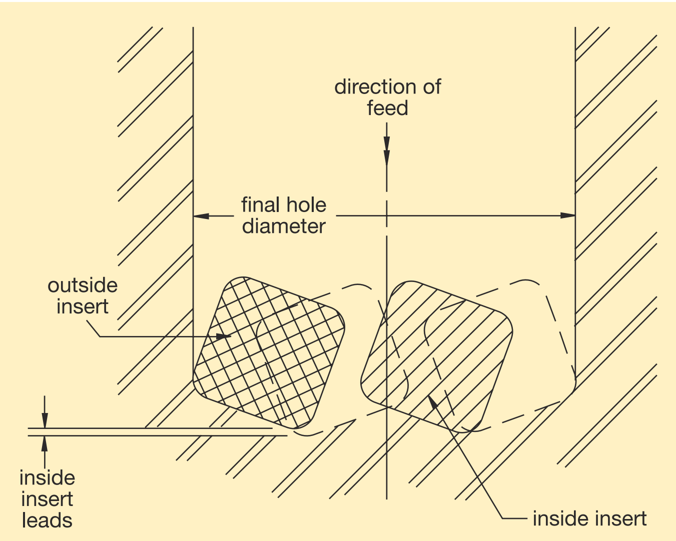
How Kendex/Metcut Drills Work

This indexable insert drill has a complex design that appears simple at first glance. There are two inserts on most drills; larger sizes have four. The inside insert cuts the inner portion of the hole, and the outside insert removes the outer portion, and is responsible for the final diameter. The inside insert will cut a path that amounts to about 30% of the total area while the outside insert removes about 70%. On the Metcut drill, the inside insert leads the cutting edge of the outside insert to cut a clearance path for the lead corner of the outside insert.

Metcut Drill

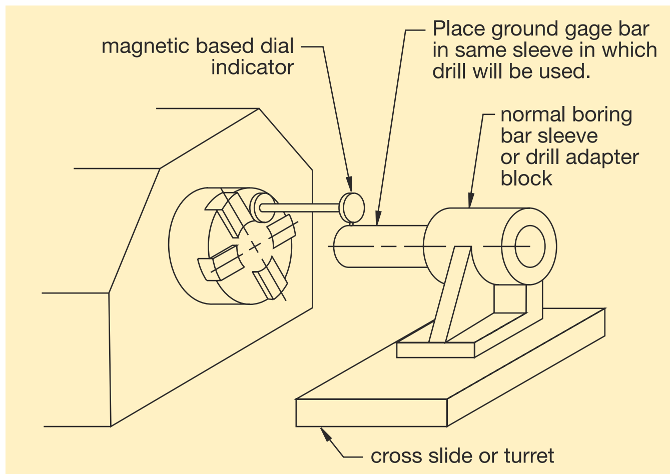


Drill Alignment

The drill must be aligned accurately in the machine. The best way to check alignment is to put a ground bar into the toolholder. Make sure the ground bar does not have runout. Mount a magnetic base dial indicator on the spindle and take four readings on the bar to determine if you are above, below, left, or right of center. You should also check angularity. On non-rotating applications, alignment must be within ±.005 and the angularity must be within ±.005 over a six-inch length. If the drill is rotating, put the dial indicator on the table and rotate the spindle. The drills have a ground area on the flute diameter near the end of the drill so that you can also indicate alignment. For rotating applications, runout should not exceed ±.005 tir.

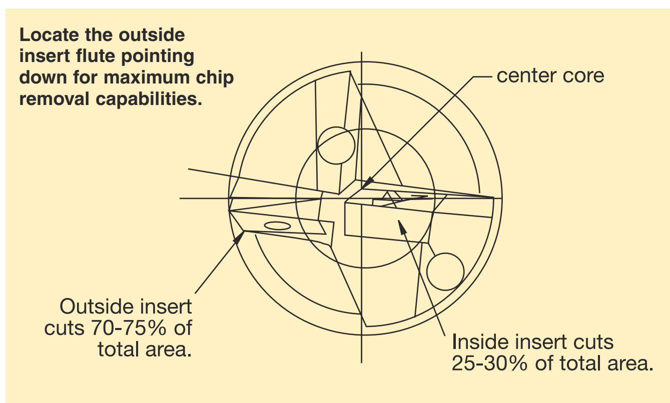
checking alignment

1. Take four readings by rotating the chuck.
2. Adjust cross slide or offsets (shimming of the tool block may be required).
3. Take four more readings to check results.
4. Replace ground bar with drill and make final check on the actual drill.



chip disposal

To facilitate chip disposal, locate the outside insert flute pointing down (below). This is not essential, but it gives the best chance of getting 70% of the chips out. Chips produced from the top insert only amount to 30% of the chips made.



Troubleshooting Guide for Kendex/Metcut Drills

Drill Misalignment

1. cutting wrong diameter (large or small)

A. If the drill is on center, it will cut the proper diameter.

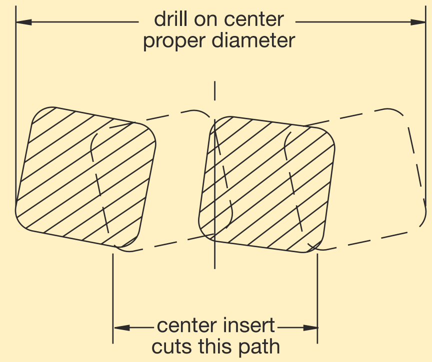
B. If the drill is to the left of center, both inserts will move to the left and the diameter of the hole will increase. The center inserts will cut a smaller path and the gap between the outside and center insert will cause breakage.

C. If the drill is to the right of center, both inserts move to the right and the diameter of the hole will decrease. The center insert will cut a larger path, and the insert overlap could cause breakage. The smaller diameter could also cause rubbing on the steel at the outside diameter.

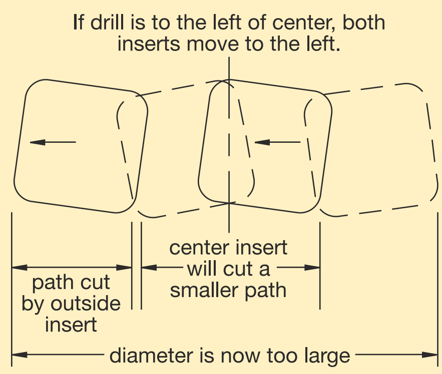
2. rubbing on the steel in the center of the drill

This condition could be caused by the drill being below center. It would cause the normally small .020 diameter core to increase. The larger core will rub in the center of the drill and cause the drill to deflect down and to the left, further increasing pressure on the drill.

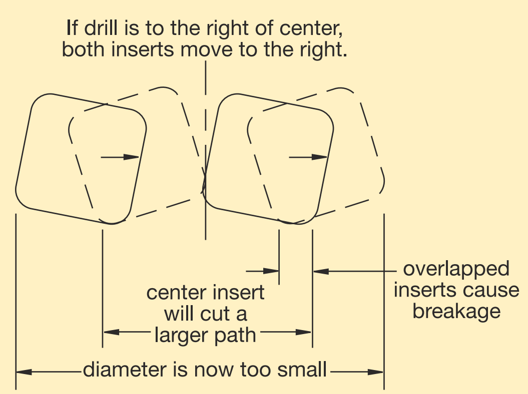
A



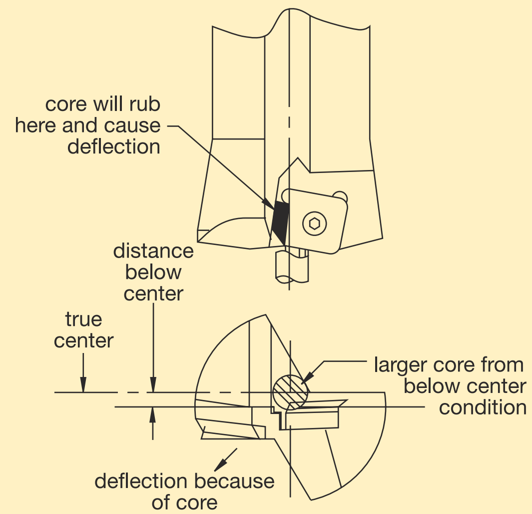
B



C



Below Center Condition



Kendex/Metcut Drills

Troubleshooting Guide for Kendex/Metcut Drills

problem	possible cause	solution
insert chipping or breakage*	off-center drill due to misalignment	Maintain proper alignment. Concentricity should not exceed ±.005 tir.
	improper seating of tool in toolholder, spindle or turret	Check tool shank and socket for nicks and dirt. Check parting line between tool shank and socket with feeler gage. Make sure tool is locked tight.
	deflection due to too much overhang and lack of rigidity	Check with indicator to see if tool can be moved by hand. Check if tool can be held shorter.
	improper seating of inserts in pocket	Clean pockets whenever indexing or changing inserts. Check pockets for nicks and burrs. Make sure inserts rest completely on pocket bottoms.
	damaged insert screws	Check head and thread for nicks and burrs. Do not over torque screws.
	improper speeds and feeds	Check recommended guidelines for given material.
	insufficient coolant supply	Check coolant flow.
	improper carbide grade used on inboard station	Use straight (unalloyed) grade for multiple insert drills.
• grooving on back stroke • drill body rubbing hole wall • oversize or undersize holes	off-center drill	Restore drill to proper alignment and concentricity. Check bottom of hole or disk for center stub.
	deflection	Check setup rigidity. Check speed/feed guidelines.
rough cutting action (tool rumbles and deflects)	too much thrust feed rate too high	Lower feed and/or increase speed.
	recutting chips	Increase coolant flow. Add coolant grooves to tool.
poor hole surface finish	vibrations	Check setup and part rigidity. Check set screw in spindle or toolholder. Check speeds and feeds.
	insufficient coolant pressure and volume	Increase coolant pressure and flow. Check coolant flow for interruptions. Make sure coolant reaches inserts at all times.
	recutting chips causing drill to jump	Increase coolant flow. Add coolant grooves to tool.
	poor chip control chips trapped in hole	Modify speed or feed.
	chatter	Modify feed rate.
very short, thick, flat chips	feed rate too high in relation to cutting speed	Lower feed and/or increase speed.
long, stringy chips	feed rate too low in relation to cutting speed	Increase feed rate and/or decrease speed, or use dimple inserts.
cannot loosen insert locking screws	seized threads due to insufficient coolant or high heat build-up	Apply water and heat-resistant lubricant to threads.

**If constant chipping occurs, especially on the inner insert, and operating conditions are optimum, try an uncoated carbide insert or a grade with higher transverse rupture strength. Contact your Kennametal representative for availability.*

Kendex/Metcut Drills — Application Information

recommended speeds and feeds				approximate torque, hp, and thrust for selected drilling diameters											
material	drilling dia. range	speed (sfm)	feed (ipr)	drilling dia.	rpm	speed (sfm)	feed (ipr)	HB	torque	hp	thrust (lbs.)	HB	torque	hp	thrust (lbs.)
carbon steel	.500-.745	300-800	.002-.003	.625	3057	500	.003	140 to 220	66	3.2	281	220 to 300	74	3.6	313
	.750-1.005		.002-.004	.875	2183				130	4.5	414		145	5.0	460
	1.010-1.193	350-900	.003-.006	1.125	1867	550	.005		358	10.7	831		398	11.8	925
	1.197-1.563		.003-.006	1.375	1528				535	13.0	1047		595	14.4	1164
	1.567-1.943	400-900	.004-.008	1.750	1309	600	.006		1040	21.6	1599		1157	24.0	1778
	1.947-2.505		.005-.010	2.250	1018				1720	27.8	2134		1912	30.9	2374
free-machining steels (1100 & 1200 series)	.500-.745	400-800	.002-.003	.625	3057	500	.003	120 to 180	44	2.1	187	180 to 260	52	2.5	219
	.750-1.005		.003-.004	.875	2183				87	3.0	276		101	3.5	322
	1.010-1.193	400-900	.004-.006	1.125	2376	700	.005		239	9.0	554		279	10.5	648
	1.197-1.563		.004-.006	1.375	1944				357	11.0	698		417	12.9	816
	1.567-1.943	400-900	.005-.007	1.750	1746	800	.006		693	19.2	1066		811	22.5	1246
	1.947-2.505		.005-.007	2.250	1358				1147	24.7	1423		1340	28.9	1663
alloy steels (4000, 5000 & 8000 series)	.500-.745	300-800	.002-.003	.625	3057	500	.003	180 to 260	66	3.2	281	260 to 340	74	3.6	312
	.750-1.005		.003-.004	.875	2183				130	4.5	414		144	5.0	460
	1.010-1.193	350-900	.004-.006	1.125	2037	600	.005		358	11.6	831		398	12.9	924
	1.197-1.563		.004-.006	1.375	1666				535	14.1	1047		595	15.7	1164
	1.567-1.943	400-900	.005-.007	1.750	1746	800	.006		1040	28.8	1599		1156	32.0	1777
	1.947-2.505		.005-.007	2.250	1358				1720	37.1	2135		1911	41.2	2372
tool steel	.500-.745	300-600	.002-.003	.625	2444	400	.003	180 to 260	66	2.6	281	260 to 340	74	2.9	312
	.750-1.005		.003-.004	.875	1746				130	3.6	414		144	4.0	460
	1.010-1.193	300-700	.004-.005	1.125	1697	500	.004		287	7.7	695		318	8.6	773
	1.197-1.563		.004-.005	1.375	1389				428	9.4	876		476	10.5	973
	1.567-1.943	300-700	.005-.010	1.750	1309	600	.007		1214	25.2	1809		1349	28.0	2010
	1.947-2.505		.006-.010	2.250	1018				2006	32.4	2415		2229	36.0	2683
stainless steel (300 & 400 series)	.500-.745	150-300	.002-.003	.625	1222	200	.003	150 to 200	55	1.1	234	200 to 300	66	1.3	281
	.750-1.005		.003-.004	.875	873				108	1.5	345		130	1.8	414
	1.010-1.193	150-400	.004-.007	1.125	1018	300	.005		299	4.8	693		358	5.8	831
	1.197-1.563		.004-.007	1.375	833				446	5.9	873		535	7.1	1047
	1.567-1.943	150-400	.005-.008	1.750	873	400	.006		867	12.0	1332		1040	14.4	1599
	1.947-2.505		.005-.008	2.250	679				1433	15.4	1779		1720	18.5	2135
cast iron	.500-.745	400-800	.002-.003	.625	3057	500	.003	180 to 250	52	2.5	219				
	.750-1.005		.003-.004	.875	2183				101	3.5	322				
	1.010-1.193	400-900	.005-.010	1.125	2376	700	.006		334	12.6	748				
	1.197-1.563		.005-.010	1.375	1944				500	15.4	942				
	1.567-1.943	400-900	.008-.012	1.750	1746	800	.009		1214	33.6	1720				
	1.947-2.505		.008-.015	2.250	1358				2006	43.2	2296				
Inconel	.500-.745	75-110	.002-.003	.625	488	80	.003	140 to 300	81	.6	343				
	.750-1.005		.003-.004	.875	349				159	.9	506				
	1.010-1.193		.004-.006	1.125	305	90	.005		438	2.1	1016				
	1.197-1.563		.004-.006	1.375	250				654	2.6	1280				
	1.567-1.943		.004-.007	1.750	218	100	.006		1272	4.4	1954				
	1.947-2.505		.004-.007	2.250	170				2102	5.7	2609				

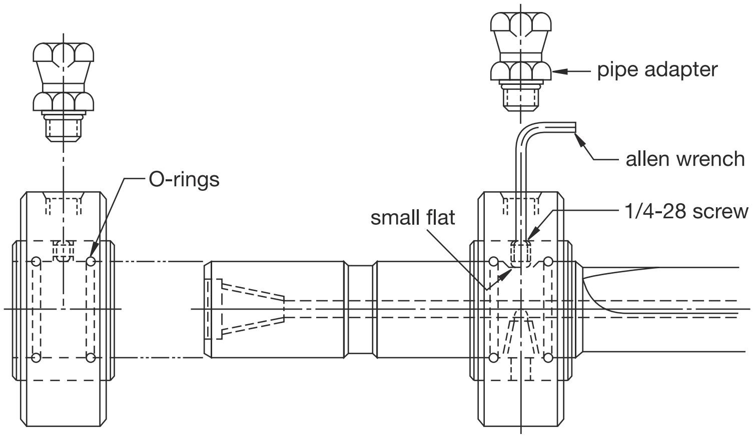
NOTE: Horsepower figured on positive rake drills; negative rake drills require approximately 10% more horsepower.

Coolant

Through-the-tool coolant flow helps to remove chips and heat from the cutting area. Use of coolant also increases insert life. For all vertical applications, through-the-tool coolant must be used.

In horizontal applications, through-the-tool coolant is strongly recommended for all applications. However, if the depth of the hole is equal to or less than the drill diameter, flood coolant may be adequate.

290-series coolant gland – installation



1. Remove pipe adapter.
2. Grease O-rings.
3. Line up 1/4-28 set screw (located inside gland) with small flat on tool shank.
4. Slip coolant gland over shank, up to small flat. Locate screw over flat and screw it down securely.
5. Replace pipe adapter.

Kendex/Metcut Drill