

SERIES	FORMATIONS	TYPES	5 - SEALED ROLLER BEARING WITH GAUGE PROTECTION				7 - FRICTION BEARING WITH GAUGE PROTECTION					
			JZ BITS		SMITH	HUGHES	REED	JZ BITS		SMITH	HUGHES	REED
4	Soft formation of low compressive strength	1	GA00, GJ00	GS01, G02, GS03B, GS04B, G04, GSI01b, GS01, GS01B, GS02B, GS02T, GS03B, GI03B, G04B, GS04B, TCT101	GTX, MX-00 VGA, VMA-02 VG, GTX, MX-03	T41, EMS41H	HA00, HJ00, MD00, MD00M	GFS04, GFSi01, GFS04B, MFS04, MFi04	GX, MXB-00 VGA, GX, MX, VMA-03	R01A, TD41A, R03A, TD41, TD41H		
		2	GA05, GJ05	GS05, GS05B, GSI06B		T42, EMS42H	HA05, HJ05	GF05, GFS05, MF05, GF05B, GFI05B, GFSi06		R07A, TD42H		
		3	GA10, GJ10	G10, GS10, GS10B, G10B, G10T, GSI12B, GSI12UB, TC10B	GTX, MX-09 VGA, VMA-10 GTX, VM, VMA-11	T43, EMS43A, EMS43H	HA10, HJ10, MD10, MD10M	F10, F12, F12Y, GF08B, GF10B, GFS10B, GF12T, XR10T, F10B, XR12T, MF10T, MFiS10T, TCT11, TCT12	GX, STX, VMA, MX, MXB-09 GX, VMC, MX-11	R09A, TD43A, HP43A, R12A, TD43H, SL43H, HP43H, RD12, D43, R14, TD43, R09A		
		4	GA15, GJ15, GA18, GJ18	G15, G18, GS18, 15JS, GSI15B, GSI18B, GSI20B, G11Y, M15S	GTX, MX-11 GTX, 12 GTX, MX-18	T44, EMS44H EMS44A	HA15, HJ15, HA18, HJ18, HA18Q	FH16, FH18, MF15T, XR15, XR15T, GF15, GFS15, FHi18, MF15M, F15T, MF15B, MF19, GF15Y, XR15G	VGA, GX, STX, VM, VMA, VMD, MX-18	R14A, TD44A, HP44X, R14, R15, TD44, R15A, TD4H, HP44H, TD44X, D44, R14A, RD15		
5	Soft to medium formations of high compressive strength	1	GA20, GJ20	G20, GS20B, G25, 2JS, GSI20B, G20B	GTX, MX-20 VG, GTX-22	T51, EMS51A EMS51H	HA20, HJ20, HA23, HJ23, HA20Q, MD20, MD20M	FH20, FH22, FH23, MF20T, MFS20T, XR20T, XR25, GF20, GF25, F15H, F2, MF2, MF15H, FHi20, FHi21, FHi23, GFi20, F25Y, TCTi20	GX, STX, VM, VMA, VMD, MX-20 VG, VGD, GX, MX-22 GX23	R19A, R20A, TD51A, HP51A, R21A, TD51X, HP51X, RD21, D51, R22A, TD51H, SL51H, HP51H, R23A		
		2	GA25, GJ25	G26B	MTX, MC-28	T52, EMS52H	HA25, HJ25, HA28Q, MD28, MD28M	FH26, FH28, F27, F27I, F27IY, GF26, XR20Y, F20Y, XR20TY, GFS28, FHi28, GFi28B, FHi29, FHi25, MF26Y, FHi24Y, GF27Y	VMD, VGD-25, 26 VG, VGD, GX, VMD, MX-28	R24A, R24, TD52A, TD52R, R25A, TD52X, TD52A, RD25, D52, R27, R28A, TD52, TD52H, TD52I, HP52, HP52X, R26A		
		3	GA30, GJ30, GA33, GJ33	G30, 3JS, GS30B	VG, GTX, MX-30	T53, EMS53 EMS53A, ETS53A	HA30, HJ30, HF30, HF33 HA33, HJ33, HA30Q, HA33Q, MD30, MD30M, MD33, MD33M,	FH30, FH32, F30T, F30T, MF30T, XR30, XR32, GF30B, GFS30B, FHi30, FHi31, FH32, GF30T, F30Y, FH30Y	VG, VGD, VMA, STX, GX, MX-30 VGD, VMD-33 VG, VGD, .35	R30A, TD532A, R30, TD53, RD33, D53, TD53H, HP53H, TD53B, JA53, SL53, SL53A, HP53, HP53A		
		4	GA35, GJ35		GTX, MX-30C	T54	HA35, HJ35, HF37, HA37Q, MD37, MD37M, HA39Q, HF39, MD39, MD39M	FH35, F37, F37Y, MF37, XR30Y, XR30YA, FHi35, GFi35, F30Y, FHi37Y, FHi38Y, F39Y, GFi35YG, XRi35	VGD, VMA, GX, STX, MX-30C VGD-33, VD-34, VG, VGD, MX, MXB-35 GX, MX, VMD-38C	R34A, TD54A, R34, R35A, R35, R36A, R36A, TD54X, TD54, R36		
6	Medium Hard formations of high compressive strength	1	GA40, GJ40, GA43, GJ43	G40, G40Y, 4JS		ETS61A	HA40, HJ40, HF40, HF41, HF43, HA43, HJ43, HA45Q, HA46, HA47Q, HF47, MD47, MD47M, HF48, MD48, MD48M	FH40, FH45, F40, GF40H, GF40YF, XR38, XR40, F47A, F47Y, GF47Y, FHi45, XR45Y, FH43Y	VG, VGD, STX, MX-40 VG, VGD, GX-44	R40A, TD61A, SL61A, HP61A, TD61H, R40, TD61, SL61, HP61H		
		2	GA47, GJ47, GA46, GJ46		GTX-40C, GTX, MX-44C	EMS62	HF45, HA45, HA45Q, HA46, HA47Q, HF47, MD47, MD47M, HF48, MD48, MD48M	FH43Y, F45H50, F47H, F57HY, XR40Y, XR50, F50, GF45Y, FHi50Y, F46HY, GF45Y, GF50Y, XR45Y	STX, MX, MXB-40C VG, GX, STX, VM, MX-44C GX-45	R44A, TD62A, SL62A, SL62X, HP62A, R45, TD62, HP62, JA62, SL62, HP62H, R48		
		3	GA50, GJ50	M57S	MX-55		HA50, HA53, HF50, HF57 MD50, MD50M, MD57, HF53, MD57M	F57, F57Y, F50YA, XR50Y, F57HY, GF50YB	VG, VGD, STX, MX-50 VG, GX, STX, VMD, MX-55	R50, SL63, TD63, HP63		
		4	GA63				HA63, HF63, HF63M	F59Y, F67Y, MF67Y, XR65Y	VG, VGD, GX, STX, VM, MX, MXB-66 GX-68	R60, TD64, HP64, R65, TD64H, HP64H		
7	Hard Semi-Abrasive and Abrasive Formations	3	GA73				HA73, HJ73, HF73M	F68Y, XR68Y, XR70Y, F7, XR68HY	VG, VGD, STX-70 STX-77	R70, TD73, SL73		
		4						XR75Y		TD74, SL74, HP74, R75		
8	Extremely hard and abrasive formations	1						F80Y, XR80Y, GF80Y	STX-88	R80, TD81, HP81		
		2						F85Y	GX-89			
		3						HA85, HF85, HF85M	VG, STX-90, GX-95, GX-98M, STX-99	R85, R90, TD83, SL83, HP83, R95		
							HA93, HF93, HF93M					

FEATURES - (SUFFIX)

- A** Enhanced Tooth Hardfacing
- B** Hardmetal Banding (shank)
- C** Center Jet
- E** Extended Inner Inserts
- G** Reinforced Gauge Protection
- H** Diamond Enhanced Gauge
- HH** Diamond Enhanced Gauge & Heel
- J** Enhanced Mud Flow
- K** Wide Crest Inserts
- L** Premium Shank Protection
- M** Metal Face Seal
- P** Gauge Protection
- Q** Advanced Cutting Structure
- R** Bit Head Stabilization Pad
- S** Full Bottom Hole Coverage
- SW** Vectored Cutter Placement
- T** Trimmer Row on Heel
- U** Double Gauge Row
- X** Aggressive Insert Design

PREMIUM SERIES (PREFIX)

MD Motor Drive	High RPM Applications Floating Bushing Bearing - Ball Lock Metal Face Seal (optional)
HF Hard Formation	High WOB Applications Journal Bearing - Ball Lock Metal Face Seal (optional)

STANDARD SERIES - (PREFIX)

W	Nonsealed Roller Bearing
GA	Sealed Roller Bearing
GJ	Sealed Roller Bearing with Metal Face Seal
HA	Sealed Journal Bearing
HJ	Sealed Journal Bearing with Metal Face Seal

CUTTING STRUCTURES

MT with 1 digit = 1 Softest - 9 Hardest

Insert with 2 digits = 00 Softest - 99 Hardest (Even=Chisel Odd=Conical)



DISTRIBUTOR OF
JZ BITS

SERIES	FORMATIONS	TYPES	1 - OPEN BEARING				4 - SEALED ROLLER BEARING				5 - SEALED ROLLER BEARING WITH GAUGE PROTECTION				6 - FRICTION BEARING				7 - FRICTION BEARING WITH GAUGE PROTECTION				
			JZ	SMITH	HUGHES	REED	JZ	SMITH	HUGHES	REED	JZ	SMITH	HUGHES	REED	JZ	SMITH	HUGHES	REED	JZ	SMITH	HUGHES	REED	
			MILLED TOOTH BITS	Soft formations having low compressive strength and high drillability	1	W1	DSJ	R1	Y11	GA-1 GA1SW	SDS	GTX-1		GA-1P GJ-1P GA-1PSW GJ-1PSWT	XR+ GSSH+ TCTi+	GTX-G1 MX-1 VG-1 VM-1	T11 EMS11G ETS11G	HA-1 HA-1SW MD-1 MD-1SW	FDS		HP11	HA-1P HJ-1P HA-1PSW HJ-1PSW MD-1P MD-1PSW	XR+ FDS+ TCTi+
2	W2	DTJ					GA-2				GA-2P GJ-2PT				HA-2	FDT		HP12	HA-2P HJ-2P			SL12 HP12	
3	W3	DGJ			R3	Y13	GA-3	MGG	GTX3		GA-3P GA-3PT	GGH+ MSDGH	MX-3 VG-3 VM-3	T13 EMS13G ETS13G	HA-3			HP13	HA-3P HJ-3P	FDGH MFDGH	MX-3 VG-3 VM-3 MXB-3	D13 HP31G	
2	Medium to medium hard formations with high compressive strength	1			OFM			GA-4			GA-4P	SVH			HA-4 MD-4				HA-4P MD-4P	FVH GFVH		HP21G	
		2																					
3	Hard semi-abrasive and abrasive formations	1						GA-7			GA-7P				HA-7 MD-7				HA-7P MD-7P				
		2		W8			R7																

IADC DULL BIT GRADING

CUTTING STRUCTURE				BEARINGS/ SEALS	GAUGE	OTHER DULL CHAR.	REASON PULLED	
INNER	OUTER	DULL CHARACTERISTICS	LOCATION					
I	O	D	L	B	G	O	R	
I INNER CUTTING STRUCTURE (All Inner Rows)				L LOCATION <i>Roller Cone</i> N — Nose Row M — Middle Row G — Gauge A — All	B BEARING SEALS <i>Non Sealed Bearings</i> A linear scale estimating bearing life used. 0 — NO LIFE USED 8 — ALL LIFE USED, i.e. NO BEARING LIFE REMAINING	G GAUGE 1 — In Gauge 1 — 1/16" Out of Gauge 2 — 2/16" Out of Gauge 4 — 4/16" Out of Gauge	O OTHER DULL CHARACTERISTICS Refer to column 3 codes	
O 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: <i>Steel Tooth Bits</i> A measure of lost tooth height due to abrasion and/or damage. 0 — NO LOSS OF TOOTH HEIGHT 8 — TOTAL LOSS OF TOOTH HEIGHT <i>Insert Bits</i> A measure of total cutting structure reduction due to lost, worn and/or broken inserts. 0 — NO LOST, WORN AND/OR BROKEN CUTTING STRUCTURE 8 — ALL OF CUTTING STRUCTURE LOST, WORN AND/OR BROKEN <i>Fixed Cutter Bits</i> A measure of lost and/or broken cutting structure. 0 — NO LOST, WORN AND/OR BROKEN CUTTING STRUCTURE 8 — ALL OF CUTTING STRUCTURE LOST, WORN AND/OR BROKEN								R REASON PULLED OR RUN TERMINATED BHA — Change Bottom Hole Assembly CM — Condition Mud DMF — Downhole Motor Failure DP — Drill Plug DSF — Drill String Failure DST — Drill Stem Testing DTF — Downhole Tool Failure FM — Formation Change HP — Hole Problems HR — Hours on Bit LIH — Left in Hole LOG — Run Logs PP — Pump Pressure RIG — Rig Repair TD — Total Depth/ Casing Depth TQ — Torque TW — Twist Off WC — Weather Conditions
D DULL CHARACTERISTICS (use only cutting structure related codes) BC — Broken Cone BF — Bond Failure BT — Broken Teeth/Cutters CI — Cone Interference CR — Core CT — Chipped Teeth / Cutters ER — Erosion FC — Flat Crested Wear HC — Heat Checking LC — Lost Cone LN — Lost Nozzle OC — Off-Center Wear PB — Pinched Bit BU — Balled Up Bit CC — Cracked Cone CD — Cone Dragged PN — Plugged Nozzle/Flow Passage RG — Rounded Gauge RO — Ring Out SD — Shirltail Damage SS — Self-Sharpening Wear TR — Tracking WO — Washed Out Bit WT — Worn Teeth/Cutters NO — No Dull Characteristics								

JET NOZZLE FLOW AREAS

Nozzle Size (in. [mm])	Nozzle Number	Flow Area of One Nozzle (in2[mm2])	Flow Area of Two Nozzles (in2[mm2])	Flow Area of Three Nozzles (in2[mm2])	Flow Area of Four Nozzles (in2[mm2])
7/32 [5.5]	7	0.0376 [24.3]	0.0752 [48.5]	0.1127 [72.9]	0.1503 [97.0]
1/4 [6.4]	8	0.0491 [31.7]	0.0982 [63.4]	0.1473 [95.0]	0.1963 [126.1]
9/32 [7.1]	9	0.0621 [40.1]	0.1242 [80.1]	0.1864 [120.2]	0.2485 [160.3]
5/16 [7.9]	10	0.0767 [49.5]	0.1534 [99.0]	0.2301 [148.4]	0.3068 [197.9]
11/32 [8.7]	11	0.0928 [59.5]	0.1856 [119.7]	0.2784 [179.6]	0.3712 [239.5]
3/8 [9.5]	12	0.1104 [71.2]	0.2209 [142.5]	0.3313 [213.7]	0.4418 [285.0]
13/32 [10.3]	13	0.1296 [83.6]	0.2592 [167.2]	0.3889 [250.9]	0.5185 [334.5]
7/16 [11.1]	14	0.1503 [97.0]	0.3007 [194.0]	0.4510 [291.0]	0.6013 [388.0]
15/32 [11.9]	15	0.1726 [111.4]	0.3451 [222.8]	0.5177 [334.2]	0.6903 [445.4]
1/2 [12.7]	16	0.1963 [126.6]	0.3927 [253.2]	0.5890 [379.8]	0.7854 [506.7]
9/16 [14.3]	18	0.2485 [160.3]	0.4970 [320.6]	0.7455 [481.0]	0.9940 [641.3]
5/8 [15.9]	20	0.3068 [197.9]	0.6136 [395.9]	0.9204 [593.8]	1.2272 [791.8]
11/16 [17.5]	22	0.3712 [239.5]	0.7424 [479.0]	1.1137 [718.5]	1.4849 [958.1]
3/4 [19.0]	24	0.4418 [285.0]	0.8836 [570.1]	1.3254 [855.0]	1.7672 [1140.2]
7/8 [22.2]	28	0.6013 [387.9]	1.2026 [775.9]	1.8040 [1163.7]	2.4053 [1551.9]

RECOMMENDED ROLLER CONE MAKEUP TORQUE

Bit Size (in. [mm])	API Pin Size (in. [mm])	Recommended Torque (lbt-ft [Newton])
3 3/4 — 4 1/2 [95.2–114.3]	2 3/8 [60.3]	3,000–3,500 [4,000–4,800]
4 5/8 — 5 [117.5–127.0]	2 7/8 [73.0]	6,000–7,000 [8,000–9,500]
5 1/8 — 7 3/8 [130.2–187.3]	3 1/2 [88.9]	7,000–9,000 [9,500–12,000]
7 5/8 — 9 [193.7–228.6]	4 1/2 [114.3]	12,000–16,000 [16,000–22,000]
9 1/2 — 13 3/4 [241.3–660.4]	6 5/8 [168.3]	28,000–32,000 [38,000–43,000]
14 3/4 — 26 [374.6–660.4]	7 5/8 [193.7]	34,000–40,000 [46,000–54,000]