GENERAL APPLICATION INFORMATION

QuadDrills are One-Effective. Indexable drills are one-effective cutting geometry regardless of the number of inserts in the tool. This is extremely important when establishing feeds and speeds for a given operation.

Rigidity. A high degree of rigidity of the machine and fixturing is critical for indexable drilling.

Spindle Rigidity. If the spindle is not tight or properly adjusted, the drill will cut off-center, producing oversize holes. Insert chipping or low tool life may also result and hole finish will be affected.

Fixture Rigidity. Workpiece strength is essential. Flimsy or inadequately supported workpieces will render indexable drills virtually ineffective.

Chip Control. Chip control is essential for indexable drilling. Proper chip control directly enhances chip evacuation, which extends tool life and improves hole tolerance and finish (see Fig. 2).

Large, long chips will restrict the flutes' capacity to evacuate chips, and cause insert chipping and possible drill failure.

Operating parameters should be adjusted to fall within recommended guidelines to achieve optimum form or figure"9" chips that can successfully evacuate along the drill flutes.

Coolant. In drilling, heat and chips are generated in a confined area at the bottom of the hole. Coolant must be used as a carrier to extract heat and chips from the bottom of the hole, along the drill flutes and out of the hole.

Through the tool water base or synthetic coolant is strongly recommended.

Do not operate indexable drills over 1:1 diameter to length ratios with air, air mist or dry. Running drills under those conditions can result in drill failure.

Fig. 2: Chip Formation

Optimum form

Too tight: Increase speed within recommended limit. If unsatisfactory, decrease feed.

Too long: May clog drill flutes. Reduce speed or increase feed within recommended limits.

QUADDRILL™ QUADDRILL+™ OPERATING GUIDELINES

Recommendations are starting parameters only and can be effected by cutting conditions such as spindal and fixture rigidity. Minimum 150 psi coolant through the tool is required for proper drill performance. If not possible, then cutting parameters may have to be reduced. Start at the midpoint of the range and adjust the cutting parameters according to your cutting conditions.

For drills that are 4:1 length to diameter ratio, it may be necessary to reduce your feed by 40% for the first .06" of drilling depth. Then increase to full feed rate for the remainder of the cut.

ISO	Material Number	Cutting Speed (SFM)	Feed (in/rev) ø.500 - ø.594	Feed (in/rev) ø.625 - ø.813	Feed (in/rev) ø.843 - ø1.063	Feed (in/rev) ø1.094 - ø1.312	Feed (in/rev) ø1.343 - ø1.625
P	1	800 - 1000	.002" - .004"	.0025" - .004"	.0025" - .005"	.003" - .005"	.003" - .006"
	2	800 - 1000	.002" - .004"	.0025" - .004"	.0025" - .005"	.003" - .005"	.003" - .006"
	3	500 - 800	.002" - .004"	.003" - .006"	.004" - .007"	.005" - .0085"	.005" - .0095"
	4	800 - 1000	.002" - .004"	.003" - .006"	.004" - .007"	.005" - .0085"	.005" - .0095"
	5	600 - 800	.002" - .004"	.003" - .006"	.004" - .007"	.005" - .0085"	.005" - .0095"
	6	500 - 800	.002" - .004"	.003" - .0055"	.004" - .007"	.005" - .0085"	.005" - .009"
	7	400 - 700	.002" - .005"	.003" - .006"	.004" - .007"	.005" - .008"	.006" - .009"
	8	400 - 600	.002" - .005"	.003" - .006"	.004" - .007"	.005" - .008"	.006" - .009"
	9	300 - 550	.002" - .005"	.003" - .006"	.004" - .007"	.005" - .008"	.006" - .009"
	10	400 - 600	.002" - .005"	.003" - .006"	.004" - .007"	.005" - .008"	.006" - .009"
	11	400 - 550	.002" - .005"	.003" - .006"	.004" - .008"	.005" - .009"	.006" - .0095"
M	12	550 - 800	.002" - .004"	.003" - .006"	.003" - .006"	.0035" - .0065"	.004" - .007"
	13	500 - 700	.002" - .004"	.003" - .006"	.003" - .006"	.0035" - .0065"	.004" - .007"
	14	500 - 700	.002" - .004"	.003" - .006"	.003" - .006"	.0035" - .0065"	.004" - .007"
K	15	500 - 800	.002" - .004"	.003" - .0065"	.005" - .008"	.006" - .010"	.006" - .011"
	16	500 - 800	.002" - .004"	.003" - .0065"	.005" - .008"	.006" - .010"	.006" - .011"
	17	600 - 800	.002" - .004"	.003" - .0065"	.005" - .008"	.006" - .010"	.006" - .011"
	18	600 - 800	.002" - .004"	.003" - .0065"	.005" - .008"	.006" - .010"	.006" - .011"
	19	600 - 800	.002" - .004"	.003" - .0065"	.005" - .008"	.006" - .010"	.006" - .011"
	20	500 - 700	.002" - .004"	.003" - .0065"	.005" - .008"	.006" - .010"	.006" - .011"
N	21	1300 - 2000	.002" - .005"	.003" - .006"	.004" - .008"	.005" - .009"	.0055" - .009"
	22	1000 - 1300	.002" - .005"	.003" - .006"	.004" - .008"	.005" - .009"	.0055" - .009"
	23	1300 - 2000	.002" - .005"	.003" - .006"	.004" - .008"	.005" - .009"	.0055" - .009"
	24	1000 - 1300	.002" - .005"	.003" - .006"	.004" - .008"	.005" - .009"	.0055" - .009"
	25	1000 - 1300	.002" - .005"	.003" - .006"	.004" - .008"	.005" - .009"	.0055" - .009"
	26	800 - 1000	.002" - .005"	.003" - .006"	.004" - .008"	.005" - .009"	.0055" - .009"
	27	750 - 900	.002" - .005"	.003" - .006"	.004" - .008"	.005" - .009"	.0055" - .009"
	28	800 - 1000	.002" - .005"	.003" - .006"	.004" - .008"	.005" - .009"	.0055" - .009"
	29						
	30						
S	31	100 - 250	.002" - .004"	.0025" - .0055"	.003" - .007"	.004" - .0085"	.0055" - .009"
	32	100 - 250	.002" - .004"	.0025" - .0055"	.003" - .007"	.004" - .0085"	.0055" - .009"
	33	100 - 250	.002" - .004"	.0025" - .0055"	.003" - .007"	.004" - .0085"	.0055" - .009"
	34	100 - 250	.002" - .004"	.0025" - .0055"	.003" - .007"	.004" - .0085"	.0055" - .009"
	35	100 - 250	.002" - .004"	.0025" - .0055"	.003" - .007"	.004" - .0085"	.0055" - .009"
	36	100 - 250	.002" - .004"	.0025" - .0055"	.003" - .007"	.004" - .0085"	.0055" - .009"
	37	100 - 200	.002" - .004"	.0025" - .0055"	.003" - .007"	.004" - .0085"	.0055" - .009"
H	38	50 - 150	.001" - .002"	.001" - .002"	.001" - .003"	.002" - .003"	.002" - .003"
	39	50 - 150	.001" - .002"	.001" - .002"	.001" - .003"	.002" - .003"	.002" - .003"
	40	50 - 150	.001" - .002"	.001" - .002"	.001" - .003"	.002" - .003"	.002" - .003"
	41	50 - 150	.001" - .002"	.001" - .002"	.001" - .003"	.002" - .003"	.002" - .003"

○=P ○=M ○=K ○=N ○=S ○=H

BORE line

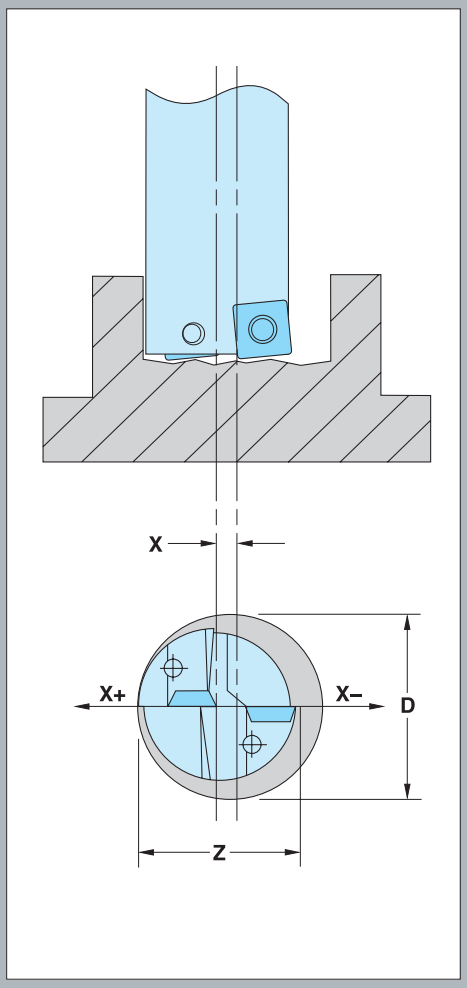
Feed (in/rev) ø1.687 - ø2.000	Feed (in/rev) ø2.125	Feed (in/rev) ø2.250 - ø2.750	Feed (in/rev) ø2.875 - ø3.000	Feed (in/rev) ø3.250
.0035" - .0065"	.003" - .006"	.0035" - .006"	.0035" - .007"	.004" - .008"
.0035" - .0065"	.003" - .006"	.0035" - .006"	.0035" - .007"	.004" - .008"
.005" - .010"	.005" - .0085"	.006" - .010"	.006" - .0115"	.006" - .012"
.005" - .010"	.005" - .0085"	.006" - .010"	.006" - .0115"	.006" - .012"
.005" - .010"	.005" - .0085"	.006" - .010"	.006" - .0115"	.006" - .012"
.005" - .0095"	.005" - .0085"	.006" - .010"	.006" - .011"	.006" - .0115"
.0065" - .010"	.005" - .0085"	.006" - .0095"	.007" - .011"	.008" - .012"
.0065" - .010"	.005" - .0085"	.006" - .0095"	.007" - .011"	.008" - .012"
.0065" - .010"	.005" - .0085"	.006" - .0095"	.007" - .011"	.008" - .012"
.0065" - .010"	.005" - .0085"	.006" - .0095"	.007" - .011"	.008" - .012"
.0065" - .010"	.005" - .0095"	.006" - .011"	.007" - .0115"	.008" - .012"
.0045" - .0075"	.0035" - .007"	.004" - .008"	.005" - .0085"	.0055" - .009"
.0045" - .0075"	.0035" - .007"	.004" - .008"	.005" - .0085"	.0055" - .009"
.0045" - .0075"	.0035" - .007"	.004" - .008"	.005" - .0085"	.0055" - .009"
.007" - .012"	.006" - .0095"	.007" - .012"	.007" - .013"	.0085" - .014"
.007" - .012"	.006" - .0095"	.007" - .012"	.007" - .013"	.0085" - .014"
.007" - .012"	.006" - .0095"	.007" - .012"	.007" - .013"	.0085" - .014"
.007" - .012"	.006" - .0095"	.007" - .012"	.007" - .013"	.0085" - .014"
.007" - .012"	.006" - .0095"	.007" - .012"	.007" - .013"	.0085" - .014"
.007" - .012"	.006" - .0095"	.007" - .012"	.007" - .013"	.0085" - .014"
.006" - .010"	.005" - .0095"	.006" - .011"	.0065" - .011"	.007" - .012"
.006" - .010"	.005" - .0095"	.006" - .011"	.0065" - .011"	.007" - .012"
.006" - .010"	.005" - .0095"	.006" - .011"	.0065" - .011"	.007" - .012"
.006" - .010"	.005" - .0095"	.006" - .011"	.0065" - .011"	.007" - .012"
.006" - .010"	.005" - .0095"	.006" - .011"	.0065" - .011"	.007" - .012"
.006" - .010"	.005" - .0095"	.006" - .011"	.0065" - .011"	.007" - .012"
.006" - .010"	.005" - .0095"	.006" - .011"	.0065" - .011"	.007" - .012"
.006" - .010"	.005" - .0095"	.006" - .011"	.0065" - .011"	.007" - .012"
.006" - .0095"	.0035" - .0085"	.005" - .010"	.006" - .011"	.007" - .0115"
.006" - .0095"	.0035" - .0085"	.005" - .010"	.006" - .011"	.007" - .0115"
.006" - .0095"	.0035" - .0085"	.005" - .010"	.006" - .011"	.007" - .0115"
.006" - .0095"	.0035" - .0085"	.005" - .010"	.006" - .011"	.007" - .0115"
.006" - .0095"	.0035" - .0085"	.005" - .010"	.006" - .011"	.007" - .0115"
.006" - .0095"	.0035" - .0085"	.005" - .010"	.006" - .011"	.007" - .0115"
.006" - .0095"	.0035" - .0085"	.005" - .010"	.006" - .011"	.007" - .0115"
.002" - .004"	.001" - .0035"	.0025" - .0035"	.0025" - .0035"	.0025" - .0045"
.002" - .004"	.001" - .0035"	.0025" - .0035"	.0025" - .0035"	.0025" - .0045"
.002" - .004"	.001" - .0035"	.0025" - .0035"	.0025" - .0035"	.0025" - .0045"
.002" - .004"	.001" - .0035	.0025" - .0035"	.0025" - .0035"	.0025" - .0045"

OFFSETTING ROTATING INDEXABLE DRILLS

Offsetting indexable drills in a positive direction has proven to be beneficial in several ways. Reports indicate that it improves chip evacuation when applied to machines with inadequate coolant.

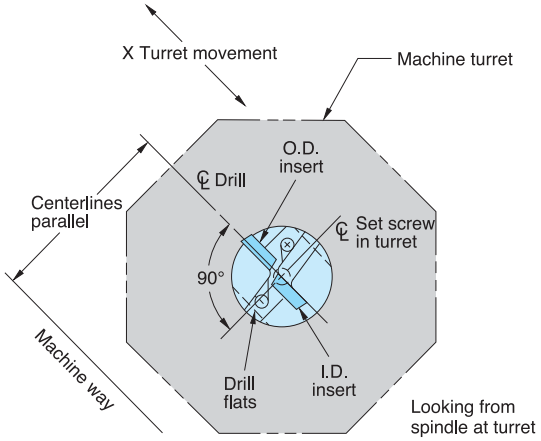
Offsetting can reduce chatter and noticeably improve surface finish when cutting materials like 316 stainless steel. It also allows drilling a full range of hole diameters with a minimum of drill sizes.

A complete list of "Maximum Offset" dimensions for each standard drill size is shown here. Remember, only 2:1 and 3:1 L/D ratio drills are recommended for this type of work because of their rigidity.

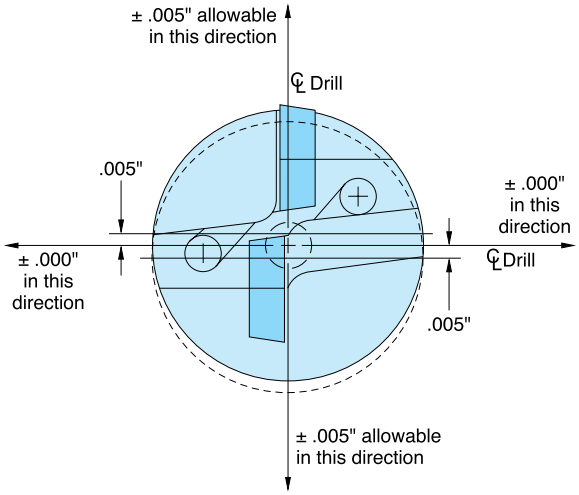


Z Drill Diameter	X Max. Radial Offset	Max. offset Dia.
.500	.010	.520
.531	.010	.551
.563	.010	.583
.594	.010	.614
.625	.020	.665
.657	.020	.697
.688	.020	.728
.719	.020	.759
.750	.020	.790
.781	.020	.821
.813	.010	.833
.844	.020	.884
.875	.020	.915
.906	.020	.946
.938	.020	.978
.969	.020	1.009
1.000	.010	1.020
1.031	.010	1.051
1.063	.010	1.083
1.094	.020	1.134
1.125	.020	1.165
1.156	.020	1.196
1.187	.020	1.227
1.219	.010	1.239
1.250	.010	1.270
1.281	.010	1.301
1.312	.010	1.332
1.343	.020	1.383
1.375	.020	1.415
1.406	.020	1.446
1.437	.020	1.477
1.468	.020	1.508
1.500	.020	1.540
1.531	.020	1.571
1.562	.010	1.582
1.594	.010	1.614
1.625	.010	1.645
1.687	.020	1.727
1.719	.020	1.759
1.750	.020	1.790
1.781	.020	1.821
1.813	.020	1.853
1.875	.010	1.895
1.937	.010	1.957
1.969	0.00 - no offset possible	
2.000	0.00 - no offset possible	
2.125	.010	2.145
2.250	.040	2.330
2.375	.015	2.405
2.500	.015	2.530
2.625	.015	2.655
2.750	0.00 - no offset possible	
2.875	.020	2.915
3.000	.015	3.030
3.250	.060	3.370

STATIONARY DRILLING



When setting up an indexable drill, it is always a good idea to locate the drill in the turret in an attitude that puts the inserts parallel to the machine ways. Most lathes have more than one set of screws in the turret that allows this.



When using drills on the lathe, the drills must be properly aligned prior to taking the first cut. Plus, periodic alignment checks must be made to insure the continued accuracy of the setup.

DRILLING CONDITIONS

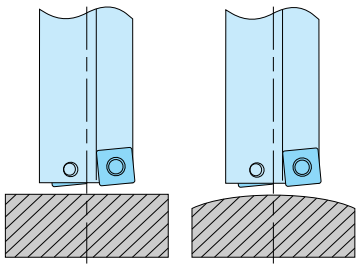
Common drilling applications with flat or convex surfaces generally require no speed or feed adjustment during the drilling cycle.

Special situations however, may necessitate temporary adjustments. In the examples below, reductions to feed and/or speed may be required to minimize deflection or tool wear.

Material surface conditions such as case hardening or scale may require slowing penetration to some degree. Interior conditions such as porosity, sandy castings, etc., also have some effect on tool life. Operating parameters may have to be adjusted accordingly.

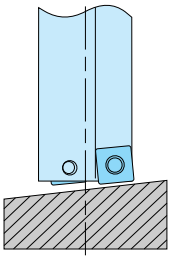
Feedrates on 4:1 drills may need to be reduced even more than the recommendations below indicate. Generally, this reduced feedrate is required until the first .200" DOC after full engagement is reached.

Most Common Conditions

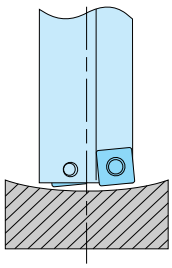


Flat **Convex**

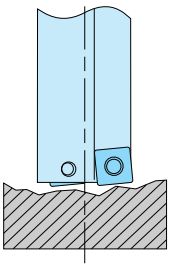
Less Common Conditions



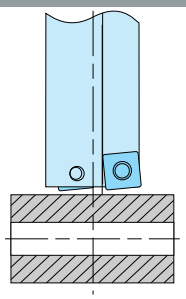
Sloped: If slope exceeds 5°, reduce feed by 50% during penetration.



Concave: Reduce feed by 60% during penetration.



Irregular: Reduce speed during penetration.



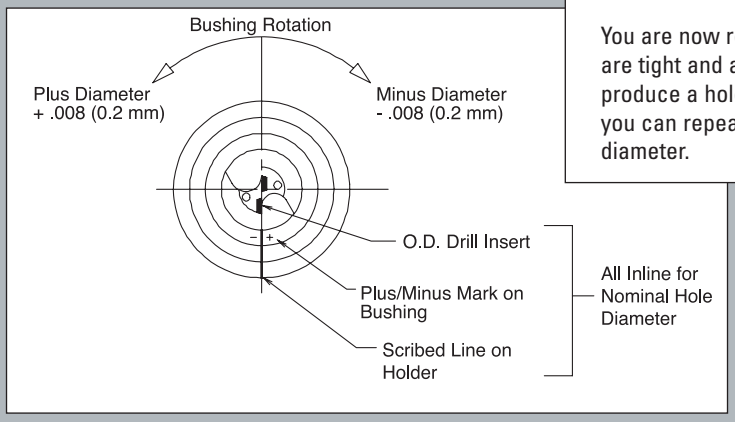
Interrupted: Reduce feed when crossing and before penetration.

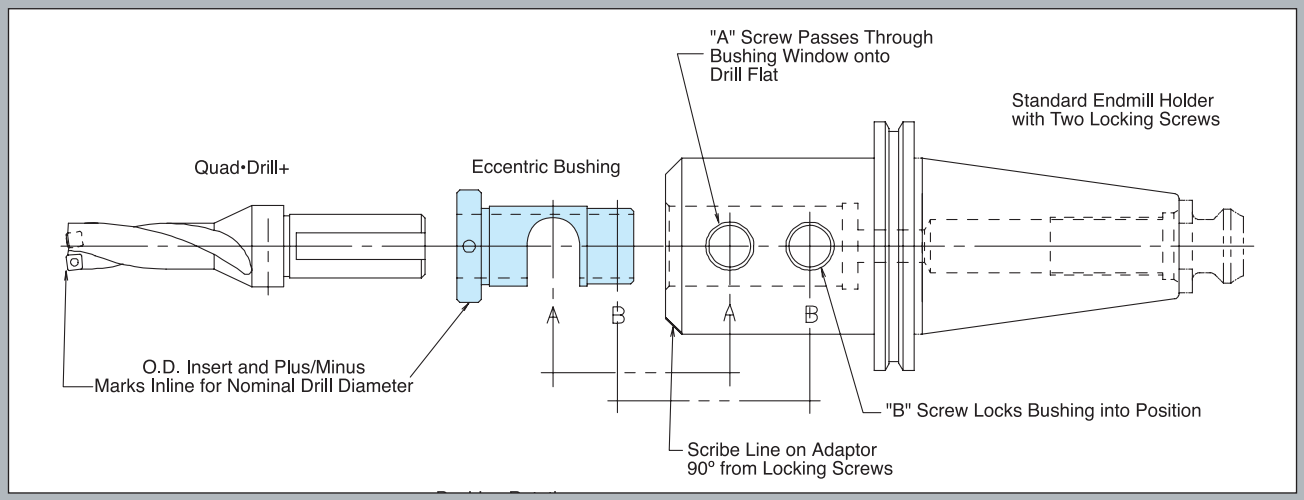
ASSEMBLY. SET-UP AND ADJUCTMENT PROCEDURES

Recommend using Weldon style end mill adapter that uses two side locking screws.

1. Scribe line on front face of adapter exactly 90 degrees from locking screws.
2. Load eccentric bushing over drill shank and into adapter lining up the scribed line on adapter and bushing.
3. Before locking the set screws in adapter, line up OD insert in drill with both scribed lines on the bushing and adapter. The drill in this position will drill a nominal (drill size) hole diameter.
4. With the drill and bushing loaded into the adapter and the OD insert in line with the scribed lines, apply the rear set screw (B) in adapter locking the bushing in place. Use only hand pressure to tighten the screw. Applying the set screw to the bushing provides positive axial retention of the bushing and hand tightening allows radial adjustment.
5. Rotate the bushing either plus or minus to desired position then lock the (B) set screw using a wrench. This will lock the radial position setting in preparation for drilling.
6. Lock the front (A) set screw in the adapter using a wrench to lock the drill into the holder.

You are now ready to drill. Please check to make sure all screws are tight and assembly is rigid before drilling. Once you produce a hole with the current setting and inspect the diameter, you can repeat procedures #5 & 6 if required to achieve desired diameter.





BOREline