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Drill Pipe

The Drill Pipe is made of AISI 4145H modified alloy steel, all physical properties confirm with API Spec.7 Latest Editions.

The wear-resistance hardbanding is standard on tool joints connections and central upset. Hardbanding is made by an automatic machine after preheating the pipe and is followed by stress relieving

The Type of handbanding include Iron-Matrix powder alloy, Tungsten Carbide particle, Arnco 100XT, Arnco 200XT, and Arnco 300XT

Internal Coating: The HWDP could be internally coated with DPC (Equivalent to TK34) as customers request which are able to prevent corrosion and extend life.



Size	Weight Designation	Calculated Plain-End Weight		Outside Diameter		Grade	Wall Thickness		Upset Ends. For Weld-on Tools Joint
		Lb/ft	kg/m	in	mm		In	mm	
2 3/8	6.65	6.26	9.32	2.375	60.3	E,X,G,S	0.280	7.11	EU
2 7/8	10.40	9.72	14.48	2.875	73.0	E,X,G,S	0.362	9.19	IU or EU
3 1/2	9.50	8.81	13.12	3.500	88.9	E	0.254	6.45	IU or EU
3 1/2	13.30	12.31	18.34	3.500	88.9	E,X,G,S	0.368	9.35	IU or EU
3 1/2	15.50	14.63	21.79	3.500	88.9	E	0.449	11.40	IU or EU
3 1/2	15.50	14.63	21.79	3.500	88.9	X,G,S	0.449	11.40	EU or IEU
4	14.00	12.93	19.26	4.000	101.6	E,X,G,S	0.330	8.38	IU or EU
4 1/2	13.75	12.24	18.23	4.500	114.3	E	0.271	6.88	IU or EU
4 1/2	16.60	14.98	22.31	4.500	114.3	E,X,G,S	0.337	8.56	EU or IEU
4 1/2	20.00	18.69	27.84	4.500	114.3	E,X,G,S	0.430	10.92	EU or IEU
5	16.25	14.87	22.15	5.000	127.0	X,G,S	0.296	7.52	IU
5	19.50	17.93	26.71	5.000	127.0	E	0.362	9.19	IEU
5	19.50	17.93	26.71	5.000	127.0	X,G,S	0.362	9.19	EU or IEU
5	25.60	24.03	35.79	5.000	127.0	E	0.500	12.70	IEU
5	25.60	24.03	35.79	5.000	127.0	X,G,S	0.500	12.70	EU or IEU
5 1/2	21.90	19.81	29.51	5.500	139.7	E,X,G,S	0.361	9.17	IEU
5 1/2	24.70	22.54	33.57	5.500	139.7	E,X,G,S	0.415	10.54	IEU
6 5/8	25.20	22.19	33.05	6.625	168.3	E,X,G,S	0.330	8.38	IEU
6 5/8	27.70	24.21	36.06	6.625	168.3	E,X,G,S	0.362	9.19	IEU

Tensile

Group	Grade	Yield Strength				Tensile Strength		Elongation, Min.Percent in 2 in. (50.80mm)%
		Minimum		Maximum		Minimum		
		psi	Mpa	psi	Mpa	psi	Mpa	
1	E-75	75000	517	105000	724	100000	689	See footnotea
3	X-95	95000	655	125000	862	105000	724	See footnotea
	G-105	105000	724	135000	931	115000	793	See footnotea
	S-135	135000	931	165000	1138	145000	1000	See footnotea

HEAVY WEIGHT DRILL PIPE

HWDP

The Heavy Weight Drill Pipe is made from one piece of AISI 4145H solid bar, fully heat-treated, all physical properties confirm with API Spec.7 Latest Editions.



Hard banding

The wear-resistance hard banding is standard on tool joints connections and central upset. Hard banding is made by an automatic machine after preheating the pipe and is followed by stress relief.

The Type of hard banding include Iron-Matrix powder alloy, Tungsten Carbide particle, and Arco 100XT.

Standard Bands:

- ◆ one 4" wear band on both pin and box ends, plus one 1" band on 18 degree shoulder of box.
- ◆ Two 3" wear bands on central upsets
- ◆ The hard banding is completing flush on both joints and 1/8" oversize on the central upset (full flush on request).

Internal Coating: The HWDP could be internally coated with DPC (Equivalent to TK34) as customers request which are able to prevent corrosion and extend life.

Order Instruction:

- ◆ Nominal Size
- ◆ Range
- ◆ Hard banding type
- ◆ Internal coating if required.
- ◆ Extra-long tool joints if required
- ◆ API Stress relief recess.

Integral Heavy Weight Drill Pipe Spec.

Nom. Size (in)	Approx. Overall Length (ft)	Tool Joints			Tube				Approx. Weight		Make-up Torque (lb-ft)
		OD (in)	ID (in)	Conn.	Center upset OD (in)	Center upsets end (in)	ID (in)	Center upset length (in)	lb/ft	kg /jts	
3 1/2	30.5	4 3/4	2 1/16	3 1/2IF	4	3 5/8	2 1/16	24	25.3	350	11,500
4	30.5	5 1/4	2 1/2	4 FH	4 1/2	4 1/8	2 1/2	24	29.5	410	17,300
4 1/2	30.5	6 1/4	2 13/16	4IF	5	4 5/8	2 13/16	24	41	565	25,500
5	30.5	6 1/2-6 5/8	3	4 1/2IF	5 1/2	5 1/8	3	24	49.3	681	34,000
5 1/2	30.5	7-7 1/4	3 5/8	5 1/2 FH	6	5 11/16	3 5/8	24	55	760	38,000
6 5/8	30.5	8-8 1/4	4	6 5/8 FH	7 1/4	6 3/4	4	24	70	970	55,800

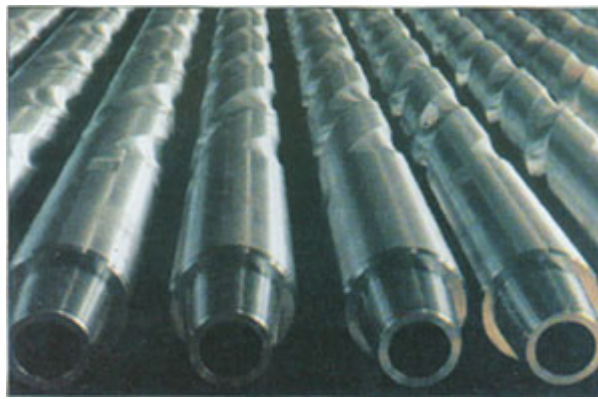
Integral Spiraled Heavy Weight Drill Pipe

Nom. Size (in)	Approx. Overall Length (ft)	Tool Joints			Tube				Approx. Weight		Make-up Torque (lb-ft)
		OD (in)	ID (in)	Conn.	Center upset OD (in)	Center upsets end (in)	ID (in)	Center upset length (in)	lb/ft	kg /jts	
3 1/2	30.5	4 3/4	2 1/16	3 1/2IF	4	3 5/8	2 1/16	18.5	28	387	11,500
4	30.5	5 1/4	2 1/2	4 FH	4 1/2	4 1/8	2 1/2	18.5	33	457	17,300
4 1/2	30.5	6 1/4	2 13/16	4IF	5	4 5/8	2 13/16	18.5	45	623	25,500
5	30.5	6 1/2-6 5/8	3	4 1/2IF	5 1/2	5 1/8	3	18.5	54	748	34,000
5 1/2	30.5	7-7 1/4	3 5/8	5 1/2 FH	6	5 11/16	3 5/8	18.5	62	858	38,000
6 5/8	30.5	8-8 1/4	4	6 5/8 FH	7 1/4	6 3/4	4	18.5	76	1052	55,800

DRILL COLLAR

Drill Collar

The Drill Collar is made of AISI 4145H or 4145 H modified Alloy Steel. Its bores are trepanned from one direction with no mismatch. All Drill Collars are Q & T overall length to ensure the hardness within 285 and 341 BHN with one inch below the surface.



Order Instructions:

- ◆ Type (Slick or Spiral grooved)
- ◆ Outside and inside size and overall length
- ◆ Connection type and size
- ◆ API Stress relief Groove on pin and box ends
- ◆ Cast or pressed steel thread protectors
- ◆ other special request, for example: slips or elevator recess and hard banding style

The Physical Properties

OD (in)	Tensile Strength (Mpa)	Yield Strength (Mpa)	Elongation (L=4D) (%)	Impact AKV (J)	Brinell Hardness (HB)
3 1/8~6 3/4	Not less than 965	not Less than 758	Not less than 13	Not less than 54	Not less than 285
7~10	Not less than 930	Not less than 689	Not less than 13	Not less than 54	Not less than 285

Standard Sizes and Spec.

Size OD (in)	Bore ID (in)	Connection	Approx Weight (kg)	
			30 ft	31 ft
3 1/8	1 1/4	NC23	296	306
3 1/4	1 1/4	NC23	325	336
3 1/2	1 1/2	2 3/8IF	358	370
4 1/8	2	2 7/8IF	469	485
4 1/4	2	2 7/8IF	509	526
4 1/2	2	2 7/8IF	585	605
4 3/4	2 1/4	NC35	629	650
5	2 1/4	3 1/2IF	716	740
5 1/4	2 1/4	3 1/2IF	811	838
5 1/2	2 1/4	3 1/2IF	905	935
5 3/4	2 1/4	4FH	1009	1043
6	2 1/4	NC44	1114	1151
6 1/4	2 1/4	4IF	1224	1265
6 1/2	2 1/4	4IF	1340	1385
6 3/4	2 1/4	4IF	1024	1058
7	2 13/16	4 1/2IF	1481	1530
7 1/4	2 13/16	4 1/2IF	1607	1661
7 1/2	2 13/16	4 1/2IF	1741	1799
7 3/4	2 13/16	6 5/8Reg	1877	1940
8	2 13/16	6 5/8 Reg	2018	2085
8 1/4	2 13/16	6 5/8 Reg	2168	2240
8 1/2	2 13/16	6 5/8 Reg	2315	2392
8 3/4	2 13/16	6 5/8 Reg	2473	2555
9	3	7 5/8 Reg	2589	2675
9 1/4	3	7 5/8 Reg	2758	2850
9 1/2	3	7 5/8 Reg	2923	3020
9 3/4	3	7 5/8 Reg	3098	3200
10	3	8 5/8 Reg	3276	3385

MAGNETIC DRILL COLLAR

Materials of Non-magnetic Drill Collars are made from chrome manganese low carbon austenitic alloy with the following characteristics:

- ◆ The chemical composition should be controlled strictly during the refining and forging process.
- ◆ With excellent lower Magnetic permeability, high strength of mechanical properties and outstanding resistant to stress corrosion cracking and no tendency to galling.

Order Instructions

- ◆ Size of Non-magnetic Drill Collar
- ◆ Length
- ◆ Connection Type
- ◆ API Stress relief recess
- ◆ other special request.



Non-magnetic Properties

- ◆ Relative Max: 1.010
- ◆ Average: 1.005
- ◆ Max. 0.05 Micro Tesla/100 mm

Mechanical Properties

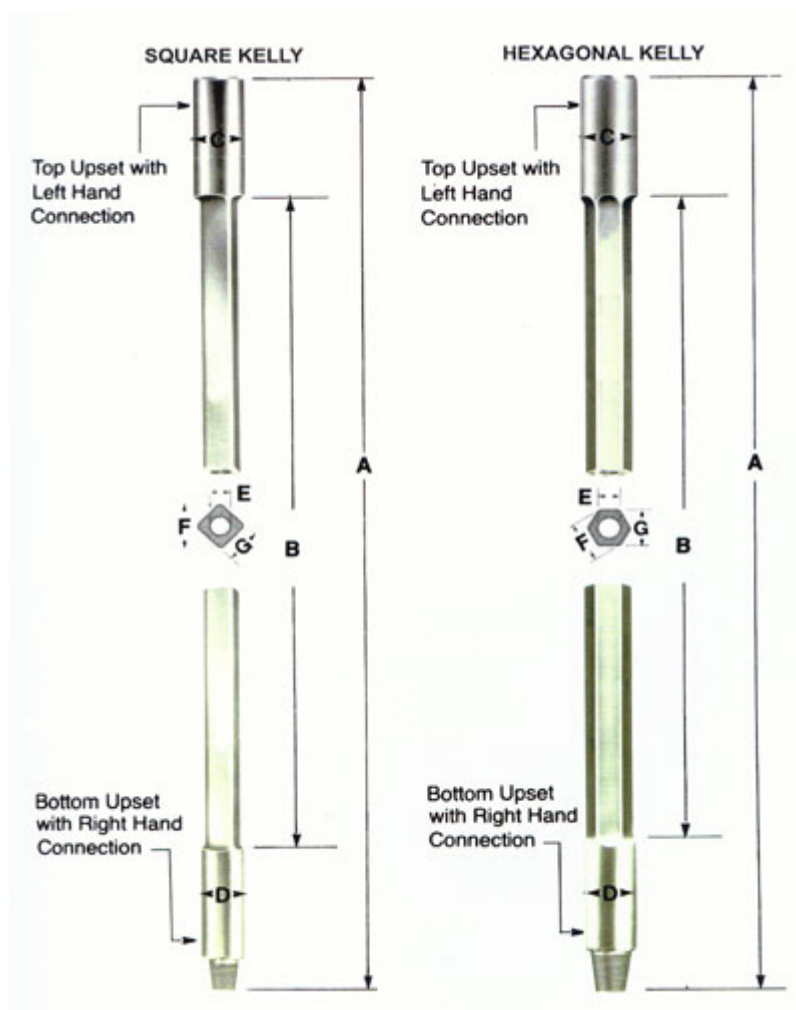
Size OD (in)	Yield Strength (Mpa)	Tensile Strength (Mpa)	Elongation (%)	Reduction of area (%)	Impact AKV (ft.lb)
3 1/8~6 3/4	not less than 758	not less than 827	not less than 18	50	not less than 50
7~10	not less than 689	not less than 758	not less than 20	50	not less than 50

KELLY

The Kelly is made from 4145 H modified alloy steel in accordance with API Spec. 7 latest edition, which are quenched and tempered along full length with the hardness up to 285 to 341 BHN and minimum impact value of 54 Joules as per ASTM A370 Charpy-V, these values are guaranteed one inch below the surface. The kelly Bars are inspected by ultrasonic unit.

Order Instructions:

- ◆ Kelly type: Square or Hexagonal
- ◆ Working space and overall length
- ◆ upper and bottom connection size and type.



Standard Size for Square Kellys

Nom. Size (in)	Length (ft)		Top Upset		Bottom upset		Bore	Drive Section		Weight (kg)
	A	B	LH Conn.	OD C (in)	RH Conn.	OD D (in)	E (in)	F (in)	G (in)	
2 1/2	40	37	6 5/8	7 3/4	2 3/8 IF	3 3/8	1 1/4	3 1/4	2 1/2	410
	46	43	Reg.							465
3	40	37	6 5/8	7 3/4	2 7/8 IF	4 1/8	1 3/4	3 7/8	3	495
	46	43	Reg.							560
3 1/2	40	37	6 5/8	7 3/4	3 1/2 IF	4 3/4	2 1/4	4 7/16	3 1/2	600
	46	43	Reg.							670
	54	51								780
4 1/4	40	37	6 5/8	7 3/4	4 IF or 4 1/2 IF	6, 6 3/8, 6 1/2	2 13/16	5 1/2	4 1/4	825
	46	43	Reg.							940
	54	51								1070
5 1/4	40	37	6 5/8	7 3/4	4 1/2IF or 5 1/2FH	7	3 1/4	6 7/8	5 1/4	1250
	46	43	Reg.							1430
	54	51								1670
6	46	37	6 5/8	7 3/4	6 5/8FH	8	3 1/2	7 5/8	6	1670
	46	43	Reg.							1920
	54	51								2250

Standard Sizes for Hexagonal Kelly

Nom. Size (in)	Length (ft)		Top Upset		Bottom upset		Bore	Drive Section		Weight (kg)
	A	B	LH Conn.	OD C (in)	RH Conn.	OD D (in)	E (in)	F (in)	G (in)	
3	40	37	6 5/8	7 3/4	2 3/8 IF	3 3/8	1 1/2	3 3/8	3	450
	46	43	Reg.							500
3 1/2	40	37	6 5/8	7 3/4	2 7/8 IF	4 1/8	1 3/4	3 15/16	3 1/2	580
	46	43	Reg.							670
	54	51								780
4 1/4	40	37	6 5/8	7 3/4	3 1/2 IF	4 3/4	2 1/4	4 7/8	4 1/4	750
	46	43	Reg.							840
	54	51								980
5 1/4	40	37	6 5/8	7 3/4	4 IIF or 4 1/2IF	6, 6 3/8 or 6 1/2	2 13/16 or 3 1/4	5 7/8	5 1/4	1020
	46	43	Reg.							1170
	54	51								1350
6	46	37	6 5/8	7 3/4	4 1/2IF, 5 1/2FH	7	3 1/2	6 13/16	6	1320
	46	43	Reg.							1500
	54	51								1770

Stabilizer

Stabilizers are made from premium chrome molybdenese alloy steel (except for non-magnetic style), heat treated by special procedures and obtain expected hardness, strength and impact value properties. All threads are made strictly in accordance with API Spec. the hardbanding of stabilizer employ "pressed in" Tungsten Carbide alloy buttons or other anti-wear materials. All stabilizers should be ultrasonic tested.

- ◆ Integral spiral stabilizer
- ◆ Integral Mandrel Sleeve Stabilizers
- ◆ Two pieces Mandrel sleeve stabilizers
- ◆ Interchangeable sleeve stabilizers
- ◆ Sleeve stabilizer
- ◆ Integral straight Rib Stabilizer



Integral Spiral Stabilizer

Integral Spiral Stabilizer is made from AISI 4145 H Modified alloy steel or non-magnetic alloy steel, the pressure button type or applied Tungsten Carbide hardbanding on the blade facing are available. The non-magnetic stabilizers have special hardbanding on the spiraled blade surface that the magnetic properties have been eliminated.

Tow-pieces Construction Integral Stabilizer

The size 26" and bigger Integral Stabilizer constructed of tow pieces .The sleeve on witch made four spiral blades is attached to the body with a shrink fit. To install sleeve, it must be heated up to 400°C. So that the sleeve is never disassemble.

The body (or mandrel) is made of modified alloy steel, then fully heat-treated with the following properties:

- ◆ Materials: 40CrMnMo (Equivalent to 4145H)
- ◆ Hardness: HB290~340
- ◆ Strength: $\sigma_b \geq 965$ Mpa ($D_2 < 160$ mm), $\sigma_b \geq 931$ Mpa ($D_2 > 160$ mm),
- ◆ Impact Strength: $AK \geq 54$ J

Order Instructions:

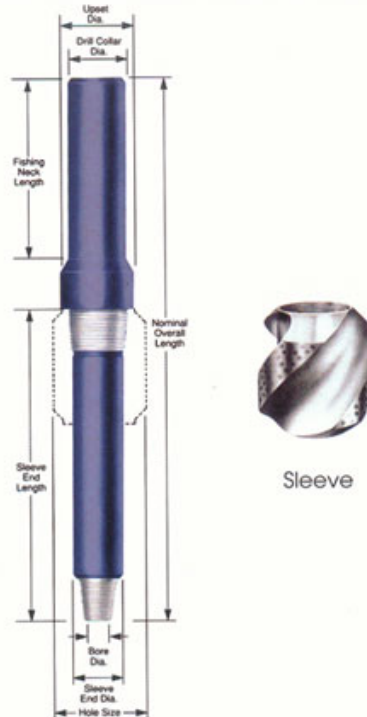
- ◆ Hole size and type (String or near-Bit)
- ◆ Drill Collar OD and ID
- ◆ Size and type of Connection
- ◆ The API Stress relief groove or bore back
- ◆ Bore for float valve
- ◆ Hardbanding type.



Hole Size (in)	Std. DC Size (in)	Wall Contact (in)	Blade width (in)	Fishing Neck Length (in)	Blade undergauge (in)	Overall Length (in)		Approx. WT. (kg)
						String	Near-Bit	
6-6 3/4	4 1/2-4 3/4	16	2 1/4	28	-1/32	74	70	165
7 1/2-8 1/2	6 1/2	16	2 1/2	28	-1/32	75	70	350
9 1/2-12 1/4	8	18	3 1/2	30	-1/32	83	78	750
14 3/4-17 1/2	9 1/2	18	4	30	-1/32	92	87	1000
20-26	9 1/2	18	4	30	-1/32	100	95	1800

Sleeve type stabilizers

Sleeve type Stabilizers are made of 4145H modified alloy steel. Heat treated to 285~341 BH and 54 Joules minimum impact value. The stabilizers consists of one piece body (Mandrel) and one sleeve which is jointed, the sleeve can be changed after fretted.



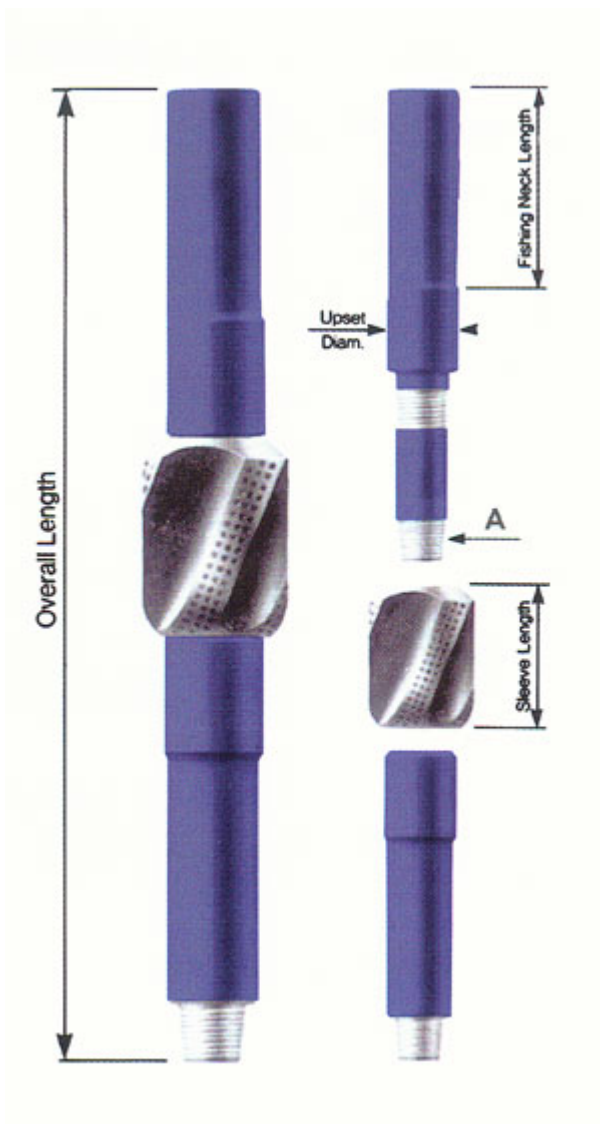
Order Instructions:

- ◆ Hole size and type (String or Near Bit)
- ◆ Drill Collar OD and ID
- ◆ Size and type of connections
- ◆ Hard facing type
- ◆ Sleeve Breaker

Hole Size (in)	Std. DC Size (in)	Wall Contact (in)	Blade width (in)	Fishing Neck Length (in)	Blade undergage (in)	Overall Length (in)		Approx. WT. (kg)
						String	Near-Bit	
6 1/4~7 1/2	4 3/4~5	5 3/4	4 3/4	65	27	22	125	14
8 1/2~9 7/8	6 1/4~6 3/4	7 1/2	6 1/4	65	27	22	220	14
8 1/2~9 7/8	6 1/2~7 1/4	7 3/4	6 1/2	65	27	22	260	14
12 1/4~17 1/2	7 3/4~8 1/4	9 1/4	7 3/4	66	27	22	370	16
12 1/4~17 1/2	8 1/2~9	9 7/8	8 1/2	66	27	22	460	18
14 3/4~20	9 1/2~10	11	9 5/8	66	27	22	550	22

Interchangeable Sleeve stabilizers

Interchangeable Sleeve Stabilizers are made of 4145H modified Alloy steel. Heat treated to 285~341 Brinell Hardness and 54 Joules minimum impact value. The physical properties would be guaranteed 1 inch below the surface. Such kinds of stabilizers consist of two pieces which are joined by the center connection and one sleeve. Every stabilizers is equipped with a certain sizes of sleeve.



Order Instructions:

- ◆ Hole Size and type (String and near-Bit)
- ◆ Drill Collar OD and ID
- ◆ Size and type of connection
- cHard facing type

Hole Size (in)	Sleeve			Body (Mandrel)					Overall Length (in)
	Balade width (in)	Length (in)	Approx. WT. (kg)	DC Size (in)	Bore (in)	Upset Dia. (in)	Center Conn.	Approx. WT. (kg)	
6 1/8, 6 1/4-6 3/4	2	18	35	4 1/8, 4 3/4	2	4 3/4	2 7/8IF	125	64
7 3/8-7 3/4	2	18	45	5 3/4	2 1/4	5 3/4	3 1/2IF	180	66
8 1/2-8 3/4	2 3/8	18	55	6 1/2	2 13/16	6 3/4	4	250	68
9 1/2-11	2 3/4	18	65	7 1/4	2 13/16	7 1/2	4 1/2	330	68
12 1/4-15, 17 1/2	3 1/8	18	95	8, 8 1/2	2 13/16	8 1/2	6 5/8 Reg.	520	72
12 1/4-17 1/2	3 1/8	24	130	9 1/2	3	9 1/2	7 5/8 Reg.	550	81
17 1/2-20	4	33	180	11 1/4	3	11 1/4	8 5/8 Reg.	810	90
22-26	4	33	250	9 1/2	3	9 1/4	7 5/8 Reg.	615	90

Integral Straight Rib Stabilizers

Straight Rib Stabilizers are made of AISI 4145 H Alloy steel by one piece of integral bar. Every stabilizer has four straight ribs that pressed Tungsten Carbide buttons or other type of hardfacing is located on the surface of the ribs. Ultrasonic inspection is performed on each stabilizer.

Variable Diameter Stabilizer Type KFQ

The stabilizer Diameter changes when WOB (Weight on Bit) works on stabilizer block, which will return back to its compact position when drilling string runs out of the hole

X-Over Sub

Tool joints welded on the drill pipe serve the oil and gas drilling operation, including pin and box joints.

All types of weld-on tool joints are in conformity with API Spec7.

The tool joints made of super alloy steel through forging and special heat treatment provides high strength, good ductility and long service life. The thread surface with copper coating or phosphate coating has excellent thread sticking resistance.

The product is granted the right to use API monogram.

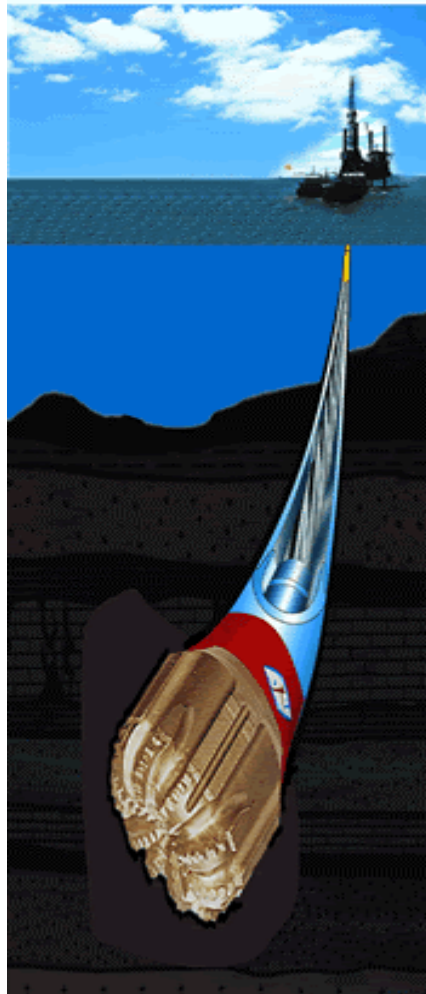


DOWN HOLE MOTOR

Down Hole Motor

The Down Hole Motor is made under Smith International Inc know-how and technology with more than 20 different sizes and 400 different designs.

The whole process from designs, machining, assy and testing are under strict ISO Q/C system with detail traceability records.



Model	3LZ60x 7Y	5LZ73 x 7Y	5LZ89x 7Y	4LZ95 x 7Y	5LZ95 X 7Y	5LZ95 x 7Y-I
Size OD (In)	2 3/8	2 7/8	3 1/2	3 3/4	3 3/4	3 3/4
Length (ft)	8.2	8.8	12	16.9	12.6	16.9
Weight (lb)	946	134	280	352	335	422
Lobe Configuration	3:4	5:6	5:6	4:5	5:6	5:6
Bit Size range	2 7/8~3 1/4	3 1/8~4 1/2	4 1/2~6	4 5/8~6	4 5/8~6	4 5/8~6
Top Sub Conn.	1 1/4 API Reg.	2 3/8 Reg	2 3/8 Reg	2 7/8 Reg	2 7/8 Reg.	2 7/8 Reg
Bit Conn.	1 1/4 API Reg.	2 3/8 Reg	2 3/8 Reg	2 7/8 Reg	2 7/8 Reg.	2 7/8 Reg
Flow Rate (GPM)	15.8~19.50	19-22-75	40-67-111	64-111-174	60-95-159	64-111-174
Bit Speed (RPM)	193~232-400	150-175-400	89-150-180	116-204-320	90-144-180	89-155-244
Operating Differential Pressure (psi)	348	464	348	464	348	464
Operating Torque (lb-ft)	87	180	473	796	656	1019
Operating Power output (hp)	6.7	14	16	48	20	47
WOB (lb)	1760	2200	5500	6600	6600	6600
Max.Diff. Pressue (ps)	557	740	557	740	557	740
Max. Torque (lb.ft)	140	288	757	1274	1050	1630
Max. Power output (hp)	11	22	25	77	32	75
Max. WOB (lb)	2816	4400	8360	12100	12100	12100

Model	5LZ95 x 7Y-J	5LZ105 x 7Y	4LZ120x 7Y	5LZ120 x 7Y	5LZ120 X 7Y-I	5LZ120 x 7Y-II
Size OD (In)	3 3/4	4 1/2	4 3/4	4 3/4	4 3/4	4 3/4
Length (ft)	15.9	14.6	20.7	18.7	14.4	20.7
Weight (lb)	440	462	946	849	663	979
Lobe Configuration	5:6	5:6	4:5	5:6	5:6	5:6
Bit Size range	4 5/8~6	4 5/8 ~6	5 7/8~7 7/8	5 7/8~7 7/8	5 7/8~7 7/8	5 7/8~7 7/8
Top Sub Conn.	2 7/8 API Reg.	2 7/8 Reg	3 1/2 Reg	3 1/2 Reg	3 1/2 Reg.	3 1/2 Reg
Bit Conn.	2 7/8 API Reg.	3 1/2 Reg	3 1/2 Reg	3 1/2 Reg	3 1/2 Reg.	3 1/2 Reg
Flow Rate (GPM)	60-71-174	95-143-222	111-190-302	111-190-302	64-158-254	64-158-254
Bit Speed (RPM)	90-144-264	102-152-180	128-220-348	87-150-180	62-156-254	80-170-270
Operating Differential Pressure (psi)	348	348	580	348	348	615
Operating Torque (lb-ft)	656	1000	1546	1200	1090	1764
Operating Power output (hp)	20	34	102	42	52	90
WOB (lb)	6600	6600	10803	10803	10803	10803
Max.Diff. Pressue (ps)	557	557	928	447	557	972
Max. Torque (lb.ft)	1050	1600	2474	1920	1774	2822
Max. Power output (hp)	32	55	163	66	84	144
Max. WOB (lb)	12100	12100	22000	22000	22000	22000

Model	7LZ120 X 7Y-I	5LZ120 x 14J	LZ165x 7Y	4LZ165 x 7Y	4LZ165 X 7Y-I	4LZ165 x 7Y-II
Size OD (In)	4 3/4	4 3/4	6 1/2	6 1/2	6 1/2	6 1/2
Length (ft)	11.5	18.7	25	22	25	22
Weight (lb)	528	849	2020	1518	1628	1562
Lobe Configuration	7:8	5:6	1:2	4:5	4:5	4:5
Bit Size range	5 7/8~7 7/8	5 7/8 ~7 7/8	8 3/8~9 7/8	8 3/8~9 7/8	8 3/8~9 7/8	8 3/8~9 7/8
Top Sub Conn.	3 1/2 API Reg.	3 1/2 Reg	4 1/2 Reg	4 1/2 Reg	4 1/2 Reg.	4 1/2 Reg
Bit Conn.	3 1/2 API Reg.	3 1/2 Reg	4 1/2 Reg	4 1/2 Reg	4 1/2 Reg.	4 1/2 Reg
Flow Rate (GPM)	79-143-254	111-190-302	238-170-397	254-349-476	254-349-476	254-380-476
Bit Speed (RPM)	89-160-180	87-150-180	267-302-445	97-134-182	97-134-182	131-197-246
Operating Differential Pressure (psi)	406	348	595	371	464	510
Operating Torque (lb-ft)	1113	1200	1340	2982	3728	3038
Operating Power output (hp)	40	42	114	103	128	142
WOB (lb)	10803	10803	18700	17600	17600	17600
Max.Diff. Pressue (ps)	650	557	957	609	740	812
Max. Torque (lb.ft)	1780	1920	2144	4771	5965	4861
Max. Power output (hp)	64	66	182	165	205	227
Max. WOB (lb)	22000	22000	35200	35200	35200	35200

Model	4LZ165 X 7Y-III	5LZ165 x 7Y	5LZ165x 7Y-IV	5LZ165 x 7Y-V	7LZ165 X 7Y	5LZ165 x 14J
Size OD (In)	6 1/2	6 1/2	6 1/2	6 1/2	6 1/2	6 1/2
Length (ft)	25	22	25	16.7	16.4	22
Weight (lb)	1716	1609	1738	1285	1584	1609
Lobe Configuration	5:6	5:6	5:6	5:6	7:8	5:6
Bit Size range	8 3/8~9 7/8	8 3/8 ~9 7/8	8 3/8~9 7/8	8 3/8~9 7/8	8 3/8~9 7/8	8 3/8~9 7/8
Top Sub Conn.	4 1/2 API Reg.	4 1/2 Reg	4 1/2 Reg	4 1/2 Reg	4 1/2 Reg.	4 1/2 Reg
Bit Conn.	4 1/2 API Reg.	4 1/2 Reg	4 1/2 Reg	4 1/2 Reg	4 1/2 Reg.	4 1/2 Reg
Flow Rate (GPM)	254-380-476	254-155-197	159-286-428	159-286-428	159-286-428	254-349-444
Bit Speed (RPM)	131-197-246	112-155-197	86-155-180	83-149-220	82-148-180	112-155-197
Operating Differential Pressure (psi)	626	464	696	348	348	464
Operating Torque (lb-ft)	3728	2800	3918	2054	2049	2800
Operating Power output (hp)	174	105	134	85	70	105
WOB (lb)	17600	17600	17600	17600	17600	17600
Max.Diff. Pressue (psi)	1001	740	1117	557	557	740
Max. Torque (lb.ft)	5965	4480	6268	3286	3278	4480
Max. Power output (hp)	278	168	214	136	112	168
Max. WOB (lb)	35200	35200	35200	35200	35200	35200

Model	9LZ165 X 7YI	3LZ172 x 7Y	4LZ172x 7Y	4LZ172 x 7Y-IV	5LZ172 X 7Y	5LZ172 x 7Y-IV
Size OD (In)	6 1/2	6 3/4	6 3/4	6 3/4	6 3/4	6 3/4
Length (ft)	19	23.6	23.6	27	23.6	27
Weight (lb)	1730	1936	2211	2574	2156	2464
Lobe Configuration	9:10	3:4	4:5	4:5	5:6	5:6
Bit Size range	8 3/8~9 7/8	8 3/8 ~9 7/8	8 3/8~9 7/8	8 3/8~9 7/8	8 3/8~9 7/8	8 3/8~9 7/8
Top Sub Conn.	4 1/2 API Reg.	4 1/2 Reg	4 1/2 Reg	4 1/2 Reg	4 1/2 Reg.	4 1/2 Reg
Bit Conn.	4 1/2 API Reg.	4 1/2 Reg	4 1/2 Reg	4 1/2 Reg	4 1/2 Reg.	4 1/2 Reg
Flow Rate (GPM)	302-380-508	254-397-476	254-413-571	254-413-571	254-397-571	254-317-571
Bit Speed (RPM)	94-120-159	183-285-342	128-208-228	128-208-288	94-146-180	125-156-280
Operating Differential Pressure (psi)	348	696	580	725	464	812
Operating Torque (lb-ft)	3392	2976	3537	4445	3589	5070
Operating Power output (hp)	103	193	152	243	131	269
WOB (lb)	17600	22000	22000	22000	22000	22000
Max.Diff. Pressue (psi)	557	1117	928	1160	740	1305
Max. Torque (lb.ft)	5427	4762	5659	7112	6174	8112
Max. Power output (hp)	165	309	244	389	210	430
Max. WOB (lb)	35200	37400	37400	37400	37400	37400

Model	5LZ172 X 14J	LZ197 x 7Y	4LZ197x 7Y	5LZ197 x 7Y	5LZ197 X 7Y-IV	5LZ197 x 14J
Size OD (In)	6 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4
Length (ft)	23.6	27.1	27.6	23.1	27.6	23.1
Weight (lb)	2156	2825	3322	3360	3542	3360
Lobe Configuration	5:6	1:2	4:5	5:6	5:6	5:6
Bit Size range	8 3/8~9 7/8	9 7/8 ~12 1/4	9 7/8~12 1/4	9 7/8~12 1/4	9 7/8~12 1/4	9 7/8~12 1/4
Top Sub Conn.	4 1/2 API Reg.	5 1/2 Reg	5 1/2 Reg	5 1/2 Reg	5 1/2 Reg.	5 1/2 Reg
Bit Conn.	4 1/2 API Reg.	6 5/8 Reg	6 5/8 Reg	6 5/8 Reg	6 5/8 Reg.	6 5/8 Reg
Flow Rate (GPM)	254-397-571	254-317-508	302-508-603	302-508-603	254-412-603	302-508-603
Bit Speed (RPM)	94-146-180	184-230-370	120-203-242	89-150-178	90-145-180	87-150-178
Operating Differential Pressure (psi)	464	600	754	464	754	464
Operating Torque (lb-ft)	3589	2160	5787	4056	6552	4056
Operating Power output (hp)	131	168	265	137	224	137
WOB (lb)	22000	28600	33000	33000	33000	33000
Max.Diff. Pressue (psi)	740	957	1206	740	1206	740
Max. Torque (lb.ft)	6174	3456	9259	6490	10483	6490
Max. Power output (hp)	210	269	424	219	560	219
Max. WOB (lb)	37400	46200	44000	44000	44000	44000

Model	4LZ203 X 7Y	5LZ203 x 7Y	3LZ210x 7Y	4LZ210 x 7Y	5LZ210 X 7Y	5LZ210 x 14J
Size OD (In)	8	8	8 1/4	8 1/4	8 1/4	8 1/4
Length (ft)	27.6	27.65	27.4	27.5	27.5	27.5
Weight (lb)	3720	3938	3542	3652	3775	3775
Lobe Configuration	4:5	5:6	3:4	4:5	5:6	5:6
Bit Size range	9 1/2~12 1/4	9 1/2 ~12 1/4	9 7/8~14 3/4	9 7/8~14 3/4	9 7/8~14 3/4	9 7/8~14 3/4
Top Sub Conn.	6 5/8 API Reg.	6 5/8 Reg	6 5/8 Reg	6 5/8 Reg	6 5/8 Reg.	6 5/8 Reg
Bit Conn.	6 5/8 API Reg.	6 5/8 Reg	6 5/8 Reg	6 5/8 Reg	6 5/8 Reg.	6 5/8 Reg
Flow Rate (GPM)	302-508-603	302-508-603	365-667-984	365-667-984	365-619-857	365-619-857
Bit Speed (RPM)	109-184-218	85-144-170	120-220-284	100-182-234	88-149-180	88-149-180
Operating Differential Pressure (psi)	696	638	624	609	609	609
Operating Torque (lb-ft)	5913	6940	5811	6783	7678	7678
Operating Power output (hp)	244	224	313	300	261	261
WOB (lb)	34100	34100	39600	39600	39600	39600
Max.Diff. Pressue (psi)	1117	1015	1001	972	972	972
Max. Torque (lb.ft)	9461	11104	9298	10852	12285	12285
Max. Power output (hp)	390	358	501	481	418	418
Max. WOB (lb)	66000	66000	79200	79200	79200	79200

Model	LZ245 X 7Y	4LZ245 x 7Y	5LZ245x 7Y	5LZ245 x 14J	5LZ245 X 7Y-IV
Size OD (In)	9 5/8	9 5/8	9 5/8	9 5/8	9 5/8
Length (ft)	30.84	33.29	26.6	26.6	29.7
Weight (lb)	5010	5324	5010	5010	5225
Lobe Configuration	1:2	4:5	5:6	5:6	5:6
Bit Size range	12 1/4~17 1/2	12 1/4 ~17 1/2	12 1/4~17 1/2	12 1/4~17 1/2	12 1/4~17 1/2
Top Sub Conn.	6 5/8 API Reg.	6 5/8 Reg	6 5/8 Reg	6 5/8 Reg	6 5/8 Reg.
Bit Conn.	6 5/8 API Reg.	6 5/8 Reg	6 5/8 Reg	6 5/8 Reg	6 5/8 Reg.
Flow Rate (GPM)	603-667-984	603-794-1190	698-794-1190	698-794-1190	603-667-984
Bit Speed (RPM)	220-246-360	139-183-275	90-101-154	90-101-154	92-101-149
Operating Differential Pressure (psi)	750	696	328	348	522
Operating Torque (lb-ft)	4000	10558	9200	9200	10558
Operating Power output (hp)	274	482	269	269	299
WOB (lb)	46200	46200	46200	46200	46200
Max.Diff. Pressue (psi)	1204	1117	557	557	841
Max. Torque (lb.ft)	6400	16892	14720	14720	16893
Max. Power output (hp)	438	771	430	430	478
Max. WOB (lb)	77000	88000	88000	8800	88000

HOLE OPENER

Hole Opener

BZ Fixed Diameters hole openers are made of tough treaded allow steel for maximum strength. Cutter arms are hard faced and welded on body, equipped with removable cutters. Cutters are available in three types.

- ◆ Type SM is for soft to medium formations.
- ◆ Type MH for medium to hard formation
- ◆ Type XH for hard formation.

The hope openers have three or six jet tubes with replaceable nozzles, so that jets streams quickly clean the enlarged hole



Hole Size (in)	No. of Cutter	Pilot Hole Size (in)	Fishing Neck Length (in)	Fishing Neck Dia (in)	Top Conn.	Bore (in)	Overall Length (in)
17 1/2	3	10 1/2	18	9 1/2	7 5/8 Reg.	2 1/4	59
26	3	17 1/2	18	10	7 5/8 Reg.	3	69
36	3	24	20	9	7 5/8 Reg.	3	75
36	4	28	43	10	7 5/8 Reg.	3	100

UNDER REAMER

Utilization

The rotary reamer is designed for every reaming operation but particularly for stabilization purposes when drilling in very abrasive formations. This is a versatile tool. It will fit hole sizes ranging from 4-5/8 " to 26". In addition, each body, by simple adjustment of blocks and proper selection of cutters, will suit a wide range of hole sizes.

Construction Features

Its body is made of modified alloy steel, fully heat treated to 285-341 Brinell hardness and 54J minimum impact strength. Connections are cold rolled, phosphatized, coated and equipped with protectors and are gaged to API Standards. Its body is inspected on an ultrasonic control unit over its full length and section. The original cutter and block assembly allows easy replacement of cutters by rig crews.

Cutters

Three different types (T, F and B) of cutters are offered.

Type T: Milled, machined with hardfaced sharp teeth for soft formations.

Type F: Milled, machined with hardfaced flat teeth, for medium hard formations.

Type B: Equipped with pressed-in tungsten carbide buttons, for hard formations



Hole Size (in)	Connection	HD (mm)	Overall Length (mm)	Fishing Neck		
				OD (mm)	D1 (mm)	L1(mm)
26	7 5/8 Reg.	660.4	3000	254	178	400
17 1/2	7 5/8 Reg.	444.6	2200	228	140	304
12 1/4	6 5/8 Reg	311.2	2000	228	100	300
9 5/8	5 1/2 FH	244.8	1800	178	71	300
8 1/2	4 1/2 Reg.	215.9	1730	165	71	200
8 3/8	4 1/2 Reg.	212.7	1600	165	71	200
8 1/8	4IF	209.00	1600	165	71	200
6 1/8	3 1/2IF	155.00	1470	140	51	200
6	3 1/2IF	152.00	1400	121	51	200
5 7/8	3 1/2IF	149.00	1470	121	51	200