6	2.480"	2.79"	.90"	3615-01	TCMT-11	4.1
PC6-3715	361-T11-3	3.937"	6.000"	PC6	6	3.740"	3.35"	1.45"	3615-01	TCMT-11	7.0
PC6-3715	362-T11-3	4.970"	7.040"	PC6	6	3.740"	3.35"	1.45"	3615-01	TCMT-11	7.0
PC6-3715	363-T11-3	6.157"	8.220"	PC6	6	3.740"	3.35"	1.45"	3615-01	TCMT-11	7.0

Insert Holders

Extension
Style 1

Extension
Style 2

Extension
Style 3

3° Part #	Insert Holder Size	Extension Style	Insert Type and Size	Insert Screw	Insert Screw Wrench
321-T06-3	2	1	TCMT 06	028-910	018-002
322-T06-3	2	2	TCMT 06	028-910	018-002
323-T06-3	2	3	TCMT 06	028-910	018-002
331-T06-3	3	1	TCMT 06	028-910	018-002
332-T06-3	3	2	TCMT 06	028-910	018-002
333-T06-3	3	3	TCMT 06	028-910	018-002
341-T11-3	4	1	TCMT 11	028-905	018-007
342-T11-3	4	2	TCMT 11	028-905	018-007
343-T11-3	4	3	TCMT 11	028-905	018-007
351-T11-3	5	1	TCMT 11	028-905	018-007
352-T11-3	5	2	TCMT 11	028-905	018-007
353-T11-3	5	3	TCMT 11	028-905	018-007
361-T11-3	6	1	TCMT 11	028-905	018-007
362-T11-3	6	2	TCMT 11	028-905	018-007
363-T11-3	6	3	TCMT 11	028-905	018-007

Precision Modular Boring

CONFIGURATION

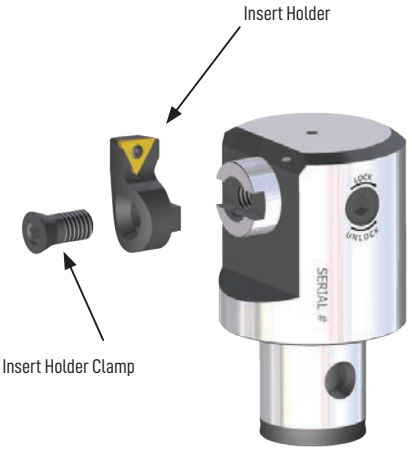
Insert Holder mounted in the standard boring position.

Insert holder mounted in the back boring position.

(See next page for application.)

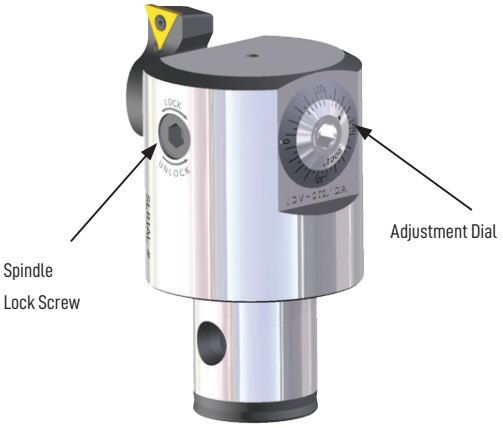
ASSEMBLY

Install the Insert Holder to the Spindle using the Insert Holder Screw.



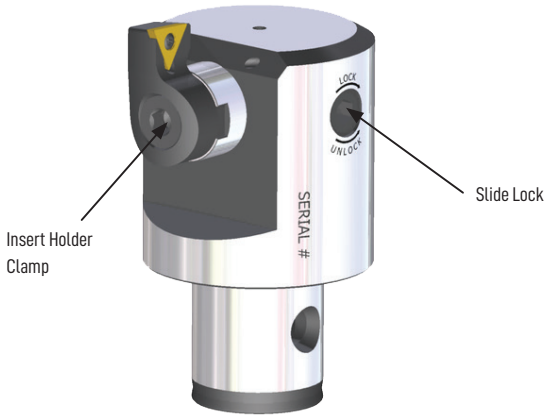
ADJUSTMENT

1. Loosen the Spindle Lock Screw.
2. Adjust tool by turning and reading the dial. The dial is graduated in increments of .001" per graduation on the diameter. Fine adjustment of .0001" can be made utilizing the Vernier Scale.
3. Tighten the Spindle Lock Screw.



Tightening Torque - Maximum

Head	Insert Holder Clamp	Slide Lock
2	11 in. lbs.(1 Nm)	5 in. lbs. (0.5 Nm)
3	20 in. lbs. (2.2 Nm)	13 in. lbs. (1.5 Nm)
4	25 in. lbs. (2.8 Nm)	22 in. lbs. (2.5 Nm)
5	50 in. lbs. (5.6 Nm)	50 in. lbs. (5.6 Nm)
6	130 in. lbs. (14.7 Nm)	85 in. lbs. (10 Nm)
7	130 in. lbs. (14.7 Nm)	85 in. lbs. (10 Nm)



USING THE VERNIER SCALE

Find the line in the vernier scale that exactly lines up with a reference line.

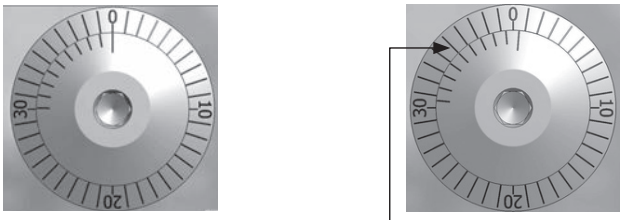
Diametral increases in .001" are made by adjusting the Dial clockwise one full line on the fixed scale.

Diametral increases in .0001" are made by adjusting the Dial clockwise until the appropriate line on the vernier scale lines up with the next fixed scale reference line.

This Example Shows .001" Adjustment

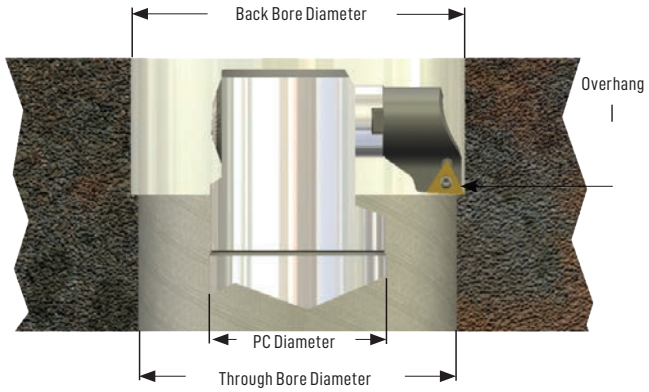
Before adjustment | After adjustment

This Example Shows .0005" Adjustment



Before adjustment | After adjustment

CALCULATING BACK BORE RANGE



- **Back Bore Diameter** is the same as "Bore Range" in the chart on page 144.
- **Minimum Through Bore Diameter** is calculated: (PC Diameter/2) + (Back Bore Diameter/2) + minimal clearance (.010)
- **Overhang** of insert from boring bar connection should be measured to make sure there is enough clearance. Calculate (Back Bore Diameter - Through Bore Diameter)/2

Finish Boring | Speeds

Effects of Cutting Speed

Variable	Low Speed	High Speed
Machining Time	Longer	Shorter
Surface Finish	Coarser	Finer
Probability of Vibration	Lower	Higher

330 BHN = Rc: 35
250 BHN = Rc: 24-25
220 BHN = Rc: 20

Recommended Finishing Speed for Steel

Steels	BHN	TR / TT / SN	C1 / C2	AL	AS	TE
Carbon Steel C = 0.15%	125	550-750	600-800	150-350	650-1000	950-1300
Carbon Steel C = 0.35%	150	525-800	600-800	150-350	625-950	850-1200
Carbon Steel C = 0.70%	180-250	425-625	550-750	150-250	500-750	750-950
Alloy Steel 4000	125-200	425-625	550-750	150-250	500-750	750-950
Alloy Steel 5000	225	250-500	350-525	150-250	300-600	400-650
Alloy Steel 8000	300	200-400	300-525	100-200	350-475	400-500
Stainless Steel, Annealed 400 SERIES	150-270	400-625	400-600	150-250	475-750	425-650
Stainless Steel, Annealed 300 SERIES	150-220	450-550	350-500	150-300	550-650	425-650
Cast Steel, Low Carbon	150	325-450	450-650	100-250	400-550	475-600
Cast Steel, Low Alloy	150-250	250-350	250-400	100-250	300-425	400-575
Cast Steel, High Alloy	160-250	–	250-400	75-250	–	400-500

All values are in SFM

Other Materials

Material	BHN	TR / TT / SN	C1 / C2	AL	AS	TE
Malleable Cast Iron, Ferritic	110-150	525-700	300-450	600-1100	700-1000	–
Malleable Cast Iron, Pearlitic	150-270	250-400	200-250	600-1000	300-750	–
Grey Cast Iron, Low Tensile	150-220	525-800	325-525	400-1200	600-1600	–
Grey Cast Iron, High Tensile	200-330	350-600	225-400	400-900	350-900	–
Nodular Iron, Ferritic	125-230	300-500	300-400	400-950	450-900	–
Nodular Iron, Pearlitic	200-300	250-400	200-350	400-700	350-700	–
Aluminum Alloys	30-120	–	600-3000	–	–	–
Aluminum Alloys, Cast	100-130	–	600-3000	–	–	–
Extra Hard Steel	50-65RC	–	60-120	–	–	–
Waspalloy, Discalloy, Incoloy	180-250	–	50-200	–	–	150-350
Monel, Inconel	125-250	–	45-90	–	–	90-300

All values are in SFM. Feed rates .002 - .008 IPR. For best finish, feed rate should be approximately 25% of Insert Nose radius. Refer to next page.

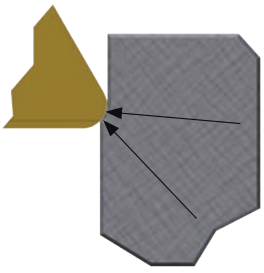
Finish Boring | Feeds

EFFECTS OF FINISH SPEED RATE

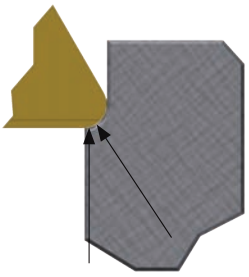
The best surface finish is produced when the tool is fed at apporximately 25% of the tool nose radius. The effect of chip formation of the feed rate and depth of cut is illustrated below.

Finish Feed Rate Effects

Feed Rates/Depth of Cut	Result	Chip Form	C1 / C2
Low	Bird's Nest Chips Difficult to remove		1. Increase Depth of Cut 2. Increase Feed Rate
Moderately Low	Long Stringy Chips Difficult to remove		1. Increase Depth of Cut 2. Increase Feed Rate
Ideal	Coil Spring Chips Easy to remove		Keep Running
Slightly Heavy	Slight Deformation of Chip		If Finish is Bad, Decrease Speed
Heavy	Deformation of Chip Increased cutting forces		If Finish is Bad, Decrease Speed
Very Heavy	Severe Deformation of Chip Increased cutting forces Heat build up		If Finish is Bad, Decrease Speed Good Chip for Roughing



Small Depth of cut allows cutting forces to push insert out of cut.



Depth of cut is large enough to prevent cutting forces from pushing insert out of cut.

A .016 nose radius insert fed at .004 IPR produces a finish as shown at the right:

A .016 nose radius insert fed at .008 IPR produces a finish as shown at the right:

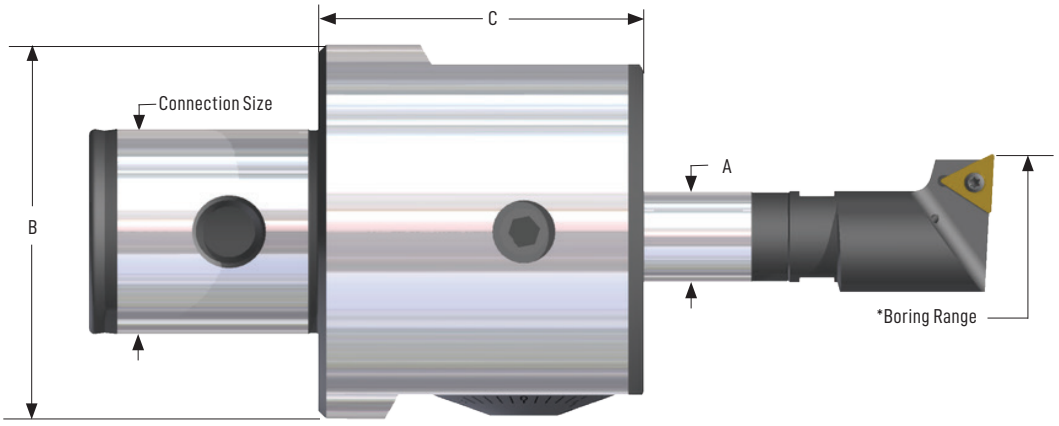
A .016 nose radius insert fed at .016 IPR produces a finish as shown at the right:

Small Diameter | Boring System

Small Diameter Balanceable Boring Heads

FEATURES

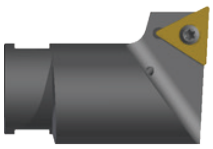
- Precise, repeatable diameter adjustment to 0.0001"
- Wide work range from .078" to 1.89"
- Coolant port directs coolant to the cutting area
- Bored-through tool receiver allows boring tool to be telescoped for maximum rigidity
- Easy-to-use balancing system permits vibration-free high-speed boring



Inch Graduation

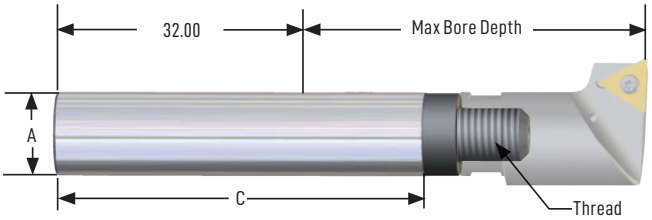
Part #	Bore Range Min.	Bore Range Max.	Connection Size	Adjustment Diameter	A	B	C	Weight (lbs)
PC4-20SDE50B	.078"	.790"	PC4	.200"	1/2"	2.00"	1.874"	1.00
PC6-20SDE62B	.078"	1.890"	PC6	.315"	5/8"	2.58"	2.24"	3.15

Modular Boring | Noses & Bars



Modular Boring Noses

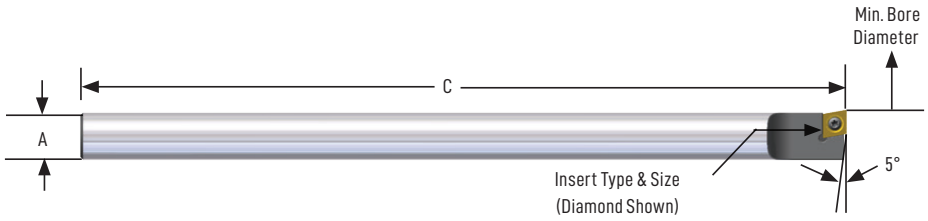
Part #	Min. Dia.	Max. Dia.	Extended Max. Dia.	Insert Size	Insert Screw	Insert Screw Wrench (sold separately)	Use w/ Bar Size	Wrench Size
BN8X9	.354"	.512"	.669"	TCMT 06	029-910	018-002	8 mm	6 mm
BN10X13	.512"	.669"	.827"	TCMT 06	029-910	018-002	10 mm	8 mm
BN12X17	.669"	.827"	.984"	TCMT 11	812-458	018-007	12 mm	10 mm
BN14X21	.827"	.984"	1.142"	TCMT 11	812-458	018-007	14 mm	12 mm
BN16X25	.984"	1.142"	1.299"	TCMT 11	028-905	018-007	16 mm or 5/8"	14 mm
BN16X29	1.142"	1.299"	1.457"	TCMT 11	028-905	018-007	16 mm or 5/8"	14 mm
BN16X33	1.299"	1.457"	1.614"	TCMT 11	028-905	018-007	16 mm or 5/8"	14 mm
BN16X37	1.457"	1.614"	1.772"	TCMT 11	028-905	018-007	16 mm or 5/8"	14 mm
BN16X41	1.614"	1.772"	1.890"	TCMT 11	028-905	018-007	16 mm or 5/8"	14 mm



Modular Boring Bars

Part #	Material	A	Reduction Bushing Size	C	Min. Clamping Length	Max. Bore Depth	Thread
BSS8	Steel	8 mm	XXRB-08MM	2.83"	32 mm	1.57"	M5
BSC8	Carbide	8 mm	XXRB-08MM	3.78"	32 mm	2.52"	M5
BSS10	Steel	10 mm	XXRB-10MM	3.78"	32 mm	2.52"	M6
BSC10	Carbide	10 mm	XXRB-10MM	4.41"	32 mm	3.15"	M6
BSS12	Steel	12 mm	XXRB-12MM	3.82"	32 mm	2.56"	M6
BSC12	Carbide	12 mm	XXRB-12MM	5.04"	32 mm	3.78"	M6
BSS14	Steel	14 mm	XXRB-14MM	4.02"	32 mm	2.76"	M6
BSC14	Carbide	14 mm	XXRB-14MM	5.67"	32 mm	4.02"	M6
BSS16	Steel	16 mm	-	4.41"	32 mm	2.78"	M10
BSC16	Carbide	16 mm	-	6.46"	32 mm	4.41"	M10
BSS625	Steel	5/8"	-	4.41"	32 mm	3.15"	M10
BSC625	Carbide	5/8"	-	6.46"	32 mm	5.20"	M10

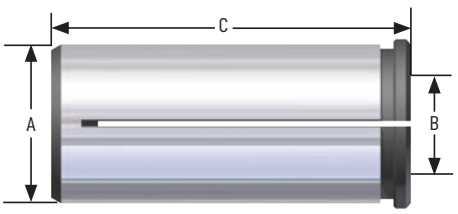
Precision Modular Boring



Boring Bars - Inch Diameter

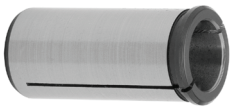
Part #	Coolant Part #	Bore Dia. Min.	Bore Dia. Max.	Reduction Bushing*	Max. Bore Depth	A	C	Bar Material	Insert Type and Size	Insert Screw	Insert Screw Wrench
CB15-18C056	CB-18C056C	.188"	.218"	XXRB-156	1.50"	5/32"	6.00"	Carbide	CDCD 05	028-919	018-002
SB18-18C052	-	.188"	.218"	XXRB-187	.50"	3/16"	2.50"	Steel	CDCD 05	028-919	018-002
CB18-21C054	-	.218"	.232"	XXRB-187	2.00"	3/16"	4.00"	Carbide	CDCD 05	028-919	018-002
SB18-23C052	-	.232"	.300"	XXRB-187	1.00"	3/16"	2.52"	Steel	CDCD 05	028-919	018-002
CB18-23C054	CB18-23C054C	.232"	.300"	XXRB-187	2.00"	3/16"	4.00"	Carbide	CDCD 05	028-919	018-002
SB18-28T053	-	.280"	.300"	XXRB-187	1.00"	3/16"	3.50"	Steel	TDAB 05	028-920	018-007
CB18-29T054	CB18-29T054C	.290"	.310"	XXRB-187	2.00"	3/16"	4.00"	Carbide	TDAB 05	028-920	018-007
SB25-29C053	-	.290"	.310"	XXRB-250	1.25"	1/4"	3.00"	Steel	CDCD 05	028-919	018-002
SB25-30T054	-	.300"	.362"	XXRB-250	1.25"	1/4"	4.00"	Steel	TDAB 05	028-920	018-007
CB25-30C054	CB25-30C054C	.300"	.362"	XXRB-250	2.50"	1/4"	4.00"	Carbide	CDCD 05	028-919	018-002
CB25-31T054	CB25-31T054C	.310"	.372"	XXRB-250	2.50"	1/4"	4.00"	Carbide	TDAB 05	028-920	018-007
SB31-36T054	-	.362"	.430"	XXRB-312	1.75"	5/16"	4.00"	Steel	TDAB 05	028-920	018-007
CB31-37T056	CB31-37T056C	.372"	.440"	XXRB-312	3.25"	5/16"	6.00"	Carbide	TDAB 05	028-920	018-007
SB37-43T105	SB37-43T105C	.430"	.580"	XXRB-375	2.00"	3/8"	5.00"	Steel	TPGH 11	028-921	018-003
CB37-44T107	CB37-44T107C	.440"	.590"	XXRB-375	4.00"	3/8"	7.00"	Carbide	TPGH 11	028-921	018-003
SB50-58T106	SB50-58T106C	.580"	.717"	XXRB-500	2.50"	1/2"	5.00"	Steel	TPGH 11	028-921	018-003
CB50-59T107	CB50-59T107C	.590"	.717"	XXRB-500	5.00"	1/2"	7.00"	Carbide	TPGH 11	028-921	018-003
SB62-71T117	SB62-71T117C	.717"	1.000"	-	3.50"	5/8"	7.00"	Steel	TPGH 11	028-921	018-003
CB62-71T118	CB62-71T118C	.717"	1.000"	-	6.00"	5/8"	8.00"	Carbide	TPGH 11	028-921	018-003
-	SB62-83T114C	.830"	1.450"	-	2.50"	5/8"	4.00"	Steel	TPGH 11	028-921	018-003
-	CB62-83T117C	.830"	1.450"	-	3.50"	5/8"	7.00"	Carbide	TPGH 11	028-921	018-003
-	SB62-83T114C	.830"	1.450"	-	2.50"	5/8"	4.00"	Steel	TPGH 11	028-921	018-003

*** Replace XX with 50 for 1/2" OD bushing or 62 for 5/8" OD bushing**



Reduction Bushings for Inch Boring Bars

Part #	A	B	C
50RB-156	1/2"	5/32"	1.18"
50RB-187	1/2"	3/16"	1.18"
50RB-250	1/2"	1/4"	1.18"
50RB-312	1/2"	5/16"	1.18"
50RB-375	1/2"	3/8"	1.18"
62RB-156	5/8"	5/32"	1.42"
62RB-187	5/8"	3/16"	1.42"
62RB-250	5/8"	1/4"	1.42"
62RB-312	5/8"	5/16"	1.42"

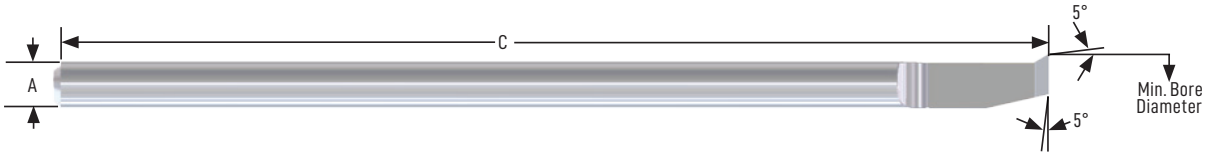


Boring Nose Wrenches

Part #	Size (mm)
894 6	6
894 8	8
894 10	10
894 14	12
894 16	14

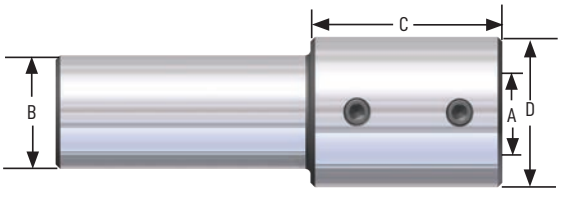
Reduction Bushings for Modular Boring Bars

Part #	Description
62RB-08MM	5/8" to 8 mm
62RB-10MM	5/8" to 10 mm
62RB-12MM	5/8" to 12 mm
62RB-14MM	5/8" to 14 mm



Boring Bars - Metric Diameter

Part #	Bore Dia. Min. (mm)	Bore Dia. Max. (mm)	Boring Bar Holder	Max. Bore Depth (mm)	A (mm)	C (mm)	Bar Material
CB2-078-393-AL41F	2	3	12RBX-04MM	10	4	24	Coated Carbide
CB3-118-590-AL41F	3	4	12RBX-04MM	15	4	30	Coated Carbide
CB4-157-787-AL41F	4	5	12RBX-04MM	20	4	34	Coated Carbide



Metric Boring Bar Holder

Part #	A (mm)	B (mm)	C (mm)
12RBX-04MM	4	12	75

Boring Kit | Small Diameter

FEATURES

- Part #: BTK-PC6S948B
- Boring range from .354" - 1.890"

Kit Includes:

Boring Head

Part #	Qty	Connection Size
PC6-20SDE62B	1	PC6

Boring Noses

Part #	Qty	Description
BN8X9	1	TCMT06
BN10X13	1	TCMT06
BN12X17	1	TCMT11
BN4X21	1	TCMT11
BN16X25	1	TCMT11
BN16X29	1	TCMT11
BN16X33	1	TCMT11
BN16X37	1	TCMT11
BN16X41	1	TCMT11

Wrenches

Part #	Qty	Description
018-105	1	5mm Hex T-handle
018-206	1	6 mm Hex Short Arm
018-002	1	T6 Torx
018-007	1	T7 Torx
894 6	1	6 mm wrench
894 8	1	8 mm wrench
894 10	1	10 mm wrench
894 12	1	12 mm wrench
894 14	1	14 mm wrench

Boring Bars

Part #	Qty	Description
BSS8	1	8 mm, steel
BSS10	1	10 mm, steel
BSS12	1	12 mm, steel
BSS14	1	14 mm, steel
BSS625	1	5/8", steel

Reduction Bushings

Part #	Qty	Description
62RB-08MM	1	5/8" to 8 mm
62RB-10MM	1	5/8" to 10 mm
62RB-12MM	1	5/8" to 12 mm
62RB-14MM	1	5/8" to 14 mm

Inserts

Part #	Qty	Insert Size
T061615TTP	4	TCMT 06
T060820C2G	4	TCMT 06
T111615TTP	4	TCMT 11
T111620C2G	4	TCMT 11

Boring Case

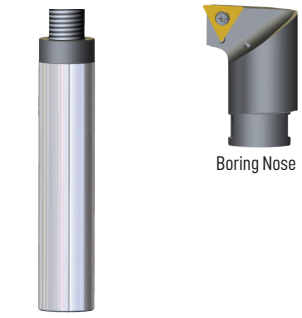
Part #	Qty	Description
902.152	1	Boring Tool Kit Case

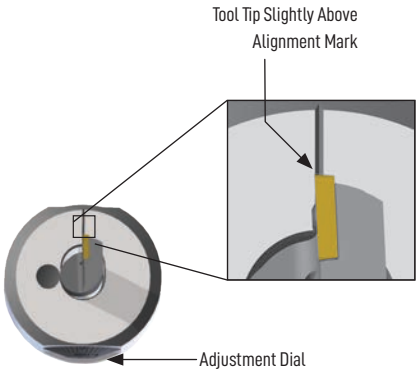
Shanks

Order shanks separately. See pages xxx-xxx

ASSEMBLY

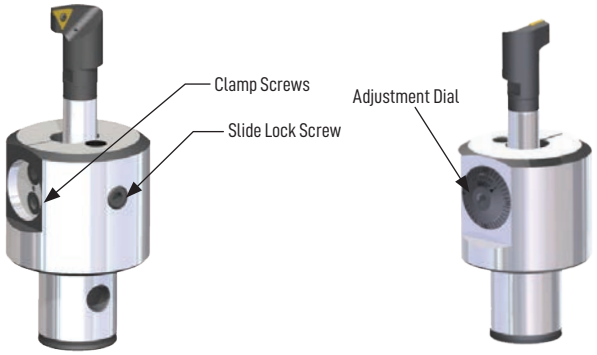
1. Screw boring nose onto boring bar shank.
2. Loosen the clamp screws.
3. Insert boring bar shank and reduction bushings (if applicable) with the slots 90˚ to clamp screws. Note: Do not use boring bars with flats.
4. Rotate the boring bar shank to align the insert tip to the alignment mark atop the boring head body. The bar should be slightly above the alignment mark for best timing.
   Note: Adjusting the position of the insert tip adjusts the "timing" of the bar which optimizes the surface finish and performance.
5. Adjust the boring bar to the minimum desired length.
6. Tighten the clamp screws, Max 20 ft/lbs. (1.13 Nm)





ADJUSTMENT

1. Loosen the slide lock screw.
2. Adjust tool position by turning and reading the dial. The dial is graduated in increments of .001" per graduation on the diameter. Fine adjustments of .0001" can be made utilizing the Vernier Scale.
   (See pg. 147 for instructions on using the Vernier Scale)
3. Tighten the slide lock screw, Max 10 ft/ lbs. (1.13 Nm)



MAINTENANCE

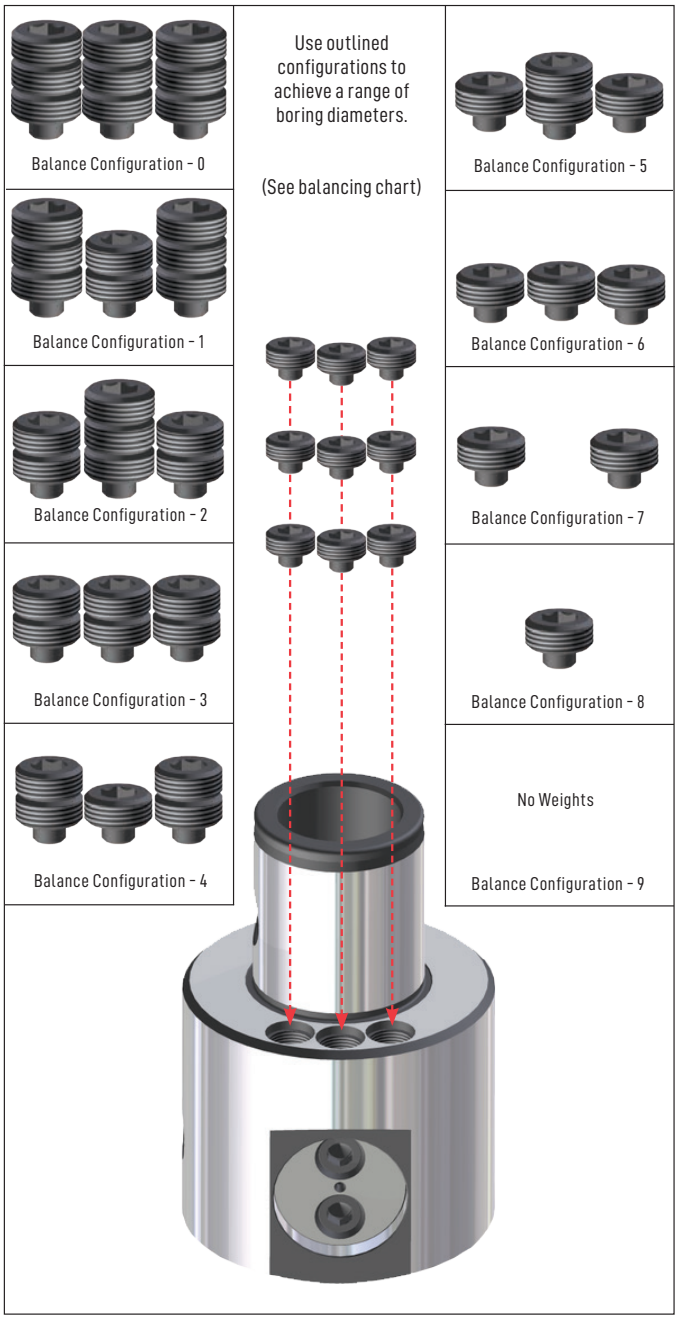
The internal components are self lubricating. To insure long service life, light spindle or machine oil may be applied to external moving parts. No further maintenance is required.

Torque Specifications

Slide Lock Screw	Clamp Screw
10 ft/ lbs (1.13 Nm)	20 ft/ lbs (2.23 Nm)

Precision Modular Boring

BALANCE CONFIGURATION CHART



For best balance results, shorten bars overall length

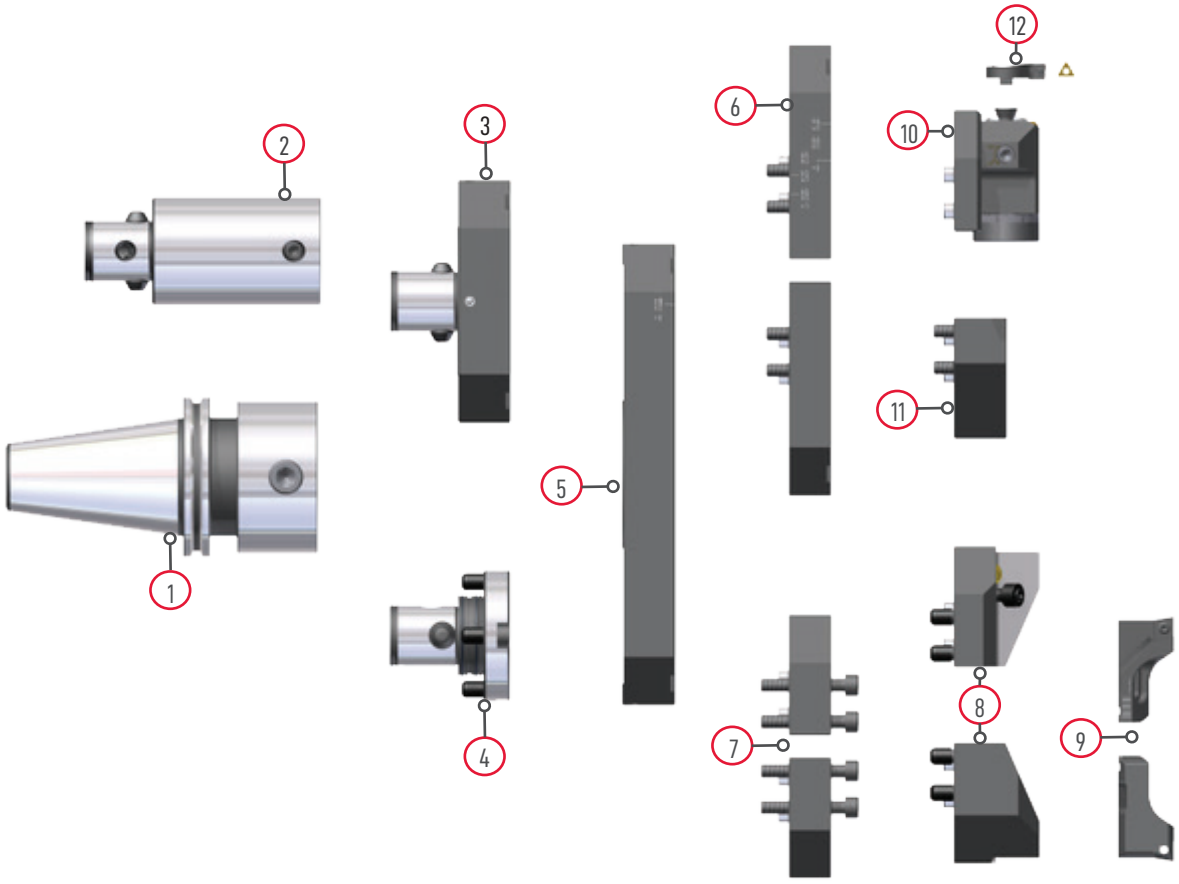
**Carbide Boring Bars

Part Number	OAL" (mm)
BSC8	2.60 (66)
BSC10	3.18 (81)
BSC12	3.50 (89)
BSC14	3.94 (100)
BSC16	4.68 (119)
BSC62	4.68 (119)

BALANCING CHART

Diameter Range		Preferred Range		Extended Range		Preferred Range		Extended Range	
		Boring Bar Shank / Nose	Balance Configuration	Boring Bar Shank / Nose	Balance Configuration	Boring Bar Shank / Nose	Balance Configuration	Boring Bar Shank / Nose	Balance Configuration
mm	in	Steel Bars		Steel Bars		Carbide Bars**		Carbide Bars**	
9	0.35	BSS8 / BN8X9	0			BSC8 / BN8X9	0		
9.5	0.37		0				1		
10	0.39		1				1		
10.5	0.41		1				2		
11	0.43		2				2		
11.5	0.45		2				3		
12	0.47		3				3		
12.5	0.49		3				4		
13	0.51	BSS10 / BN10X13	0	BSS8 / BN8X9	4	BSC10 / BN10X13	0	BSC8 / BN8X9	5
13.5	0.53		1		5		1		5
14	0.55		2		5		1		6
14.5	0.57		2		6		2		6
15	0.59		3		6		3		7
15.5	0.61		3		6		3		8
16	0.63		4		7		4		8
16.5	0.65		4		8		5		9
17	0.67	BSS12 / BN12X17	0	BSS10 / BN10X13	5	BSC12 / BN12X17	0	BSC10 / BN10X13	5
17.5	0.69		1		5		1		6
18	0.71		1		6		1		7
18.5	0.73		2		6		2		7
19	0.75		2		7		3		8
19.5	0.77		3		8		4		8
20	0.79		3		8		4		9
20.5	0.81		4		9		5		9
21	0.83	BSS14 / BN14X21	0	BSS12 / BN12X17	5	BSC14 / BN14X21	0	BSC12 / BN12X17	6
21.5	0.85		1		5		1		7
22	0.87		1		6		2		7
22.5	0.89		2		6		3		8
23	0.91		3		7		4		9
23.5	0.93		3		7		4		9
24	0.94		4		8		5		9
24.5	0.96		4		9		6		9
25	0.98	BSS16 / BN16X25	0	BSS14 / BN14X21	5	BSC16 / BN16X25	0	BSC14 / BN14X21	7
25.5	1.00		1		6		1		8
26	1.02		1		6		2		9
26.5	1.04		2		7		3		9
27	1.06		3		8		4		9
27.5	1.08		3		8		6		9
28	1.10		4		9		7		9
28.5	1.12		5		9		8		9
29	1.14	BSS16 / BN16X29	0	BSS16 / BN16X25	5	BSC16 / BN16X29	0	BSC16 / BN16X25	9
29.5	1.16		1		6		1		9
30	1.18		2		7		2		9
30.5	1.20		2		7		3		9
31	1.22		3		8		4		9
31.5	1.24		3		8		6		9
32	1.26		4		9		7		9
32.5	1.28		5		9		8		9
33	1.30	BSS16 / BN16X33	0	BSS16 / BN16X29	6	BSC16 / BN16X33	0	BSC16 / BN16X29	9
33.5	1.32		1		6		1		9
34	1.34		1		7		2		9
34.5	1.36		2		8		3		9
35	1.38		3		8		5		9
35.5	1.40		3		9		6		9
36	1.42		4		9		7		9
36.5	1.44		5		9		8		9
37	1.46	BSS16 / BN16X37	0	BSS16 / BN16X33	5	BSC16 / BN16X37	0	BSC16 / BN16X33	9
37.5	1.48		1		6		1		9
38	1.50		2		7		2		9
38.5	1.52		2		8		3		9
39	1.54		3		8		5		9
39.5	1.56		4		9		6		9
40	1.57		4		9		7		9
40.5	1.59		5		9		8		9
41	1.61	BSS16 / BN16X41	0	BSS16 / BN16X37	6	BSC16 / BN16X41	0	BSC16 / BN16X37	9
41.5	1.63		1		6		1		9
42	1.65		2		7		2		9
42.5	1.67		2		8		3		9
43	1.69		3		9		5		9
43.5	1.71		4		9		6		9
44	1.73		4		9		8		9
44.5	1.75		5		9		9		9
45	1.77			BSS16 / BN16X41	6			BSC16 / BN16X41	9
45.5	1.79				6				9
46	1.81				7				9
46.5	1.83				8				9
47	1.85				9				9
47.5	1.87				9				9
48	1.89				9				9
48.5	1.91				9				9
49	1.93				9				9

Large Diameter | Product Tree



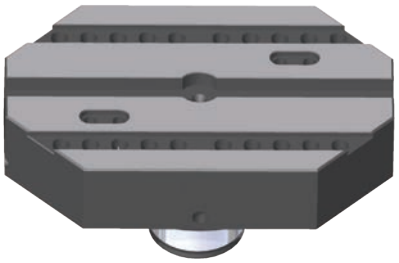
Large Diameter Tree: 5.95" - 26.35" (151.13 - 669.29 mm)

Label	Component	Selection Criteria	Catalog page
1	Modular Shank	Machine tool taper and projection requirement	Pages 134 - 138
2	PC Extensions	Extended reach requirements	Pages 138 - 139
3	PC6 Extension Base	One piece design for 5.95"-8.50" (151.2 - 216 mm)	Page 158
4	Extension Base Coupler	Modular connection between shank and extension base	Page 158
5	Extension Base	Bore range 8.50" (216 mm) and up	Page 158
6	Extension Slide	Extends range of base to eliminate next size	Page 159
7	Riser	Extends reach when used for OD boss	Page 159
8	Insert Holder Base	Mounts rough insert holders to base	Page 160
9	Twin Bore Insert Holders	Mounts and adjusts insert to diameter	Page 160
10	Finish Boring Unit	For precision adjustment of finish bore diameter	Page 161
11	Counter Weight	Offset the mass of Finish Boring Unit for high rpm	Page 161
12	Finish Insert Holder	Mounts finish Insert to Finish Boring Unit	Page 161

Large Diameter | Boring System

FEATURES

- **Boring range from 5.95" - 26.35"**



Extension Base Coupler

Part #	Connection Size	Weight (lbs)
PC6-EBC	PC6	2.3
PC7-EBC	PC7	2.75

Integral PC Connection Extension Base

Part #	Bore Range Min.	Bore Range Max.	Weight (lbs)
PC6-910-850	5.95"	8.50"	6

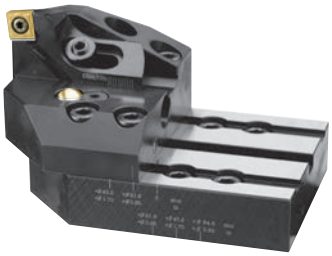
Extension Bases

Part #	Bore Range Min.	Bore Range Max.	Weight (lbs)
910-1150	8.50"	11.05"	6.6
910-1360	11.05"	13.60"	9.4
910-1615	13.60"	16.15"	12.4
910-1870	16.15"	18.70"	15.4
910-2125	18.70"	21.25"	18.4
910-2380	21.25"	23.80"	21.3
910-2635	23.80"	26.35"	24.2

Extension Slide

FEATURES

- Extends the range of extension base 2.55" or 65 mm
- Eliminates the requirement of next slide diameter for low volume or non-production applications



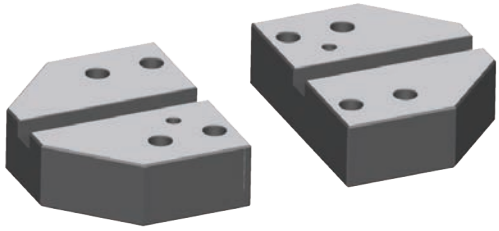
Extension Slide

Part #	Boring Range	Weight (lbs)
910-RES	+2.55"	7.9

Extension Slide Mounting Cap Srews (8 incl)

Part #
SHCSM8X30 (ea.)

Riser



Riser

Part #	Bore Reach	Weight (lbs)
910-ZRIS	+1.00"	4.4

Riser Mounting Cap Srews (8 incl)

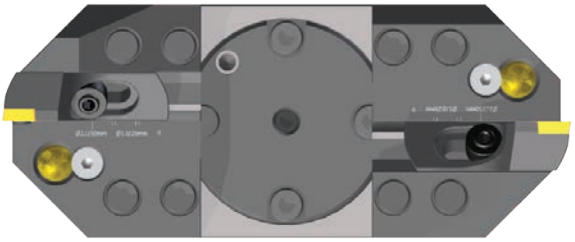
Part #
SHCSM8X50 (ea.)

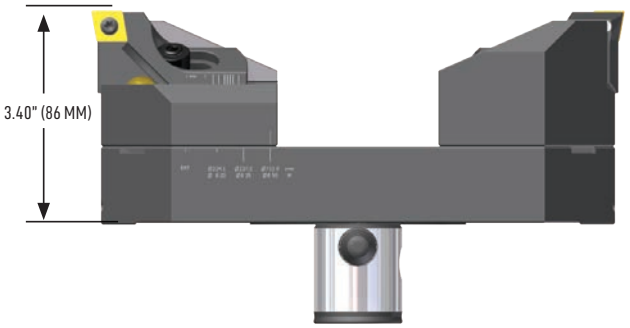
Precision Modular Boring

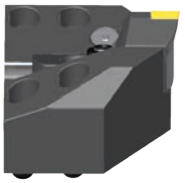
Large Diameter | Rough Boring

FEATURES

- 3 positions allows a single insert holder to bore the complete range
- Coolant directed onto the cutting edge for maximum cooling, chip forming, and tool life
- Independent height and diameter setting permits balanced and step cutting
- ISO standard inserts





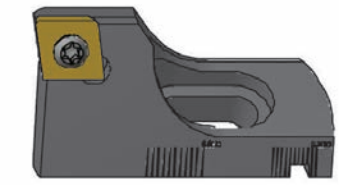


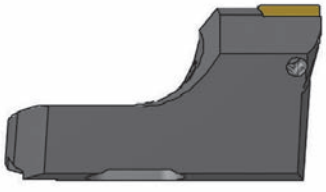
Rough Boring Holder Base

Part #	Bore Range	Weight (lbs)
910-HBP	2.55"	4.7

Spare Components

Mounting Cap Screw (8 incl.)	Insert Holder Clamps	Diameter Adjustment Screw	Height Adjustment Cam
SHCSM8X20 (ea.)	4605-12 (pair)	910-HBP-2 (2)	4605-13 (pair)





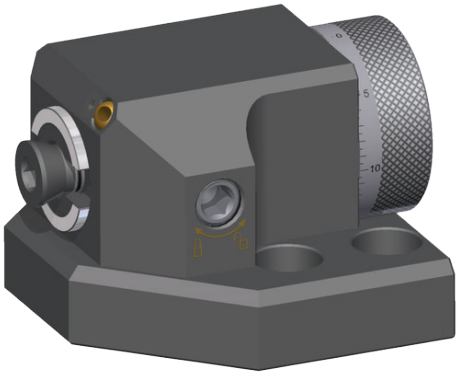
Twin Bore Insert Holders

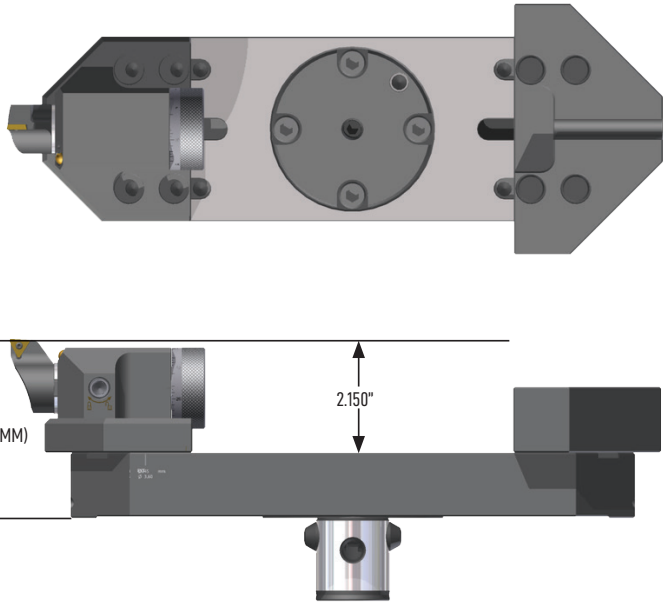
Part #	Size	Insert Type and Size	Lead Angle	Insert Screw	Insert Screw Wrench
4605-61S12	61	SCMT 12	6°	028-009	018-009
4605-61C12	61	CCMT 12	0°	028-907	018-009

Large Diameter | Finish Boring

FEATURES

- .0005" adjustment graduation
- Coolant directed onto the cutting edge for maximum cooling, chip forming, and tool life
- No movement between lock and unlock eliminates setting errors common to other systems
- Large easy to adjust dial



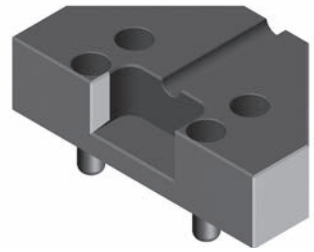


Large Diameter Finish Boring Unit

Part #	Graduation	Bore Range	Weight (lbs)
910-FBU	Inch	2.55"	3.2

Spare Parts

Insert Holder Clamp Screw	Mounting Screws (4 inlc.)
3615-01	SHCSM8X20 (ea.)



Counter Weight

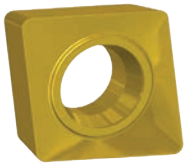
Part #	Weight (lbs)
910-FCW	3.2

Finish Insert Holder

Part #	Size	Insert Type and Size	Lead Angle	Insert Screw	Insert Screw Wrench
361-T11-3	6	TCMT 11	-3°	028-905	018-007

Precision Modular Boring

Inserts | Shape Descriptions

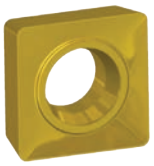


80° DIAMOND

- **For rough boring to a shoulder or deep bore depths where maximum rigidity of the bar is required.**
- **For finishing small diameters where maximum edge strength is required.**

TRIANGLE

- **For finishing with three corners for maximum insert life.**



SQUARE

- **For rough boring through holes and castings to avoid exit hole breakout.**
- **Four usable edges for maximum insert life.**

CARBIDE GRADE

Coated - Longer service life at higher speeds.

Uncoated - Less expensive and effective in materials for which coatings do not add any benefit.

Cermet - Yields the highest speed and durability for selected materials.

RADIUS

Larger - Better surface finish and longer insert life.

Smaller - Less cutting pressures in extreme conditions, reduced bar flex and chatter.

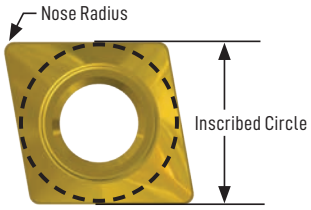
PERIPHERY

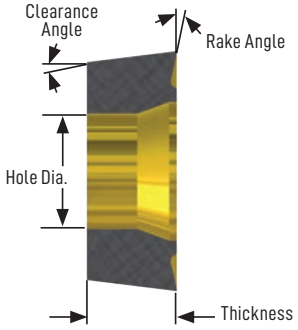
Pressed - Utility grade for general purpose. Longer tool life.

Ground - Better for finishing where tight bore tolerances are required.

Part Number Explanation

EXAMPLE:
C121615TTP





C	12	16	15	TT	P
Shape	**Size**	**Radius**	**Rake Angle**	**Grade**	**Periphery**
T = Triangular S = Square C = Diamond (80°) W = Trigon	03, 04, 05, 06, 08, 09, 11, 12	07 = .007 08 = .008 12 = .012 16 = .016 31 = .031 47 = .047	00 = 0° 06 = 6° 15 = 15° 20 = 20°	See Carbide Grade section on Next Page	P = Pressed G = Ground

Inserts | Carbide Grades

Uncoated Grades

C2 ■ Is a relatively fine grain grade on a WC-CO base. It has very good toughness and good rake angle resistance to abrasive wear. Applications include stainless steels, cast irons, non-ferrous metals, and most high temperature alloys.

C7 ■ Finish and light roughing non-coated grade for steel and steel castings. Performs best in favorable conditions. High speeds and moderate feeds.

Titanium Coated Grades

TT ■ Is a very tough grade with a triple coating of Tin, TiC, and TiN. It is a good grade for roughing and finishing in less than ideal conditions. Used in machining steels and stainless steels at low speeds.

TE ■ Is a carbide grade with a PVD coating. It is used for machining aerospace materials, high temperature alloys, and stainless steels.

TR ■ Is a PVD coated micro grain carbide. Performs well in alloy steels, nickel-based materials, and heat-treated materials up to Rc: 40.

SN ■ Delivers outstanding performance in moderate-roughing to semi-finishing operations, especially in interrupted cuts. An advanced multi-layer coating (TiCN/Al2 O3 /TiN), applied over a cobalt enriched substrate, gives SN a near optimum balance of toughness, surface lubricity, and resistance to metal build-up to yield excellent wear resistance throughout its application range.

VN ■ Is a micro-grained grade with an excellent balance of toughness and wear resistance. Coated with PVD TiN for improved lubricity and wear resistance with up-sharp cutting edges, VN excels in light roughing to high-speed finishing of high-temperature alloys, stainless steels, cast iron, aluminum, and non-ferrous materials.

Cermet Grades

CT ■ Is a cermet grade of TiC and TiN particles in a nickel cobalt binder, for finishing steels at high cutting speeds.

CM ■ Is a cermet grade. It is slightly less hard than CT and can be used in less favorable conditions.

Aluminum Oxide Coated Grades

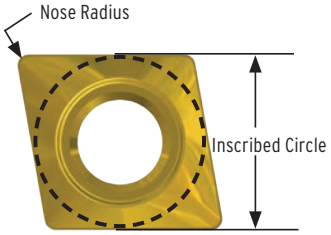
AS ■ Is an AL2 O3 coated insert. Its application is machining cast iron and steels at moderately high speeds.

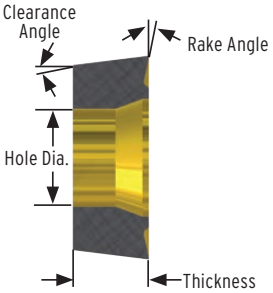
Polycrystalline Diamond Grades

PCD ■ Used for non-ferrous metals, high-silicon aluminum, carbon fiber, and fiber-reinforced plastics. Allows high cutting speed, long tool life, and high thermal conductivity.

Precision Modular Boring

Diamond Inserts





Size: CDCD 05

Part #	IC	Clearance Angle	Nose Radius	Thickness	Rake Angle	Hole Diameter	Grade	Type	Periphery
C050700C2G	.156"	15°	.007"	.040"	0°	.084"	C2	Uncoated	Ground
C051600C2G	.156"	15°	.016"	.040"	0°	.084"	C2	Uncoated	Ground
C050700TRG	.156"	15°	.007"	.040"	0°	.084"	TR	Coated	Ground
C051600TRG	.156"	15°	.016"	.040"	0°	.084"	TR	Coated	Ground
C050700PCD	.156"	15°	.007"	.040"	0°	.084"	PCD	Diamond	Ground
C051600PCD	.156"	15°	.016"	.040"	0°	.084"	PCD	Diamond	Ground

Size: CCMT 06

Part #	IC	Clearance Angle	Nose Radius	Thickness	Rake Angle	Hole Diameter	Grade	Type	Periphery
C061615C2P	.250"	7°	.016"	.094"	15°	.110"	C2	Uncoated	Pressed
C063115C2P	.250"	7°	.031"	.094"	15°	.110"	C2	Uncoated	Pressed
C061620C2G	.250"	7°	.016"	.094"	20°	.110"	C2	Uncoated	Ground
C061615TTP	.250"	7°	.016"	.094"	15°	.110"	TT	Coated	Pressed
C063115TTP	.250"	7°	.031"	.094"	15°	.110"	TT	Coated	Pressed

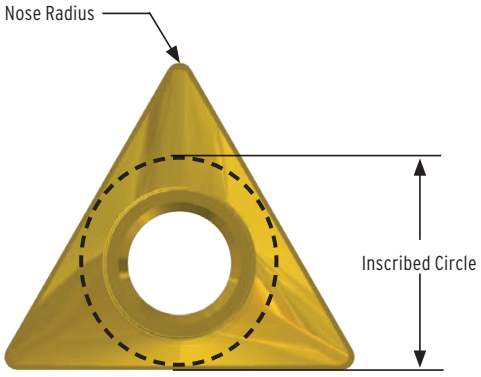
Size: CCMT 09

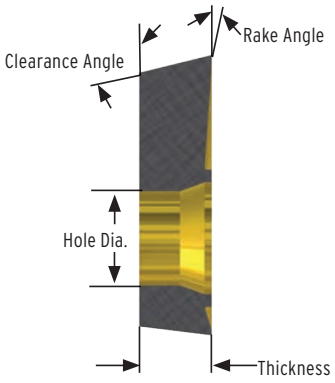
Part #	IC	Clearance Angle	Nose Radius	Thickness	Rake Angle	Hole Diameter	Grade	Type	Periphery
C091615C2P	.375"	7°	.016"	.156"	15°	.173"	C2	Uncoated	Pressed
C093115C2P	.375"	7°	.031"	.156"	15°	.173"	C2	Uncoated	Pressed
C091620C2G	.375"	7°	.016"	.156"	20°	.173"	C2	Uncoated	Ground
C091615TTP	.375"	7°	.016"	.156"	15°	.173"	TT	Coated	Pressed
C093115TTP	.375"	7°	.031"	.156"	15°	.173"	TT	Coated	Pressed

Size: CCMT 12

Part #	IC	Clearance Angle	Nose Radius	Thickness	Rake Angle	Hole Diameter	Grade	Type	Periphery
C121615C2P	.500"	7°	.016"	.188"	15°	.216"	C2	Uncoated	Pressed
C123115C2P	.500"	7°	.031"	.188"	15°	.216"	C2	Uncoated	Pressed
C124715C2P	.500"	7°	.047"	.188"	15°	.216"	C2	Uncoated	Pressed
C121620C2G	.500"	7°	.016"	.188"	20°	.216"	C2	Uncoated	Ground
C123120C2G	.500"	7°	.031"	.188"	20°	.216"	C2	Uncoated	Ground
C121615TTP	.500"	7°	.016"	.188"	15°	.216"	TT	Coated	Pressed
C123115TTP	.500"	7°	.031"	.188"	15°	.216"	TT	Coated	Pressed
C124715TTP	.500"	7°	.047"	.188"	15°	.216"	TT	Coated	Pressed

Triangle Inserts





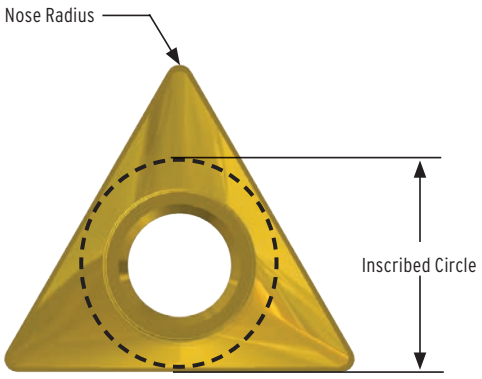
Size: TDAB 05

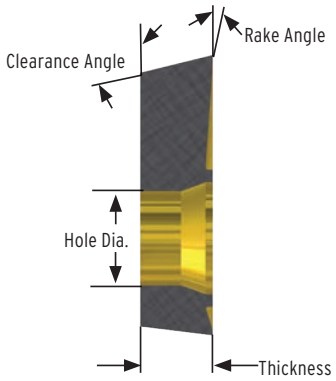
Part #	IC	Clearance Angle	Nose Radius	Thickness	Rake Angle	Hole Diameter	Grade	Type	Periphery
T050700C2G	.160"	15°	.007"	.047"	0°	.094"	C2	Uncoated	Ground
T051600C2G	.160"	15°	.016"	.047"	0°	.094"	C2	Uncoated	Ground
T050700TRG	.160"	15°	.007"	.047"	0°	.094"	TR	Coated	Ground
T051600TRG	.160"	15°	.016"	.047"	0°	.094"	TR	Coated	Ground
T050700PCD	.160"	15°	.007"	.047"	0°	.094"	PCD	Diamond	Ground

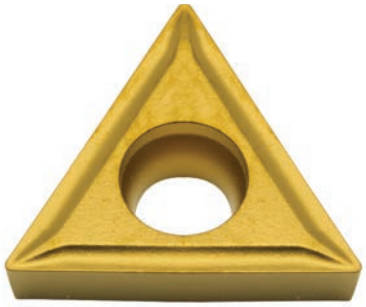
Size: TCMT 06

Part #	IC	Clearance Angle	Nose Radius	Thickness	Rake Angle	Hole Diameter	Grade	Type	Periphery
T061206C7G	.156"	7°	.012"	.078"	6°	.087"	C7	Uncoated	Ground
T060820C2G	.156"	7°	.008"	.078"	20°	.087"	C2	Uncoated	Ground
T060815C2P	.156"	7°	.008"	.078"	15°	.087"	C2	Uncoated	Pressed
T061615C2P	.156"	7°	.016"	.078"	15°	.087"	C2	Uncoated	Pressed
T060815TTP	.156"	7°	.008"	.078"	15°	.087"	TT	Coated	Pressed
T061615TTP	.156"	7°	.016"	.078"	15°	.087"	TT	Coated	Pressed
T060820CTG	.156"	7°	.008"	.078"	20°	.087"	CT	Cermet	Ground
T061620CTG	.156"	7°	.016"	.078"	20°	.087"	CT	Cermet	Ground
T060815CTP	.156"	7°	.008"	.078"	15°	.087"	CT	Cermet	Pressed
T061615CTP	.156"	7°	.016"	.078"	15°	.087"	CT	Cermet	Pressed
T061600PCD	.156"	7°	.016"	.078"	0°	.087"	PCD	Diamond	Ground

Triangular Inserts (continued)



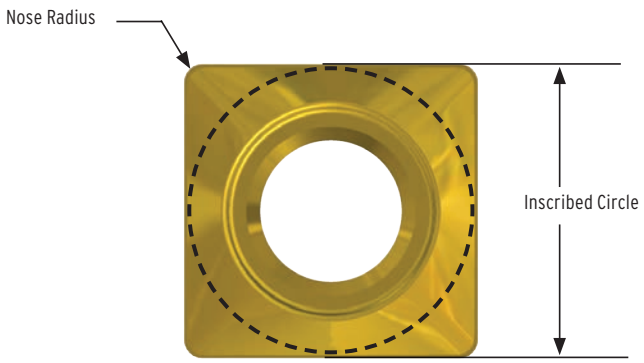


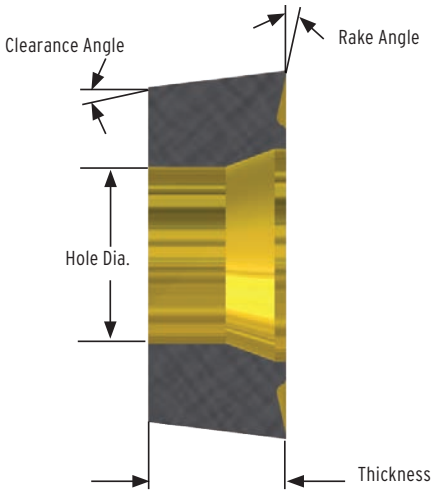


Size: TCMT 11

Part #	IC	Clearance Angle	Nose Radius	Thickness	Rake Angle	Hole Diameter	Grade	Type	Periphery
T111615C7P	.250"	7°	.016"	.094"	15°	.108"	C7	Uncoated	Pressed
T111600C2P	.250"	7°	.016"	.094"	0°	.108"	C2	Uncoated	Pressed
T111615C2P	.250"	7°	.016"	.094"	15°	.108"	C2	Uncoated	Pressed
T113115C2P	.250"	7°	.031"	.094"	15°	.108"	C2	Uncoated	Pressed
T111620C2G	.250"	7°	.016"	.094"	20°	.108"	C2	Uncoated	Ground
T111600C2G	.250"	7°	.016"	.094"	0°	.108"	C2	Uncoated	Ground
T113120C2G	.250"	7°	.031"	.094"	20°	.108"	C2	Uncoated	Ground
T110815TTP	.250"	7°	.008"	.094"	15°	.108"	TT	Coated	Pressed
T111615TTP	.250"	7°	.016"	.094"	15°	.108"	TT	Coated	Pressed
T113115TTP	.250"	7°	.031"	.094"	15°	.108"	TT	Coated	Pressed
T110823TEG	.250"	7°	.008"	.094"	15°	.108"	TE	Coated	Ground
T111623TEG	.250"	7°	.016"	.094"	23°	.108"	TE	Coated	Ground
T111615CTP	.250"	7°	.016"	.094"	15°	.108"	CT	Cermet	Pressed
T111615CMP	.250"	7°	.016"	.094"	15°	.108"	CM	Cermet	Pressed
T111600ASP	.250"	7°	.016"	.094"	0°	.108"	AS	Coated	Pressed
T111600PCD	.250"	7°	.016"	.094"	0°	.108"	PCD	Diamond	Ground
T111615SNG	.250"	7°	.016"	.094"	15°	.108"	SN	Coated	Ground
T113115SNG	.250"	7°	.031"	.094"	15°	.108"	SN	Coated	Ground
T111615VNG	.250"	7°	.016"	.094"	15°	.108"	VN	Coated	Ground

Square Inserts





Size: SCMT 09

Part #	IC	Clearance Angle	Nose Radius	Thickness	Rake Angle	Hole Diameter	Grade	Type	Periphery
S091615C2P	.375"	7°	.016"	.156"	15°	.173"	C2	Uncoated	Pressed
S093115C2P	.375"	7°	.031"	.156"	15°	.173"	C2	Uncoated	Pressed
S091615TTP	.375"	7°	.016"	.156"	15°	.173"	TT	Coated	Pressed
S093115TTP	.375"	7°	.031"	.156"	15°	.173"	TT	Coated	Pressed

Size: SCMT 12

Part #	IC	Clearance Angle	Nose Radius	Thickness	Rake Angle	Hole Diameter	Grade	Type	Periphery
S123115C2P	.500"	7°	.031"	.188"	15°	.216"	C2	Uncoated	Pressed
S121615TTP	.500"	7°	016"	.188"	15°	.216"	TT	Coated	Pressed
S123115TTP	.500"	7°	.031"	.188"	15°	.216"	TT	Coated	Pressed
S124715TTP	.500"	7°	.047"	.188"	15°	.216"	TT	Coated	Pressed