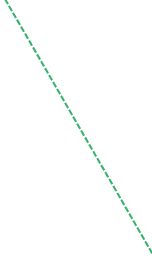


***Your priority is  getting to total depth. Our priority is making it happen.***



The DBI range of Tungsten Carbide Insert (TCI) and Milled Tooth Bits are designed for high durability, increased ROP and optimum drilling performance and are manufactured with different bearing designs to suit each drilling application.

DBI designs, customizes and manufactures drilling and well construction products that reduce complexity, risk, and help solve real-world challenges. We are practical innovators.

Since 1975 the Nashik plant has been manufacturing drill bits for the mining and petroleum industries, placing emphasis on product line expansion and technical advancements. The improvements made in blast hole drill bit cutting structures has resulted in higher rates of penetration and longer bit life and metallurgical advancements include new tougher grades of tungsten carbide for hardfacing and profiled TC inserts

Our drilling and well construction products - many of them unique -are widely recognized for their innovation, simplicity, and effectiveness in ensuring that clients reach TD as quickly and as cost effectively as possible. We call it practical innovation.

## Quality

DBI is committed to delivering the highest quality engineering, design, manufacturing, sales, training and after sales support services.

We are exceeding industry quality standards and customer expectations at every step of the product development process. This includes the planned and systematic monitoring, testing and documenting of all practices as well as alignment with all recognized global standards, such as ISO and API.

By manufacturing many of our key products at strategically located manufacturing facilities, we monitor and control the quality of our products in-house, ensuring that no opportunity for improvement is lost.

All products manufactured at our facility in Nashik, India are certified to ISO 9001: 2015 standard with the Rock Roller Bits certified to carry the API monogram.



## Journal Bearing Bit

The Journal Bearing Bit is a result of intensive efforts by our engineers at developing and perfecting this critical component. The improved Journal Bearing Bit incorporates the following features:

### Features

Be-Cu special alloy bushing pressed in the cone to contact the special hard metal inlay bearing surface of leg journal. The Be-Cu bushing transfers the heat from the bearing interface and minimizes bearing surface wear for longer life.

Carburized cone thrust surface and hard metal inlay on leg pin bearing.

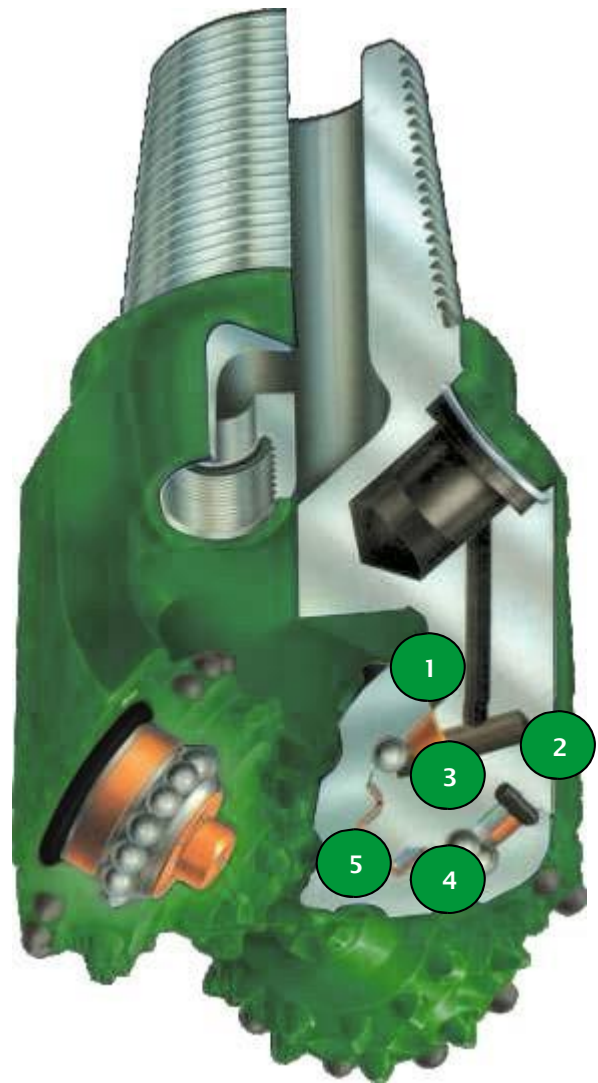
Carburized cone pin bearing and hard metal inlay on leg pin bearing.

Hydrogenated nitrile rubber (HNBR) seals: The HNBR compound has higher wear resistance, higher temperature resistance and greater tensile strength than the standard NBR compound. All of these properties help to provide a longer sealing life.

Silver plated Be-Cu special alloy bearing components: Silver acts as solid lubricant, which reduces friction, dissipates heat quickly and reduces galling under heavy load conditions.

Improved hard-facing material to enhance teeth life.

Specially formulated high temperature lubricant with extreme pressure additives for longer bearing life.



- 1 Be-Cu Fixed Bushing
- 2 HNBR O-Ring
- 3 Ball Bearing
- 4 Be-Cu Thrust Washer
- 5 Spindle Bearing



### Milled Tooth Journal Bearing Bit

### Soft Formations



<i><b>Bearing</b></i>	<i><b>IADC Type Code</b></i>	<i><b>Weight (lb/in bit diameter)</b></i>	<i><b>RPM</b></i>	<i><b>Formation</b></i>
Journal Bearing	116 G11F	2,000-5,000	70-100	Soft
	117 G11FH			
	126 G12F	2,000-6,000	60-120	Soft Abrasive
	127 G12FH			
136 G13F	3,000-7,000	60-110	Medium Soft and	
137 G13FH	Soft with Hard			Streaks

Available Sizes: 6", 6-1/8", 6-1/4", 7-7/8", 8-3/8", 8-1/2", 8-3/4", 9-7/8", 12-1/4"

### Medium to Hard Formations



<i><b>Bearing</b></i>	<i><b>IADC Type Code</b></i>	<i><b>Weight (lb/in bit diameter)</b></i>	<i><b>RPM</b></i>	<i><b>Formation</b></i>
Journal Bearing	216 G21F	3,000-8,000	50-80	Medium Hard
	217 G21FH			
	236 G23F	3,000-9,000	50-80	Medium Hard with high compressive strength
	237 G23FH			
	316 G31F	4,000-9,000	45-70	Hard
	317 G31FH			
326 G32F	4,000-9,000	45-70	Hard Abrasive	
327 G32FH				

Available Sizes: 6", 6-1/4", 7-7/8", 8-3/8", 8-1/2", 8-3/4", 9-7/8", 12-1/4"

### TCI Journal Bearing Bit



<i><b>Bearing</b></i>	<i><b>IADC Type Code</b></i>	<i><b>Weight (lb/in bit diameter)</b></i>	<i><b>RPM</b></i>	<i><b>Formation</b></i>
Journal Bearing	4-2-7 G42FH	1,500-3,500	60-120	Soft Soft
	4-3-7 G43FH	1,500-3,500	60-120	
	5-1-7 G51FH	2,000-4,000	50-110	Soft
	5-3-7 G53FH	2,500-5,000	50-80	Medium Soft
	7-3-7 G73FH	3,000-6,000	50-110	Hard

Available Sizes: 6", 8-1/2", 9-7/8", 12-1/4"



## Milled Tooth Sealed Bearing Bit

Sealed Bearing bits employ improved bearing sealing arrangement, lubrication and grease reservoir systems to increase drilling hours and reduce the occurrence of early seal failure. The specific seal gland design helps to retain the seal in the center of the gland, thereby reducing the spiralling and twisting which normally leads to excessive heat build-up and wear.

### Soft



Sealed Bearing	114	G11S	2,000-6,000	75-250	Soft
	115	G11SH			
	124	G12S	2,000-6,000	75-250	Soft Abrasive
	125	G12SH			

### Formations

Bearing	IADC Type Code	Weight (lb/in bit diameter)	RPM	Formation
134	G13S	3,000-7,000	60-175	Medium Soft and
135	G13SH	Soft with Hard		Streaks

Available Sizes: 6", 6-1/4", 6-3/4", 7-7/8", 8-3/8", 8-1/2", 8-3/4", 9-7/8", 10-5/8", 12", 12-1/4", 13-1/2", 14-3/4", 16", 17", 17-1/2"

### Medium to Hard Formations



<i>Bearing</i>	<i>IADC Type Code</i>		<i>Weight (lb/in RPM bit diameter)</i>		<i>Formation</i>
Sealed Bearing	214	G21S	3,000-8,000	50-120	Medium Hard
	215	G21SH			
	234	G23S	3,000-9,000	50-90	Medium Hard with high compressive strength
	235	G23SH			
	314	G31S	4,000-9,000	45-75	Hard
	315	G31SH			
	324	G32S	4,000-9,000	45-75	Hard Abrasive
	325	G32SH			

Available Sizes: 6", 6-1/4", 6-3/4", 7-7/8", 8-3/8", 8-1/2", 8-3/4", 9-7/8", 10-5/8", 12", 12-1/4", 13-3/4", 16", 17", 17-1/2"

### TCI Sealed Bearing Bit



Bearing	IADC Type Code	Weight (lb/in bit diameter)	RPM	Formation
Sealed Bearing	4-4-5 G44SH	1,500-4,000	60-110	Soft <sup>1</sup>
	5-1-5 G51SH	2,000-4,500	50-100	Soft <sup>2</sup>
	5-3-5 G53SH	2,500-5,000	50-80	Medium Soft <sup>2</sup>
	6-1-5 G61SH	2,500-5,500	45-65	Medium Hard <sup>1</sup>
	6-2-5 G62SH	3,000-6,000	50-160	Hard <sup>3</sup>
	6-3-5 G63SH	3,000-6,000	45-85	Hard <sup>1</sup>

Available Sizes: 1 7-1/2" 2 8-1/2", 9-7/8", 12-1/4" 3 12-1/4"

## Milled Tooth Open Bearing Bit

Open Bearing bits withstand effectively higher pull down loads, impact loads and rotation speeds. The optimized cutting structure design, coupled with improved teeth hard facing material, results in longer life and higher rate of penetration. The Open Bearing bits have two different bearing arrangements. In the first arrangement roller-ball-friction is used on the bit sizes up to 12-1/4" and, in the second type, roller-ball-roller is used on bits larger than 12-1/4". The balanced load distribution is the key design feature. This triple bearing arrangement reduces friction to a minimum and eliminates unbalanced wear in any of the bearings.

**Soft**



Open Bearing	111	G110	2,000-6,000	75-250	Soft
	113	G110H			
	121	G120	2,000-6,000	75-250	Soft Abrasive
	123	G120H			

### Formations

Bearing	IADC Type	Weight (lb/in RPM bit diameter)	Formation
131	G130	3,000-7,000 60-175	Medium and Soft
133	G130H		with Hard Streaks

Available Sizes: 4", 4-1/2", 4-5/8", 4-3/4", 5-5/8", 5-7/8", 6", 6-1/8", 6-1/4", 6-3/4", 7-7/8", 8-3/8", 8-1/2", 8-5/8", 9-5/8", 9-7/8", 10-5/8", 12", 12-1/4", 13-3/4", 14", 14-3/4", 15, 16", 17", 17-1/2"

## Medium to Hard Formations

**Bearing IADC Type Weight (lb/in RPM Formation Code bit  
diameter)**



Open Bearing	211	G210	3,000-8,000	50-90	Medium Hard
	213	G210H			
	231	G230	3,000-9,000	50-80	Medium Hard
	233	G230H			with high compressive strength
	311	G310	4,000-9,000	45-75	Hard
	313	G310H			
	321	G320	4,000-9,000	45-75	Hard Abrasive
	323	G320H			

Available Sizes: 4", 4-1/2", 4-5/8", 4-3/4", 4-7/8", 5-5/8", 5-7/8", 6", 6-1/8", 6-1/4", 6-3/4", 7-7/8", 8-3/8", 8-5/8", 8-3/4", 9-5/8", 9-7/8", 10-5/8", 12", 12-1/4", 13-3/4", 14", 14-3/4", 15, 16", 17", 17-1/2"

## Jet Nozzles



<b>Bit Size (inches)</b>	<b>Nozzle Series</b>	<b>Available Sizes (32<sup>nd</sup> inch)</b>	<b>Center Jet Nozzle Series</b>	<b>Available Center Jet Nozzle Sizes (32<sup>nd</sup> inch)</b>	<b>Mini Extended Nozzle Series</b>	<b>Available Mini Extended Nozzle Sizes (32<sup>nd</sup> inch)</b>
6 to 6-3/4	AA	7 to 20	-	-	-	-
7-7/8" to 8-3/4"	BB only for Open Bearing	8 to 28	-	-	CE	7 to 20
7-7/8" to 8-3/4"	CC for Sealed and Journal Bearing	7 to 32	AA	10 to 14	CE	7 to 20
9-7/8" to 12-1/4"	CC	7 to 32	CC	7 to 32	CE	7 to 20
13-1/2" to 17-1/2"	DD	8 to 32	CC	7 to 32	-	-

## Jet Nozzle Flow Area

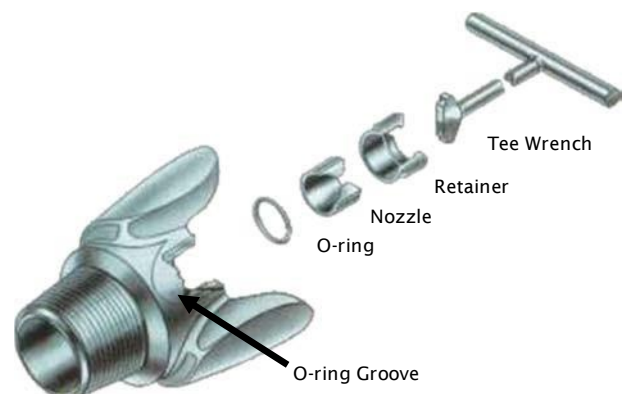
<b>Nozzle Size</b>		<b>Nozzle Number</b>	<b>w Area of zzle</b>		<b>w Area of 2 Flozzles</b>		<b>Flow Area of 3 Nozzles</b>	
<i>inches</i>	<i>mm</i>		<i>sq inches</i>	<i>mm<sup>2</sup></i>	<i>sq inches</i>	<i>mm<sup>2</sup></i>	<i>sq inches</i>	<i>mm<sup>2</sup></i>
7/32	5.5	7	.0376	24.3	.0752	48.5	.1127	72.7
8/32	6.4	8	.0491	31.7	.0982	63.4	.1473	95.0
9/32	7.1	9	.0621	40.1	.1242	80.1	.1864	120.2
10/32	7.9	10	.0767	49.5	.1534	99.0	.2301	148.4
11/32	8.3	11	.0928	59.9	.1856	119.7	.2784	179.6
12/32	9.5	12	.1104	71.2	.2209	142.5	.3313	213.7
13/32	10.3	13	.1296	83.6	.2592	167.2	.3389	250.9
14/32	11.1	14	.1503	97.0	.3007	194.0	.4510	291.0
15/32	11.9	15	.1726	111.4	.3451	222.6	.5177	334.0
16/32	12.7	16	.1963	126.6	.3927	253.4	.5890	380.0
18/32	14.3	18	.2485	160.3	.4970	320.6	.7455	481.0
20/32	15.9	20	.3068	197.9	.6136	395.9	.9204	593.8
22/32	17.5	22	.3712	239.5	.7424	479.0	1.1137	718.5
24/32	19.0	24	.4418	285.0	.8836	570.1	1.3254	855.2
28/32	22.2	28	.6013	387.9	1.2026	775.9	1.8040	1163.9

## Installation of Nozzles

*Proper installation of nozzle to prevent washouts*

### Standard Jet

- Remove the plastic plug and O-ring from each nozzle housing
- Grease the O-ring and place it in the O-ring groove
- Lightly grease the nozzle and retainer threads and screw the nozzle into the nozzle housing. Nozzles and retainers will come from the factory glued together.
- Hand-tighten the retainer with the tee cheater on the tee wrench handle. For best results, do not use a



## Custom and Special Orders

### Center Jet

A Center Jet is mounted at the center of the bit. They are used to effectively prevent bit balling in sticky formations. Available both in convergent and diffuser type.

### Gauge Protection Inserts

Profiled inserts pressed in the outer edge of the gauge face. These protect the gauge of the bit in abrasive formations.

### Air Circulation

This is available in milled tooth and TCI bits to drill with air as a circulation media. Some of the air flow is used to clean and cool the bearings.

### Mini Extended Nozzle

Used to increase RPM in soft to medium soft formations. These nozzles keep the jet flow closer to the hole bottom to maximize hole cleaning and cutting evacuation, especially in soft formations.

### Extra Shirt Tail and Ball Plug Protection

Tungsten Carbide inserts are pressed in the shirt tail area to provide extra protection of ball plug and shirt tail.

### Body and Shirt Tail Protection

Additional Protection to the leg, body and shirt tail while drilling in abrasive formations and in directional drilling applications.

## Nomenclature

Letters are added to the end of bit designation to identify extra features e.g.: G12F becomes G12FCN when Center Jet and Mini Extended Nozzle are added.

Journal	C – Center Jet	G11S
Sealed	N – Mini Extended Nozzle	G11SH
Open	H – Gauge Protection	G12F
	WW – Water Well Bit (regular circulation)	G12FH
	B – Body and Shirt Tail Protection	G21S
	XX – Extra Shirt Tail Protection	
	A – Air Circulation	

Center Jet  
Bit type





# G12 FCN

## Mini Extended Nozzle

### IADC Dull Bit Grading

#### Cutting Structure

Inner	Outer	Dull. Char	Location	Bearings/ Seals	Gauge	Other Dull Char.	Reason Pulled
1	2	3	4	5	6	7	8

#### 1 Inner Cutting Structure (all inner rows) 2 Outer Cutting Structure (gauge row only)

In columns 1 and 2 a linear scale from 0 to 8 is used to describe the condition of the cutting structure according to the following:

STEEL TOOTH BITS - A measure of lost tool height due to abrasion and/or damage

0 No loss of tool height 8 Total loss of tool height

INSERT BITS - A measure of total cutting structure reduction due to lost, worn and/or broken inserts

0 No lost, worn and/or broken inserts 8 All inserts lost, worn and/or broken

FIXED CUTTER BITS - A measure of lost, worn and/or broken cutting structures

0 No lost, worn and/or broken cutting structures  
8 All cutting structures lost, worn and/or broken

#### 3 Dull Characteristics (use only cutting structure related codes)

BC*	Broken Cone	FC	Flat Crested Wear	RG	Rounded Gauge
BF	Bond Failure	HC	Heat Checking	RO	Ring Out
BT	Broken Teeth/Cutters	JD	Junk Damage	SD	Shirt Tail Damage
BU	Balled Up Bit	LC*	Lost cone	SS	Self-Sharpening Wear
CC*	Cracked Cone	LN	Lost Nozzle	TR	Tracking
CD	Cone Dragged	LT	Lost Teeth/Cutters	WO	Washed Out Bit
CI	Cone Interference	OC	Off-Center Wear	WT	Worn Teeth/Cutters
CR	Cored	PB	Pinched Bit	NO	No Dull Characteristic
CT	Chipped Teeth/Cutters	PN	Plugged Nozzle/Flow Passage		
ER	Erosion	*	Show cone # or #s under location 4		

#### 4 Location

Roller Cone			Fixed Cutter			
N	Nose Row	Cone #	C	Cone	S	Shoulder
M	Middle Row	1	N	Nose	G	Gauge
G	Gauge Row	2	T	Taper	A	All Areas
A	All Rows	3				

#### 5 Bearings/Seals

Non-Sealed Bearings

Sealed Bearings

A linear scale estimating bearing life used.

E

Seals Effective



(0 No life used - 8 All life used (no bearing life F remaining))

N  
X

Seals Failed (Bearingless)

Not Able to Grade  
Fixed Cutter Bit

**6 Gauge** – measure in fractions of an inch

I In Gauge

2/16

1/8" Out of Gauge

1/16 1/16" Out of Gauge

4/16

1/4" Out of Gauge

**7 Other Dull Characteristics** – refer to column 3 codes

**8 Reason Pulled or Run Terminated**

**BHA** Change Bottom Hole  
Assembly

**LIH** Left in Hole

**HR** Hours on Bit

**DMF** Downhole Motor  
Failure

**RIG** Rig Repair

**PP** Pump Pressure

**DTF** Down Hole Tool  
Failure

**CM** Condition Mud

**PR** Penetration Rate

**DSF** Drill String Failure

**CP** Core Point

**TD** Total Depth/Casing Depth

**DST** Drill Stem Test

**DP** Drill Plug

**TQ** Torque

**LOG** Run Logs

**FM** Formation Change

**TW** Twist Off

**HP** Hole Problems

**WC** Weather Conditions

IADC Roller Cone Comparison Chart

Series	Type	Formation	1 Standard R o l l e r B e a r i n g				4 Sealed R o l l e r B e a r i n g				5 Sealed R o l l e r B e a r i n g Gauge P r o t e c t e d				6 Sealed F r i c t i o n B e a r i n g				7 Sealed F r i c t i o n B e a r i n g Gauge P r o t e c t e d								
			DBI	H	ughes	S	m	i	t	h	H	D	B	S	R	e	e	d	DBI	H	ughes	S	m	i	t	h	H
1	1	Steel Tooth Soft	G110R e e d	RC111	DSJ	XN1	Y11	G11S	GTX-1, SDS RC114		G11SH	VG-1, GTX-G1, RC11 TCT1+		G11F	FDS	XS1	HP11	G11FH	VG-1, STX-1, RC117	XR+, FDS, TCT1+	XSC1, EBXS1, QH1	RT1G, TC10, TC11					
	2		G120	RC121	DTJ			G12S	RC124		G12SH	RC125		G12F	FDT			G12FH	RC127		QH2						
	3		G130	RC131	DGJ	XN3	Y13	G13S	GTX-3	MCG	G13SH	VG-3, RC135	GGH+, MSDGH	G13F	RC136			G13FH	VG-3, RC137	MFDGH, FDGH	XS3, EBXS3, QH3	HP13G					
	4																										
2	1	Steel Tooth M edium	G210 G230	RC211		XN4		G21S			G21SH	RC215	SVH	G21F	RC216			G21FH	RC217	GFVH, FVH	XS4, EBXS4, QH4	HP21G					
	2					OFM																					
	3							G23S			G23SH	RC235		G23F	RC236			G23FH	RC237								
	4																										
3	1	Steel Tooth Hard	G310 G320			XN5		G31S			G31SH			G31F				G31FH									
	2			RC321				G32S			G32SH			G32F				G32FH									
	3																			QH7							
	4																		RC347								
4	1	Insert Very Soft										VG-03, VG-03M, GS101B, GS01, XT(D)00 to 05(D), T41 VGA-02, VGA-02M, GS01B, GS02B, EBXT(D)00 to 05 GTX-00, GTX-00H, GS02T, GS03B, (D) GTX-00M, GTX-03, G103B, G04B, GS04B, TCT101 GTX-03H, RC415		RC416			VGA-03, GX-00, GX-03, GX-03H, GFS101, GFS04, GFS04B, XS(D)00 to 05(D), EBXS(D)00 to R01A, R03A RC417 MFS04, MF104 05(D), QH02, QH03, QH05										
	2											G205, GS05B, XT(D)06 to 09(D), T42 GS106B, G08B, EBXT(D)06 to 09(D) GS08B				G42FH	GF05, GF05B, GF105B, GFS106, XS(D)06 to 09(D), EBXS(D)06 to R07A MF05B 09(D), QH08, QH09										
	3											VGA-10, VGA-10G, G10B, G10T, GS10B, XT(D)10 to 13(D), EMS44H, VGA-10M, VGA-11M, GS112B, GS12UB, EBXT(D)10 to 13(D) T43 GTX-09, GTX-09H, TCT10 GTX-11H, RC435				G43FH	GX-09, STX-09, GX-09C, STX- F10, F10B, F12, F12Y, GF08B, XS(D)10 to 13(D), EBXS(D)10 to R09A, R12A, RD12 09C, GX-09H, STX-09H, GX-09M, GF10B, GFH10HB, GFS10B, 13(D), QH10, QH12 GX-11, GX-11C, GX-11M, RC437 GF12T, XR12, MF10T, MFS10T, XR10T, TCT11, TCT12										
	4											G44SH GTX-11C, GTX-GS115B, G15, XT(D)14 to 17(D), EMS44H, 11CH, GS18B, GS20B, EBXT(D)14 to 17(D) T44 G11Y, T43 GTX-12H, GTX-18H, M15S, 15JS GTX-18CH					VGA-18, GX-18, STX-18, GX-18H, FH16, FH16B, FH18, MF15M, XS(D)14 to 17(D), EBXS(D)14 to R14A, R15A, RD15 STX-18H, GX-18C F15T, MF15B, MF19, GF15, GF15B, 17(D), QH14, QH16 GF15Y, GFS15B, XR15, XR15T, XR15G										
5	1	Insert Soft										G51SH VG-22, GTX-20, G20, GS20B, G25, XT(D)18 to 23(D), EMS51A, GTX-20H, GTX-22, G20B, 20GMS, 2JS, EBXT(D)18 to 23(D) EMS51H, T51 RC515 GS120B				G51FH VG-20M, VG-22S, VGD-20, VGD- F15H, F2, MF2, MF15H, FH20, XS(D)18 to 23(D), EBXS(D)18 to R19A, R20A, R21A, R22A, 21S, VGD-22S, GX-20, STX-20, FH21, FH23, GF120, GF21, GF25, 23(D), QH18, QH20, QH21, QH22, R23A, RD21 STX-20G, GX-20H, STX-20H, GX- GFS20, MFS20, XR20, XR20B, 20M, GX-22, GX-22M, GX-22S, XR25, F25Y, GF20Y, XR20Y, TCT120 GX-23, GX-25, RC517											
	2											GTX-28	G28B XT(D)24 to 27(D), T52 EBXT(D)24 to 27(D)					VG-28, VGD-25, VGD-25S, VGD- GF26, F27, GFS28, FH28, XS(D)24 to 27(D), EBXS(D)24 to R24A, R25A, R26A, R27, R28A, 26, VGD-28, GX-20C, STX-20C, GF28B, FH29, FH25, F26Y, 27(D), QH23, QH24, QH25, QH26, RD25 GX-20CH, GX-28, GX-28C, RC527 MF26Y, FH24Y, F27A, F271Y, QH27, QH28 GF27Y, XR20TY									

[illegible]

## Blast Hole Drill Bits

Since 1975 the Nashik plant has been manufacturing drill bits for the mining and petroleum industries, placing emphasis on product line expansion and technical advancements. The improvements made in blast hole drill bit cutting structures has resulted in higher rates of penetration and longer bit life and metallurgical advancements include new tougher grades of tungsten carbide for hardfacing and profiled TC inserts.

### Features

#### Air Circulation Systems

All blast hole bits are manufactured with jet circulation. Compressed air is circulated through the system to cool and flush the matched precision bearings, to clean bit teeth and to remove cuttings from the hole. Jet circulation bits employ nozzles that direct the stream of air for optimum bottom-hole cleaning without a sand-blasting effect on the cutting structure. Nozzles are available in many sizes to meet the requirements of the customer's compressor.

#### Cutting Structure

The cutting structure configurations of each blast hole bit is engineered to meet the most extreme drilling conditions for which the bit is intended. Designs include mechanical considerations such as the pitch or spacing of teeth. Metallurgical considerations include appropriate variations in the heat treatment and use of special alloys.

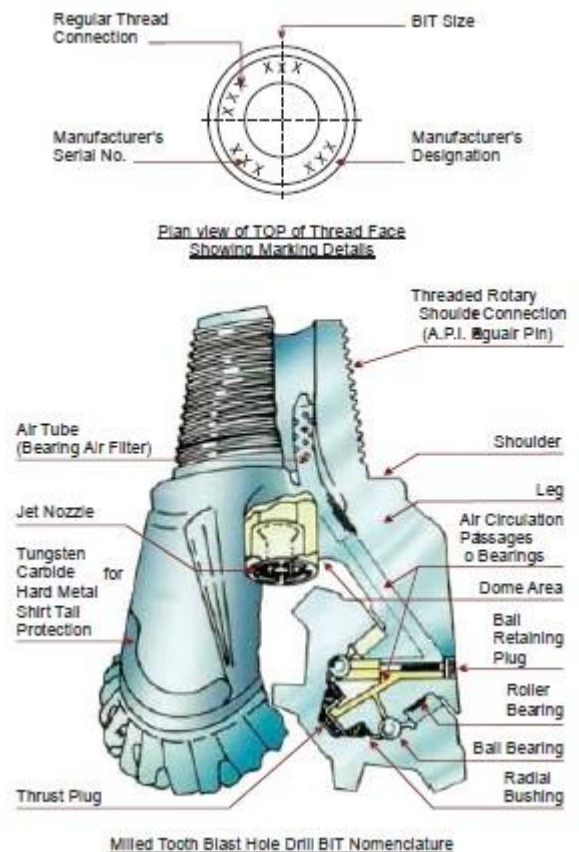
#### Bearings

The bearing structure in blast hole bits provides balanced load distribution that ensures a long, trouble-free life capable of withstanding the heaviest drilling conditions. The balanced triple-bearing arrangement used in mounting the cones on the legs reduces friction to a minimum and eliminates unbalanced wear on any one of the bearings. Bearings are automatically matched to close tolerances to ensure equal loading. The outer and inner bearings support only the radial load. The ball bearing which retains the cutters on the legs along with the thrust spindle resists the longitudinal thrust loads and provides additional support for radial loads.

#### Shirt Tail Protection

Shirt tail protection is provided on all blast hole bits to retard the rate of wear caused by the regrinding of cuttings. This feature reduces the danger of wearing away the shirt tail which acts as protection for the bearings. Tungsten carbide hardfacing is applied on the shirt tail to provide super abrasion resistance.

## Blast Hole Drill Bits *(air circulation bits)*





### **Milled Tooth Bits**

**IADC Code      Type      Weight (lb/in bit RPM      Formation diameter)**

121	G12M	1,000-3,000	50-200	Soft
221	G22M	1,000-5,000	50-150	Medium Hard to Hard
321	G32M	3,000-7,000	40-100	Hard

Available Sizes: 6-1/4", 9-7/8", 10-5/8", 12-1/4"



**IADC Code      Type      Weight (lb/in bit diameter)      RPM      Formation**

533	G53M	2,000-3,000	65-150	Soft
623	G62M	3,000-6,000	65-90	Medium Hard to Hard

### **Tungsten Carbide Insert Bits**

723	G72M	4,000-7,000	65-90	Hard to Very Hard
813	G81M	5,000-8,000	65-90	Very Hard

Available Sizes: 6-1/4", 8-1/2", 9-7/8", 10-5/8", 12-1/4"

### **Tips for Top Performance**

1. The suggested bit weights and rotational speeds shown in this catalogue are for guideline purposes only. Initial testing is usually necessary to find the most economical cost per meter penetration.
2. It is always recommended to break in a new bit by drilling at reduced weight and speed for a period. bit weight and RPM that results in
3. Always open air valves before the bit collars the hole and keep air on until the bit is out of hole.
4. Always maintain drilling air pressure at appropriate levels.
5. Always make up and break out the bit carefully.
6. Always maintain as high a pressure drop as possible across the bit air courses in wet holes, or where water injection is used for dust control.
7. Always guard against dropping the bit and drill string. Dropping may cause damage to cones and/or bearings.
8. Always inspect the bit after each hole and test for uniform cone temperature to make sure none of the air courses to the bearings are obstructed.
9. Always use straight drill steel with properly maintained threaded connections. A bent drill steel can often cause premature bit failure. been idle, make sure all cones turn freely by hand.
10. Always clean the bit before an idle period by passing air through it while rotating the cutters by hand. Immediately before reusing a bit that has

11. Use of a bit stabilizer will lengthen the bit life and lower the drilling cost per meter.

## Air Pressure and Bailing Velocity

Bit Size Range	Air Course Size 3 each	Air pressure drop across DBI blast hole bits with various nozzle sizes. Air volume delivered -																											
		400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2600	2800	3000				
6	5/16	45	55	65	75	84																					5/16		
to	3/8	36	46	54	64	72	81																				3/8		
6-3/4	7/16	30	37	44	51	60	68	76	82																		7/16		
	1/2	26	32	36	44	51	57	64	70	76	82																1/2		
	9/16	21	26	32	37	44	50	54	59	65	70	76	82														9/16		
	3/8	30	39	48	58	69	78	86																			3/8		
7-3/8	7/16	24	31	38	45	52	58	66	72	78	84																7/16		
to	1/2		24	30	36	42	48	54	62	70	79	87															1/2		
7-7/8	9/16			23	29	35	40	46	52	58	64	70	76	82													9/16		
	5/8				24	29	34	39	44	50	55	60	65	71	76	82											5/8		
	11/16					23	28	32	37	42	47	53	58	63	68	74	80										11/16		
	3/4						24	28	32	37	40	44	50	54	58	63	68	73	78	82							3/4		
	3/8	29	39	49	57	65	73	80																			3/8		
	7/16	22	30	38	45	53	61	68	75	82																	7/16		
9	1/2		24	30	36	42	48	56	63	69	74	80															1/2		
to	9/16			23	29	35	41	46	52	57	62	67	71	76	81												9/16		
9-7/8	5/8				22	28	35	39	44	49	52	54	61	65	69	73	77	81									5/8		
	11/16					23	27	32	37	42	46	50	54	57	61	65	69	73	77	81							11/16		
	3/4						22	25	29	34	39	43	44	50	53	57	60	64	67	71	74	78	82				3/4		
	7/8								23	27	29	33	35	38	41	44	47	49	52	55	58	61	66	72	78	7/8			
	1											22	24	26	28	31	33	36	38	41	43	45	50	55	60	1			







Delivered air volume CFM required for a bailing velocity of 5000 FPM										
Pipe Size	Bit Size	6	6-1/4	7-3/8	7-7/8	9	9-7/8	10-5/8	12-1/4	15
3-1/2		732	909	1149	1358	1875	-	-	-	-
4		629	807	1047	1255	1773	-	-	-	-
4-1/2 to 4-5/8		513	691	931	1139	1657	-	-	-	-
5		383	561	602	1010	1528	1978	2397	3411	-
5-1/2			418	658	867	1384	1835	2254	3268	-
6-1/4				418	626	1144	1594	2013	3027	-
6-5/8					495	1012	1463	1882	2896	-
7						873	1323	1742	2756	-
7-3/4						571	1022	1441	2455	-
8-5/8							631	1050	2064	-
9								870	1884	-

### Additional Information *(air circulation bits)*

#### Nozzle Size Selection Procedure

1. Establish the approximate air delivery volume and operating pressure for the air compressor used. The condition of the compressor, efficiency and altitude should be taken into consideration when estimating these values.
2. Ten (10) psi should be subtracted from the above operating pressure for pressure loss through the surface equipment and drill steel between the compressor and bit. This becomes the corrected air pressure.
3. From the table choose the "Air Volume Delivered" column nearest to the volume established in step 1.
4. Proceed down the correct "Air Volume Delivered" column to the proper "Bit Size Range" for the bit being used.
5. Select the smallest nozzle size within a given bit size range that can be used without exceeding the corrected air pressure delivered to the bit.



### Example 1

- a. Bit size: 12-1/4"
- b. Air volume delivered: 1,800 cfm
- c. Compressor operating pressure: 75 psi
- d. Corrected air pressure: 65 psi (75-10)  
From table select three 9/16 jet nozzles (62 psi)

### Example 2

- a. Bit size: 9-7/8"
- b. Air volume delivered: 1,600 cfm
- c. Compressor operating pressure: 60 psi
- d. Corrected air pressure: 50 psi (60-10)  
From table select three 3/4 jet nozzles (50 psi)

### Bailing the Blast Hole with Air

In order for a blast hole drill bit to perform at its best, it must work on a clean hole bottom. Air velocity is what moves the cuttings from the hole. Years of blast hole drilling experience have shown that a velocity of 5,000 feet per minute is the optimum for cleaning a blast hole in all but the very heaviest ores. Because blast holes are relatively shallow, friction losses and the weight of the material in suspension are virtually negligible. Therefore the simple formula  $Q=AV$  can be applied to determine what volume flow of air (Q) is necessary to give the desired velocity (V). (A) is the area of the hole through which the cuttingsladen air flows. This area is the area of the hole less the area filled by the drill stem. The accompanying table gives the delivered air volume necessary to provide a bailing velocity of 5,000 per minute. This volume is calculated for the most common bit and pipe sizes. For very heavy ores, this volume will have to be increased in order to yield the optimum cleaning efficiency.

### Water Well Drill Bits

#### Product Features

#### Circulation System

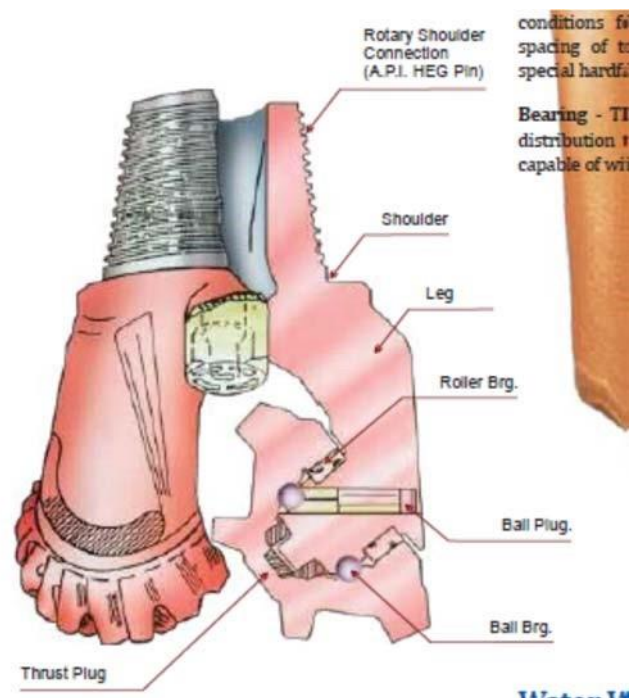
Water well bits are manufactured with full water course circulation. For this purpose, bits 5-5/8" and smaller are provided with a center hole for circulation and bits larger than 5-5/8" are provided with three side MS nozzles and a center hole

#### Cutting Structure

The cutting structure configuration of water well bits is designed to meet the most extreme drilling conditions for which the bit is intended. This includes spacing of teeth, appropriate heat treatment and use of special hardfacing deposition on the teeth.

#### Bearing

The bearing structure provides a balanced load distribution that ensures a long, trouble-free life, and being capable of withstanding the heaviest drilling conditions.



## Water Well Bit Availability

Formation	IADC Code	Type	Bit Size (inch)
Soft	111, 121, 131, 113, 123, 133	G110, G120, G130, G110H, G120H, G130H	5-5/8, 5-7/8, 6, 6-1/4
Medium Hard	211, 231, 623, 213, 233	G210, G230, G620H, G210H, G230H	6-3/4, 7-7/8, 8-3/8, 8-1/2, 8-3/4, 9-7/8, 10-5/8, 12-1/4, 13-3/4
Hard	311, 321, 313, 323	G310, G320, G310H, G320H	14, 16, 17-1/2



## Packing and Weight Data

Bit Size		Standard API Pin Shank Size	Weight (approx)		Box Dimensions			
			kg	lbs				
inch	mm	inch			inch	cm	cubic ft	cubic m
4-1/2	114.30	2-3/8	5.5	12.0	9-1/2 x 13 x 13	24.1 x 33 x 33	0.929	0.026
6	152.40	3-1/2	16.0	35.0	15 x 10-1/2 x 10-1/2	38.1 x 26.7 x 26.7	0.957	0.027
6-1/4	158.80	3-1/2	16.0	35.0	15 x 10-1/2 x 10-1/2	38.1 x 26.7 x 26.7	0.957	0.027
7-7/8	200.00	4-1/2	33.0	73.0	19 x 13 x 13	48.3 x 33 x 33	1.858	0.053
8-3/8	212.70	4-1/2	37.0	83.0	19 x 13 x 13	48.3 x 33 x 33	1.858	0.053
8-1/2	215.90	4-1/2	38.0	85.0	19 x 13 x 13	48.3 x 33 x 33	1.858	0.053
8-5/8	219.00	4-1/2	38.0	85.0	19 x 13 x 13	48.3 x 33 x 33	1.858	0.053
8-3/4	222.20	4-1/2	39.0	87.0	19 x 13 x 13	48.3 x 33 x 33	1.858	0.053
9-7/8	250.80	6-5/8	59.0	130.0	20 x 14-1/8 x 14-1/8	50.8 x 35.9 x 35.9	2.309	0.066
10-5/8	269.80	6-5/8	70.0	155.0	20-1/2 x 14-7/8 x 14-7/8	52.1 x 37.8 x 37.8	2.624	0.074
12	304.80	6-5/8	91.0	200.0	21-1/2 x 16-1/2 x 16-1/2	54.6 x 41.9 x 41.9	3.387	0.096
12-1/4	311.20	6-5/8	95.0	210.0	21-1/2 x 16-1/2 x 16-1/2	54.6 x 41.9 x 41.9	3.387	0.096
13-3/4	349.25	6-5/8	140.0	308.0	22-1/2 x 18 x 18	57.2 x 45.7 x 45.7	4.218	0.120
14-3/4	374.65	6-5/8 or 7-5/8	150.0	330.0	23-1/2 x 19-1/2 x 19-1/2	59.7 x 49.5 x 49.5	5.169	0.146
16	406.40	6-5/8 or 7-5/8	225.0	496.0	27 x 20-1/2 x 20-1/2	68.6 x 52.1 x 52.1	6.563	0.186
17	431.80	6-5/8 or 7-5/8	238.0	525.0	27 x 22 x 22	68.6 x 55.9 x 55.9	7.562	0.214
17-1/2	444.50	6-5/8 or 7-5/8	250.0	550.0	27 x 22 x 22	68.6 x 55.9 x 55.9	7.562	0.214

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