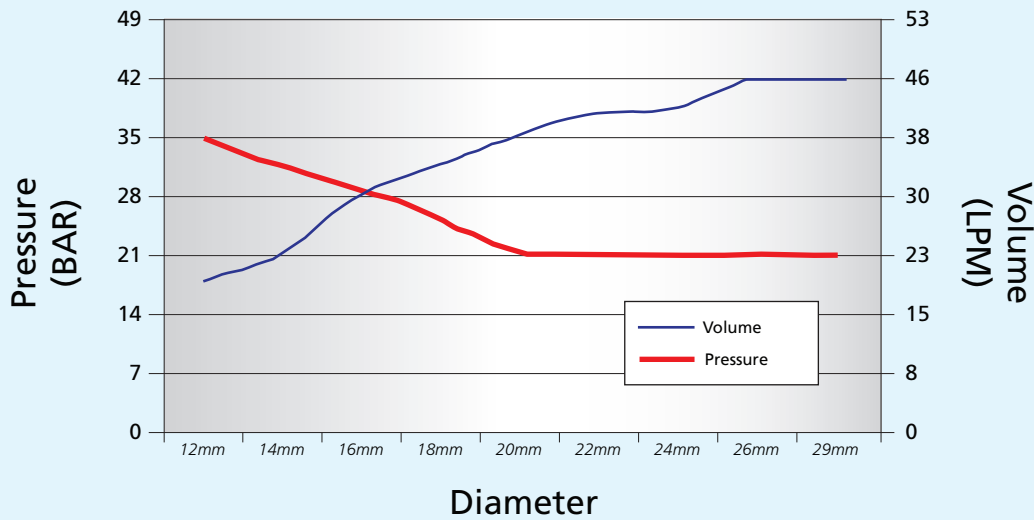




Drill Inserts Coolant Recommendations

Inch and Metric

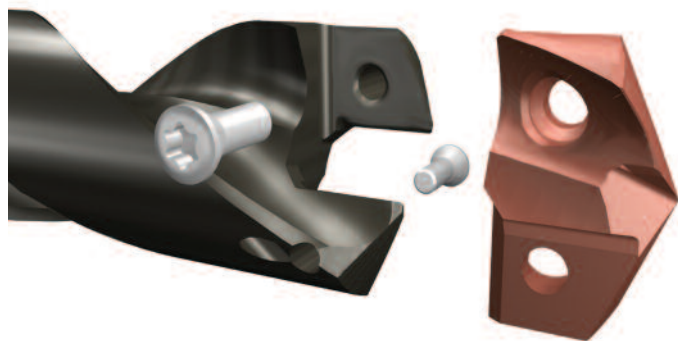


Diameter	Metric		Inch	
	BAR	LPM	PSI	GPM
12mm	35	19	500	5
14mm	31	23	450	6
16mm	28	30	410	8
18mm	25	34	360	9
20mm	21	38	300	10
22mm	21	42	300	11
24mm	21	42	300	11
26mm	21	46	300	12
29mm	21	46	300	12

The coolant pressure and flow rate recommendation above, represents a good approximation to obtain optimum tool life and chip evacuation at AMEC recommended speeds and feeds for 3x & 5x diameter holder lengths. Please multiply the above by 1.5 when using the 7x diameter holder. For a more specific approximation of coolant requirements, consult the AMEC Application Engineering Department.

Tool Assembly

- Place the GEN3SYS® Drill Insert into the precision ground locating pocket on the GEN3SYS® Holder. The drill insert should not be turned rotated or twisted for locking purposes. The holder pocket and locating pad on the drill insert assure optimum fit and repeatability.
- Place a generous amount of Never Seize (provided in the packaging) onto the supplied TORX Plus Screws.
- Tighten the TORX Plus Screws utilizing the predetermined TORX Plus Drivers and TORX Plus Screw admissible tightening Torque outlined in the catalogue per GEN3SYS® Series.



TAP DRILL INFORMATION						
Metric Profile Screw Thread						
Tap Size	Tap Drill Size	Decimal Equivalent	* Theo % Thread	Prob Mean Oversize	Prob Hole Size	** Prob % Thread
12 x 1,75	10.2mm	.4016"	79%	0.075mm	10.28mm	76%
	13.32	.4063"	74%	0.075mm	10.40mm	71%
12 x 1,25	²⁷ / ₆₄ "	.4219"	79%	0.075mm	10.79mm	74%
	10.8mm	.4252"	74%	0.075mm	10.88mm	69%
14 x 2,0	¹⁵ / ₃₂ "	.4688"	81%	0.075mm	11.98mm	78%
	12.0mm	.4724"	77%	0.075mm	12.08mm	74%
14 x 1,5	12.5mm	.4921"	77%	0.075mm	12.58mm	73%
16 x 2,0	14.0mm	.5512"	77%	0.075mm	14.08mm	74%
16 x 1,5	14.5mm	.5709"	77%	0.075mm	14.58mm	73%
	³⁷ / ₆₄ "	.5781"	68%	0.075mm	14.76mm	64%
18 x 2,5	15.5mm	.6102"	77%	0.075mm	15.58mm	75%
18 x 1,5	16.5mm	.6496"	77%	0.075mm	16.58mm	73%
	²¹ / ₃₂ "	.6563"	68%	0.075mm	16.75mm	64%
20 x 2,5	¹¹ / ₁₆ "	.6875"	78%	0.075mm	17.54mm	76%
	17.5mm	.6890"	77%	0.075mm	17.58mm	74%
20 x 1,5	18.5mm	.7283"	77%	0.075mm	18.58mm	73%
	⁴⁷ / ₆₄ "	.7344"	69%	0.075mm	18.66mm	65%
22 x 2,5	⁴⁹ / ₆₄ "	.7656"	79%	0.075mm	19.52mm	76%
	19.5mm	.7677"	77%	0.075mm	19.58mm	75%
22 x 1,5	20.5mm	.8071"	77%	0.075mm	20.58mm	73%
	¹³ / ₁₆ "	.8125"	70%	0.075mm	20.71mm	66%
24 x 3	¹³ / ₁₆ "	.8125"	86%	0.075mm	20.71mm	84%
	21.0mm	.8268"	76%	0.075mm	21.08mm	75%
24 x 2	22.0mm	.8661"	77%	0.075mm	22.08mm	74%
	⁷ / ₈ "	.8750"	68%	0.075mm	22.30mm	65%
27 x 3	24.0mm	.9449"	77%	0.075mm	24.08mm	75%

*Based on nominal tap drill diameter.

**Based on 0.075mm probable mean oversize.

To calculate percent of full thread for a given hole diameter:

$$\% \text{ Thread} = \frac{76.93}{\text{Pitch mm}}$$

(Basic Major drill Hole)
(Diameter (mm) - Size (mm))

Taper Pipe Thread (BSP & ISO 7-1)						
Metric Profile Screw Thread						
Tap Size	Tap Drill Size	Decimal Equivalent	* Theo % Thread	Prob Mean Oversize	Prob Hole Size	** Prob % Thread
¹ / ₄ " - 19	⁷ / ₁₆ "	.4325"	N/A	0.075mm	11.19mm	N/A
³ / ₈ " - 19	³⁷ / ₆₄ "	.5781"	N/A	0.075mm	14.76mm	N/A
¹ / ₂ " - 14	²³ / ₃₂ "	.7188"	N/A	0.075mm	18.33mm	N/A
³ / ₄ " - 14	¹⁵ / ₁₆ "	.9375"	N/A	0.075mm	23.89mm	N/A

The above tap drill information represents probable thread percentages for the standard tap drills stocked at AMEC. Special insert diameters may be required in order to meet a user specific percentage of thread requirements. The 0.075mm probable mean oversize hole condition is based on optimum cutting conditions. Probable % of full thread may vary based on less ideal cutting conditions.

THRUST & HORSEPOWER

FORMULAS

1. RPM = $\frac{(318.47) \cdot (M/min)}{DIA}$

where:

RPM = revolutions per minute (rev/min)
M/min = surface meter per minute (M/min)
DIA = diameter of drill (mm)

2. Thrust = $154 \cdot (mm/rev) \cdot DIA \cdot Km$

where:

Thrust = axial thrust in newtons (N)
mm/rev = feed rate (mm/rev)
DIA = diameter of drill (mm)
Km = specific cutting energy (kPa)

3. Tool Power = $\frac{(mm/rev) \cdot (RPM) \cdot (Km) \cdot (DIA^2)}{218604,8}$

where:

Tool Power = tool power in kilowatts (KW)
Mm/rev = feedrate (mm/rev)
RPM = revolutions per minute (rev/min)
Km = specific cutting energy (kpa)
DIA = diameter of drill (mm)

Note:

The table and equations are found in the *Machinery's Handbook*. Permission to simplify and print the equations is granted by the editor of the *Machinery's Handbook*.

MATERIAL CONSTANTS

Type of Material Km (kPa)

Plain Carbon and Alloy Steel

85 - 200 BHN 5.45
200 - 275 BHN 6.48
275 - 375 BHN 6.89
375 - 425 BHN 7.93

High Temperature Alloys

9.93

Stainless Steel

135 - 275 BHN 6.48

30 - 45 RC 7.45

Copper Alloy

20 - 80 RB 2.96

80 - 100 RB 4.96

Titanium Alloy

4.96

Aluminium Alloy

1.52

Magnesium Alloy

1.10

Cast Iron

100 - 200 BHN 3.45

200 - 300 BHN 7.45



Drill Inserts and Holders

Recommended Speeds and Feeds

Carbide Metric

Material Category	Material Hardness (BHN)	Carbide Drill Inserts													
		Grade	AM200 [®] M/min	Feed (mm/rev)											
				12	13	14	15	16	17	18	20	22	24	26	29
				12.00 to 12.99	13.00 to 13.99	14.00 to 14.99	15.00 to 15.99	16.00 to 16.99	17.00 to 17.99	18.00 to 19.99	20.00 to 22.00	22.00 to 23.99	24.00 to 25.99	26.00 to 28.99	29.00 to 32.00
Free Machining Steel 118,1215, 12L14,etc	100-150	K35	146	0.30	0.33	0.36	0.38	0.41	0.43	0.48	0.53	0.56	0.58	0.61	0.64
	150-200	K35	127	0.28	0.30	0.33	0.36	0.38	0.41	0.43	0.48	0.51	0.53	0.56	0.58
	200-250	K35	119	0.23	0.25	0.28	0.30	0.33	0.36	0.41	0.46	0.48	0.51	0.53	0.56
Low Carbon Steel 1010, 1020, 1025, 1522, 1144, etc	85-125	K35	137	0.30	0.33	0.36	0.38	0.41	0.43	0.48	0.53	0.56	0.58	0.61	0.64
	125-175	K35	119	0.28	0.30	0.33	0.36	0.38	0.41	0.46	0.48	0.51	0.53	0.56	0.58
	175-225	K35	108	0.25	0.28	0.30	0.33	0.36	0.38	0.43	0.46	0.48	0.51	0.53	0.56
Medium Carbon Steel 1030, 1040, 1050, 1527, 1140, 1151, etc	125-175	K35	119	0.28	0.30	0.33	0.36	0.38	0.41	0.46	0.51	0.53	0.56	0.58	0.61
	175-225	K35	108	0.25	0.28	0.30	0.33	0.36	0.38	0.43	0.48	0.51	0.53	0.56	0.58
	225-275	K35	95	0.23	0.25	0.28	0.30	0.33	0.36	0.41	0.46	0.48	0.51	0.53	0.56
Alloy Steel 4140, 5140, 8640, etc	125-175	K35	114	0.28	0.30	0.33	0.36	0.38	0.41	0.46	0.51	0.53	0.56	0.58	0.61
	175-225	K35	105	0.25	0.28	0.30	0.33	0.36	0.38	0.43	0.48	0.51	0.53	0.56	0.58
	225-275	K35	95	0.23	0.25	0.28	0.30	0.33	0.36	0.41	0.46	0.48	0.51	0.53	0.56
	275-325	K35	87	0.18	0.20	0.23	0.25	0.28	0.30	0.36	0.38	0.41	0.43	0.46	0.48
High Strength Steel 4340, 4330V, 300M, etc	325-375	K35	78	0.15	0.18	0.20	0.23	0.25	0.28	0.33	0.36	0.38	0.41	0.43	0.46
	225-300	K35	70	0.23	0.25	0.28	0.28	0.30	0.33	0.36	0.38	0.41	0.43	0.46	0.48
	300-350	K35	63	0.18	0.20	0.23	0.25	0.28	0.28	0.30	0.33	0.36	0.38	0.41	0.43
Structural Steel A36, A285, A516, etc	350-400	K35	56	0.15	0.18	0.20	0.23	0.25	0.25	0.28	0.30	0.33	0.36	0.38	0.41
	100-150	K35	108	0.28	0.30	0.33	0.33	0.38	0.38	0.43	0.48	0.53	0.56	0.58	0.61
	150-250	K35	87	0.23	0.25	0.28	0.30	0.33	0.36	0.38	0.43	0.48	0.51	0.53	0.56
Hardox	250-350	K35	81	0.20	0.23	0.25	0.28	0.30	0.33	0.36	0.38	0.43	0.48	0.51	0.53
	400	K35	45	0.13	0.15	0.17	0.19	0.21	0.23	0.25	0.27	0.27	0.29	0.29	0.31
	500	K35	37	0.11	0.13	0.15	0.17	0.19	0.21	0.23	0.25	0.25	0.27	0.27	0.29
High Temp Alloy	600	K20	25	0.10	0.11	0.13	0.15	0.17	0.19	0.21	0.23	0.23	0.25	0.25	0.27
	140-220	K20	37	0.18	0.18	0.20	0.20	0.23	0.23	0.25	0.28	0.28	0.30	0.30	0.33
	220-310	K20	29	0.15	0.15	0.18	0.18	0.20	0.20	0.23	0.25	0.25	0.28	0.28	0.30
Titanium Alloy	140-220	K20	42	0.15	0.17	0.20	0.20	0.22	0.22	0.25	0.28	0.28	0.30	0.30	0.33
	220-310	K20	33	0.12	0.15	0.17	0.17	0.20	0.20	0.22	0.25	0.25	0.28	0.28	0.30
Aerospace Alloy 582	185-275	K20	45	0.10	0.12	0.14	0.15	0.16	0.18	0.18	0.20	0.22	0.24	0.26	0.28
	275-350	K20	37	0.09	0.10	0.12	0.14	0.15	0.16	0.16	0.18	0.20	0.22	0.24	0.26
Stainless Steel 400 Series 416, 420	185-275	K20	73	0.18	0.18	0.20	0.20	0.23	0.25	0.28	0.30	0.33	0.36	0.38	0.41
	275-350	K20	56	0.15	0.15	0.18	0.18	0.20	0.23	0.25	0.28	0.30	0.33	0.36	0.38
Stainless Steel 300 Series 304, 316, 17-4PH	185-275	K35	64	0.13	0.13	0.15	0.15	0.18	0.18	0.20	0.20	0.23	0.23	0.25	0.25
	275-350	K35	47	0.10	0.10	0.13	0.13	0.15	0.15	0.18	0.18	0.20	0.20	0.23	0.23
Super Duplex Duplex St.Stl	135-185	K20	38	0.07	0.09	0.10	0.11	0.12	0.13	0.15	0.16	0.18	0.20	0.20	0.22
	185-275	K20	30	0.06	0.08	0.09	0.10	0.11	0.12	0.14	0.15	0.16	0.18	0.18	0.20
Tool Steel H-13, H-21, A-4, O-2, S-3	150-200	K35	78	0.18	0.18	0.20	0.20	0.23	0.23	0.25	0.28	0.30	0.33	0.36	0.38
	200-250	K35	59	0.15	0.15	0.18	0.18	0.20	0.20	0.23	0.25	0.28	0.30	0.33	0.36
Hardened Steel	300-400	K35	47	0.13	0.15	0.17	0.19	0.21	0.22	0.23	0.25	0.25	0.27	0.27	0.29
	400-500	K35	37	0.11	0.13	0.15	0.17	0.19	0.20	0.21	0.23	0.23	0.25	0.25	0.27
Cast Aluminium	30	K20	300	0.33	0.35	0.38	0.40	0.43	0.45	0.48	0.50	0.53	0.56	0.58	0.61
	180	TiCN	225	0.30	0.33	0.35	0.38	0.40	0.43	0.45	0.48	0.51	0.53	0.56	0.58
Wrought Aluminium	30	K20	425	0.38	0.40	0.43	0.45	0.48	0.50	0.55	0.58	0.61	0.66	0.68	0.74
	180	K20	300	0.35	0.38	0.40	0.43	0.45	0.48	0.50	0.55	0.58	0.63	0.66	0.71
SG/Nodular Cast Iron	120-150	K20	146	0.30	0.33	0.36	0.38	0.41	0.46	0.51	0.53	0.56	0.58	0.61	0.64
	150-200	K20	138	0.28	0.30	0.33	0.36	0.38	0.43	0.48	0.51	0.53	0.56	0.58	0.61
	200-220	K20	123	0.25	0.28	0.30	0.33	0.36	0.41	0.46	0.48	0.51	0.53	0.56	0.58
	220-260	K20	108	0.23	0.25	0.28	0.30	0.33	0.38	0.43	0.46	0.48	0.51	0.53	0.56
	260-320	K20	97	0.21	0.23	0.25	0.28	0.30	0.36	0.38	0.43	0.46	0.48	0.51	0.53
Grey/White Iron	120-150	K20	152	0.33	0.36	0.38	0.41	0.43	0.48	0.53	0.56	0.58	0.61	0.64	0.66
	150-200	K20	146	0.30	0.33	0.36	0.38	0.41	0.46	0.51	0.53	0.56	0.58	0.61	0.64
	200-220	K20	131	0.28	0.30	0.33	0.36	0.38	0.43	0.48	0.51	0.53	0.56	0.58	0.61
	220-260	K20	113	0.25	0.28	0.30	0.33	0.36	0.41	0.46	0.48	0.51	0.53	0.56	0.58
	260-320	K20	102	0.25	0.28	0.30	0.33	0.36	0.38	0.43	0.46	0.48	0.51	0.53	0.56
Aluminium Bronze	100-200	K20	110	0.28	0.30	0.32	0.34	0.36	0.38	0.40	0.42	0.44	0.46	0.48	0.48
	200-250	K20	90	0.24	0.26	0.28	0.30	0.32	0.34	0.36	0.38	0.42	0.48	0.46	0.46
Brass	100	K20	200	0.30	0.33	0.36	0.38	0.41	0.43	0.48	0.53	0.56	0.60	0.63	0.66
Copper	60	K20	130	0.08	0.09	0.11	0.13	0.15	0.16	0.18	0.20	0.20	0.22	0.25	0.25



.80 Multiplier for 7 x Diameter

Formulas: $\text{mm/min} = \text{RPM} \cdot \text{mm/rev}$

$\text{m/min} = \text{RPM} \cdot 0.003 \cdot \text{DIA}$

$\text{RPM} = \text{M/min} \cdot 318.47/\text{DIA}$

Speed and Feed Recommendation Example: If recommended speed and feed is 61M/min and 0.20 mm/rev for a 3 x diameter or 5 x diameter holder, then the speed and feeds using a 7 x diameter holder in the same application would be 48.8M/min and 0.16mm/rev.

Example: $61 \text{ M/min} \cdot 0.80 = 48.8 \text{ M/min}$ $0.20 \text{ mm/rev} \cdot 0.80 = 0.16\text{mm/rev}$

- The speeds recommended for AM200® coated tools are based on empirical data obtained under "Optimum Conditions". Many applications do not exhibit "Optimum Conditions". Reductions in speed parameters may be required due to excessive tool wear generated in the application.

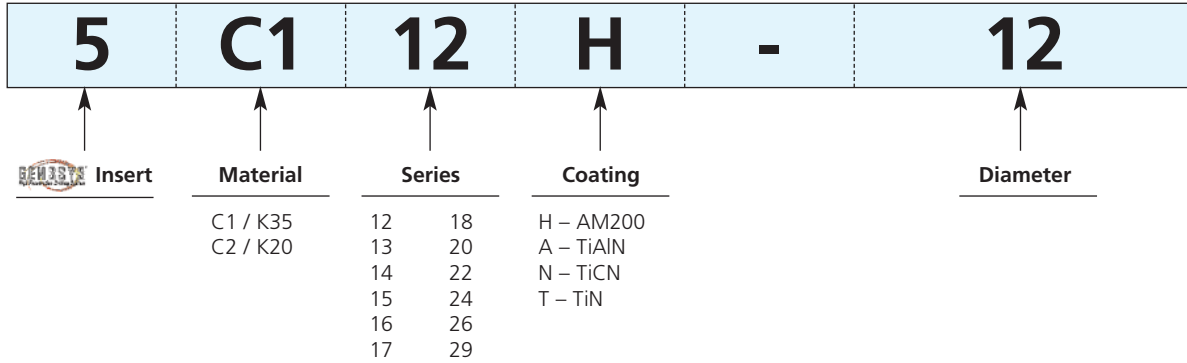
The speeds and feeds listed above are considered a general starting point for all applications. Factory technical assistance is also available for your specific applications through our Application Engineering Team. Please have item number, hole diameter, depth, material grade, BHN hardness and coolant pressure information available when you call. Additional information such as part and machine rigidity, horsepower and thrust limits vertical or horizontal spindle, revolving or stationary tool, flood or through holder coolant are also very helpful to our Application Engineers.



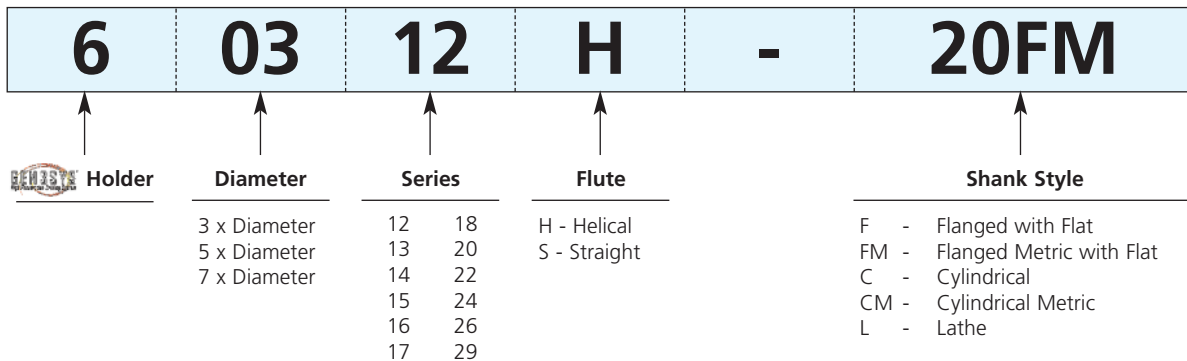
How To Identify GEN3SYS[®] Holders And Inserts



Drill Insert Item Number



Holder Item Number



Ordering Instructions for Standard Stock Items

All orders are processed through Allied's computerised Order Entry and Invoicing System. Please specify the correct catalogue number and coating as well as a full description of the desired item(s) so we can process your order accurately and efficiently. Incorrect item numbers and/or descriptions will cause unnecessary delays and, possibly, returns that are subject to a 10% restocking charge. Your assistance is critical if we are to achieve our goal of processing orders and shipping in stock items error free.



Holder Ordering information

The chart at the right illustrates the correlation between the drill insert and holder series.

We use a series designator in the header, at the top of each page of both the drill insert and Holder sections of the catalogue for reference when ordering.

Please refer to these series designators when placing your order.

For example, series 12 Drill Inserts will fit in a Series 12 holder.

Drill Insert Series	Holder Series
12	12
13	13
14	14
15	15
16	16
17	17
18	18
20	20
22	22
24	24
26	26
29	29

Potential Problem																							LPM
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	
Setup Condition	Accelerated corner wear	Barber pole	Ball mouth hole	Blade chipping	Blue chips	Build Up Edge (BUE)	Chatter	Chip packing	Chipping of point	Damaged or broken tools	Excessive margin wear	High flank wear	Hole lead off	Hole out of position	Northing of round	Oversize hole	Poor hole finish	Poor tool life	Power spikes - Load meter	Retract spiral	Step burned		
Worn is mis-aligned spindle (lathe, screw machine, chuck)	1		3				7		9	10	11		13				17	18			21		<ul style="list-style-type: none"> Align spindle and turret or tailstock. Repair spindle. Spot hole with stub tool of same or greater included angle as GEN3SYS® Drill Insert.
Use of low rigidity machine tools		2	3	4			7		9	10			13	14							21		<ul style="list-style-type: none"> Spot hole with stub tool of same or greater included angle as GEN3SYS® Drill Insert. Reduce penetration rate to fall within the physical limits of the machine or setup (Caution: do not reduce feed below threshold of good chip formation). Use special holder with wear pads or chrome bearing area to work with drill bushing.
Poor work piece support		2		4			7			10	11				15			18			21		<ul style="list-style-type: none"> Provide additional support for the work piece. Reduce penetration rate to fall within the physical limits of the machine or setup (Caution: do not reduce feed below threshold of good chip control).
Flood coolant, low coolant pressure or low coolant volume	1				5	6		8		10		12					17	18	19	20		22	<ul style="list-style-type: none"> Run coolant through tool holder when drilling greater than one times diameter. Increase coolant pressure and volume through the tool holder. Reduce penetration rate to fall within the coolant limitations (Caution: do not reduce feed below threshold of good chip formation). Add a peck cycle to help clear chips.
Interrupted cuts. Entry or exit surfaces that are not perpendicular to the spindle. (draft angles, parting lines, curved or stepped surfaces, cross holes and cast or forged surfaces)				4			7		9	10	11		13	14	15		17	18	19				<ul style="list-style-type: none"> Pre-mill (spot face) entry or exit surface to remove interruption. Spot hole with stub tool of same or greater included angle as GEN3SYS® Drill Insert. Decrease feed as much as 50% through entry or exit interruption. Use short holders in low impact entry cuts.
Material harder than expected or running tools beyond recommended speed	1				5	6				10		12							19			22	<ul style="list-style-type: none"> Reduce speed. If a step is worn in the blade, calculate SFM at the worn diameter. Reduce this value by 10% and apply this new value to the original tool diameter. Increase coolant pressure and volume. Improve coolant condition by use of quality products and regular maintenance.
Poor chip control				4		6				10		12	13			16			19				<ul style="list-style-type: none"> Compare performance of other tools for similar wear problems, which may indicate poor micro-structure. Anneal or normalize parts to improve micro-structure for machining. To improve tool life in materials with poor micro-structure try carbide grades. Reduce feeds. (Caution: Do not reduce feed below threshold of good chip formation).
Poor material micro-structure of foreign particles: (forgings and castings that have not been normalized or annealed, poorly prepared steel, flame cut parts and sand casting).								8		10	11		13				17	18	19	20			<ul style="list-style-type: none"> Increase feed to recommended levels. Contact Allied Application Engineering for technical recommendations. Increase coolant pressure and volume. Improve coolant condition by use of quality products and regular maintenance.
Spot drilled holes with included angle less than that matching GEN3SYS® or cored holes	1			4			7						13			16			19				<ul style="list-style-type: none"> Spot hole with short tool of same or greater included angle as GEN3SYS® Drill Insert. Reduce feed. (Caution: Do not reduce feed below threshold of good chip formation.) If possible, drill from solid.