Workpiece Material – Group 1

Low-Carbon Steels (<0.25% C) (<220 HB)

AISI: 1008, 1010, 1018, 1020, 1026, 10L18, 10L45, 10L50, 1108, 1117, 11L44, 11L44, 1200 series, 12L14, A36, 516, grade 70

Material Characteristics:

Low-carbon steels are selected for their low cost and ease of machinability. When carbon content is below 0.15%, it becomes difficult to machine to a fine finish quality. Low-carbon steels exhibit the following characteristics:

- Soft and gummy.
- Difficult to obtain good chip control.
- Torn finishes are common.
- Burrs and sharp edges are common.
- High-speed machining is possible.

Solid Carbide Application Guide:

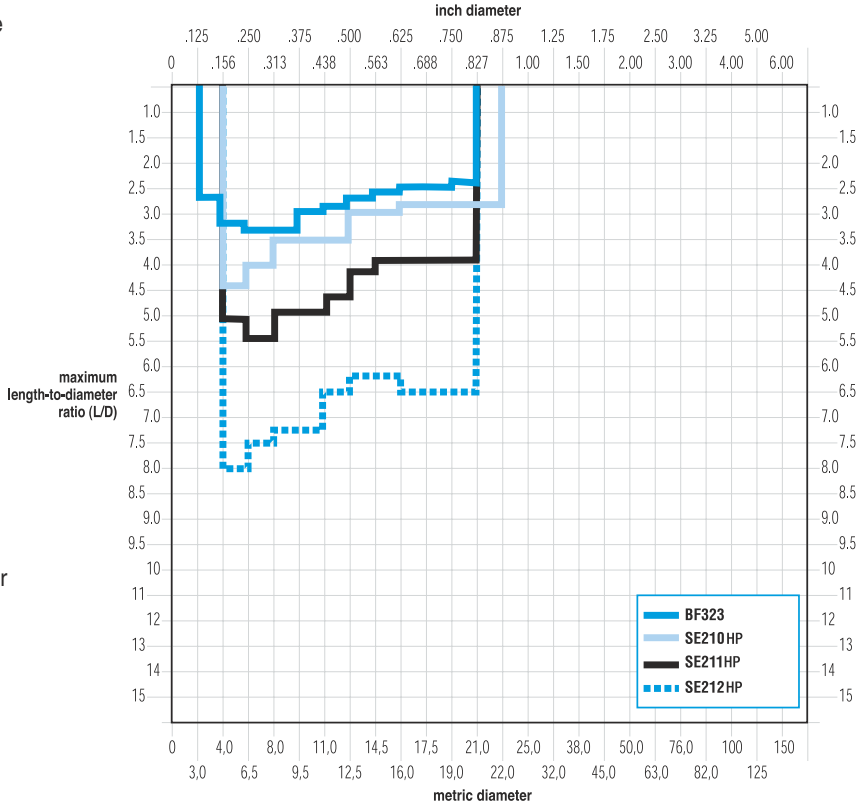
- Use starting feed rates and move up as conditions allow.
- Increasing feed rates will help reduce built-up edge.

Indexable and Modular Application Guide:

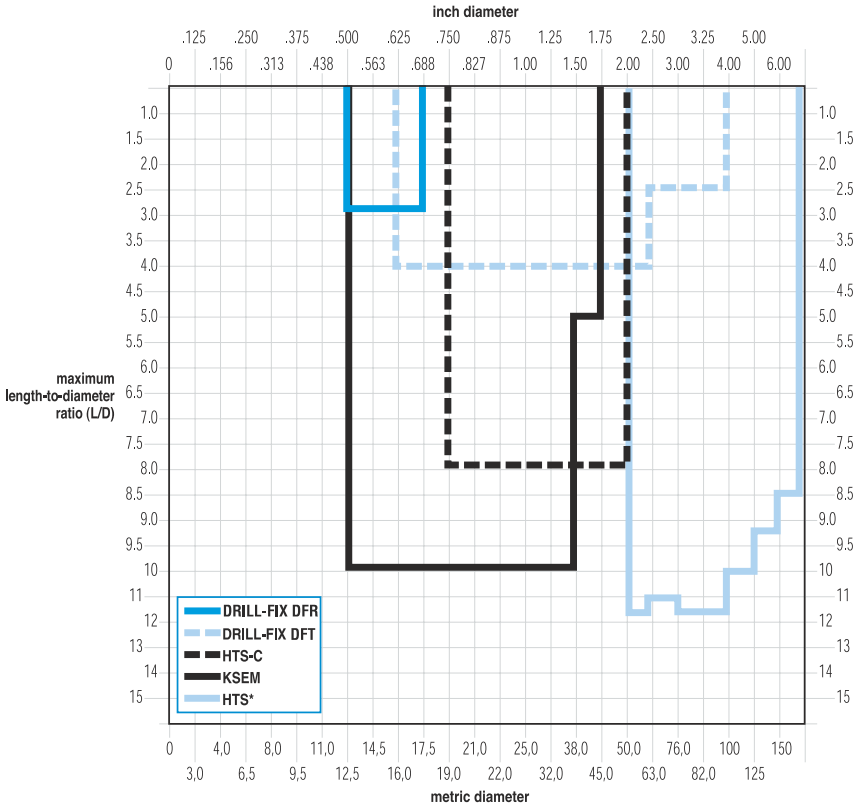
- When applying DRILL-FIX drills, higher speeds and lower feeds are generally necessary for the insert chipbreaker to be effective.
- For KSEM drills, at 5x diameter and greater L/D ratio, spot drilling should be used. See page H128.
- For HTS-C 8x diameter or long HTS drills, you must provide spot for pilot drill.
- Use HSS pilot drill to prevent chipping in the HTS-C bodies because sfm is generally too slow for carbide.
- For HTS-C metric bodies **only**, consider our SPHX-20 geometry in the outer pocket.
- When using 4x diameter and longer indexable drills, apply at 75% of the recommended speed.
- In unstable machining conditions, or for situations where the recommended speed cannot be attained when applying indexable drills, consider using grade KC720 inserts in the outer pocket.

NOTE: For optimum performance, do not peck drill with solid carbide or indexable drill products.

Solid Carbide



Indexable/Modular



NOTES: L/D ratios and diameters are approximate; see product catalog pages for specific information. Inch to metric conversions are approximate. Inch and metric products are not available as a standard in all drill styles.
**L/D ratio for HTS drills is based upon two joints, longest basic inch shank and longest extension. An HTS drill diameter above 6.70" requires special mounting.*

Workpiece Material – Group 1

drill style	application	geometry	grade	sfm	starting recommendation for feed (ipr) by drill diameter															
					.125	.156	.187	.250	.375	.500	.625	.750	.875	1.00	1.25	1.50	1.75	2.00	3.00	4.00	≥6.00
					3,0	4,0	5,0	6,5	9,5	12,5	16,0	19,0	21,0	25,0	32,0	38,0	44,5	50,0	76,0	100	≥150
Dynapoint	short and regular depth with coolant	SE210HP SE211HP	KC7515	400 **700** 800	.003 **.004** .005	.004 **.005** .006	.004 **.006** .007	.005 **.007** .010	.007 **.009** .012	.010 **.012** .016	.011 **.016** .019	.015 **.018** .020	.017 **.019** .021	.018 **.020** .024							
	long depth with coolant	SE212HP	KC7515	400 **700** 800		.003 **.004** .005	.005 **.006** .007	.005 **.007** .009	.007 **.009** .012	.008 **.012** .015	.011 **.016** .018	.015 **.018** .020	.017 **.019** .021	.018 **.020** .023							
	BF drill	BF323	CS5	280 **300** 350	.003 **.004** .005	.004 **.005** .007	.005 **.006** .009	.006 **.007** .011	.008 **.010** .014	.010 **.012** .019	.012 **.016** .020	.015 **.018** .020									
†CTR	counterbore	-20	KC7140	180 **280** 375								.0010 **.0020** .0035	.0010 **.0020** .0035	.0010 **.0020** .0035	.0020 **.0030** .0035	.0020 **.0030** .0035	.0020 **.0030** .0035				
Ken-Tip	small diameter modular	HP	KC7315	240 **300** 450					.008 **.010** .014	.009 **.013** .016	.010 **.014** .018										
KSEM	larger diameter modular	HP	KC7235	250 **320** 425						.0070 **.0110** .0150	.0080 **.0120** .0150	.0080 **.0130** .0160	.0080 **.0140** .0160	.0080 **.0140** .0160	.0090 **.0150** .0180	.0090 **.0150** .0180					
DRILL-FIX DFR	smaller diameter indexable	inner pocket LD / outer pocket LD	KC7025	700 **900** 1100						.0025 **.0030** .0040	.0025 **.0030** .0040	.0030 **.0040** .0050	.0040 **.0050** .0070	.0040 **.0050** .0070							
DRILL-FIX DFT	larger diameter indexable	inner pocket LD / outer pocket LD	KC720 / KC7140	500 **900** 1100							.0020 **.0030** .0040	.0020 **.0030** .0040	.0020 **.0030** .0040								
		inner pocket LD / outer pocket MD	KC720 / KC7140	500 **850** 1100										.0025 **.0040** .0055	.0025 **.0040** .0055						
		inner pocket LD / outer pocket MD	KC720 / KC7140	500 **675** 1100												.0030 **.0050** .0070	.0040 **.0075** .0100	.0050 **.0090** .0120	.0050 **.0090** .0120		
HTS-C	larger diameter deep hole	inner pocket HP / outer pocket HP	KC7140 / KC7140	350 **620** 800								.0015 **.0020** .0040	.0015 **.0020** .0040	.0015 **.0020** .0040	.0020 **.0040** .0065	.0020 **.0040** .0065	.0020 **.0040** .0065				
HTS	very large and deep hole	inner pockets HP** / outer pockets HP	KC7140 / KC7140	250 **450** 600													.0020 **.0040** .0060	.0020 **.0040** .0080	.0030 **.0050** .0070	.0035 **.0070** .0090	.0050 **.0090** .0110

• These are starting condition guidelines only. The machine tool, fixturing, toolholding, part configuration, and coolant capability may significantly influence specific applications.
• Use proper and safe machining practices.
• Inch and metric diameters are not standard in all drill styles. See specific catalog pages.
• Typically, large-diameter indexable drills require lower sfm than the recommended starting speed.
• Decrease sfm as material hardness increases.
• Decrease sfm and ipr (feed) as tool length-to-diameter ratio increases, especially on KSEM and HTS drills.
• To convert from ipr to mm/rev., multiply value by 25.4. To convert sfm to m/min., divide value by 3.27.
• Calculate sfm from largest diameter of drill.
† CTR – Counterboring feed rate is given in cpt (chip load per tooth). A chipbreaking program routine may be necessary.
*** Inner pockets on HTS drills are those closest to the pilot drill. For an illustration, see page H608.*

Workpiece Material – Group 1

Free-Machining Steels (<275 HB) (≤ 28 HRC)

AISI: 1109, 1111, 1112, 1113, 1114, 1115, 1116, 1132, 1137, 1138, 1140, 1141, 1144, 1145, 1151

Material Characteristics:

This group of steels is characterized by a higher sulfur content than comparable carbon steels. They are considered the best machining steels available. Machinability generally improves as sulfur content increases. Free-machining steels exhibit the following material characteristics:

- Recommendations are based on a hardness of 20 HRC.
- Easy to machine.
- Chip control can be difficult.

Solid Carbide Application Guide:

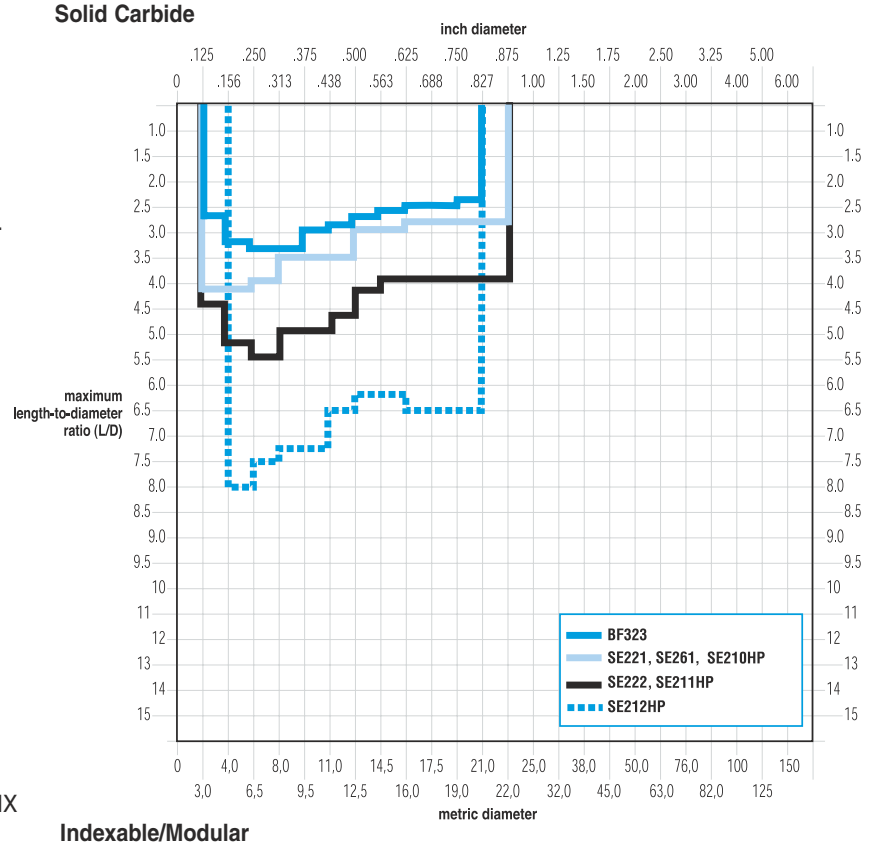
- Harder materials require lower speed.
- Maintain recommended feed and adjust speed for material hardness.

Indexable and Modular Application Guide:

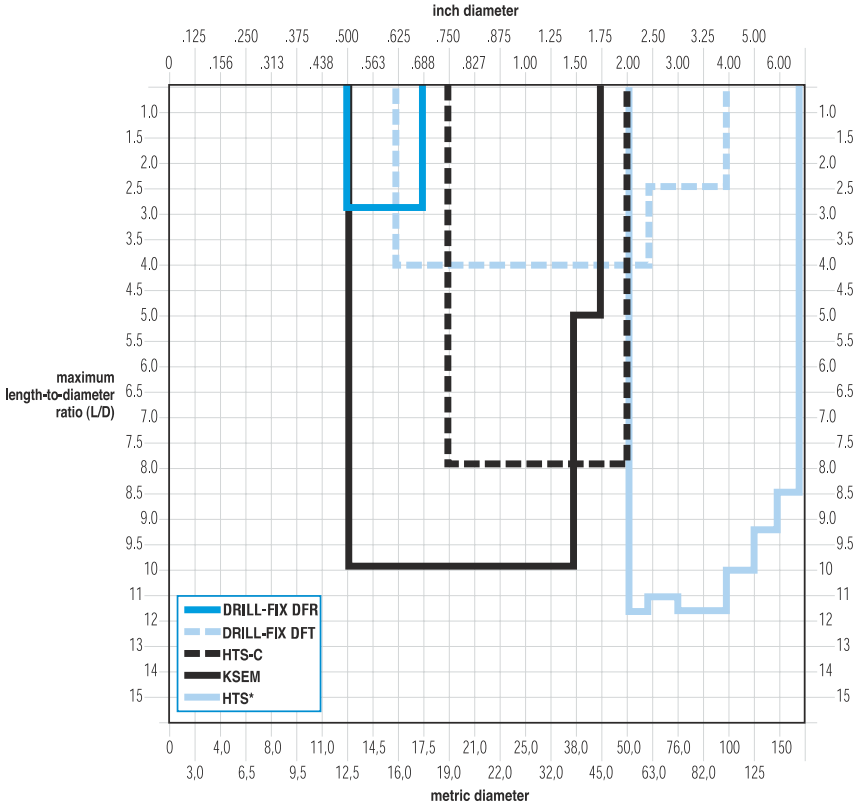
- Applying different geometries in the HTS head can optimize chip control (example: -MD toward pilot drill and -GD in outer pockets).
- For KSEM drills, at 5x diameter and greater L/D ratio, spot drilling should be used. See page H128.
- For HTS-C 8x diameter or long HTS drills, you must provide spot for pilot drill.
- Chipping of the inside insert on small diameter DRILL-FIX drills can be eliminated by using grade KC7845.
- Use HSS pilot drill to prevent chipping in the HTS-C bodies because sfm is generally too slow for carbide.
- For HTS-C metric bodies **only**, consider our SPHX-20 geometry in the outer pocket.
- Stack drilling can be accomplished with KSEM drills if the parts are well fixtured and tightly clamped together.
- Do not stack drill with indexable drills unless they are specifically designed for that purpose.
- When using 4x diameter and longer indexable drills, apply at 75% of the recommended speed.
- With KSEM drills, consider using grade KC7030 for deep-hole applications greater than 7x diameter.
- In unstable machining conditions or situations where recommended speed cannot be attained when applying indexable drills, consider using grade KC720 in both pockets.

NOTE: For optimum performance, do not peck drill with solid carbide or indexable drill products.

Solid Carbide



Indexable/Modular



*NOTES: L/D ratios and diameters are approximate; see product catalog pages for specific information. Inch to metric conversions are approximate. Inch and metric products are not available as a standard in all drill styles. *L/D ratio for HTS drills is based upon two joints, longest basic inch shank and longest extension. An HTS drill diameter above 6.70" requires special mounting.*

Workpiece Material – Group 1

drill style	application	geometry	grade	sfm	starting recommendation for feed (ipr) by drill diameter															
					.125	.156	.187	.250	.375	.500	.625	.750	.875	1.00	1.25	1.50	1.75	2.00	3.00	4.00	≥6.00
					3,0	4,0	5,0	6,5	9,5	12,5	16,0	19,0	21,0	25,0	32,0	38,0	44,5	50,0	76,0	100	≥150
Dynapoint	short depth without coolant	SE221	CS5	240 **255** 280	.003 **.004** .005	.004 **.005** .007	.005 **.006** .008	.006 **.008** .011	.008 **.011** .014	.010 **.013** .019	.012 **.016** .020	.012 **.018** .020	.014 **.019** .020								
	regular depth without coolant	SE222	KC7215	250 **275** 290	.003 **.004** .005	.004 **.005** .007	.005 **.006** .008	.006 **.008** .011	.008 **.011** .014	.010 **.013** .019	.012 **.016** .020	.012 **.018** .020	.014 **.019** .021								
	short and regular depth with coolant	SE210HP SE211HP	KC7515	300 **600** 700	.003 **.004** .005	.004 **.005** .006	.004 **.006** .007	.005 **.007** .010	.007 **.009** .012	.010 **.012** .016	.011 **.016** .019	.015 **.018** .020	.017 **.019** .021	.018 **.020** .024							
	long depth with coolant	SE212HP	KC7515	300 **600** 700		.003 **.004** .005	.005 **.006** .007	.005 **.007** .009	.007 **.009** .012	.008 **.012** .015	.011 **.016** .018	.015 **.018** .020	.017 **.019** .021	.017 **.019** .021							
	long depth with coolant	SE256	KC7015	225 **275** 350		.002 **.004** .005	.003 **.005** .007	.004 **.006** .009	.005 **.008** .011	.007 **.010** .015	.007 **.012** .019	.009 **.014** .019									
	dry drilling	SE261	KC7040	220 **240** 260			.003 **.004** .007	.004 **.005** .009	.005 **.008** .011	.008 **.009** .013	.011 **.013** .020	.016 **.019** .021	.018 **.020** .024								
	BF drill	BF323	CS5	220 **240** 280	.003 **.004** .005	.004 **.005** .007	.005 **.006** .008	.006 **.007** .010	.007 **.009** .013	.010 **.012** .016	.012 **.016** .019	.015 **.018** .020									
†CTR	counterbore	-20	KC7140	200 **245** 350								.0010 **.0020** .0035	.0010 **.0020** .0035	.0010 **.0020** .0035	.0020 **.0030** .0035	.0020 **.0030** .0035	.0020 **.0030** .0035				
Ken-Tip	small diameter modular	HP	KC7315	200 **240** 325					.007 **.009** .012	.008 **.013** .015	.009 **.013** .018										
KSEM	larger diameter modular	HP	KC7235	220 **290** 325						.0030 **.0100** .0120	.0070 **.0110** .0150	.0080 **.0120** .0150	.0080 **.0140** .0160	.0080 **.0140** .0160	.0080 **.0140** .0160	.0090 **.0160** .0180					
DRILL-FIX DFR	smaller diameter indexable	inner pocket GD	KC7020	650 **850** 1000						.0020 **.0030** .0035	.0020 **.0030** .0035	.0025 **.0030** .0050	.0040 **.0050** .0070	.0040 **.0050** .0070							
		outer pocket GD	KC7020																		
DRILL-FIX DFT	larger diameter indexable	inner pocket MD	KC7845	450 **830** 1000							.0020 **.0030** .0040	.0020 **.0030** .0040	.0020 **.0030** .0040								
		outer pocket MD	KC7935																		
		inner pocket MD	KC7140	450 **525** 1000										.0025 **.0040** .0055	.0025 **.0040** .0055						
		outer pocket MD	KC7935																		
		inner pocket MD	KC7140	450 **475** 1000												.0030 **.0055** .0070	.0030 **.0055** .0070	.0040 **.0075** .0100	.0040 **.0075** .0100		
		outer pocket MD	KC7935																		
HTS-C	larger diameter deep hole	inner pocket MD	KC720	200 **325** 450								.0015 **.0020** .0040	.0015 **.0020** .0040	.0015 **.0020** .0040	.0020 **.0030** .0050	.0020 **.0040** .0065	.0020 **.0040** .0065				
		outer pocket MD	KC720																		
HTS	very large and deep hole	inner pockets MD**	KC720	175 **300** 450													.0015 **.0020** .0040	.0015 **.0030** .0050	.0020 **.0050** .0070	.0030 **.0060** .0080	.0040 **.0070** .0090
		outer pockets MD	KC7935																		

- *These are starting condition guidelines only. The machine tool, fixturing, toolholding, part configuration, and coolant capability may significantly influence specific applications.*
- *Use proper and safe machining practices.*
- *Inch and metric diameters are not standard in all drill styles. See specific catalog pages.*
- *Typically, large-diameter indexable drills require lower sfm than the recommended starting speed.*
- *Decrease sfm as material hardness increases.*
- *Decrease sfm and ipr (feed) as tool length-to-diameter ratio increases, especially on KSEM and HTS drills.*
- *To convert from ipr to mm/rev., multiply value by 25.4. To convert sfm to m/min., divide value by 3.27.*
- *Calculate sfm from largest diameter of drill.*

† CTR – Counterboring feed rate is given in cpt (chip load per tooth). A chipbreaking program routine may be necessary.

*** Inner pockets on HTS drills are those closest to the pilot drill. For an illustration, see page H608.*

Workpiece Material – Group 1

Medium and High Plain-Carbon, Alloy, and Tool Steels (≥ 0.25% C) (≤ 330 HB) (≤ 35 HRC)

Medium and High Carbon Steels: AISI: 1035, 1040, 1045, 1055, 1080, 1090, 1095, 1525, 1541, 1548, 1551, 1561, 1572

Alloy Steels: AISI: 1300 series, 2000 series, 3000 series, 4012, 4023, 4140, 4150, 4320, 4422, 5120, E51100, E52100, 6118, 6150, 7000 series, 8620, 8622, 8640, 8822, E-9310, 94B15, Rycut 40, Cr-Mo alloy and Super-Kut steels

Tool Steels: high-speed - classes M and T; hot and cold work SAE classes A, D, H, O and S; wrought high carbon/low alloy W1, W2, L2, P1, P6, P20

Material Characteristics:

As a group, the medium and high carbon steels, alloy, and tool steels exhibit excellent machinability in drilling operations. The carbon, chrome, and nickel content will affect cutting conditions as follows:

- The higher the chrome, nickel, and moly content, the greater the tendency to workharden.
- The higher the nickel content, the more difficult it is to control the chip.
- The higher the carbon and alloy content, the more difficult it generally is to machine.
- The higher the carbon content, the more abrasive it is, the easier it is to achieve surface finish, and the lower the speeds.

Solid Carbide Application Guide:

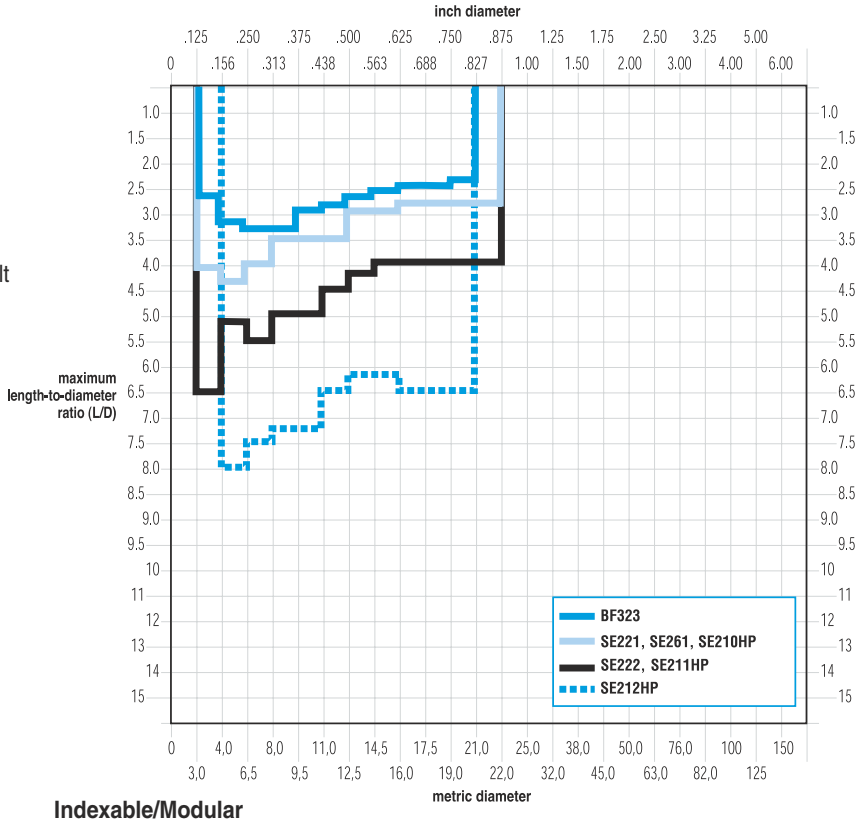
- Use our recommendations as a starting point, and then move up in speed for optimum productivity.

Indexable and Modular Application Guide:

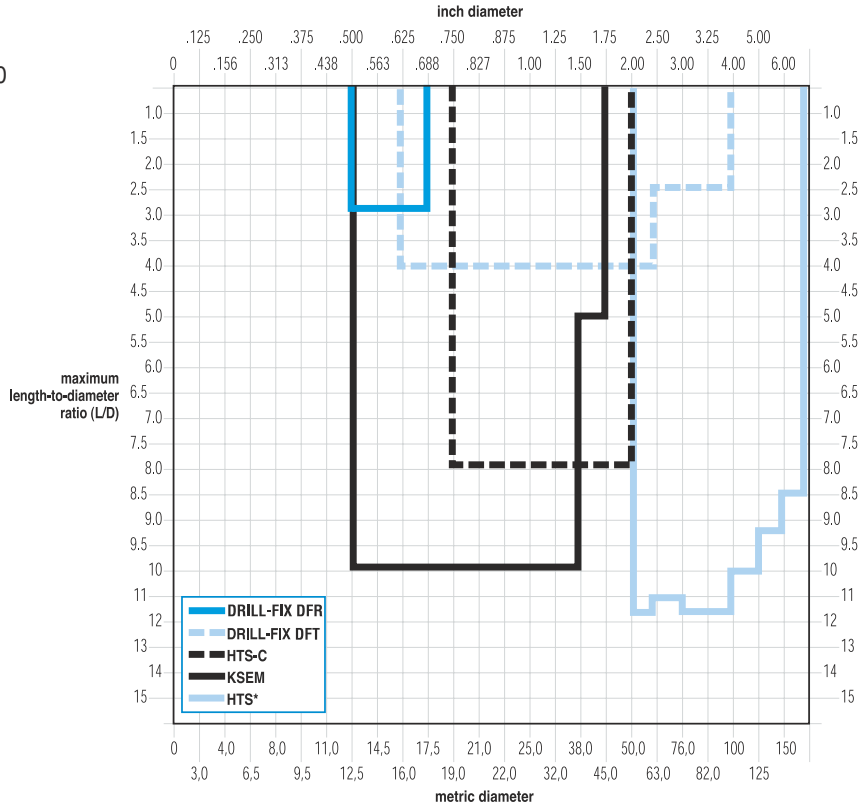
- Consider our -GD geometry in the outside pocket of DRILL-FIX drills, if edge breakdown exists.
- For KSEM drills, at 5x diameter and greater L/D ratio, spot drilling should be used. See page H128.
- For HTS-C 8x diameter or long HTS drills, you must provide spot for pilot drill.
- For counterbore tools, a chipbreaking program routine may be necessary.
- If operating conditions do not permit using grade KC7140 in the outside pocket of a DRILL-FIX drill, use grade KC720 with a 20% sfm reduction.
- When using 4x diameter and longer indexable drills, apply at 75% of the recommended speed.
- Use HSS pilot drill to prevent chipping in the HTS-C bodies because sfm is generally too slow for carbide.
- For HTS-C metric bodies **only**, consider our SPHX-20 geometry in the outer pocket.
- With KSEM drills, consider using grade KC7030 for deep-hole applications greater than 7x diameter.
- When drilling 8620 or other long-chipping material with KSEM drills, consider using our -MD geometry in grade KC7030.
- In unstable machining conditions, or for situations where the recommended speed cannot be attained when applying indexable drills, consider using grade KC720 in both pockets.

NOTE: For optimum performance, do not peck drill with solid carbide or indexable drill products.

Solid Carbide



Indexable/Modular



*NOTES: L/D ratios and diameters are approximate; see product catalog pages for specific information. Inch to metric conversions are approximate. Inch and metric products are not available as a standard in all drill styles. *L/D ratio for HTS drills is based upon two joints, longest basic inch shank and longest extension. An HTS drill diameter above 6.70" requires special mounting.*

Workpiece Material – Group 1

drill style	application	geometry	grade	sfm	starting recommendation for feed (ipr) by drill diameter															
					.125	.156	.187	.250	.375	.500	.625	.750	.875	1.00	1.25	1.50	1.75	2.00	3.00	4.00	≥6.00
					3,0	4,0	5,0	6,5	9,5	12,5	16,0	19,0	21,0	25,0	32,0	38,0	44,5	50,0	76,0	100	≥150
Dynapoint	short depth without coolant	SE221	CS5	200	.003	.004	.005	.006	.008	.010	.012	.012	.014								
				230	**.004**	**.005**	**.006**	**.008**	**.011**	**.013**	**.016**	**.018**	**.019**								
				260	.005	.007	.008	.011	.014	.019	.020	.020	.021								
	regular depth without coolant	SE222	KC7215	210	.003	.004	.005	.006	.008	.010	.012	.012	.014								
				250	**.004**	**.005**	**.006**	**.008**	**.011**	**.013**	**.016**	**.018**	**.019**								
				275	.005	.007	.008	.011	.014	.019	.020	.020	.021								
	short and regular depth with coolant	SE210HP SE211HP	KC7515	300	.003	.004	.004	.005	.007	.010	.011	.015	.017	.018							
				500	**.004**	**.005**	**.006**	**.007**	**.009**	**.012**	**.016**	**.018**	**.019**	**.020**							
				700	.005	.006	.007	.010	.012	.016	.019	.020	.021	.024							
	long depth with coolant	SE212HP	KC7515	300		.003	.005	.005	.007	.008	.011	.015	.017	.017							
				500		**.004**	**.006**	**.007**	**.009**	**.012**	**.016**	**.018**	**.019**	**.019**							
				700		.005	.007	.009	.012	.015	.018	.020	.021	.021							
	long depth with coolant	SE256	KC7015	200		.002	.003	.003	.005	.005	.007	.008									
				250		**.004**	**.005**	**.005**	**.007**	**.008**	**.010**	**.012**									
				300		.005	.006	.007	.009	.011	.013	.016									
	dry drilling	SE261	KC7040	220			.003	.004	.005	.008	.011	.016	.018								
				240			**.004**	**.005**	**.008**	**.009**	**.013**	**.019**	**.020**								
				260			.008	.010	.012	.014	.021	.022	.025								
	BF drill	BF323	CS5	220	.003	.004	.005	.006	.007	.010	.012	.012									
				240	**.004**	**.005**	**.006**	**.007**	**.002**	**.012**	**.016**	**.018**									
				240	.005	.007	.008	.011	.013	.016	.019	.020									
†CTR	counterbore	-20	KC7140	200								.0010	.0010	.0010	.0020	.0020	.0020				
				245								**.0020**	**.0020**	**.0020**	**.0030**	**.0030**	**.0030**				
				325								.0035	.0035	.0035	.0035	.0035	.0035				
Ken-Tip	small diameter modular	HP	KC7315	220					.007	.008	.009										
				265					**.008**	**.012**	**.013**										
				300					.010	.014	.016										
KSEM	larger diameter modular	HP	KC7315	160						.0050	.0060	.0070	.0080	.0090	.0110	.0130					
				230						**.0080**	**.0100**	**.0110**	**.0130**	**.0140**	**.0160**	**.0170**					
				290						.0120	.0130	.0140	.0150	.0180	.0200	.0240					
DRILL-FIX DFR	smaller diameter indexable	inner pocket GD	KC7020	520						.0025	.0025	.0030	.0040	.0040							
				750						**.0030**	**.0030**	**.0030**	**.0050**	**.0050**							
		outer pocket GD	KC7020	900						.0040	.0040	.0040	.0070	.0070							
DRILL-FIX DFT	larger diameter indexable	inner pocket MD	KC7845	400							.0020	.0020	.0020								
				600							**.0030**	**.0030**	**.0030**								
		outer pocket MD	KC7935	800							.0040	.0040	.0040								
		inner pocket MD	KC7140	400										.0025	.0025						
				500										**.0040**	**.0040**						
		outer pocket MD	KC7935	800										.0055	.0055						
		inner pocket MD	KC7140	400												.0030	.0030	.0040	.0040		
				450												**.0055**	**.0055**	**.0075**	**.0075**		
		outer pocket MD	KC7935	800												.0070	.0070	.0100	.0100		
HTS-C	larger diameter deep hole	inner pocket MD	KC7935	200								.0015	.0015	.0015	.0020	.0020	.0020				
				265								**.0020**	**.0020**	**.0020**	**.0030**	**.0040**	**.0040**				
		outer pocket MD	KC7140	350								.0040	.0040	.0040	.0050	.0065	.0065				
HTS	very large and deep hole	inner pockets MD**	KC720	125													.0015	.0020	.0030	.0030	.0040
				245													**.0020**	**.0030**	**.0060**	**.0060**	**.0070**
		outer pockets MD	KC7935	400													.0040	.0050	.0080	.0080	.0090

- *These are starting condition guidelines only. The machine tool, fixturing, toolholding, part configuration, and coolant capability may significantly influence specific applications.*
- *Use proper and safe machining practices.*
- *Inch and metric diameters are not standard in all drill styles. See specific catalog pages.*
- *Typically, large-diameter indexable drills require lower sfm than the recommended starting speed.*
- *Decrease sfm as material hardness increases.*
- *Decrease sfm and ipr (feed) as tool length-to-diameter ratio increases, especially on KSEM and HTS drills.*
- *To convert from ipr to mm/rev., multiply value by 25.4. To convert sfm to m/min., divide value by 3.27.*
- *Calculate sfm from largest diameter of drill.*

† CTR – Counterboring feed rate is given in cpt (chip load per tooth). A chipbreaking program routine may be necessary.

*** Inner pockets on HTS drills are those closest to the pilot drill. For an illustration, see page H608.*

Workpiece Material – Group 1

Medium and High Plain-Carbon, Alloy, and Tool Steels (≥ 0.25% C) (340-450 HB) (36-48 HRC)

Alloy Steels: AISI: 1335, 4140, 4330, 5046, 5140, 52100, 8625, 8640, 300-M, EDT-180, Hy Tuff steel and stress-proof steel
Tool Steels: SAE class M and T, hot and cold work SAE classes A, D, H, O and S: wrought high carbon/low alloy W1, W2, L2, P1, P6, P20

Material Characteristics:

This is a group of harder steels and is more difficult to machine. The steel's toughness makes chipbreaking difficult. Other characteristics are:

- Recommendations are based on a hardness of 40 HRC.
- Alloyed (chromium, tungsten, molybdenum, vanadium, nickel)
  - Abrasive metal carbides may form, causing poor finish and low tool life.
- Alloyed (chromium, nickel)
  - Workhardened part surface can cause chipping or notching of the cutting edge.
- Very low alloy content
  - It can cause built-up edge due to the gumminess of the steel.

Solid Carbide Application Guide:

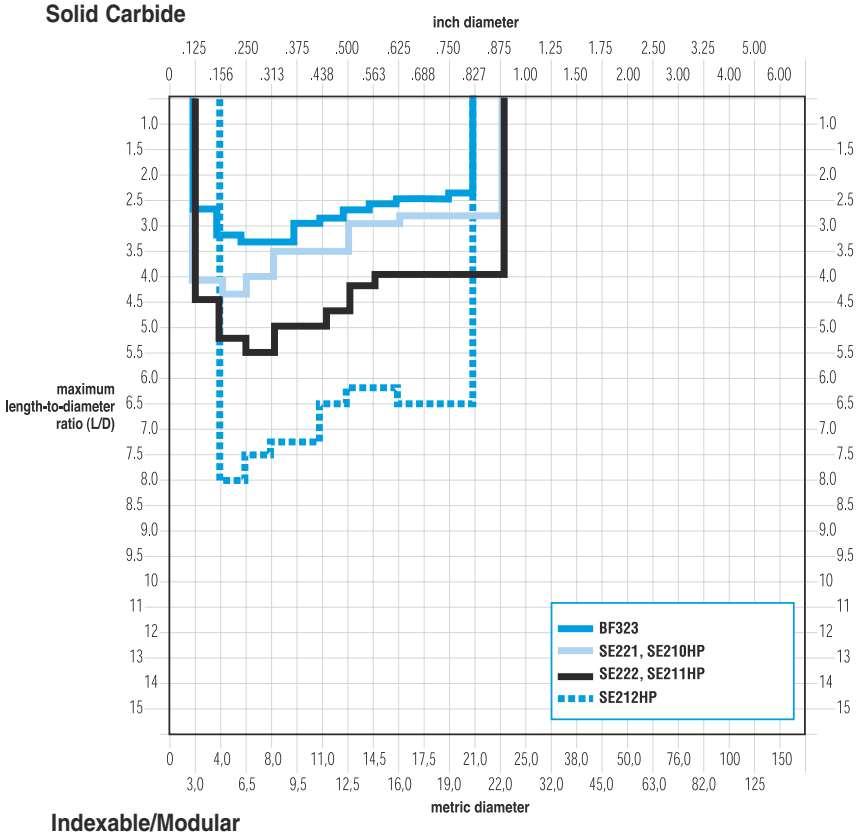
- High-tensile-strength materials require proper coolant concentration to dissipate heat and reduce abrasion to the cutting edge.
- Always back-stop the drill.

Indexable and Modular Application Guide:

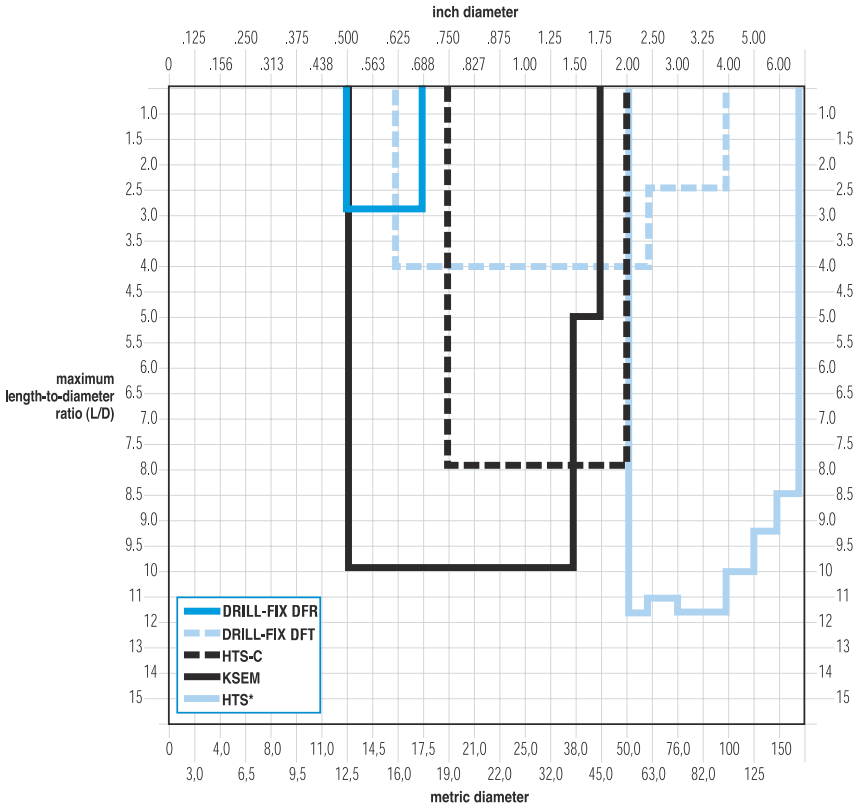
- For this material group, thrust requirements will increase.
- For KSEM drills, at 5x diameter and greater L/D ratio, spot drilling should be used. See page H128.
- For HTS-C 8x diameter or long HTS drills, you must provide spot for pilot drill.
- To avoid exceeding the limits of the axis drive motors, care should be taken when applying large diameter drills.
- When using 4x diameter and longer indexable drills, apply at 75% of the recommended speed.
- Use HSS pilot drill to prevent chipping in the HTS-C bodies because sfm is generally too slow for carbide.
- For HTS-C metric bodies **only**, consider our SPHX-20 geometry in the outer pocket.
- In unstable machining conditions, or for situations where the recommended speed cannot be attained when applying indexable drills, consider using grade KC720 in the outer pocket.

NOTE: For optimum performance, do not peck drill with solid carbide or indexable drill products.

Solid Carbide



Indexable/Modular



*NOTES: L/D ratios and diameters are approximate; see product catalog pages for specific information. Inch to metric conversions are approximate. Inch and metric products are not available as a standard in all drill styles. *L/D ratio for HTS drills is based upon two joints, longest basic inch shank and longest extension. An HTS drill diameter above 6.70" requires special mounting.*

drill style	application	geometry	grade	sfm	starting recommendation for feed (ipr) by drill diameter															
					.125	.156	.187	.250	.375	.500	.625	.750	.875	1.00	1.25	1.50	1.75	2.00	3.00	4.00	≥6.00
					3,0	4,0	5,0	6,5	9,5	12,5	16,0	19,0	21,0	25,0	32,0	38,0	44,5	50,0	76,0	100	≥150
Dynapoint	short depth without coolant	SE221	CS5	150	.002	.003	.003	.004	.006	.007	.010	.010	.010								
				170	**.004**	**.005**	**.006**	**.007**	**.010**	**.011**	**.014**	**.016**	**.016**								
				190	.005	.006	.007	.008	.012	.012	.015	.018	.018								
	regular depth without coolant	SE222	KC7215	150	.002	.003	.003	.004	.006	.007	.010	.010	.010								
				185	**.004**	**.005**	**.006**	**.007**	**.010**	**.011**	**.014**	**.016**	**.016**								
				200	.005	.006	.007	.008	.012	.012	.015	.018	.018								
	short and regular depth with coolant	SE210HP SE211HP	KC7515	220	.003	.004	.004	.005	.006	.009	.011	.014	.015	.016							
				270	**.004**	**.005**	**.006**	**.007**	**.009**	**.011**	**.014**	**.016**	**.017**	**.018**							
				320	.005	.006	.007	.009	.011	.013	.016	.018	.018	.020							
	long depth with coolant	SE212HP	KC7515	220		.001	.003	.003	.004	.005	.008	.009	.010	.012							
				270		**.002**	**.004**	**.005**	**.006**	**.007**	**.010**	**.011**	**.012**	**.014**							
				320		.003	.005	.007	.008	.009	.012	.013	.014	.016							
	long depth with coolant	SE256	KC7015	140		.002	.002	.002	.003	.003	.005	.006									
				160		**.003**	**.003**	**.003**	**.004**	**.005**	**.007**	**.008**									
				200		.004	.005	.005	.006	.007	.009	.011									
	BF drill	BF323	CS5	110	.002	.003	.004	.005	.006	.007	.010	.010									
				135	**.004**	**.005**	**.006**	**.007**	**.009**	**.011**	**.014**	**.016**									
				155	.005	.006	.007	.009	.011	.014	.015	.018									
†CTR	counterbore	-20	KC7140	90								.0010	.0010	.0010	.0020	.0020	.0020				
				140								**.0020**	**.0020**	**.0020**	**.0030**	**.0030**	**.0030**				
				200								.0035	.0035	.0035	.0035	.0035	.0035				
Ken-Tip	small diameter modular	HP	KC7315	180					.006	.007	.008										
				220					**.007**	**.011**	**.012**										
				300					.009	.013	.014										
KSEM	larger diameter modular	HP	KC7315	**145**						.0050	.0060	.0070	.0080	.0090	.0110	.0110					
										.0080	**.0100**	**.0110**	**.0130**	**.0140**	**.0160**	**.0160**					
										.0120	.0130	.0140	.0150	.0180	.0200	.0200					
DRILL-FIX DFR	smaller diameter indexable	inner pocket GD	KC7020	340						.0020	.0020	.0020	.0030	.0030							
		outer pocket GD	KC7020	**500**						**.0020**	**.0020**	**.0030**	**.0040**	**.0040**							
				620						.0030	.0030	.0035	.0055	.0055							
DRILL-FIX DFT	larger diameter indexable	inner pocket MD	KC7935	250							.0020	.0020	.0020								
		outer pocket MD	KC7935	**350**							**.0030**	**.0030**	**.0030**								
				520							.0040	.0040	.0040								
		inner pocket GD	KC720	250										.0020	.0025						
		outer pocket MD	KC7935	**310**										**.0035**	**.0040**						
				520										.0045	.0055						
		inner pocket GD	KC720	250												.0030	.0040	.0050	.0050		
		outer pocket MD	KC7935	**280**												**.0055**	**.0075**	**.0090**	**.0090**		
				520												.0070	.0100	.0120	.0120		
HTS-C	larger diameter deep hole	inner pocket MD	KC7935	150								.0015	.0015	.0015	.0020	.0020	.0020				
		outer pocket HP	KC7140	**200**								**.0020**	**.0020**	**.0020**	**.0030**	**.0040**	**.0040**				
				320								.0040	.0040	.0040	.0050	.0065	.0065				
HTS	very large and deep hole	inner pockets GD**	KC720	100													.0015	.0020	.0030	.0040	.0040
		outer pockets MD	KC7935	**175**													**.0020**	**.0030**	**.0060**	**.0070**	**.0070**
				300													.0040	.0050	.0080	.0090	.0090

• These are starting condition guidelines only. The machine tool, fixturing, toolholding, part configuration, and coolant capability may significantly influence specific applications.
• Use proper and safe machining practices.
• Inch and metric diameters are not standard in all drill styles. See specific catalog pages.
• Typically, large-diameter indexable drills require lower sfm than the recommended starting speed.
• Decrease sfm as material hardness increases.
• Decrease sfm and ipr (feed) as tool length-to-diameter ratio increases, especially on KSEM and HTS drills.
• To convert from ipr to mm/rev., multiply value by 25.4. To convert sfm to m/min., divide value by 3.27.
• Calculate sfm from largest diameter of drill.
† CTR – Counterboring feed rate is given in cpt (chip load per tooth). A chipbreaking program routine may be necessary.
*** Inner pockets on HTS drills are those closest to the pilot drill. For an illustration, see page H608.*

Workpiece Material – Group 1

Ferritic, Martensitic, and PH Stainless Steels (<330 HB) (≤ 40 HRC)

400 and 500 series, and precipitation hardening (PH)
AISI: 410, 416, 416F, 416Se, 420F, 4389F Se, 440, 440C, 502, 504
17-4PH, PH 13-8 Mo, 15-5 PH

Material Characteristics:

- Recommendations are based on a hardness of 36 HRC.
- Brittle, stringy chips
- High cutting forces

Solid Carbide Application Guide:

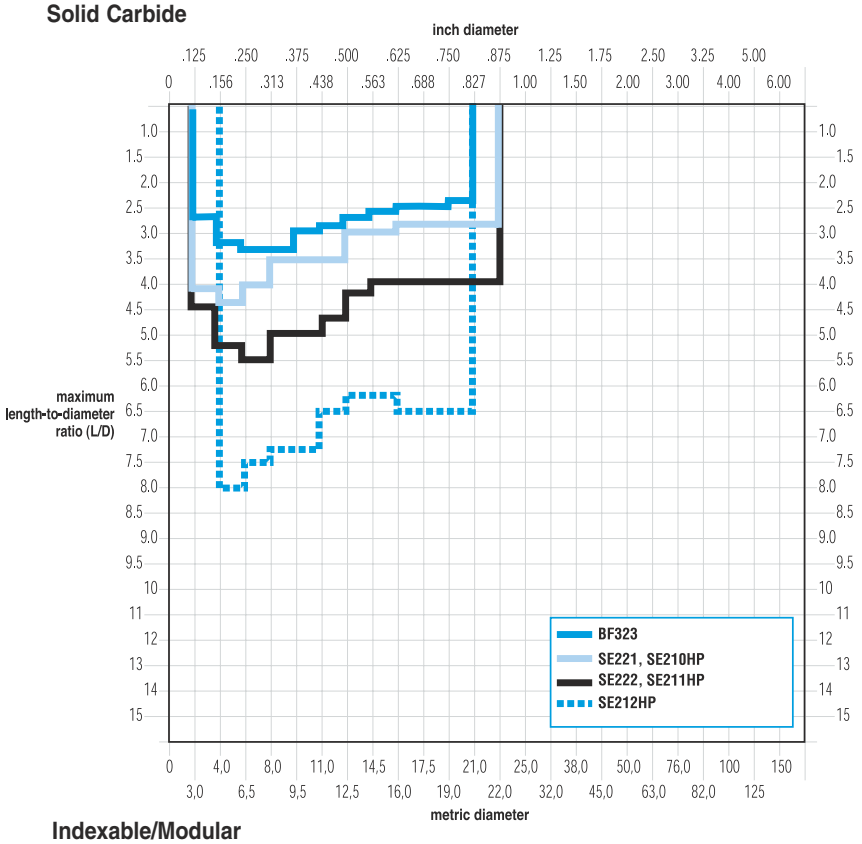
- High-tensile-strength materials require proper coolant concentration to dissipate heat and reduce abrasion to the cutting edge.
- When drilling PH stainless steels, drill styles SE210HP, SE211HP, and SE212HP, in grade KC7515, may offer better tool life.
- Drill runout must not exceed .001 tir. Use hydraulic chucks or Powergrip milling chucks.
- Always back-stop the drill.

Indexable and Modular Application Guide:

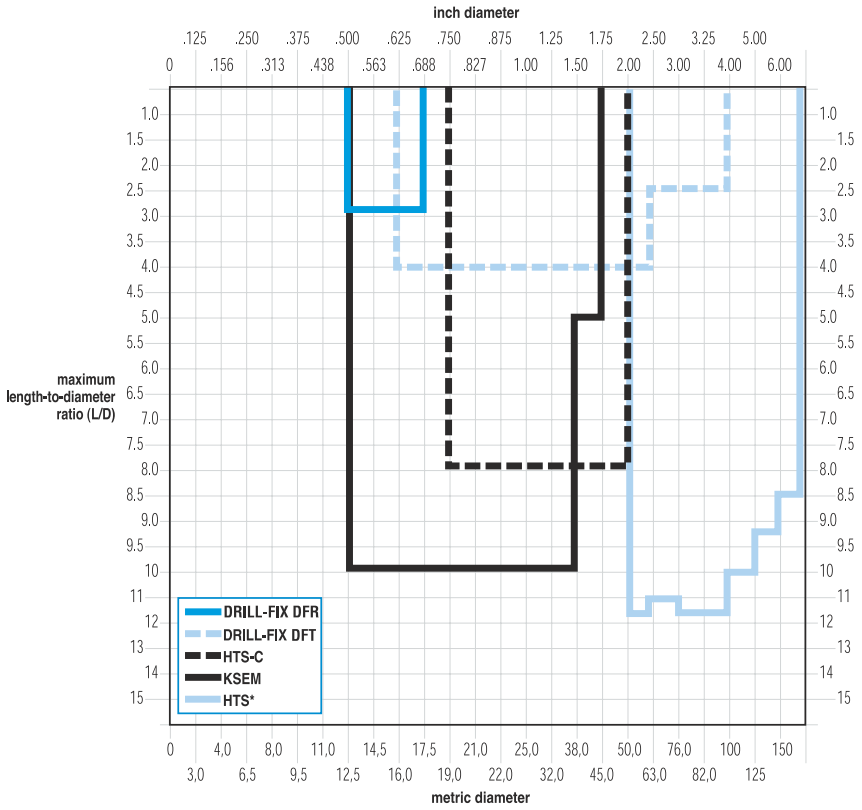
- For this material group, thrust requirements will increase.
- For KSEM drills, at 5x diameter and greater L/D ratio, spot drilling should be used. See page H128.
- For HTS-C 8x diameter or long HTS drills, you must provide spot for pilot drill.
- In DRILL-FIX drill's inner pocket, use our -LD geometry for PH stainless steels and -MD geometry for the 400 series stainless steels.
- When using 4x diameter and longer indexable drills, apply at 75% of the recommended speed.
- Use HSS pilot drill to prevent chipping in the HTS-C bodies because sfm is generally too slow for carbide.
- With KSEM drills, consider using grade KC7030 for deep-hole applications greater than 7x diameter.
- In unstable machining conditions or situations where recommended speed cannot be attained when applying indexable drills, consider using grade KC720 in the outer pocket.

NOTE: For optimum performance, do not peck drill with solid carbide or indexable drill products.

Solid Carbide



Indexable/Modular



*NOTES: L/D ratios and diameters are approximate; see product catalog pages for specific information. Inch to metric conversions are approximate. Inch and metric products are not available as a standard in all drill styles. *L/D ratio for HTS drills is based upon two joints, longest basic inch shank and longest extension. An HTS drill diameter above 6.70" requires special mounting.*

Workpiece Material – Group 1

drill style	application	geometry	grade	sfm	starting recommendation for feed (ipr) by drill diameter															
					.125	.156	.187	.250	.375	.500	.625	.750	.875	1.00	1.25	1.50	1.75	2.00	3.00	4.00	≥6.00
					3,0	4,0	5,0	6,5	9,5	12,5	16,0	19,0	21,0	25,0	32,0	38,0	44,5	50,0	76,0	100	≥150
Dynapoint	short and regular depth with coolant	SE210HP SE211HP	KC7515	220 **250** 300		.002 **.003** .004	.002 **.003** .004	.002 **.003** .004	.003 **.005** .006	.004 **.006** .008	.005 **.007** .009	.006 **.008** .010	.008 **.010** .012								
	long depth with coolant	SE212HP	KC7515	220 **250** 300		.002 **.003** .004	.003 **.004** .005	.003 **.005** .007	.003 **.005** .007	.004 **.006** .008	.005 **.007** .009	.006 **.008** .010	.007 **.009** .012								
	BF drill	BF323	CS5	140 **170** 200	.002 **.004** .005	.004 **.005** .007	.005 **.006** .008	.006 **.007** .011	.007 **.009** .013	.010 **.012** .016	.012 **.016** .019	.012 **.018** .020									
†CTR	counterbore	-20	KC7140	150 **190** 250								.0010 **.0020** .0035	.0010 **.0020** .0035	.0010 **.0020** .0035	.0020 **.0030** .0035	.0020 **.0030** .0035	.0020 **.0030** .0035				
KSEM	larger diameter modular	HP	KC7315	150 **175** 210						.0050 **.0080** .0120	.0070 **.0110** .0140	.0080 **.0130** .0150	.0090 **.0140** .0180	.0090 **.0140** .0180	.0090 **.0140** .0180	.0110 **.0160** .0200					
DRILL-FIX DFR	smaller diameter indexable	inner pocket GD	KC7020	425 **550** 700						.0010 **.0020** .0025	.0010 **.0020** .0025	.0015 **.0020** .0030	.0020 **.0030** .0040	.0020 **.0030** .0040							
		outer pocket GD	KC7020																		
DRILL-FIX DFT	larger diameter indexable	inner pocket LD	KC720	325 **550** 700							.0010 **.0020** .0035	.0010 **.0020** .0035	.0010 **.0020** .0035								
		outer pocket LD	KC7225																		
		inner pocket LD	KC720	325 **490** 700										.0020 **.0035** .0050	.0020 **.0035** .0050						
		outer pocket GD	KC7935																		
		inner pocket LD	KC720	325 **400** 700												.0025 **.0040** .0065	.0025 **.0040** .0065	.0035 **.0050** .0080	.0035 **.0050** .0080		
		outer pocket GD	KC7935																		
HTS-C	larger diameter dep hole	inner pocket LD	KC720	180 **280** 350								.0015 **.0020** .0040	.0015 **.0020** .0040	.0020 **.0030** .0050	.0020 **.0040** .0065	.0020 **.0040** .0065	.0020 **.0040** .0065				
		outer pocket HP	KC7215																		
HTS	very large and deep hole	inner pockets LD**	KC720	150 **260** 350													.0015 **.0020** .0040	.0020 **.0030** .0050	.0030 **.0050** .0070	.0030 **.0060** .0080	.0040 **.0070** .0090
		outer pockets GD	KC720																		

- *These are starting condition guidelines only. The machine tool, fixturing, toolholding, part configuration, and coolant capability may significantly influence specific applications.*
- *Use proper and safe machining practices.*
- *Inch and metric diameters are not standard in all drill styles. See specific catalog pages.*
- *Typically, large-diameter indexable drills require lower sfm than the recommended starting speed.*
- *Decrease sfm as material hardness increases.*
- *Decrease sfm and ipr (feed) as tool length-to-diameter ratio increases, especially on KSEM and HTS drills.*
- *To convert from ipr to mm/rev., multiply value by 25.4. To convert sfm to m/min., divide value by 3.27.*
- *Calculate sfm from largest diameter of drill.*

† CTR – Counterboring feed rate is given in cpt (chip load per tooth). A chipbreaking program routine may be necessary.

*** Inner pockets on HTS drills are those closest to the pilot drill. For an illustration, see page H608.*

Workpiece Material – Group 2

Austenitic Stainless Steels (135-275 HB) (≤ 28 HRC)

200 and 300 series, Duplex
AISI: 210, 209, 302, 303, 304, 304L, 310, 316, 316L, 321, 329, 347, 384
ASTM: XM-1, XM-5, XM-7, XM-21, CF-8M

Material Characteristics:

- Recommendations are based on 316 stainless steel.
- Creates tough and stringy chips that form build-up on the drill.
- Fine feeds are difficult.
- Gummy while being machined due to the nickel content.
- Low thermal conductivity causes high heat at drill tip.
- Workhardens rapidly due to high chromium content.
- The softer the material, the more difficult it is to machine.

Solid Carbide Application Guide:

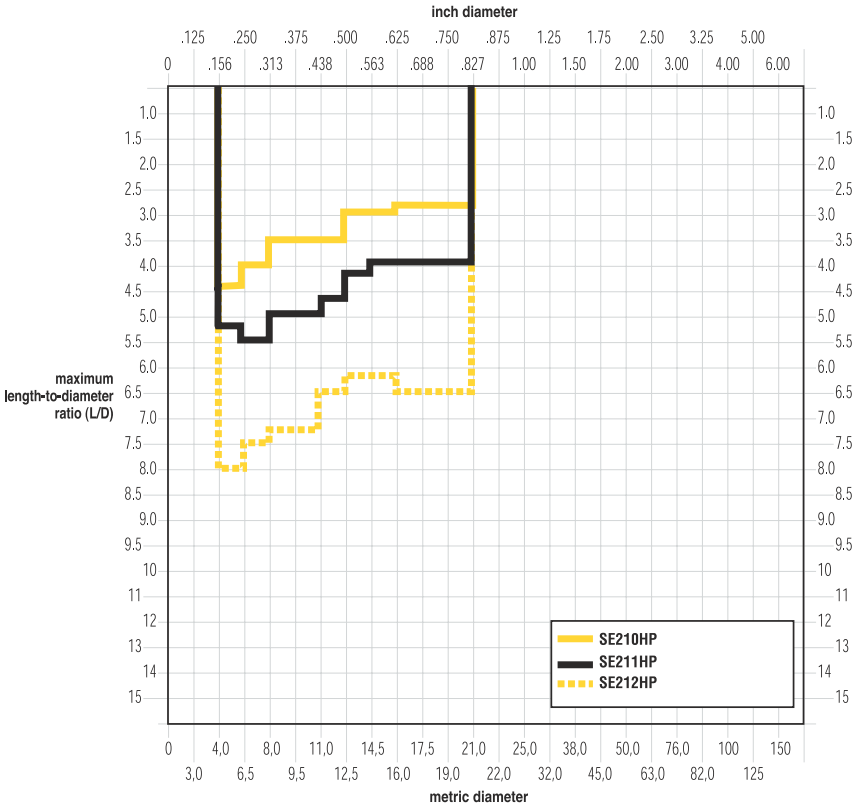
- High-tensile-strength materials require proper coolant concentration to dissipate heat and reduce abrasion to the cutting edge.
- To prevent workhardening, do not let the drill point dwell in the hole.
- Drill runout must not exceed .001 tir. Use hydraulic chucks or Powergrip milling chucks.
- Always back-stop the drill.

Indexable and Modular Application Guide:

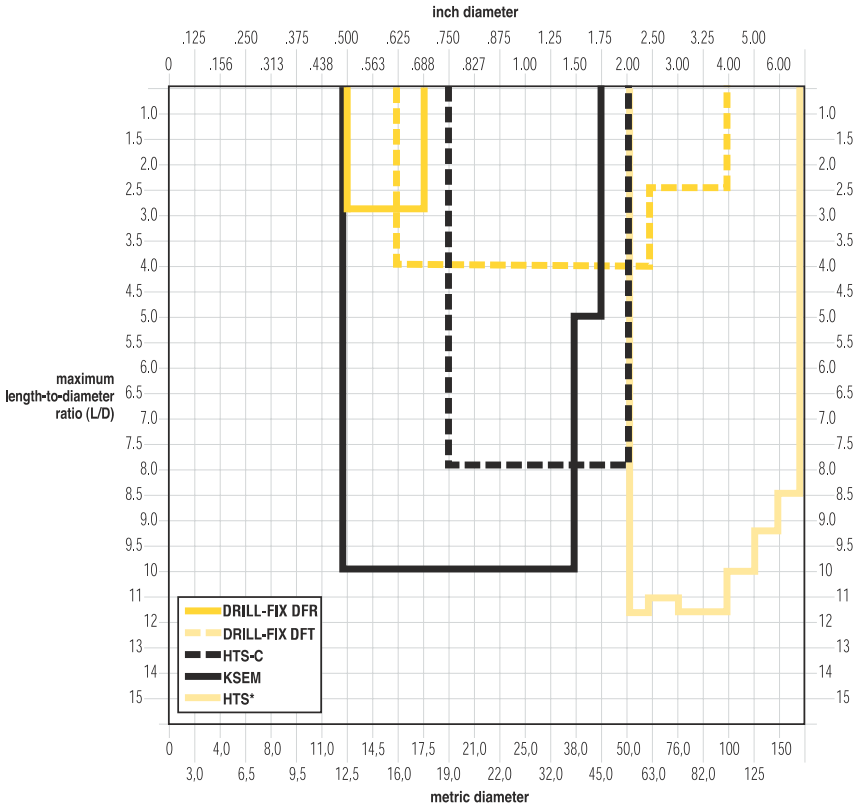
- For this material group, thrust requirements will increase.
- To avoid exceeding the limits of the axis drive motors, care should be taken when using large-diameter drills.
- Maintain minimum recommended feed rates to prevent workhardening.
- For KSEM drills, at 5x diameter and greater L/D ratio, spot drilling should be used. See page H128.
- For HTS-C 8x diameter or long HTS drills, you must provide spot for pilot drill.
- Use HSS pilot drill to prevent chipping in the HTS-C bodies, as sfm is generally too slow for carbide.
- When using 4x diameter and longer indexable drills, apply at 75% of the recommended speed.
- In unstable machining conditions, or for situations where the recommended speed cannot be attained when applying indexable drills, consider using grade KC720 in the outer pocket.

NOTE: For optimum performance, do not peck drill with solid carbide or indexable drill products.

Solid Carbide



Indexable/Modular



*NOTES: L/D ratios and diameters are approximate; see product catalog pages for specific information. Inch to metric conversions are approximate. Inch and metric products are not available as a standard in all drill styles. *L/D ratio for HTS drills is based upon two joints, longest basic inch shank and longest extension. An HTS drill diameter above 6.70" requires special mounting.*

Workpiece Material – Group 2

drill style	application	geometry	grade	sfm	starting recommendation for feed (ipr) by drill diameter															
					.125	.156	.187	.250	.375	.500	.625	.750	.875	1.00	1.25	1.50	1.75	2.00	3.00	4.00	≥6.00
					3,0	4,0	5,0	6,5	9,5	12,5	16,0	19,0	21,0	25,0	32,0	38,0	44,5	50,0	76,0	100	≥150
Dynapoint	short and regular depth with coolant	SE210HP SE211HP	KC7515	230 **270** 325		.002 **.003** .004	.002 **.004** .006	.003 **.005** .007	.004 **.006** .008	.005 **.007** .009	.006 **.008** .010	.007 **.009** .011	.008 **.010** .012	.008 **.010** .012							
	long depth with coolant	SE212HP	KC7515	230 **270** 325		.001 **.002** .003	.002 **.003** .004	.003 **.004** .005	.003 **.004** .005	.004 **.006** .008	.004 **.006** .008	.007 **.009** .012	.009 **.011** .013	.010 **.012** .014							
†CTR	counterbore	-21	KM1	125 **200** 280								.0010 **.0020** .0035	.0010 **.0020** .0035	.0010 **.0020** .0035	.0020 **.0030** .0035	.0020 **.0030** .0035	.0020 **.0030** .0035				
KSEM	larger diameter modular	HP	KC7235	110 **180** 240						.0040 **.0060** .0080	.0060 **.0080** .0090	.0070 **.0090** .0110	.0080 **.0100** .0120	.0100 **.0120** .0150	.0110 **.0140** .0170						
DRILL-FIX DFR	smaller diameter indexable	inner pocket GD	KC7140	425 **520** 620						.0015 **.0020** .0030	.0015 **.0020** .0030	.0020 **.0030** .0035	.0030 **.0040** .0055	.0030 **.0040** .0055							
		outer pocket GD	KC7140																		
DRILL-FIX DFT	larger diameter indexable	inner pocket HP	KC7140	325 **520** 620							.0015 **.0020** .0035	.0015 **.0020** .0035	.0015 **.0040** .0050								
		outer pocket HP	KC7140																		
		inner pocket HP	KC7140	325 **450** 600										.0025 **.0045** .0060	.0025 **.0045** .0060						
		outer pocket HP	KC7140																		
		inner pocket HP	KC7140	325 **350** 620												.0030 **.0050** .0070	.0035 **.0060** .0080	.0035 **.0050** .0080	.0035 **.0050** .0080		
		outer pocket GD	KC7215																		
HTS-C	larger diameter deep hole	inner pocket HP	KC7935	180 **280** 350								.0015 **.0020** .0040	.0015 **.0020** .0040	.0015 **.0020** .0040	.0020 **.0030** .0050	.0020 **.0030** .0050	.0020 **.0030** .0050				
		outer pocket HP	KC7140																		
HTS	very large and deep hole	inner pockets HP**	KC7140	150 **260** 350													.0015 **.0020** .0040	.0020 **.0030** .0050	.0020 **.0030** .0050	.0020 **.0040** .0060	.0030 **.0060** .0080
		outer pockets HP	KC7140																		

• These are starting condition guidelines only. The machine tool, fixturing, toolholding, part configuration, and coolant capability may significantly influence specific applications.
• Use proper and safe machining practices.
• Inch and metric diameters are not standard in all drill styles. See specific catalog pages.
• Typically, large-diameter indexable drills require lower sfm than the recommended starting speed.
• Decrease sfm as material hardness increases.
• Decrease sfm and ipr (feed) as tool length-to-diameter ratio increases, especially on KSEM and HTS drills.
• To convert from ipr to mm/rev., multiply value by 25.4. To convert sfm to m/min., divide value by 3.27.
• Calculate sfm from largest diameter of drill.
† CTR – Counterboring feed rate is given in cpt (chip load per tooth). A chipbreaking program routine may be necessary.
*** Inner pockets on HTS drills are those closest to the pilot drill. For an illustration, see page H608.*

Workpiece Material – Group 3

Ductile (Nodular) and Malleable Cast Irons (120-320 HB)

nodular/ductile, ferritic/pearlitic, pearlitic/martensitic
ASTM A536, 60-40-18, 65-45-12, 80-55-06, 100-70-03
SAE: J434, D4018, D4512, D5506, D7003
ASTM: A47, grade 32510, 35018
SAE J148: grade M3210, M4504, M5003

Material Characteristics:

- Graphite is in spherical form (rather than flake form inherent in gray cast iron).
- Typically contains hard spots that are concentrations of carbide in the structure.
- Structure of workpiece material can vary dramatically.
- Machining difficulties arise from both flank and crater wear on the drill.
- Higher tensile strength requires better rigidity in the machining system.

Solid Carbide Application Guide:

The SE254HPC, SE255HPC, and SE256HPC in grade KC7315 are the first choice drills for:

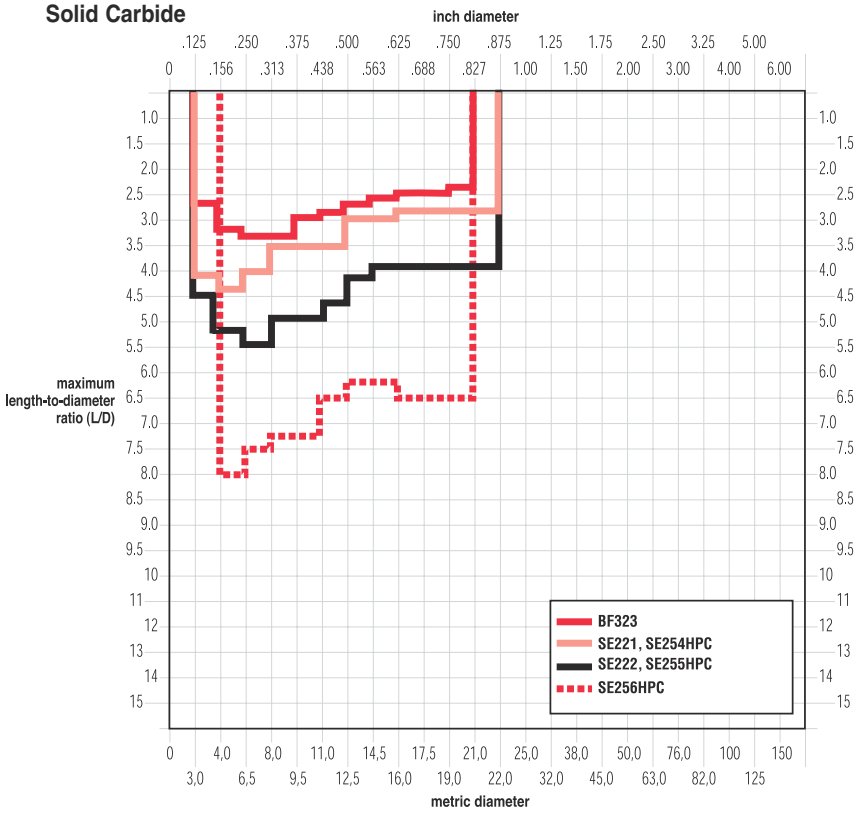
- All through-coolant applications.
- Flood applications.

Indexable and Modular Application Guide:

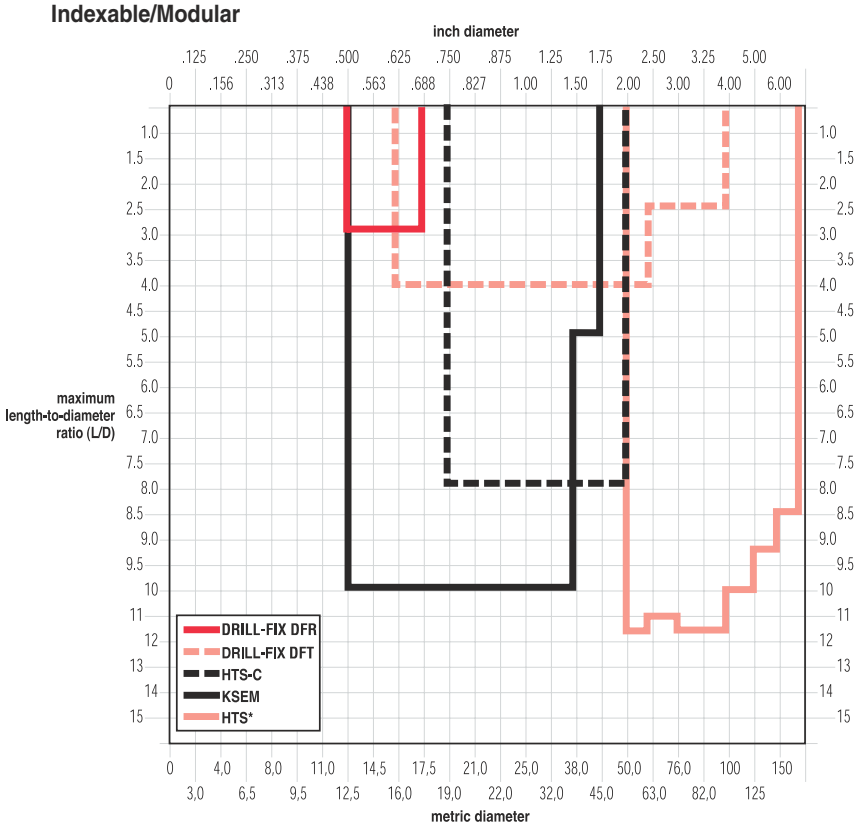
- An optional grade for HTS outer pockets is KC7935. It's especially effective in increased speed applications.
- TiAlN coated grade KC7225 or alumina grade KC7935 are your first choices in high sfm applications. Lowering the speed may require a grade change to KC720.
- For KSEM drills, at 5x diameter and greater L/D ratio, spot drilling should be used. See page H128.
- For HTS-C 8x diameter or long HTS drills, you must provide spot for pilot drill.
- Use HSS pilot drill to prevent chipping in the HTS-C bodies because sfm is generally too slow for carbide.
- For HTS-C metric bodies **only**, consider our SPHX-21 geometry in the outer pocket.
- When using 4x diameter and longer indexable drills, apply at 75% of the recommended speed.
- In unstable machining conditions, or for situations where the recommended speed cannot be attained when applying indexable drills, consider using grade KC720 in the outer pocket.

NOTE: For optimum performance, do not peck drill with solid carbide or indexable drill products.

Solid Carbide



Indexable/Modular



*NOTES: L/D ratios and diameters are approximate; see product catalog pages for specific information. Inch to metric conversions are approximate. Inch and metric products are not available as a standard in all drill styles. *L/D ratio for HTS drills is based upon two joints, longest basic inch shank and longest extension. An HTS drill diameter above 6.70" requires special mounting.*

Workpiece Material – Group 3

drill style	application	geometry	grade	sfm	starting recommendation for feed (ipr) by drill diameter																
					.125	.156	.187	.250	.375	.500	.625	.750	.875	1.00	1.25	1.50	1.75	2.00	3.00	4.00	≥6.00
					3,0	4,0	5,0	6,5	9,5	12,5	16,0	19,0	21,0	25,0	32,0	38,0	44,5	50,0	76,0	100	≥150
Dynapoint	short and regular depth with coolant	SE254HPC SE255HPC	KC7315	480	.003	.003	.005	.006	.009	.013	.016	.019	.023								
				525	**.004**	**.005**	**.006**	**.008**	**.013**	**.016**	**.019**	**.023**	**.026**								
				600	.005	.006	.008	.013	.016	.019	.023	.025	.029								
	long depth with coolant	SE256HPC	KC7315	480	.003	.003	.004	.005	.007	.010	.013	.015	.018								
				525	**.003**	**.004**	**.005**	**.007**	**.010**	**.013**	**.015**	**.018**	**.020**								
				600	.006	.007	.008	.010	.014	.016	.019	.021	.024								
	BF drill	BF323	CS5	220	.003	.004	.005	.006	.008	.010	.012	.012									
				240	**.004**	**.005**	**.006**	**.007**	**.009**	**.012**	**.016**	**.018**									
				300	.005	.007	.008	.010	.013	.016	.019	.022									
†CTR	counterbore	-20	KC7215	175								.0010	.0010	.0010	.0020	.0020	.0020				
				245								**.0020**	**.0020**	**.0020**	**.0030**	**.0030**	**.0030**				
				350								.0035	.0035	.0035	.0035	.0035	.0035				
KSEM	larger diameter modular	LD	KC7215	180						.0060	.0060	.0090	.0080	.0110	.0110	.0110					
				325						**.0080**	**.0100**	**.0110**	**.0130**	**.0140**	**.0140**	**.0160**					
				450						.0090	.0130	.0140	.0150	.0170	.0170	.0200					
DRILL-FIX DFR	smaller diameter indexable	inner pocket LD	KC7225	390						.0025	.0025	.0030	.0040	.0040							
				520						**.0030**	**.0030**	**.0040**	**.0050**	**.0050**							
		outer pocket LD	KC7225	780						.0040	.0040	.0050	.0070	.0070							
DRILL-FIX DFT	larger diameter indexable	inner pocket GD	KC7935	325							.0015	.0020	.0020								
				550							**.0020**	**.0040**	**.0040**								
		outer pocket GD	KC7935	700							.0035	.0055	.0055								
		inner pocket GD	KC720	325										.0035	.0035						
				500										**.0050**	**.0050**						
		outer pocket GD	KC7935	700										.0070	.0070						
		inner pocket GD	KC720	325												.0040	.0040	.0040	.0080		
				400												**.0060**	**.0080**	**.0080**	**.0100**		
		outer pocket GD	KC7935	700												.0080	.0100	.0100	.0150		
HTS-C	larger diameter deep hole	inner pocket GD	KC7935	300								.0020	.0020	.0020	.0030	.0030	.0030				
				450								.0040	.0040	.0040	.0060	.0060	.0060				
		outer pocket FP	KC7210	600								.0065	.0065	.0065	.0080	.0080	.0080				
HTS	very large and deep hole	inner pockets GD**	KC7935	250													.0020	.0020	.0030	.0050	.0060
				425													**.0040**	**.0040**	**.0050**	**.0080**	**.0100**
		outer pockets GD	KC7935	600													.0060	.0060	.0080	.0100	.0150

• These are starting condition guidelines only. The machine tool, fixturing, toolholding, part configuration, and coolant capability may significantly influence specific applications.
• Use proper and safe machining practices.
• Inch and metric diameters are not standard in all drill styles. See specific catalog pages.
• Typically, large-diameter indexable drills require lower sfm than the recommended starting speed.
• Decrease sfm as material hardness increases.
• Decrease sfm and ipr (feed) as tool length-to-diameter ratio increases, especially on KSEM and HTS drills.
• To convert from ipr to mm/rev., multiply value by 25.4. To convert sfm to m/min., divide value by 3.27.
• Calculate sfm from largest diameter of drill.
† CTR – Counterboring feed rate is given in cpt (chip load per tooth). A chipbreaking program routine may be necessary.
*** Inner pockets on HTS drills are those closest to the pilot drill. For an illustration, see page H608.*

Workpiece Material – Group 3

Gray Cast Irons (120-320 HB)

ASTM: A48, class 20, 25, 30, 35, 40, 45, 50, 55, 60

SAE: J431: grade G1800, G3000, G3500, G4000

Material Characteristics:

- Recommendations are based on a hardness of 180 HB.
- Tendency to break out during exit from cut requires chamfered corners on drills (special order).
- Contains abrasive elements; sand may be embedded in the cast surface.
- Potential is there for chatter on thin-wall sections.
- Corners and thin sections can be chilled (hard and brittle).
- Potential for scale and inclusions is present.

Solid Carbide Application Guide:

The SE254HPC, SE255HPC, and SE256HPC in grade KC7315 are the first choice drills for:

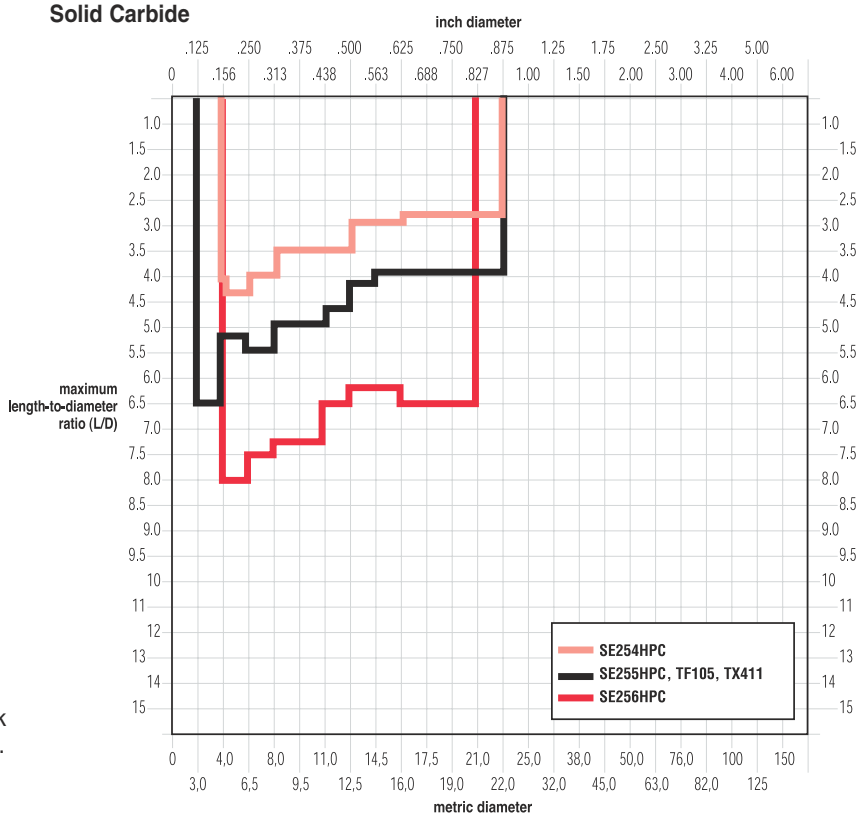
- All through-coolant applications.
- Flood coolant applications.
- Dry applications.
- Use TX drills for high-precision holes that require extremely close hole size and excellent hole finishes.

Indexable and Modular Application Guide:

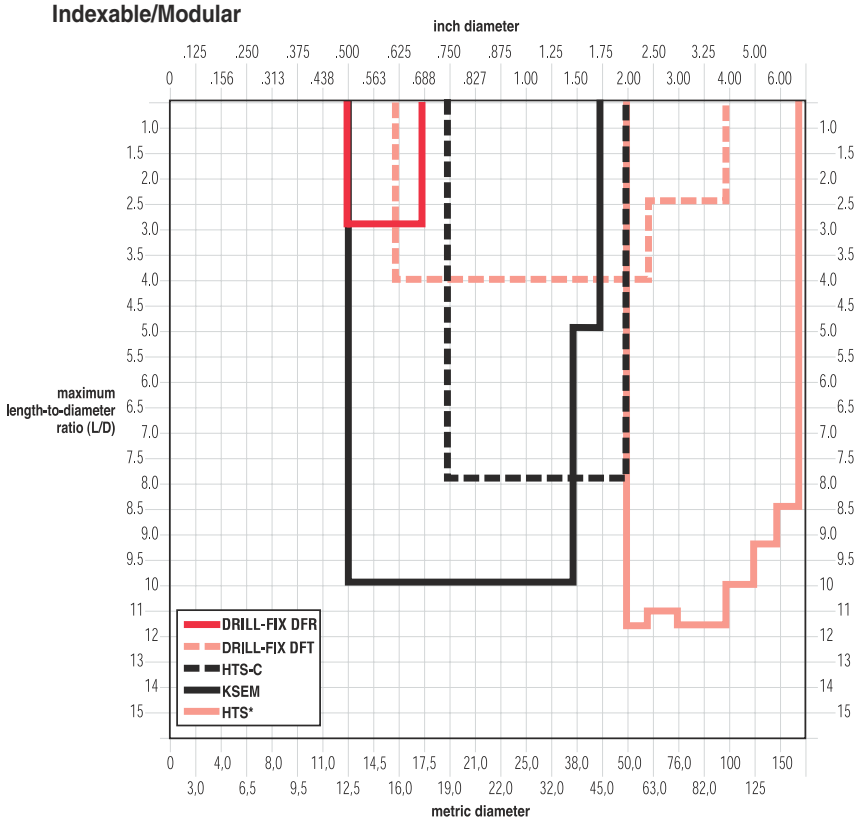
- When applying KSEM drills, consider using the non-stock standard -LDC geometry if breakout becomes a problem.
- An optional grade for HTS outer pockets is KC7935. It's especially effective in increased speed applications.
- TiAlN coated grade KC7225 or alumina grade KC7935 are your first choices at high sfm. Lowering the speed may require changing to grade KC720.
- For KSEM drills, at 5x diameter and greater L/D ratio, spot drilling should be used. See page H128.
- For HTS-C 8x diameter or long HTS drills, you must provide spot for pilot drill.
- Use HSS pilot drill to prevent chipping in the HTS-C bodies because sfm is generally too slow for carbide.
- For HTS-C metric bodies **only**, consider our SPHX-21 geometry in the outer pocket.
- When using 4x diameter and longer indexable drills, apply at 75% of the recommended speed.
- In unstable machining conditions, or for situations where the recommended speed cannot be attained when applying indexable drills, consider using grade KC720 in the outer pocket.

NOTE: For optimum performance, do not peck drill with solid carbide or indexable drill products.

Solid Carbide



Indexable/Modular



*NOTES: L/D ratios and diameters are approximate; see product catalog pages for specific information. Inch to metric conversions are approximate. Inch and metric products are not available as a standard in all drill styles. *L/D ratio for HTS drills is based upon two joints, longest basic inch shank and longest extension. An HTS drill diameter above 6.70" requires special mounting.*

Workpiece Material – Group 3

drill style	application	geometry	grade	sfm	starting recommendation for feed (ipr) by drill diameter															
					.125	.156	.187	.250	.375	.500	.625	.750	.875	1.00	1.25	1.50	1.75	2.00	3.00	4.00	≥6.00
					3,0	4,0	5,0	6,5	9,5	12,5	16,0	19,0	21,0	25,0	32,0	38,0	44,5	50,0	76,0	100	≥150
Dynapoint	short and regular depth with coolant	SE254HPC SE255HPC	KC7315	600	.003	.003	.005	.006	.009	.013	.016	.019	.023								
				700	**.004**	**.005**	**.006**	**.008**	**.013**	**.016**	**.019**	**.023**	**.026**								
				750	.005	.006	.009	.014	.017	.020	.024	.027	.031								
	long depth with coolant	SE256HPC	KC7315	600	.003	.003	.004	.005	.007	.010	.013	.015	.018								
				700	**.003**	**.004**	**.005**	**.007**	**.010**	**.013**	**.015**	**.018**	**.020**								
				750	.008	.009	.010	.012	.016	.018	.021	.023	.026								
	regular depth without coolant	TF105	K10	300	.003	.003	.004	.006	.008	.012	.015	.018	.022								
				350	**.005**	**.006**	**.008**	**.009**	**.012**	**.014**	**.017**	**.022**	**.024**								
				390	.006	.007	.009	.013	.016	.019	.023	.027	.030								
			KC7210	385	.003	.003	.004	.006	.008	.012	.015	.018									
				420	**..05**	**.006**	**.008**	**.009**	**.012**	**.014**	**.017**	**.022**									
				440	.006	.007	.009	.013	.016	.019	.023	.027									
	dry drilling	TF105	KC7210	300	.003	.003	.004	.006	.008	.012	.015	.018									
				330	**.005**	**.006**	**.008**	**.009**	**.012**	**.014**	**.017**	**.022**									
				340	.006	.007	.009	.013	.016	.019	.023	.027									
	regular depth with coolant	TX411	KF1	300	.003	.003	.004	.006	.008	.012	.015	.018	.022	.024							
				360	**.004**	**.005**	**.006**	**.008**	**.012**	**.015**	**.018**	**.022**	**.024**	**.028**							
				390	.006	.007	.009	.013	.016	.019	.023	.027	.030	.032							
	BF drill	BF462 (special TX)	KF1	300	.003	.005	.006	.008	.009	.012	.014										
				360	**.005**	**.006**	**.008**	**.009**	**.012**	**.014**	**.017**										
				450	.007	.010	.010	.013	.014	.017	.020										
†CTR	counterbore	-21	KC7215	200								.0010	.0010	.0010	.0020	.0020	.0020				
				320								**.0020**	**.0020**	**.0020**	**.0030**	**.0030**	**.0030**				
				400								.0035	.0035	.0035	.0035	.0035	.0035				
KSEM	larger diameter modular	LD	KC7215	200						.0060	.0080	.0100	.0110	.0110	.0120	.0140					
				400						**.0100**	**.0130**	**.0150**	**.0160**	**.0160**	**.0180**	**.0200**					
				500						.0130	.0150	.0170	.0200	.0200	.0230	.0240					
DRILL-FIX DFR	smaller diameter indexable	inner pocket LD	KC7225	450						.0030	.0030	.0030	.0040	.0040							
		outer pocket LD	KC7225	**650**						**.0040**	**.0040**	**.0040**	**.0050**	**.0050**							
				850						.0050	.0050	.0060	.0080	.0080							
DRILL-FIX DFT	larger diameter indexable	inner pocket GD	KC7935	400							.0015	.0020	.0020								
		outer pocket GD	KC7935	**600**							**.0020**	**.0040**	**.0040**								
				800							.0035	.0055	.0055								
		inner pocket GD	KC7935	400										.0035	.0040						
		outer pocket GD	KC7935	**550**										**.0050**	**.0060**						
				800										.0070	.0080						
		inner pocket GD	KC7935	400												.0040	.0040	.0080	.0080		
		outer pocket GD	KC7935	**500**												**.0080**	**.0080**	**.0100**	**.0100**		
				800												.0100	.0100	.0150	.0150		
HTS-C	larger diameter deep hole	inner pocket GD	KC7935	300								.0020	.0020	.0020	.0025	.0030	.0030				
		outer pocket FP	KC7210	**475**								**.0040**	**.0040**	**.0040**	**.0050**	**.0060**	**.0060**				
				650								.0065	.0065	.0065	.0070	.0080	.0080				
HTS	very large and deep hole	inner pockets GD**	KC7935	250													.0020	.0030	.0040	.0050	.0050
		outer pockets GD	KC7935	**450**													**.0040**	**.0060**	**.0070**	**.0090**	**.0090**
				625													.0060	.0090	.0100	.0120	.0120

- *These are starting condition guidelines only. The machine tool, fixturing, toolholding, part configuration, and coolant capability may significantly influence specific applications.*
- *Use proper and safe machining practices.*
- *Inch and metric diameters are not standard in all drill styles. See specific catalog pages.*
- *Typically, large-diameter indexable drills require lower sfm than the recommended starting speed.*
- *Decrease sfm as material hardness increases.*
- *Decrease sfm and ipr (feed) as tool length-to-diameter ratio increases, especially on KSEM and HTS drills.*
- *To convert from ipr to mm/rev., multiply value by 25.4. To convert sfm to m/min., divide value by 3.27.*
- *Calculate sfm from largest diameter of drill.*

† CTR – Counterboring feed rate is given in cpt (chip load per tooth). A chipbreaking program routine may be necessary.

*** Inner pockets on HTS drills are those closest to the pilot drill. For an illustration, see page H608.*

Workpiece Material – Group 4

Free-Machining and Low-Silicon Aluminum Alloys (Hypoeutectic <12.2% Si)

AA: 2024-T4, 2014-T6, 2011-T3, 3003-H18, A2, Alcoa 510, Duralumin aluminum, 6061-T4, 6061-T6, 7075-T4, and 7075-T6

Material Characteristics:

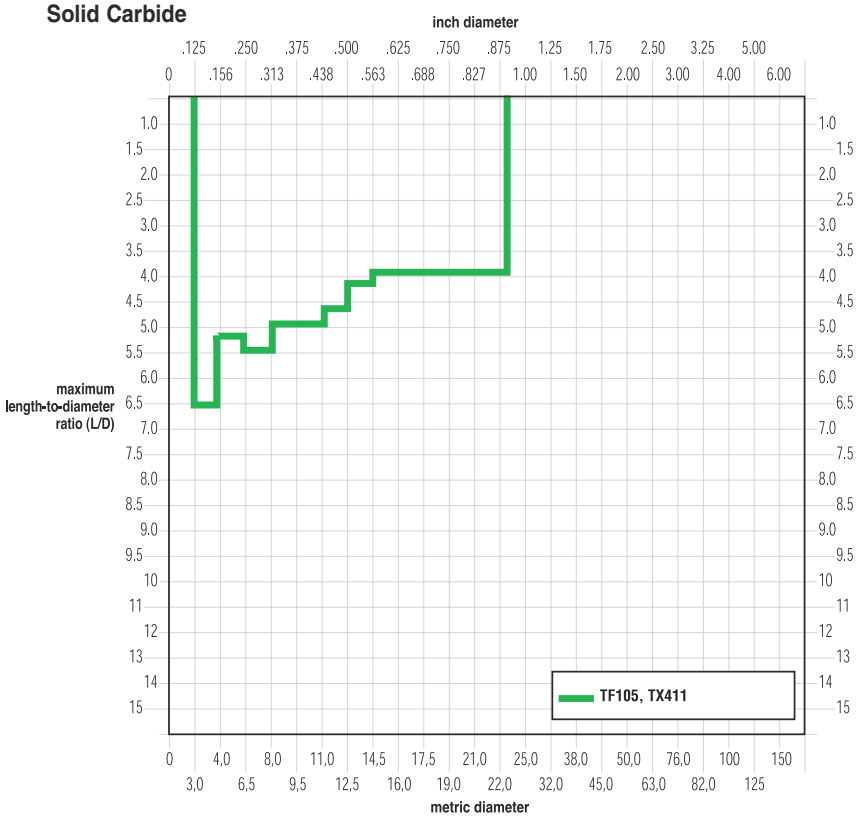
- Soft and gummy with a low melting temperature, and tends to weld to the drill.
- Built-up edge may cause surface finish problems.
- Has low modulus of elasticity and high ductility.
- Exhibits greater tendency to yield under pressure of the cutting tool.
- Can be machined rapidly and economically with carbide tools.

Solid Carbide, Indexable, and Modular Application Guide:

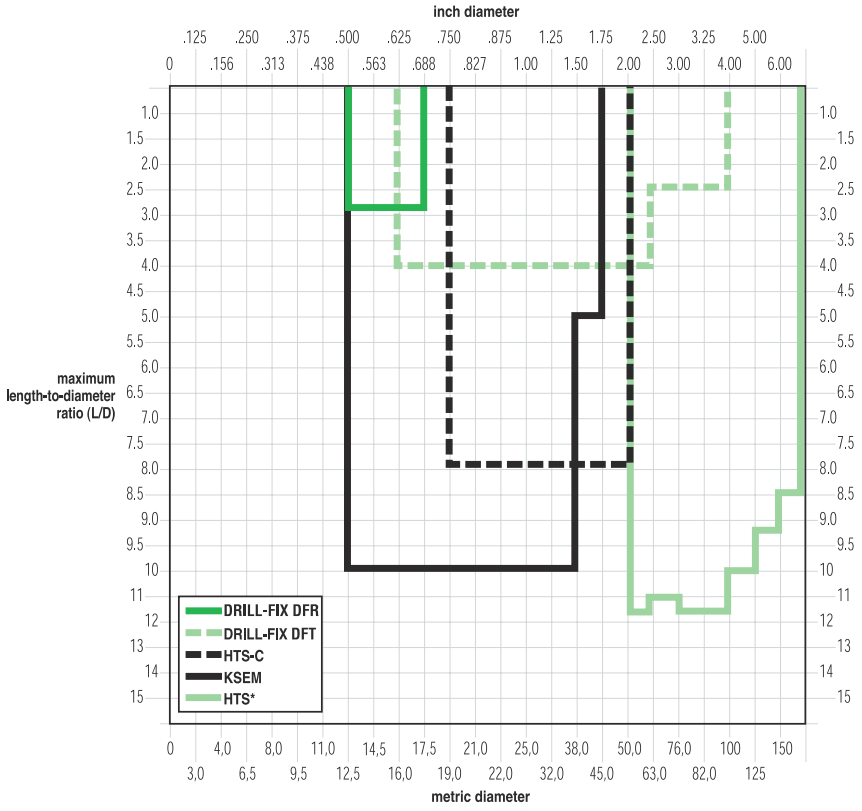
- Maintain high sfm to prevent built-up edge.
- As a first choice, consider drills with through-coolant capability to prevent chip packing.
- If workpiece contains silicon, decrease speed (sfm) and feed (ipr) as silicon content increases.
- When applying HTS-C drills, consider using a solid carbide spot drill because higher speeds are generally appropriate.
- For HTS-C metric bodies **only**, consider our SPHX-22 geometry in the outer pocket.
- For KSEM drills, at 5x diameter and greater L/D ratio, spot drilling should be used. See page H128.
- For HTS-C 8x diameter or long HTS drills, you must provide spot for pilot drill.
- Specially manufactured G-drills in solid carbide or PCD tipped styles offer an effective solution for high-production applications.
- Under ideal machining conditions, higher sfm can be achieved beyond starting recommendations.
- For hole tolerances >.001, use TF drills. For tolerances <.001, use TX drills.

NOTE: For optimum performance, do not peck drill with solid carbide or indexable drill products.

Solid Carbide



Indexable/Modular



*NOTES: L/D ratios and diameters are approximate; see product catalog pages for specific information. Inch to metric conversions are approximate. Inch and metric products are not available as a standard in all drill styles. *L/D ratio for HTS drills is based upon two joints, longest basic inch shank and longest extension. An HTS drill diameter above 6.70" requires special mounting.*

Workpiece Material – Group 4

drill style	application	geometry	grade	sfm	starting recommendation for feed (ipr) by drill diameter															
					.125	.156	.187	.250	.375	.500	.625	.750	.875	1.00	1.25	1.50	1.75	2.00	3.00	4.00	≥6.00
					3,0	4,0	5,0	6,5	9,5	12,5	16,0	19,0	21,0	25,0	32,0	38,0	44,5	50,0	76,0	100	≥150
Dynapoint	regular depth with coolant	TF105	K10	600 **750** 1000	.003 **.005** .007	.004 **.006** .008	.005 **.007** .010	.007 **.009** .013	.010 **.013** .017	.013 **.016** .020	.017 **.020** .023	.021 **.026** .029	.025 **.029** .031								
	regular depth with coolant	TX411	KF1	600 **750** 1000	.003 **.004** .006	.004 **.005** .007	.005 **.006** .010	.006 **.008** .010	.009 **.011** .017	.012 **.015** .021	.017 **.020** .023	.020 **.022** .025	.022 **.024** .030	.024 **.030** .034							
	BF drill	TX462 (special TX)	KF1	550 **600** 700	.003 **.004** .005	.004 **.005** .007	.005 **.006** .009	.007 **.008** .012	.009 **.011** .015	.012 **.015** .018	.014 **.018** .020										
	special PCD	TXD495	KC1415	650 **1200** 2600			.003 **.004** .006	.003 **.005** .008	.004 **.007** .011	.005 **.008** .014	.006 **.010** .016	.008 **.013** .017	.012 **.015** .017	.014 **.017** .019	.014 **.019** .022						
†CTR	counterbore	-22	KM1	400 **600** 1000								.0010 **.0020** .0035	.0010 **.0020** .0035	.0020 **.0030** .0035	.0020 **.0030** .0035	.0020 **.0030** .0035	.0020 **.0030** .0035				
KSEM	larger diameter modular	LD	KC7215	400 **600** 800						.0070 **.0090** .0140	.0090 **.0110** .0160	.0120 **.0140** .0200	.0140 **.0160** .0240	.0160 **.0180** .0270	.0200 **.0220** .0300	.0220 **.0240** .0320					
DRILL-FIX DFR	smaller diameter indexable	inner pocket LD	KC7025	1300 **1600** 2300						.0010 **.0020** .0030	.0010 **.0020** .0030	.0015 **.0030** .0050	.0025 **.0030** .0060	.0025 **.0030** .0060							
		outer pocket LD	KC7025																		
DRILL-FIX DFT	larger diameter indexable	inner pocket HP	KC7215	1300 **1600** 2300							.0020 **.0020** .0030	.0020 **.0020** .0030	.0020 **.0020** .0030								
		outer pocket HP	KC7215																		
		inner pocket HP	KC7215	1300 **1300** 2300										.0020 **.0020** .0030	.0025 **.0030** .0035						
		outer pocket HP	KC7215																		
		inner pocket HP	KC7215	**1300**												.0025 **.0030** .0035	.0030 **.0040** .0055	.0040 **.0050** .0065	.0050 **.0060** .0075		
		outer pocket HP	KC7215																		
HTS-C	larger diameter deep hole	inner pocket HP	KC7215	500 **900** 1100								.0015 **.0200** .0400	.0015 **.0200** .0400	.0015 **.0200** .0400	.0020 **.0030** .0050	.0020 **.0040** .0065	.0025 **.0050** .0075				
		outer pocket HP	KC7215																		
HTS	very large and deep hole	inner pockets HP**	KC7215	550 **800** 1000													.0020 **.0030** .0050	.0020 **.0030** .0050	.0020 **.0040** .0060	.0030 **.0050** .0080	.0030 **.0060** .0080
		outer pockets HP	KC7215																		

• These are starting condition guidelines only. The machine tool, fixturing, toolholding, part configuration, and coolant capability may significantly influence specific applications.
• Use proper and safe machining practices.
• Inch and metric diameters are not standard in all drill styles. See specific catalog pages.
• Typically, large-diameter indexable drills require lower sfm than the recommended starting speed.
• Decrease sfm as material hardness increases.
• Decrease sfm and ipr (feed) as tool length-to-diameter ratio increases, especially on KSEM and HTS drills.
• To convert from ipr to mm/rev., multiply value by 25.4. To convert sfm to m/min., divide value by 3.27.
• Calculate sfm from largest diameter of drill.
† CTR – Counterboring feed rate is given in cpt (chip load per tooth). A chipbreaking program routine may be necessary.
*** Inner pockets on HTS drills are those closest to the pilot drill. For an illustration, see page H608.*

Workpiece Material – Group 4

Miscellaneous Non-Ferrous Work Materials

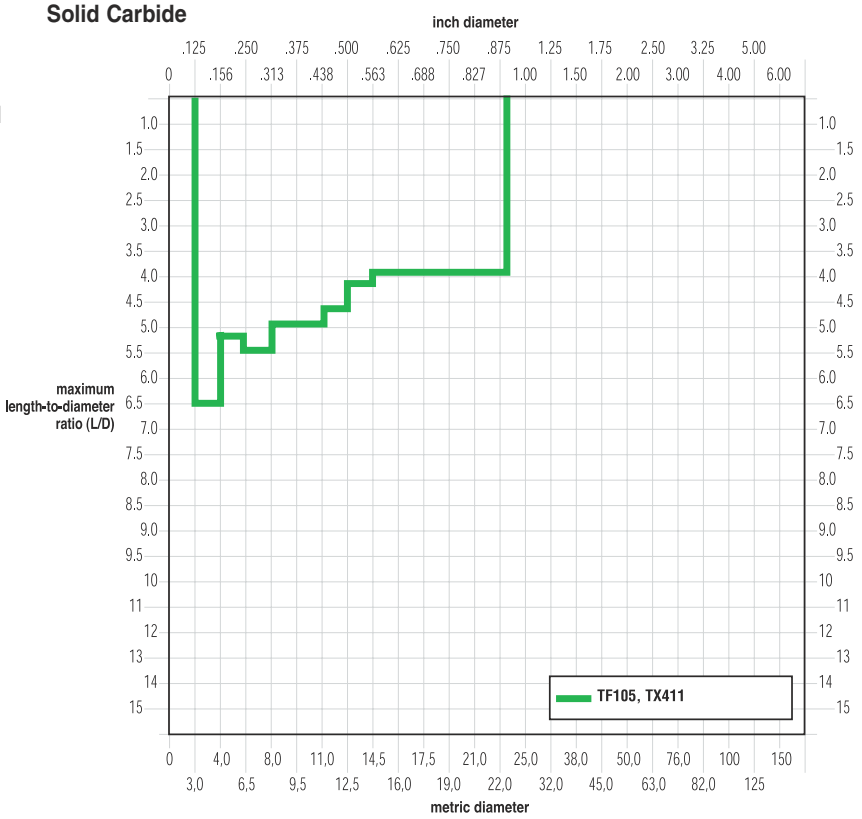
Non-Ferrous Machining Alloys: copper, brass, zinc

Drill Application Guide:

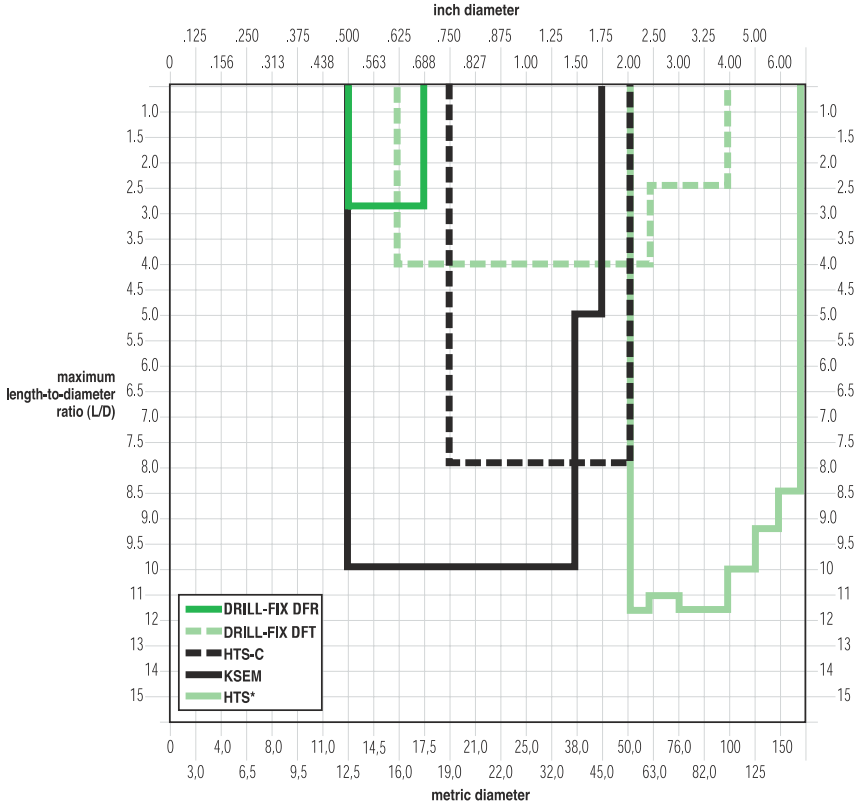
- When drilling copper, chip control may become unmanageable at high feed rates.
- For holes greater than 2x diameter, consider a feed dwell in the CNC cycle. This will shorten the chip lengths and avoid bird-nesting around the drill.
- Reduce feed rates as material softness increases to avoid packing the drill flutes.
- When applying HTS-C drills, consider using a solid carbide spot drill because higher speeds are generally appropriate.

NOTE: For optimum performance, do not peck drill with solid carbide or indexable drill products.

Solid Carbide



Indexable/Modular



*NOTES: L/D ratios and diameters are approximate; see product catalog pages for specific information. Inch to metric conversions are approximate. Inch and metric products are not available as a standard in all drill styles. *L/D ratio for HTS drills is based upon two joints, longest basic inch shank and longest extension. An HTS drill diameter above 6.70" requires special mounting.*

Workpiece Material – Group 4

drill style	application	geometry	grade	sfm	starting recommendation for feed (ipr) by drill diameter															
					.125	.156	.187	.250	.375	.500	.625	.750	.875	1.00	1.25	1.50	1.75	2.00	3.00	4.00	≥6.00
					3,0	4,0	5,0	6,5	9,5	12,5	16,0	19,0	21,0	25,0	32,0	38,0	44,5	50,0	76,0	100	≥150
Dynapoint	regular depth without coolant	TF105	K10	400 **525** 700	.003 **.005** .006	.005 **.006** .007	.005 **.007** .009	.007 **.009** .013	.009 **.013** .015	.013 **.015** .018	.015 **.017** .019	.018 **.020** .022	.020 **.020** .022								
	regular depth with coolant	TX411	KF1	400 **525** 700	.003 **.004** .006	.004 **.005** .007	.005 **.006** .010	.006 **.008** .012	.009 **.011** .015	.012 **.015** .018	.015 **.017** .020	.017 **.020** .022	.020 **.020** .022								
	BF drill	TX462 (special TX)	KF1	400 **420** 480	.003 **.004** .006	.004 **.005** .008	.005 **.006** .010	.007 **.008** .013	.009 **.011** .016	.012 **.015** .019	.014 **.017** .020										
†CTR	counterbore	-22	KM1	300 **420** 600								.0010 **.0010** .0025	.0010 **.0010** .0025	.0010 **.0020** .0035	.0010 **.0020** .0035	.0010 **.0020** .0035	.0010 **.0200** .0035				
KSEM	larger diameter modular	LD	KC7215	400 **600** 800						.0070 **.0090** .0140	.0090 **.0110** .0160	.0120 **.0140** .0200	.0140 **.0160** .0240	.0160 **.0180** .0270	.0200 **.0220** .3000	.0220 **.0240** .0320					
DRILL-FIX DFR	smaller diameter indexable	inner pocket LD	KC7025	650 **1200** 1900						.0010 **.0020** .0030	.0010 **.0020** .0030	.0015 **.0030** .0050	.0025 **.0030** .0060	.0025 **.0030** .0060							
		outer pocket LD	KC7025																		
DRILL-FIX DFT	larger diameter indexable	inner pocket HP	KC7215	550 **900** 1200							.0020 **.0020** .0030	.0020 **.0020** .0030	.0020 **.0020** .0030								
		outer pocket HP	KC7215																		
		inner pocket HP	KC7215	550 **900** 1200										.0020 **.0020** .0030	.0025 **.0030** .0035						
		outer pocket HP	KC7215																		
		inner pocket HP	KC7215	550 **900** 1200												.0025 **.0030** .0035	.0030 **.0040** .0055	.0040 **.0050** .0065	.0050 **.0060** .0075		
		outer pocket HP	KC7215																		
HTS-C	larger diameter deep hole	inner pocket HP	KC7215	350 **630** 850								.0015 **.0020** .0040	.0015 **.0020** .0040	.0015 **.0020** .0040	.0020 **.0040** .0065	.0020 **.0040** .0060	.0025 **.0050** .0075				
		outer pocket HP	KC7215																		
HTS	very large and deep hole	inner pockets HP**	KC7215	250 **560** 750													.0020 **.0030** .0050	.0020 **.0030** .0050	.0020 **.0040** .0060	.0030 **.0050** .0080	.0030 **.0060** .0080
		outer pockets HP	KC7215																		

• These are starting condition guidelines only. The machine tool, fixturing, toolholding, part configuration, and coolant capability may significantly influence specific applications.
• Use proper and safe machining practices.
• Inch and metric diameters are not standard in all drill styles. See specific catalog pages.
• Typically, large-diameter indexable drills require lower sfm than the recommended starting speed.
• Decrease sfm as material hardness increases.
• Decrease sfm and ipr (feed) as tool length-to-diameter ratio increases, especially on KSEM and HTS drills.
• To convert from ipr to mm/rev., multiply value by 25.4. To convert sfm to m/min., divide value by 3.27.
• Calculate sfm from largest diameter of drill.
† CTR – Counterboring feed rate is given in cpt (chip load per tooth). A chipbreaking program routine may be necessary.
*** Inner pockets on HTS drills are those closest to the pilot drill. For an illustration, see page H608.*

Workpiece Material – Group 5

Iron-Base, Heat-Resistant Alloys (135-320 HB) (≤ 34 HRC)

Wrought: A-286, Discaloy, Incoloy 801, N-155, 16-25-6, 19-9 DL
Cast: ASTM A297, A351, A608, A567

Material Characteristics:

- Relatively poor tool life.
- Work-hardens rapidly.
- Usually abrasive, rather than hard.
- Tough and stringy chips.

Solid Carbide Application Guide:

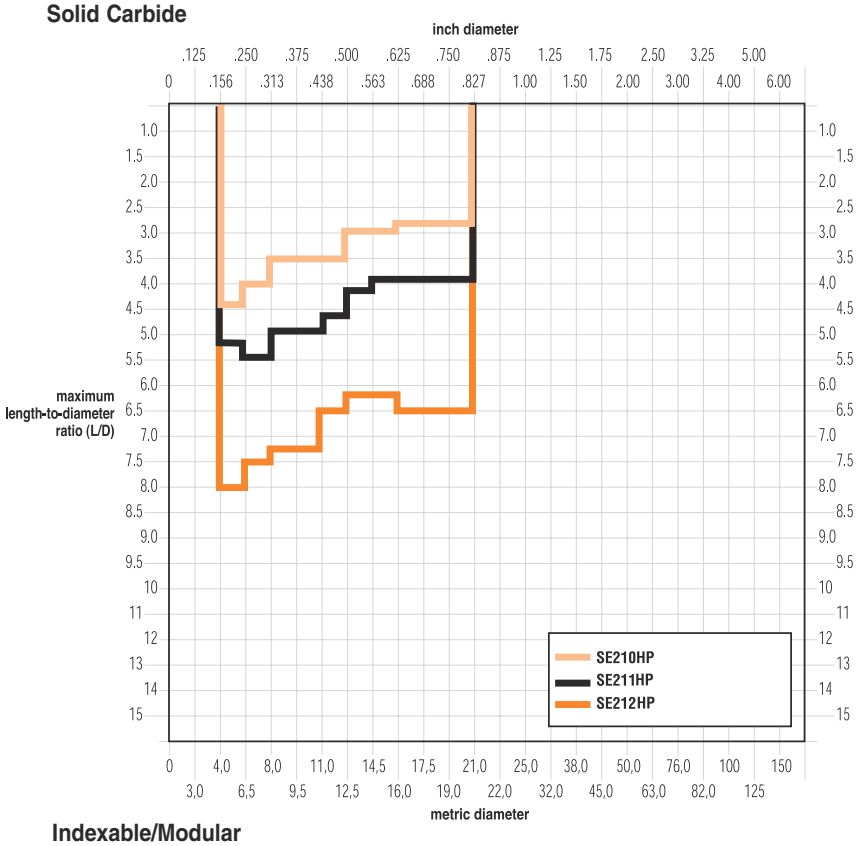
- Increase coolant concentration per coolant supplier recommendations.
- Use generous amount of coolant volume and pressure.
- Drill runout must not exceed .001 tir. Use hydraulic chucks or Powergrip milling chucks.
- Always back-stop the drill.

Indexable and Modular Application Guide:

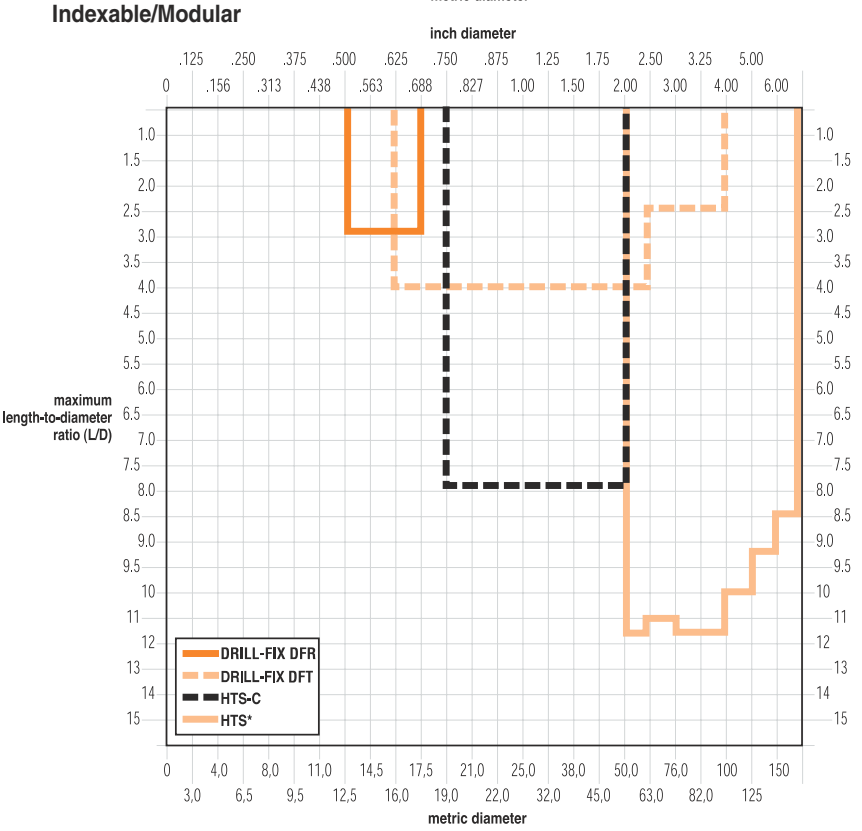
- TiAlN coated grades are usually the first choice for wear resistance and edge integrity.
- Use generous amount of coolant and coolant pressure.
- For HTS-C 8x diameter or long HTS drills, you must provide spot for pilot drill.
- Use HSS pilot drill to prevent chipping in the HTS-C bodies, as sfm is generally too slow for carbide.
- When using 4x diameter and longer indexable drills, apply at 75% of the recommended speed.

NOTE: For optimum performance, do not peck drill with solid carbide or indexable drill products.

Solid Carbide



Indexable/Modular



*NOTES: L/D ratios and diameters are approximate; see product catalog pages for specific information. Inch to metric conversions are approximate. Inch and metric products are not available as a standard in all drill styles. *L/D ratio for HTS drills is based upon two joints, longest basic inch shank and longest extension. An HTS drill diameter above 6.70" requires special mounting.*

Workpiece Material – Group 5

drill style	application	geometry	grade	sfm	starting recommendation for feed (ipr) by drill diameter																
					.125	.156	.187	.250	.375	.500	.625	.750	.875	1.00	1.25	1.50	1.75	2.00	3.00	4.00	≥6.00
					3,0	4,0	5,0	6,5	9,5	12,5	16,0	19,0	21,0	25,0	32,0	38,0	44,5	50,0	76,0	100	≥150
Dynapoint	short and regular depth with coolant	SE210HP SE211HP	KC7515	45 **55** 65	.002 **.003** .004	.002 **.003** .004	.002 **.003** .004	.002 **.003** .004	.003 **.004** .005	.004 **.005** .006	.005 **.006** .007	.006 **.007** .008	.007 **.008** .009	.008 **.009** .010							
†CTR	counterbore	-20	KC7140	35 **55** 90								.0010 **.0010** .0025	.0010 **.0020** .0035	.0010 **.0020** .0035	.0020 **.0030** .0035	.0020 **.0030** .0035	.0020 **.0030** .0035				
DRILL-FIX DFR	smaller diameter indexable	inner pocket LD	KC7225	160 **195** 230						.0010 **.0020** .0025	.0010 **.0020** .0025	.0015 **.0020** .0025	.0020 **.0030** .0035	.0020 **.0030** .0035							
		outer pocket LD	KC7225																		
DRILL-FIX DFT	larger diameter indexable	inner pocket GD	KC720	80 **100** 120							.0020 **.0020** .0035	.0020 **.0020** .0035	.0020 **.0020** .0035								
		outer pocket GD	KC720																		
		inner pocket GD	KC720	80 **100** 120										.0020 **.0030** .0040	.0020 **.0030** .0040						
		outer pocket GD	KC720																		
		inner pocket GD	KC720	80 **100** 120												.0020 **.0030** .0040	.0020 **.0040** .0050	.0020 **.0040** .0050	.0020 **.0040** .0050		
		outer pocket GD	KC720																		
HTS-C	larger diameter deep hole	inner pocket GD	KC720	80 **110** 120								.0015 **.0020** .0040	.0015 **.0020** .0040	.0015 **.0020** .0040	.0020 **.0030** .0050	.0020 **.0030** .0050	.0020 **.0030** .0050				
		outer pocket MD	KC720																		
HTS	very large and deep hole	inner pockets GD**	KC720	80 **100** 120													.0015 **.0020** .0040	.0020 **.0030** .0050	.0020 **.0030** .0050	.0020 **.0040** .0060	.0020 **.0040** .0060
		outer pockets GD	KC720																		

- *These are starting condition guidelines only. The machine tool, fixturing, toolholding, part configuration, and coolant capability may significantly influence specific applications.*
- *Use proper and safe machining practices.*
- *Inch and metric diameters are not standard in all drill styles. See specific catalog pages.*
- *Typically, large-diameter indexable drills require lower sfm than the recommended starting speed.*
- *Decrease sfm as material hardness increases.*
- *Decrease sfm and ipr (feed) as tool length-to-diameter ratio increases, especially on KSEM and HTS drills.*
- *To convert from ipr to mm/rev., multiply value by 25.4. To convert sfm to m/min., divide value by 3.27.*
- *Calculate sfm from largest diameter of drill.*

† CTR – Counterboring feed rate is given in cpt (chip load per tooth). A chipbreaking program routine may be necessary.

*** Inner pockets on HTS drills are those closest to the pilot drill. For an illustration, see page H608.*

Workpiece Material – Group 5

Cobalt-Base, Heat-Resistant Alloys (150-425 HB) (≤ 45 HRC)

Wrought: AiResist 213, Haynes 25 (L605), Haynes 188, J-1570, Stellite
Cast: AiResist 13, Haynes 21, MAR-M509, NASA Co-W-Re, WI-52

Material Characteristics:

- High forces at the cutting edge.
- High heat concentration in cutting area.
- High cutting speed may cause insert failure by plastic deformation.
- Cast material is more difficult to machine than wrought.
- Relatively poor tool life.
- Work-hardens rapidly.
- Usually abrasive, rather than hard.

Solid Carbide Application Guide:

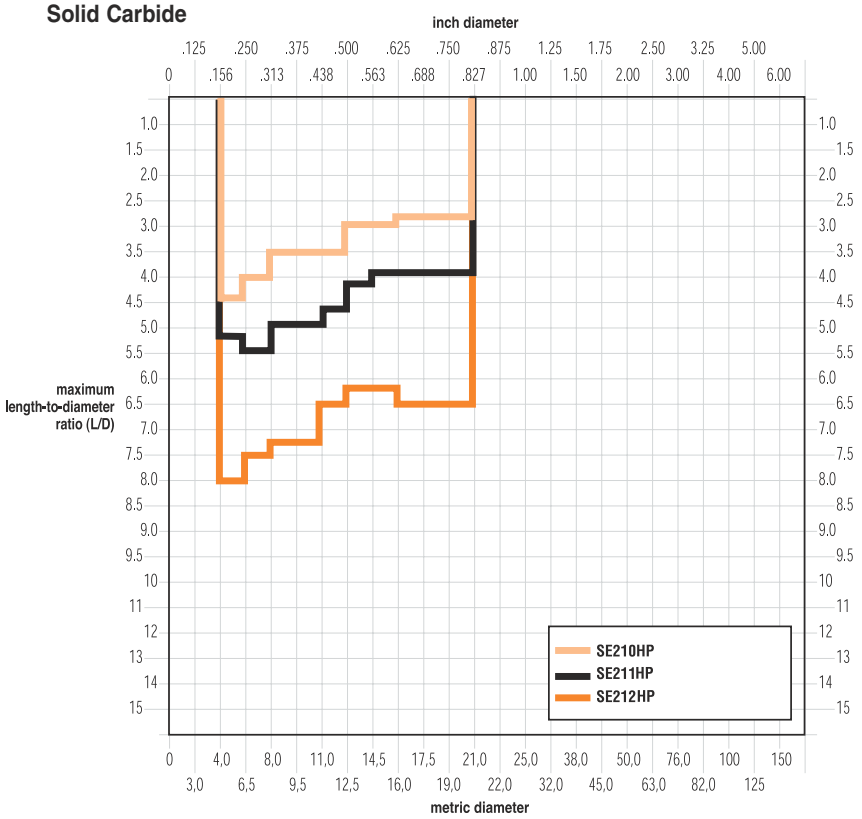
- Increase coolant concentration per coolant supplier recommendations.
- Use generous amount of coolant and coolant pressure.
- Drill runout must not exceed .001 tir. Use hydraulic chucks or Powergrip milling chucks.
- Always back-stop the drill.

Indexable and Modular Application Guide:

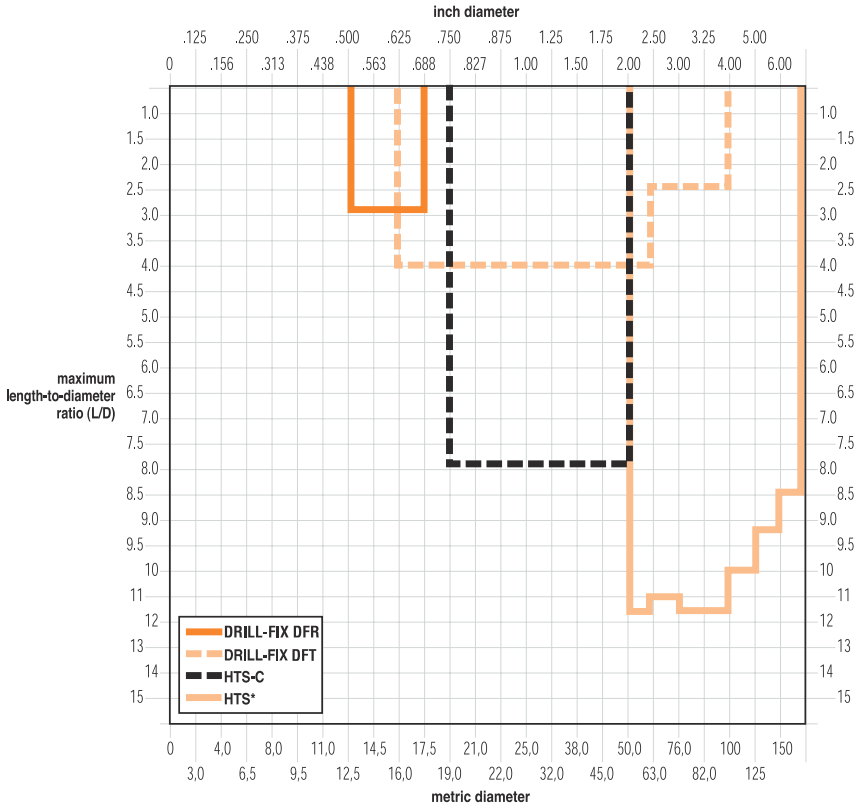
- TiAlN coated grades are usually the first choice for wear resistance and edge integrity.
- Use generous amount of coolant and coolant pressure.
- For HTS-C 8x diameter or long HTS drills, you must provide spot for pilot drill.
- Use HSS pilot drill to prevent chipping in the HTS-C bodies because sfm is generally too slow for carbide.
- When using 4x diameter and longer indexable drills, apply at 75% of the recommended speed.

NOTE: For optimum performance, do not peck drill with solid carbide or indexable drill products.

Solid Carbide



Indexable/Modular



*NOTES: L/D ratios and diameters are approximate; see product catalog pages for specific information. Inch to metric conversions are approximate. Inch and metric products are not available as a standard in all drill styles. *L/D ratio for HTS drills is based upon two joints, longest basic inch shank and longest extension. An HTS drill diameter above 6.70" requires special mounting.*

Workpiece Material – Group 5

drill style	application	geometry	grade	sfm	starting recommendation for feed (ipr) by drill diameter																
					.125	.156	.187	.250	.375	.500	.625	.750	.875	1.00	1.25	1.50	1.75	2.00	3.00	4.00	≥6.00
					3,0	4,0	5,0	6,5	9,5	12,5	16,0	19,0	21,0	25,0	32,0	38,0	44,5	50,0	76,0	100	≥150
Dynapoint	short and regular depth with coolant	SE210HP SE211HP	KC7515	40 **50** 60	.002 **.003** .004	.002 **.003** .004	.002 **.003** .004	.002 **.003** .004	.003 **.004** .005	.004 **.005** .006	.005 **.006** .007	.006 **.007** .008	.007 **.008** .009	.008 **.009** .010							
†CTR	counterbore	-20	KC7140	35 **55** 90								.0010 **.0010** .0025	.0010 **.0020** .0035	.0010 **.0020** .0035	.0020 **.0030** .0035	.0020 **.0030** .0035	.0020 **.0030** .0035				
DRILL-FIX DFR	smaller diameter indexable	inner pocket LD outer pocket LD	KC7025 KC7225	130 **160** 195						.0010 **.0020** .0025	.0010 **.0020** .0025	.0015 **.0020** .0025	.0020 **.0030** .0035	.0020 **.0030** .0035							
DRILL-FIX DFT	larger diameter indexable	inner pocket GD outer pocket GD	KC720 KC720	75 **95** 110							.0020 **.0020** .0035	.0020 **.0020** .0035	.0020 **.0030** .0040								
		inner pocket GD outer pocket GD	KC720 KC720	75 **95** 110										.0020 **.0030** .0040	.0020 **.0030** .0040						
		inner pocket GD outer pocket GD	KC720 KC720	75 **95** 110												.0020 **.0030** .0040	.0020 **.0040** .0050	.0020 **.0040** .0050	.0020 **.0040** .0050		
HTS-C	larger diameter deep hole	inner pocket GD outer pocket MD	KC720 KC720	80 **100** 115								.0015 **.0020** .0040	.0015 **.0020** .0040	.0015 **.0020** .0040	.0020 **.0030** .0050	.0020 **.0030** .0050	.0020 **.0030** .0050				
HTS	very large and deep hole	inner pockets GD** outer pockets GD	KC720 KC720	75 **95** 110													.0015 **.0020** .0040	.0020 **.0030** .0050	.0020 **.0030** .0050	.0020 **.0040** .0060	.0020 **.0040** .0060

• These are starting condition guidelines only. The machine tool, fixturing, toolholding, part configuration, and coolant capability may significantly influence specific applications.
• Use proper and safe machining practices.
• Inch and metric diameters are not standard in all drill styles. See specific catalog pages.
• Typically, large-diameter indexable drills require lower sfm than the recommended starting speed.
• Decrease sfm as material hardness increases.
• Decrease sfm and ipr (feed) as tool length-to-diameter ratio increases, especially on KSEM and HTS drills.
• To convert from ipr to mm/rev., multiply value by 25.4. To convert sfm to m/min., divide value by 3.27.
• Calculate sfm from largest diameter of drill.
† CTR – Counterboring feed rate is given in cpt (chip load per tooth). A chipbreaking program routine may be necessary.
*** Inner pockets on HTS drills are those closest to the pilot drill. For an illustration, see page H608.*

Workpiece Material – Group 5

Nickel-Base, Heat-Resistant Alloys (140-475 HB) (≤ 48 HRC)

Astroloy, Hastelloy B/C/C-276/X, Inconel 601/617/625/700/706/718, IN 102, Incoloy 901, MAR- M200, Nimonic, Rene 41, Udimet, Waspaloy, Monel

Material Characteristics:

- High forces at the cutting edge.
- High heat concentration in cutting area.
- High cutting speed may cause insert failure by plastic deformation.
- Cast material is more difficult to machine than wrought.
- Relatively poor tool life.
- Work-hardens rapidly.
- Usually abrasive, rather than hard.

Solid Carbide Application Guide:

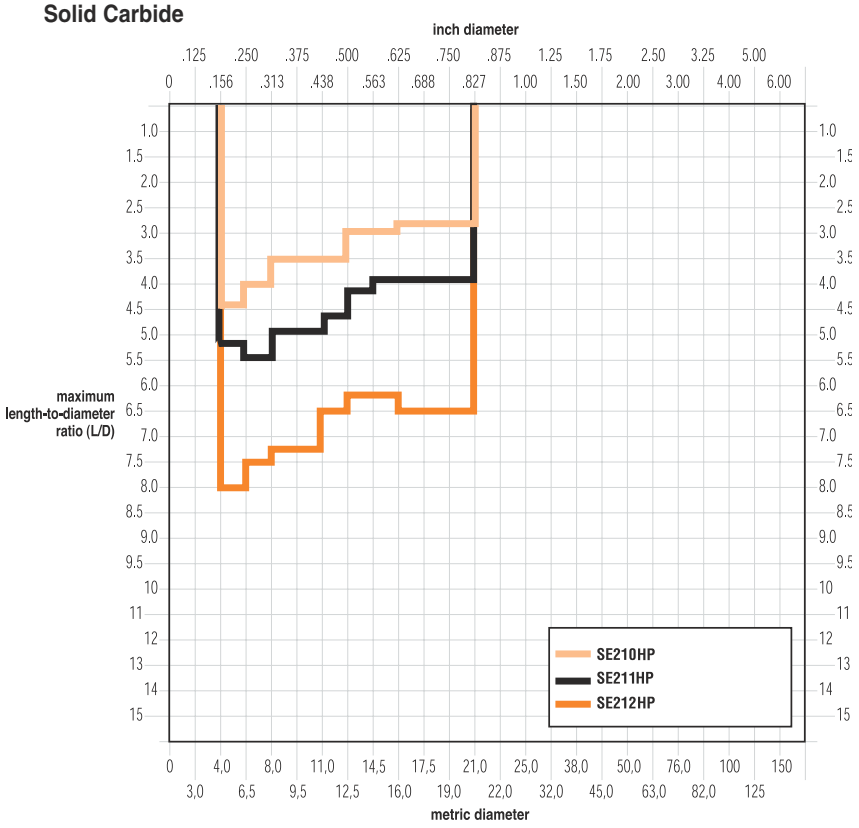
- Increase coolant concentration per coolant supplier recommendations.
- Use generous amount of coolant and coolant pressure.
- Drill runout must not exceed .001 tir. Use hydraulic chucks or Powergrip milling chucks.
- Always back-stop the drill.

Indexable and Modular Application Guide:

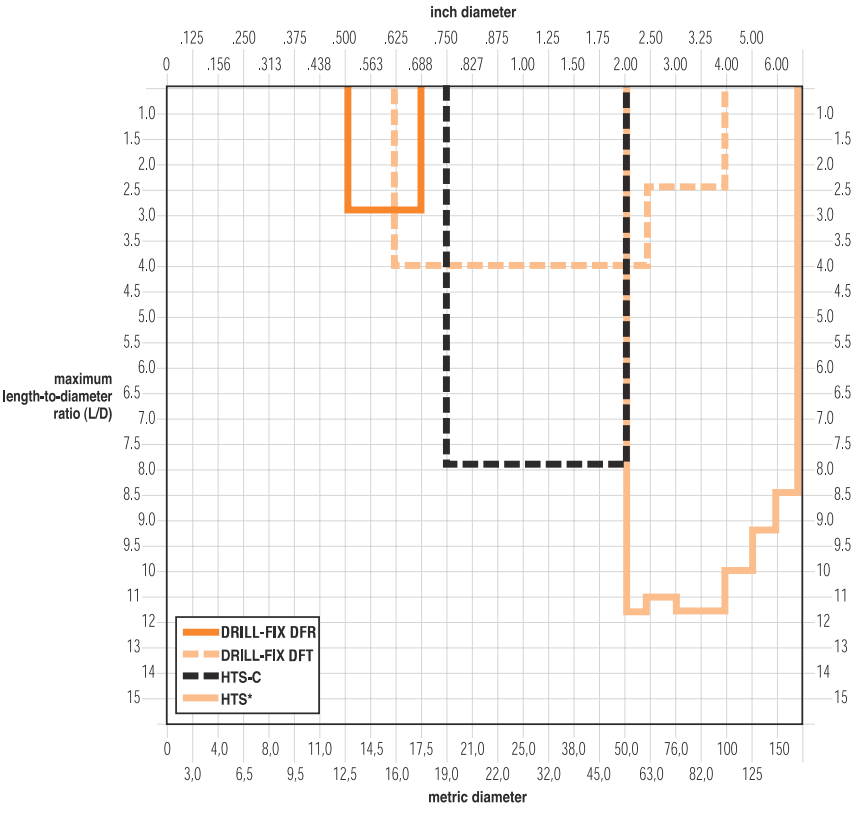
- TiAlN-coated grades are usually the first choice for wear resistance and edge integrity.
- Use generous amount of coolant and coolant pressure.
- For KSEM drills, at 5x diameter or greater L/D ratio, spot drilling should be used. See page H128.
- For HTS-C 8x diameter or long HTS drills, you must provide spot for pilot drill.
- Use HSS pilot drill to prevent chipping in the HTS-C bodies because sfm is generally too slow for carbide.
- When using 4x diameter and longer indexable drills, apply at 75% of the recommended speed.

NOTE: For optimum performance, do not peck drill with solid carbide or indexable drill products.

Solid Carbide



Indexable/Modular



*NOTES: L/D ratios and diameters are approximate; see product catalog pages for specific information. Inch to metric conversions are approximate. Inch and metric products are not available as a standard in all drill styles. *L/D ratio for HTS drills is based upon two joints, longest basic inch shank and longest extension. An HTS drill diameter above 6.70" requires special mounting.*

Workpiece Material – Group 5

drill style	application	geometry	grade	sfm	starting recommendation for feed (ipr) by drill diameter																
					.125	.156	.187	.250	.375	.500	.625	.750	.875	1.00	1.25	1.50	1.75	2.00	3.00	4.00	≥6.00
					3,0	4,0	5,0	6,5	9,5	12,5	16,0	19,0	21,0	25,0	32,0	38,0	44,5	50,0	76,0	100	≥150
Dynapoint	short and regular depth with coolant	SE210HP SE211HP	KC7515	65 **75** 90	.002 **.003** .004	.002 **.003** .004	.002 **.003** .004	.002 **.003** .004	.003 **.004** .005	.004 **.005** .006	.005 **.006** .007	.006 **.007** .008	.007 **.008** .009	.008 **.009** .010							
†CTR	counterbore	-20	KC7140	35 **55** 90								.0010 **.0010** .0025	.0010 **.0020** .0035	.0010 **.0020** .0035	.0020 **.0030** .0035	.0020 **.0030** .0035	.0020 **.0030** .0035				
DRILL-FIX DFR	smaller diameter indexable	inner pocket LD	KC7225	130 **160** 195						.0010 **.0020** .0025	.0010 **.0020** .0025	.0015 **.0020** .0025	.0020 **.0030** .0035	.0020 **.0030** .0035							
		outer pocket LD	KC7225																		
DRILL-FIX DFT	larger diameter indexable	inner pocket GD	KC720	75 **95** 110							.0020 **.0020** .0035	.0020 **.0020** .0035	.0020 **.0020** .0035								
		outer pocket GD	KC720																		
		inner pocket GD	KC720	75 **95** 110										.0020 **.0030** .0040	.0020 **.0030** .0040						
		outer pocket GD	KC720																		
		inner pocket GD	KC720	75 **95** 110												.0020 **.0030** .0040	.0020 **.0040** .0050	.0020 **.0040** .0050	.0020 **.0040** .0050		
		outer pocket GD	KC720																		
HTS-C	larger diameter deep hole	inner pocket GD	KC720	80 **100** 115								.0015 **.0020** .0040	.0015 **.0020** .0040	.0015 **.0020** .0040	.0020 **.0030** .0050	.0020 **.0030** .0050	.0020 **.0030** .0050				
		outer pocket MD	KC720																		
HTS	very large and deep hole	inner pockets GD**	KC720	75 **95** 110													.0015 **.0020** .0040	.0020 **.0030** .0050	.0020 **.0030** .0050	.0020 **.0040** .0060	.0020 **.0040** .0060
		outer pockets GD	KC720																		

- *These are starting condition guidelines only. The machine tool, fixturing, toolholding, part configuration, and coolant capability may significantly influence specific applications.*
- *Use proper and safe machining practices.*
- *Inch and metric diameters are not standard in all drill styles. See specific catalog pages.*
- *Typically, large-diameter indexable drills require lower sfm than the recommended starting speed.*
- *Decrease sfm as material hardness increases.*
- *Decrease sfm and ipr (feed) as tool length-to-diameter ratio increases, especially on KSEM and HTS drills.*
- *To convert from ipr to mm/rev., multiply value by 25.4. To convert sfm to m/min., divide value by 3.27.*
- *Calculate sfm from largest diameter of drill.*

† CTR – Counterboring feed rate is given in cpt (chip load per tooth). A chipbreaking program routine may be necessary.

*** Inner pockets on HTS drills are those closest to the pilot drill. For an illustration, see page H608.*

Workpiece Material – Group 5

Titanium and Titanium Alloys (110-450 HB) (≤ 48 HRC)

pure: Ti98.8, Ti99.9

alloyed: Ti5Al2.5Sn, Ti-6Al-4V, Ti6Al2Sn-4Zr-2Mo, Ti3Al-8V-6Cr-4Mo-4Zr, Ti10V-2Fe-3Al, Ti-13V-11Cr-3Al

Material Characteristics:

- Recommendations are based on material hardness of 38 HRC.
- Relatively poor tool life, even at low cutting speeds.
- High chemical reactivity causes chips to gall and weld to cutting edge.
- Low thermal conductivity increases cutting temperatures.
- Usually abrasive, tough, and stringy.
- Take precautionary measures when machining a reactive metal.
- Low elastic modulus easily causes deflection of workpiece.
- Workhardens easily.

Solid Carbide Application Guide:

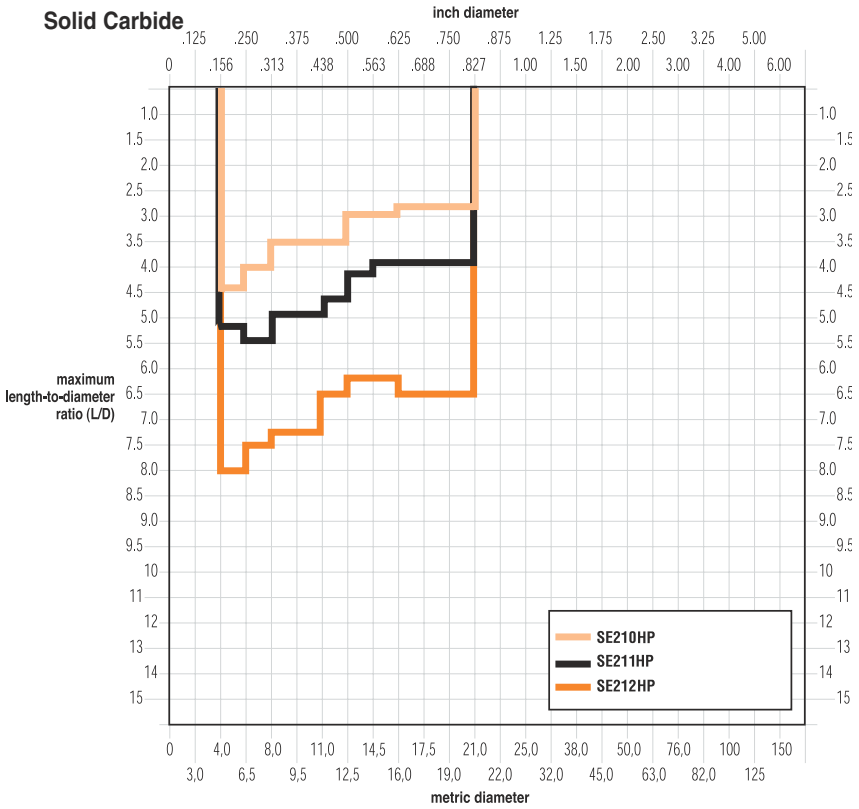
- Drills with through-coolant capability are usually the first choice for this group.
- Feeds and speeds are based on high-quality, high-precision holes.
- Coolant is essential for heat dissipation.
- Apply TF105 drills only on short-hole applications, less than 2x diameter.
- Always back-stop the drill.

Indexable and Modular Application Guide:

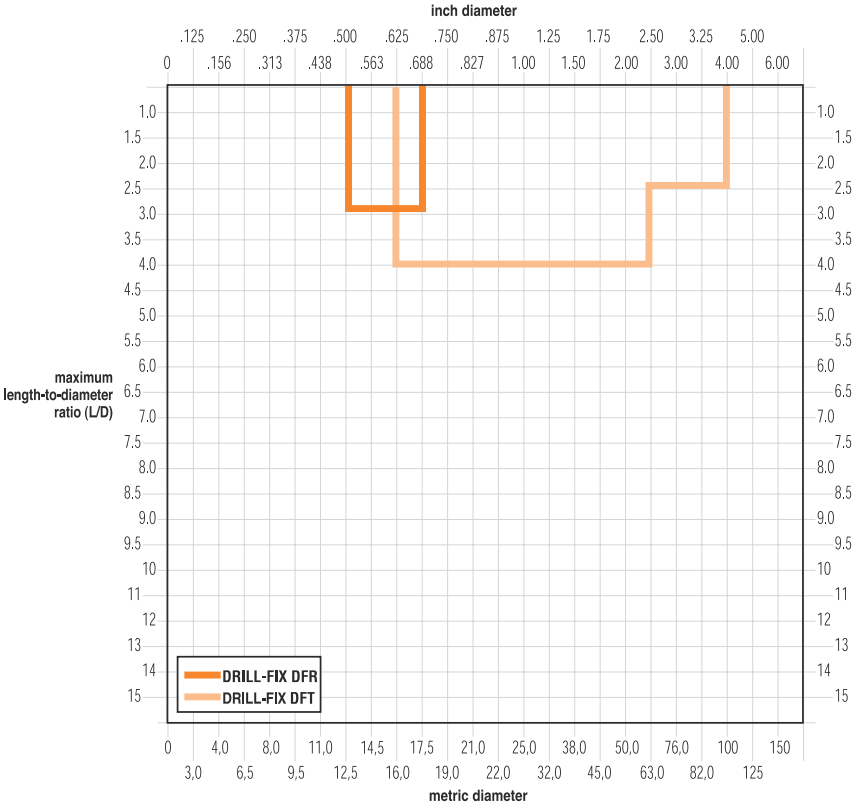
- KSEM drills may be applied on pure titanium only.
- Pure titanium can be machined at speeds 30% higher than listed.

NOTE: For optimum performance, do not peck drill with solid carbide or indexable drill products.

Solid Carbide



Indexable/Modular



*NOTES: L/D ratios and diameters are approximate; see product catalog pages for specific information. Inch to metric conversions are approximate. Inch and metric products are not available as a standard in all drill styles. *L/D ratio for HTS drills is based upon two joints, longest basic inch shank and longest extension. An HTS drill diameter above 6.70" requires special mounting.*

Workpiece Material – Group 5

drill style	application	geometry	grade	sfm	starting recommendation for feed (ipr) by drill diameter															
					.125	.156	.187	.250	.375	.500	.625	.750	.875	1.00	1.25	1.50	1.75	2.00	3.00	4.00	≥6.00
					3,0	4,0	5,0	6,5	9,5	12,5	16,0	19,0	21,0	25,0	32,0	38,0	44,5	50,0	76,0	100	≥150
Dynapoint	short and regular depth with coolant	SE210HP SE211HP	KC7515	90 **150** 180	.002 **.003** .004	.002 **.003** .004	.002 **.003** .004	.003 **.004** .005	.003 **.004** .005	.003 **.004** .005	.004 **.005** .006	.004 **.005** .006	.005 **.006** .007	.006 **.006** .007							
	regular depth with coolant	TF125	K715	70 **90** 100				.001 **.002** .003	.001 **.002** .004	.003 **.004** .006	.003 **.004** .006										
	regular length without coolant	TF105	K10	70 **90** 100	.001 **.002** .003	.001 **.002** .003	.001 **.002** .003	.001 **.002** .003	.001 **.002** .004	.003 **.004** .006	.003 **.004** .006	.003 **.004** .006	.004 **.005** .007								
†CTR	counterbore	-22	KM1	50 **75** 125								.0010 **.0010** .0025	.0010 **.0010** .0025	.0010 **.0020** .0030	.0010 **.0020** .0030	.0010 **.0020** .0030	.0010 **.0020** .0030				
DRILL-FIX DFR	smaller diameter indexable	inner pocket LD	KC7225	160 **190** 320						.0010 **.0020** .0035	.0010 **.0020** .0035	.0015 **.0020** .0035	.0020 **.0030** .0035	.0020 **.0030** .0035							
		outer pocket LD	KC7225																		
DRILL-FIX DFT	larger diameter indexable	inner pocket GD	KC7215	100 **130** 180							.0020 **.0020** .0035	.0020 **.0020** .0035	.0020 **.0020** .0035								
		outer pocket GD	KC7215																		
		inner pocket GD	KC7215	100 **130** 180										.0020 **.0020** .0035	.0020 **.0020** .0035						
		outer pocket GD	KC7215																		
		inner pocket GD	KC7215	100 **130** 180												.0020 **.0030** .0040	.0020 **.0030** .0040	.0020 **.0030** .0040	.0020 **.0030** .0040		
		outer pocket GD	KC7215																		
HTS-C	larger diameter deep hole	inner pocket HP	KC7215	100 **140** 175								.0015 **.0020** .0040	.0015 **.0020** .0040	.0015 **.0020** .0040	.0020 **.0030** .0050	.0020 **.0030** .0050	.0020 **.0030** .0050				
		outer pocket MD	KC7215																		
HTS	very large and deep hole	inner pockets HP**	KC7215	100 **130** 180													.0015 **.0020** .0040	.0015 **.0020** .0040	.0015 **.0020** .0040	.0020 **.0030** .0050	.0020 **.0030** .0050
		outer pockets HP	KC7215																		

• These are starting condition guidelines only. The machine tool, fixturing, toolholding, part configuration, and coolant capability may significantly influence specific applications.
• Use proper and safe machining practices.
• Inch and metric diameters are not standard in all drill styles. See specific catalog pages.
• Typically, large-diameter indexable drills require lower sfm than the recommended starting speed.
• Decrease sfm as material hardness increases.
• Decrease sfm and ipr (feed) as tool length-to-diameter ratio increases, especially on KSEM and HTS drills.
• To convert from ipr to mm/rev., multiply value by 25.4. To convert sfm to m/min., divide value by 3.27.
• Calculate sfm from largest diameter of drill.
† CTR – Counterboring feed rate is given in cpt (chip load per tooth). A chipbreaking program routine may be necessary.
*** Inner pockets on HTS drills are those closest to the pilot drill. For an illustration, see page H608.*