UNIDEX™

INGERSOLL has now launched the **UNIDEX**-Reamer, a line of indexable single edged adjustable reamers. **UNIDEX** is a high speed reaming system with internal coolant holes and indexable blades with two cutting edges, four lead angles and three rake angle options.

SINGLE-EDGED REAMER

The standard **UNIDEX** line covers reaming applications from 5/16" to 1 1/4" diameter. The single indexable blade and high wear resistant carbide or cermet pads provide a combination of economical and high precision results on a very wide range of materials.

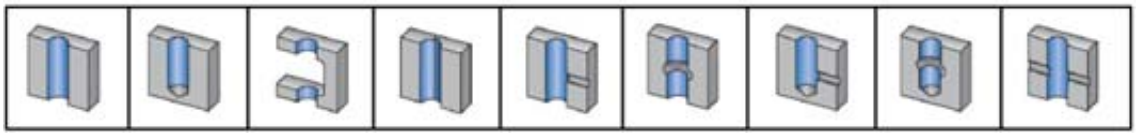
UNIDEX has been designed to achieve tight hole tolerances of H6 with a high surface finish quality. This is done by using brazed guide pads and a simple adjustable system of blades on pockets to achieve the required diameter and tolerance. This exceptional level of accuracy eliminates additional operations such as honing or grinding, reducing production times considerably.

UNIDEX reamers are designed for high speed reaming, a feature highly desired in mass production environments. When large lot sizes are involved, the indexable insert provides an economical solution.

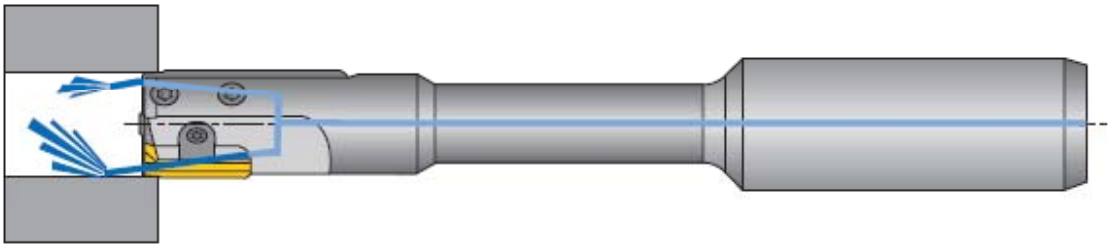
1. Application of UNIDEX.

Several hole types for UNIDEX

The UNIDEX Reamers can be used for blind and through holes as well as for cross-holes or keyways as shown below.

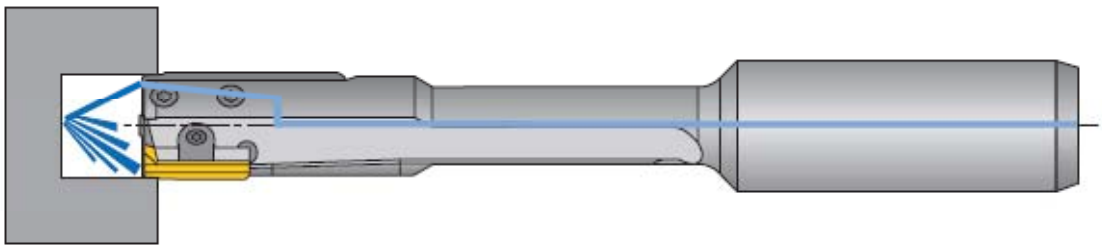


a. Through Holes



The **UNIDEX** reamers for through holes feature two coolant ports.
One is located behind the insert, which directs the chips forward to prevent scratching the hole surface. A second port is located behind the pads in order to convey coolant and reduce the friction between the pads and the hole surface.

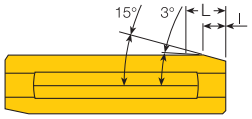
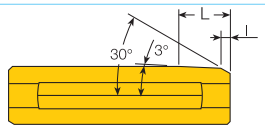
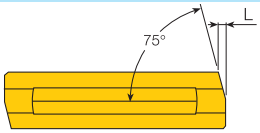
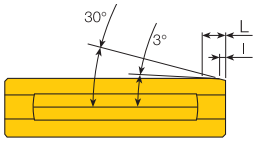
b. Blind Holes



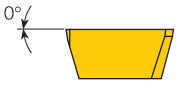
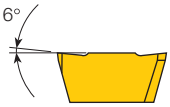
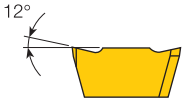
The **UNIDEX** reamers for blind holes feature a single coolant port located at the front end of the tool as shown above, which directs the coolant and the chips backwards.

2. Specification of Blades

FOUR STANDARD LEAD ANGLES ARE AVAILABLE

Lead Type	L (inch)	l (inch)		Use
A	.118	.039		Higher Surface quality, lower cutting conditions
B	.051	.020		Universal use, high speed cutting conditions
C	.022			Suitable for aluminum and brass
D	.024	.008		When needed for blind hole- lower feed

THREE STANDARD CUTTING RAKE ANGLES ARE AVAILABLE

Rake Type		Use
0		For cast iron applications
6		General use
2		For stainless steel and aluminum

3. Recommended Cutting Conditions:

The cutting conditions in the table below should be used to start a new application. Optimal conditions for a specific application should be evaluated by examining the results and changing the machining conditions accordingly.

	Lead A=15º/3º L .118" (reaming allowance = 0.004" ~ 0.012")						
	Feed (inch/rev)	Rake (°)	Cutting Speed Vc(Surface Foot per Minute)				
Material			Carbide	Coated Carbide	Cermet	PCD	CBN
Non-alloy steel, cast steel and free cutting steel	0.004"-0.015"	6	131-197	197-262	361-525		
Low alloy steel and cast steel (less than 5% of alloying elements)	0.004"-0.015"	6	66-131	131-197	361-525		
High alloyed steel,cast steel and tool steel	0.004"-0.015"	6	66-131	66-197	66-197		
Stainless steel and cast steel	0.004"-0.011"	12	66-131	131-197	131-197		
Cast iron nodular (GGG)	0.004"-0.011"	0 / 6	131-197	131-328			Please ask
Grey cast iron (GG)	0.004"-0.011"	0 / 6	131-197	131-328			
Malleable cast iron	0.004"-0.011"	0 / 6	131-197	131-328			
Aluminum wrought alloy						Please ask	
Aluminum-cast,alloyed							
Copper alloys							
Non-metallic							

	Lead B=30º/3º L .051" (reaming allowance = 0.004"~0.012")						
	Feed (inch/rev)	Rake (°)	Cutting Speed Vc(Surface Foot per Minute)				
Material			Carbide	Coated Carbide	Cermet	PCD	CBN
Non-alloy steel, cast steel and free cutting steel	0.004"-0.011"	6	197-262	197-394	361-525		
Low alloy steel and cast steel (less than 5% of alloying elements)	0.004"-0.011"	6	197-262	197-394	361-525		
High alloyed steel,cast steel and tool steel	0.004"-0.011"	6	131-197	131-262	131-262		
Stainless steel and cast steel	0.004"-0.007"	12	131-197	197-262	197-262		
Cast iron nodular (GGG)	0.004"-0.011"	0 / 6	197-262	197-394			Please ask
Grey cast iron (GG)	0.004"-0.011"	0 / 6	197-262	197-394			
Malleable cast iron	0.004"-0.011"	0 / 6	197-262	197-394			
Aluminum wrought alloy	0.004"-0.011"	12	525-656			Please ask	
Aluminum-cast,alloyed	0.004"-0.011"	12	525-656				
Copper alloys	0.004"-0.007"	0	262-328				
Non-metallic	0.004"-0.011"	0	33-230				

	Lead C=75º/3º L .022" (reaming allowance = 0.007"~ 0.015")						
	Feed (inch/rev)	Rake (°)	Cutting Speed Vc(Surface Foot per Minute)				
Material			Carbide	Coated Carbide	Cermet	PCD	CBN
Non-alloy steel, cast steel and free cutting steel							
Low alloy steel and cast steel (less than 5% of alloying elements)							
High alloyed steel,cast steel and tool steel							
Stainless steel and cast steel							
Cast iron nodular (GGG)							Please ask
Grey cast iron (GG)							
Malleable cast iron							
Aluminum wrought alloy	0.006" -0.012"		492-820			Please ask	
Aluminum-cast,alloyed	0.006" -0.012"		492-820				
Copper alloys							
Non-metallic							

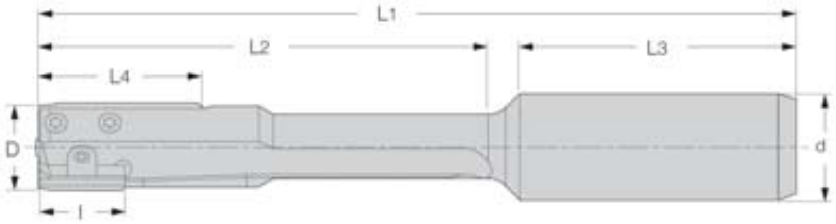
	Lead D=30º/3º L .024" (reaming allowance = 0.003"~ 0.008")						
	Feed (inch/rev)	Rake (°)	Cutting Speed Vc(Surface Foot per Minute				
Material			Carbide	Coated Carbide	Cermet	PCD	CBN
Non-alloy steel, cast steel and free cutting steel	0.002"- 0.008"	6	197-262	262-394	361-525		
Low alloy steel and cast steel (less than 5% of alloying elements)	0.002"-0.008"	6	197-262	262-120	361-525		
High alloyed steel,cast steel and tool steel	0.002"-0.008"	6	131-197	131-262	131-262		
Stainless steel and cast steel	0.002"-0.008"	12	131-197	131-197	197-262		
Cast iron nodular (GGG)	0.002"-0.008"	0 / 6	197-262	262-394			Please ask
Grey cast iron (GG)	0.002"-0.008"	0 / 6	197-262	262-394			
Malleable cast iron	0.002"-0.008"	0 / 6	197-262	262-394			
Aluminum wrought alloy	0.002"-0.008"	12	361-656			Please ask	
Aluminum-cast,alloyed	0.002"-0.008"	12	594-656				
Copper alloys	0.002"-0.008"	0	262-328				
Non-metallic							

4. UNIDEX-REAMER Holders

Tool Designation Code Key (This spacing allows for three decimal places for diameter callout)

UD X 12.700 090 S6 R 01

- UD — Unidex Reamer
- X — X: Blind Hole, W: Thru Hole
- 12.700 — Diameter (mm)
- 090 — L2 Effective Length (mm)
- S6 — Shank Diameter S1=1.000, S6= .6250, S7= .7500
- R — R=Tool Body Only, A= Assembled Complete w/Blade
- 01 — Modification Level



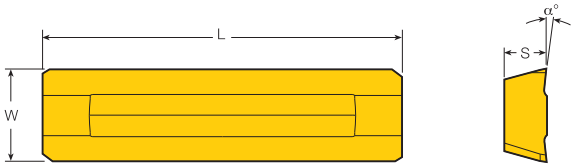
INDEXABLE BLADE STYLE REAMER FOR BLIND HOLES

D Diameter	Part Number For *Blind* Holes	l Blade Length	L_1 Overall	L_2 Eff. Length	L_3 Shank Length	L_4 Guidepad	d Shank Diameter	Blade Size
.3125	**UDX07938078S6R01**	.61	4.86	3.09	1.77	1.18	.625	1
.3750	**UDX09525078S6R01**	.61	4.86	3.09	1.77	1.18	.625	1
.4375	**UDX11113078S6R01**	.61	4.86	3.09	1.77	1.18	.625	2
.5000	**UDX12700090S6R01**	.67	5.31	3.54	1.77	1.18	.625	3
.5625	**UDX14288090S6R01**	.67	5.31	3.54	1.77	1.18	.625	3
.6250	**UDX15875090S6R01**	.67	5.31	3.54	1.77	1.18	.625	3
.6875	**UDX17463115S7R01**	.67	6.50	4.53	1.97	1.18	.75	3
.7500	**UDX19050115S7R01**	.67	6.50	4.53	1.97	1.18	.75	3
.8125	**UDX20638115S1R01**	.67	6.73	4.53	2.20	1.18	1.00	3
.8750	**UDX22225135S1R01**	.67	6.73	5.31	2.20	1.18	1.00	3
.9375	**UDX23813135S1R01**	.67	7.52	5.31	2.20	1.18	1.00	3
1.0000	**UDX25400135S1R01**	.67	7.52	5.31	2.20	1.18	1.00	3
1.0625	**UDX26988165S1R01**	.67	8.70	6.50	2.20	1.18	1.00	4
1.1250	**UDX28575165S1R01**	.89	8.70	6.50	2.20	1.18	1.00	4
1.1875	**UDX30163165S1R01**	.89	8.70	6.50	2.20	1.18	1.00	4
1.2500	**UDX31750165S1R01**	.89	8.70	6.50	2.20	1.18	1.00	4

INDEXABLE BLADE STYLE REAMER FOR THRU HOLES

D Diameter	Part Number For *Thru* Holes	l Blade Length	L_1 Overall	L_2 Eff. Length	L_3 Shank Length	L_4 Guidepad	d Shank Diameter	Blade Size
.3125	**UDW07938078S6R01**	.61	4.86	3.09	1.77	1.18	.625	1
.3750	**UDW09525078S6R01**	.61	4.86	3.09	1.77	1.18	.625	1
.4375	**UDW11113078S6R01**	.61	4.86	3.09	1.77	1.18	.625	2
.5000	**UDW12700090S6R01**	.67	5.31	3.54	1.77	1.18	.625	3
.5625	**UDW14288090S6R01**	.67	5.31	3.54	1.77	1.18	.625	3
.6250	**UDW15875090S6R01**	.67	5.31	3.54	1.77	1.18	.625	3
.6875	**UDW17463115S7R01**	.67	6.50	4.53	1.97	1.18	.75	3
.7500	**UDW19050115S7R01**	.67	6.50	4.53	1.97	1.18	.75	3
.8125	**UDW20638115S1R01**	.67	6.73	4.53	2.20	1.18	1.00	3
.8750	**UDW22225135S1R01**	.67	6.73	5.31	2.20	1.18	1.00	3
.9375	**UDW23813135S1R01**	.67	7.52	5.31	2.20	1.18	1.00	3
1.0000	**UDW25400135S1R01**	.67	7.52	5.31	2.20	1.18	1.00	3
1.0625	**UDW26988165S1R01**	.67	8.70	6.50	2.20	1.18	1.00	4
1.1250	**UDW28575165S1R01**	.89	8.70	6.50	2.20	1.18	1.00	4
1.1875	**UDW30163165S1R01**	.89	8.70	6.50	2.20	1.18	1.00	4
1.2500	**UDW31750165S1R01**	.89	8.70	6.50	2.20	1.18	1.00	4

5. UNIDEX Blades



UNIDEX REAMER BLADES

Blade Size	Part Number	Lead Type*	Rake Angle**	Dimensions (inch)			Grades		
				L	W	S	TT5030	TT5050	UF1A
1	LDHR1501B6R	B	6	.610	.110	.059	■		
1	LDHR1501B2R	B	12				■		
1	LDHR1501A6R	A	6					■	
1	LDHR1501A2R	A	12					■	■
2	LDHR1601B6R	B	6	.610	.142	.059	■		
2	LDHR1601B2R	B	12				■		
2	LDHR1601A6R	A	6					■	
2	LDHR1601A2R	A	12					■	■
3	LDHR1702B6R	B	6	.669	.173	.079	■		
3	LDHR1702B2R	B	12				■		
3	LDHR1702A6R	A	6					■	
3	LDHR1702A2R	A	12					■	■
4	LDHR2203B6R	B	6	.886	.260	.118	■		
4	LDHR2203B2R	B	12				■		

*** C and D lead types available by quote**
**** 0° Rake angle available by quote**

Grade Selection

TT5030
PVD - TiAlN
- For a wide range of high-temp alloys.
- For machining of stainless steel and all steels
- Very hard submicron substrate with good fracture toughness

TT5050
PVD - TiCN+TiN
- Designed for Cast Iron applications

UF1A
- Uncoated, for use in non-ferrous Applications
- Basic substrate for UNIDEX Blades.
- High fracture resistance, good wear resistance

6. Accessories

Holder Diameter	Clamping Wedge	Clamping Screw	Adjustment Screw	Adjustment Pin	Blade Size
					
0.3124	WDG-TB-1	SR-CL-TB-1	SR-ADJ-M3x2.5	PIN-ADJ-TB-1	1
0.3750	WDG-TB-1	SR-CL-TB-1	SR-ADJ-M3x3	PIN-ADJ-TB-1	1
0.3937	WDG-TB-2	SR-CL-TB-2	SR-ADJ-M3x3	PIN-ADJ-TB-2	2
0.4375	WDG-TB-2	SR-CL-TB-2	SR-ADJ-M3x4	PIN-ADJ-TB-2	2
0.4724	WDG-TB-3	SR-CL-TB-3	SR-ADJ-M4x4	PIN-ADJ-TB-3	3
0.5000 - 0.5625	WDG-TB-3	SR-CL-TB-3	SR-ADJ-M4x4	PIN-ADJ-TB-3	3
0.5905	WDG-TB-3	SR-CL-TB-3	SR-ADJ-M4x6	PIN-ADJ-TB-3	3
0.6250	WDG-TB-3	SR-CL-TB-3	SR-ADJ-M4x6	PIN-ADJ-TB-3	3
0.6692	WDG-TB-3	SR-CL-TB-3	SR-ADJ-M4x8	PIN-ADJ-TB-3	3
0.6875	WDG-TB-3	SR-CL-TB-3	SR-ADJ-M4x8	PIN-ADJ-TB-3	3
0.7500	WDG-TB-3	SR-CL-TB-3	SR-ADJ-M4x8	PIN-ADJ-TB-3	3
0.7874	WDG-TB-3	SR-CL-TB-3	SR-ADJ-M4x10	PIN-ADJ-TB-3	3
0.8125 - 0.9448	WDG-TB-3	SR-CL-TB-3	SR-ADJ-M4x10	PIN-ADJ-TB-3	3
1.0000 - 1.2500	WDG-TB-4	SR-CL-TB-4	SR-ADJ-M4x10	PIN-ADJ-TB-4	4

USER GUIDE

a. Tooling System for UNIDEX

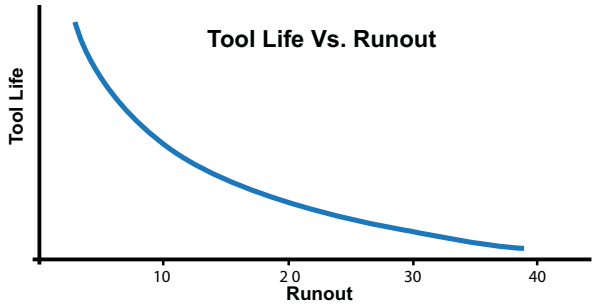
We recommend using a rigid holding system with low radial and angular runout on machines. Ingersoll Shrink holder or Adjustable Collet chuck are recommended, and coolant through the holding system is very important to achieve tight tolerances and high productivity.

On lathe applications, when the tool is stationary, we suggest the GFI Floating Chuck, which enables the reamer to locate the correct position. It is important to note, this still requires positioning the reamer parallel to the workpiece rotating axis when using a floating holder.

b. Runout:

Radial and angular runout should be thoroughly inspected prior to reaming. Excessive runout accelerates wear, causes chipping of the leading chamfer and produces poor surface finish and cylindricity – resulting in a tapered hole.
The runout is influenced by the entire system through the spindle, the adapter and the shank clamping. All of the connecting elements should be thoroughly inspected during assembly.

Runout can cause an out of tolerance hole, especially in soft materials such as aluminum. In order to obtain the best reaming results, we recommend verifying that the whole system runout does not exceed 5μm.



c. Guidelines for High Speed Reaming

As the cutting speed and feed are much higher than in conventional reaming, the following guidelines should be followed:

- The machine being used should be in good condition, meaning:
  - Very rigid, to minimize vibration and low runout.
  - Equipped with an internal coolant spindle. In order to reduce the friction and have efficient chip evacuation, high pressure and capacity is required.
- The inserts being used for high speed reaming are generally coated or made from PCD/ CBN.
- Conventional reaming should be considered:
  - When the machine is not sufficiently rigid.
  - If only external cooling can be applied.
  - In special applications such as thin-walled tubes or when reaming soft materials (plastic, etc).
  - When there is a demand or need to use floating adapters.

d. Pre-Drilling for reaming allowance

The diameter of hole we recommend prior to the reaming operation depends on several parameters such as workpiece material, coolant, application, required surface quality, etc.

Our recommended starting guideline is specified in the recommended cutting condition table. The pre-reaming hole diameter may change according to the specific machining results.

It is recommended to chamfer the hole before reaming in order to help the reamer maintain an accurate central position, obtain better surface finish and improve tool life. It is recommended to drill and ream while the workpiece is clamped in the same position.

If the workpiece has been removed after drilling and then clamped again for reaming, misalignment between the reamer and the hole center lines may occur. Therefore, it is recommended to leave a larger allowance for reaming.

e. Setting Process

e-1. How to index blade:

1. Rotate the adjustment screws 1 turn counter-clockwise (CCW).

2. Rotate the clamping screw CCW from the top and/or clockwise from the bottom, turning both sides simultaneously.

3. Remove the Blade. Clean the Blade and the pocket. Place the sharp edge on the outer position.

4. Press the Blade against the back stopper and the two adjustment pins. Tighten the clamping wedge by rotating the clamping screw CW from the top or CCW from the bottom.

e-2. How to set diameter of UNIDEX

There are two optional setting mechanisms: a comparison micrometer and a setting device.

1. To use micrometer with dial gauge:

A. Set the micrometer to the correct diameter using the precision blocks.
B. Adjust the frontal diameter and back taper by turning the adjustment screws C.W. The frontal diameter should be larger than the rear diameter by approximately 0.0006" (0.015mm).

- Low cost solution and readily available for small shops.
- Prone to damaging the cutting edge; therefore not recommended

2. To use setting device,

Ingersoll is offering a mechanical setting device. It enables an easy, quick and accurate adjustment (see following pictures).
Due to its modular construction, it can be used for standard as well as for special and more complicated reamer adjustments.

*** Advantage of setting device.**

- Quicker setting time
- Modular Design
- Higher accuracy
- No risk of damaging the cutting edge

1. Place the reamer between fixture's centers. (figure 1)

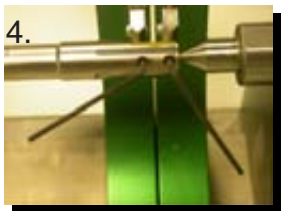
2. Use the pad as a zero reference to set the indicators to zero. (figure 2)

3. Rotate and position the insert against indicators. (figure 3)

4. Tighten the adjustment screws in a clockwise direction. (figure 4)

5. Adjust the frontal side of insert to +15-20 microns (.0005"-.0007".) (figure 5)

6. Adjust the back side of insert to +5-10 microns (.0001"-.0003".) (figure 6)



f. Back Taper

The rear diameter of the reamer head should be 0.05-0.015 mm (0.0019"-0.0005") smaller than the frontal diameter. The back taper prevents the reamer from jamming, as well as lowering reaming forces and improving surface quality. Incorrect back taper may cause unstable reaming, accelerated wear and rough surface finish.

g. Coolant

In order to gain maximum tool life and hole quality, high volume and pressure of internal coolant is required.

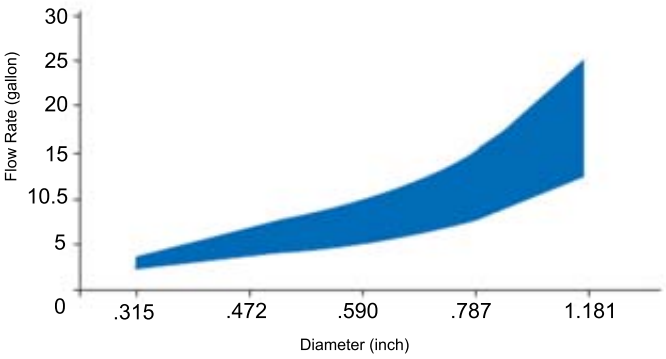
Coolant has three main functions during the machining process:

1. To reduce wear of the cutting edge, in order to maintain size and surface finish.

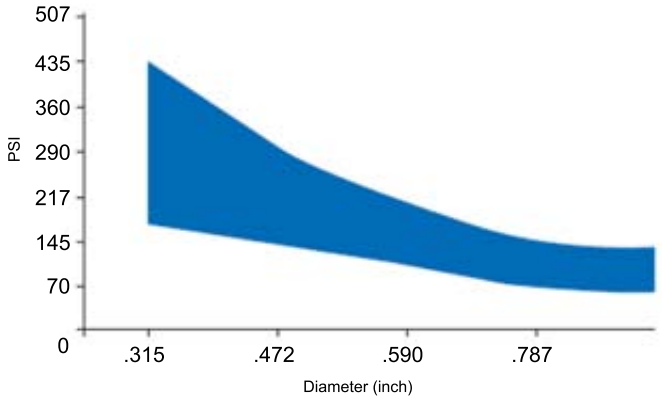
2. To maintain good chip evacuation.

3. Lubrication. The high friction between the guiding pads and the hole surface requires an adequate coolant film to lubricate the pads. Good lubrication is needed to maintain size and surface quality of the finished hole.
It is recommended to adjust the coolant concentration to a 10%-12% mixture.
A mineral oil based coolant should be used in order to achieve the best performance.
Recommended pressure and lubricant capacity can be seen in the graph below.

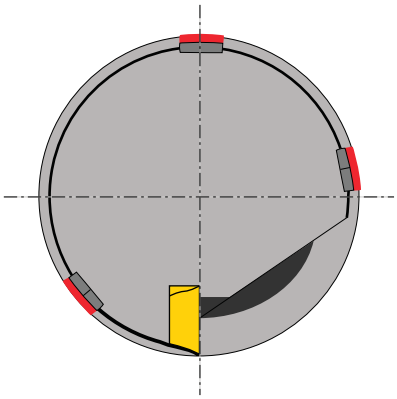
Recommended Coolant Flow Rate



Recommended Coolant Pressure



High Friction Lubricated Zones



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