



## PRODUCT INDEX

### Gas Lift Equipment

#### DESCRIPTION

Side Pocket Mandrel  
Side Pocket Mandrel-Round Body  
Side Pocket Mandrel-Chemical Injection  
Valve Latch  
Dummy Valve  
Orifice Valve  
Retrievable Gas Lift Valve  
Retrievable Chemical Injection Gas Lift Valve  
Kick Over Tool  
Conventional Gas Lift Valve  
Check Valve  
Conventional Gas Lift Mandrel  
Running Tool  
Pulling Tool

## SIDE POCKET MANDREL (WRVM)

Product No. BI 820-02

BOTIL Side Pocket Mandrels allow use of standard Wireline tools for installation and retrieval of different types of flow control devices.

### MATERIALS:

Generally Low Alloy Steel AISI 4130 is used. For corrosive application, AISI 410 is used. Other materials may be used as per customer's requirement.

### FORGINGS:

Pockets & tool discriminators are closed die forged and are integral part of the pocket. Swages are forged from seamless mechanical tubing or it can be machined from solid bar stock. Forgings are made by using a precision closed die process. All forged parts are visually and dimensionally inspected by Quality Control before machining. After Heat Treatment, additional testing i.e. Grain Flow, Micro Examination, Hardness Testing, Dye Penetrant Testing Magnetic Particle Testing & Ultra Sonic Testing are also carried out.

### MACHINING:

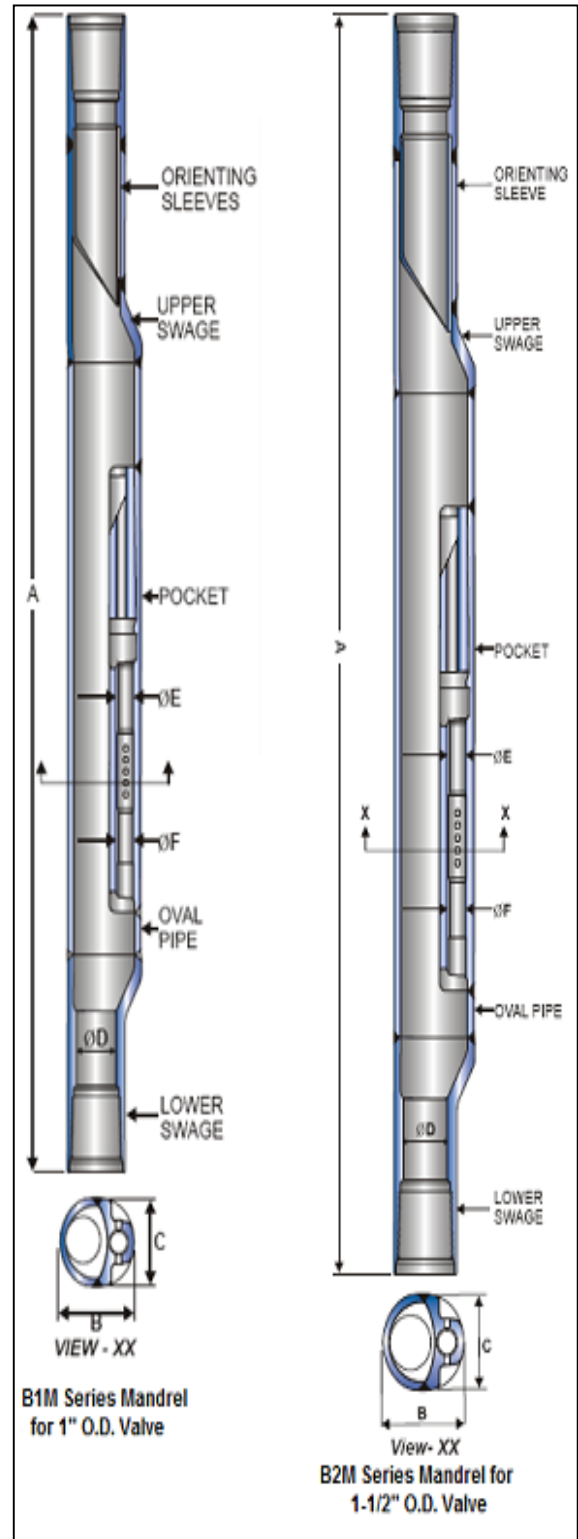
Pockets are machined using Deep Hole Drilling & boring process that provides accurate polished bore diameters, alignment and better surface finish for packing seals. The swages are machined with precision accuracy. Threads are machined as per design specification. All components are dimensionally inspected.

### WELDING HEAT TREATMENT:

Welding is done as per ASME Section VIII & IX with the use of proper welding electrodes. Full penetration welds take place when joining the swages and forged pocket are welded to the oval pipe. After welding, all external weld deposits are evenly grounded down to match the outside profile. All mandrels are heat treated, Quenched & Tempered to 18-22 HRC, for corrosive service and 24-33 HRC for standard service application.

### ASSEMBLED MANDREL:

After heat treatment and threading each mandrel is tested for hardness, internal and external drift and pressure test. Additional testing i.e. dye penetrant, ultrasonic, magnetic particle and radiography can also be provided as per customer requirement.





## GAS LIFT EQUIPMENT

ENGINEERING DATA FOR SIDE POCKET MANDREL (WRVM)										
Tubing Size (Inch)	Valve OD (Inch)	Mandrel		Dimensions (Inch)						
		Type	Shape	Length A	Major OD B	Minor OD C	I.D. ØD	*Drift Dia.	ØE E	ØF F
2 3/8	1.0	B1M	OVAL	83	4.25	2.92	2.000	1.901	1.027	1.027
2 3/8	1.5	B2M	OVAL	102	4.75	4.00	2.000	1.901	1.600	1.500
2 7/8	1.0	B1M	OVAL	85	4.75	4.00	2.441	2.347	1.027	1.027
2 7/8	1.5	B2M	OVAL	103	5.50	4.59	2.441	2.347	1.600	1.500
3 1/2	1.0	B1M	OVAL	85	5.31	4.12	2.992	2.867	1.027	1.027
3 1/2	1.5	B2M	OVAL	104	6.06	5.00	2.992	2.867	1.600	1.500
4.0	1.0	B1M	OVAL	86	5.85	5.00	3.476	3.351	1.027	1.027
4.0	1.5	B2M	OVAL	107	6.63	5.55	3.476	3.351	1.600	1.500
4 1/2	1.0	B1M	OVAL	90	5.86	5.00	3.897	3.790	1.027	1.027
4 1/2	1.0	B1M	OVAL	86	6.45	5.50	3.958	3.833	1.027	1.027
4 1/2	1.5	B2M	OVAL	107	7.03	5.625	3.958	3.833	1.600	1.500
5.0	1.5	B2M	OVAL	116	7.94	6.80	4.408	4.283	1.600	1.500
5 1/2	1.0	B1M	OVAL	87	7.94	6.80	4.778	4.653	1.600	1.500
5 1/2	1.5	B2M	OVAL	115	7.44	6.05	4.000	3.833	1.600	1.500
5 1/2	1.5	B2M	OVAL	115	7.94	6.80	4.778	4.653	1.600	1.500

\* Other Drift sizes can also be provided upon request.



## GAS LIFT EQUIPMENT

PRESSURE RATING FOR SIDE POCKET MANDRELS (WRVM)								
Tubing Size (Inch)	Valve O.D. (Inch)	Mandrel Type	Weight Lbs - F* (Kg - F)	Volume (Cubic Ft.)	Test Pressure (PSI) *			
					Standard Services		Corrosive Services	
					Internal	External	Internal	External
2 3/8	1.0	B1M	73 (33)	0.47	8000	7000	6000	5500
2 3/8	1.5	B2M	128 (58)	0.88	7500	6500	6000	5000
2 7/8	1.0	B1M	119 (54)	0.73	8000	7000	6000	5500
2 7/8	1.5	B2M	179 (81)	1.18	7500	6500	6000	5000
3 1/2	1.0	B1M	148 (67)	0.84	8000	6500	6000	5000
3 1/2	1.5	B2M	207 (94)	1.43	8000	6500	7000	5500
4.0	1.0	B1M	203 (92)	1.14	8000	6500	7000	5500
4.0	1.5	B2M	234 (106)	1.78	8000	6500	7000	5500
4 1/2	1.0	B1M	118 (54)	1.38	7500	6000	6000	5000
4 1/2	1.0	B1M	214 (97)	1.38	7500	6000	6000	5000
4 1/2	1.5	B2M	240 (109)	1.92	7500	6000	6000	5000
5.0	1.5	B2M	308 (140)	2.84	8500	7000	6500	5500
5 1/2	1.0	B1M	260 (118)	2.13	7500	6000	6000	5000
5 1/2	1.5	B2M	289 (131)	2.20	7500	6000	6000	5000
5 1/2	1.5	B2M	295 (134)	2.64	8500	7000	6500	5500

\* Test Pressure given are for mandrels made of AISI-4130 (9Cr 1Mo, 13Cr) materials heat treated for Standard or Corrosive environments. Test Pressure may be reduced due to end connection limitations.

\*\* Weight & Length may vary depending upon end connection

### SIDE POCKET MANDREL-ROUND BODY Product No. BI 820-07

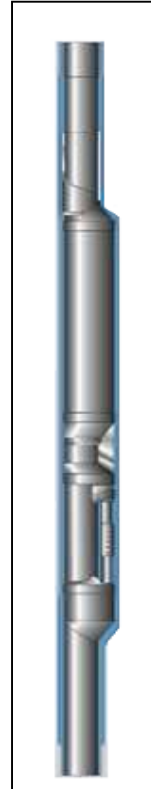
BOTIL Side Pocket Mandrels allow use of standard Wireline tools for installation and retrieval of different types of flow control devices.

**MATERIALS:**

Generally Low Alloy Steel AISI 4130 is used. For corrosive application, AISI 410 is used. Other materials may be used as per customer's requirement.

**FEATURES & BENIFITS:**

- The high-pressure design allows use of these mandrels in deep applications requiring high pressure and/or tensile ratings.
- The machined pocket and tool guard protect gas-lift equipment by preventing tools larger than the pulling/running tool from damaging the valve latch.





## GAS LIFT EQUIPMENT

<b>ENGINEERING DATA FOR SIDE POCKET MANDREL</b>										
Tubing Size (Inch)	Valve OD (Inch)	Mandrel		Dimensions (Inch)						
		Type**	Shape	Length	Major OD	Minor OD	I.D.	Drift Dia.	UPPER SEAL	LOWER SEAL
2 3/8	1.0	B1HO	ROUND	83	4.60	N/A	2.000	1.901	1.027	1.027
2 7/8	1.0	B1HO	ROUND	85	5.00	N/A	2.441	2.347	1.027	1.027
3 1/2	1.0	B1HO	ROUND	87	5.750	N/A	2.992	2.867	1.027	1.027
4	1.0	B1HO	ROUND	84	5.812	N/A	3.476	3.351	1.027	1.027
4 1/2	1.0	B1HO	ROUND	92	5.98	N/A	3.958	3.833	1.027	1.027

\*\* B1HO Mandrel is equivalent to HO-1/SMOR/SMR/KBTG.

<b>PRESSURE RATING FOR SIDE POCKET MANDRELS</b>								
Tubing Size (Inch)	Valve O.D. (Inch)	Mandrel Type**	Weight Lbs - F* (Kg - F)	Volume (Cubic Ft.)	Test Pressure (PSI) *			
					Standard Services		Corrosive Services	
					Internal	External	Internal	External
2 3/8	1.0	B1HO	50 (23)	0.40	13500	13500	12000	11000
2 7/8	1.0	B1HO	70 (32)	0.50	13500	13500	12000	11000
3 1/2	1.0	B1HO	120 (54)	0.73	13500	13500	12000	11000
4	1.0	B1HO	203(92)	1.14	10000	9000	7000	5500
4 1/2	1.0	B1HO	140 (64)	0.84	7400	7000	5650	5400

- \* Test Pressure given are for mandrels made of AISI-4130 (9Cr 1Mo, 13Cr) materials heat treated for Standard or Corrosive environments. Test Pressure may be reduced due to end connection limitations.
- \*\* B1HO Mandrel is equivalent to HO-1/SMOR/SMR/KBTG.
- \*\*\* Weight & Length may vary depending upon end connection.

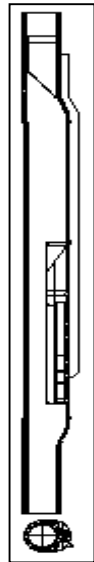


## GAS LIFT EQUIPMENT

### SIDE POCKET MANDREL-CHEMICAL INJECTION

Product No. BI 820-08

Tubing Size (Inch)	Valve OD (Inch)	Type	Latches	Major OD	Minor OD	Drift Dia.	Upper Seal	Lower Seal
2 3/8	1.0	B1M-CI	GBK-2	4.250	3.410	1.901	1.027	1.027
2 3/8	1.5	B2M-CI	GRK	4.750	4.500	1.901	1.600	1.500
2 7/8	1.0	B1M-CI	GBK-2	4.750	4.500	2.347	1.027	1.027
2 7/8	1.5	B2M-CI	GRK	5.500	5.093	2.347	1.600	1.500
3 1/2	1.0	B1M-CI	GBK-2	5.313	4.500	2.867	1.027	1.027
3 1/2	1.5	B2M-CI	GRK	5.968	5.500	2.867	1.600	1.500
4 1/2	1.5	B2M-CI	GRK	7.063	6.641	3.833	1.600	1.500
5 1/2	1.5	B2M-CI	GRK	8.015	7.375	4.653	1.600	1.500

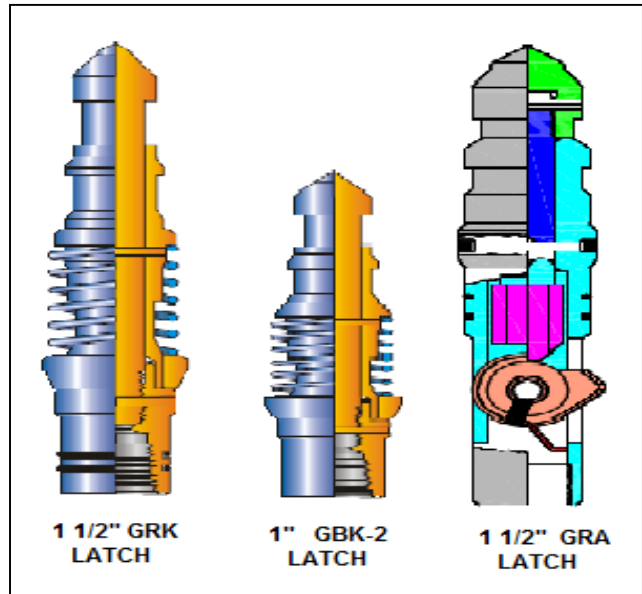


Tubing Size (Inch)	Valve O.D. (Inch)	Mandrel Type	Test Pressure (PSI)*			
			Standard Services		Corrosive Services	
			Internal	External	Internal	External
2 3/8	1.0	B1M-CI	8000	6000	6000	4000
2 3/8	1.5	B2M-CI	7500	5500	5500	3500
2 7/8	1.0	B1M-CI	8000	6000	6000	4000
2 7/8	1.5	B2M-CI	7500	5500	5500	3500
3 1/2	1.0	B1M-CI	8000	6000	6000	4000
3 1/2	1.5	B2M-CI	7500	5500	5500	3500
4 1/2	1.5	B2M-CI	7500	6000	6000	5000
5 1/2	1.5	B2M-CI	8500	7000	6500	5500

\* Test Pressure given are for mandrels made of AISI-4130 (9Cr 1Mo, 13Cr) materials heat treated for Standard or Corrosive environments. Test Pressure may be reduced due to end connection limitations.

## GBK-2 (BI 10-01-1000) & GRK (BI 10-25-1000) LATCHES

BOTIL Wireline retrievable latches 1" **GBK-2** and 1 1/2" **GRK** are designed for installation in **G-type pocket profile** Side Pocket Mandrels (**B1M & B2M**). They utilize a locking ring which is held in position by spring forces. As the latch enters the Side Pocket profile, the locking ring moves up and into the recessed area of the latch. When the latch seats, the ring is positioned in the locking recess of the pocket. To retrieve the latch, a pin is sheared by upward force allowing the locking ring mandrel to move up and out of the way. The ring is then freed to disengage from the locking recess as the valve and latch are retrieved.



## GRA LATCH (BI 10-20-1000)

The **GRA Latch** is a cam style latch used to secure a 1 1/2" **O.D. valve (Non- Orienting)** or dummy in "**MM**" and "**MMA**" Mandrels.

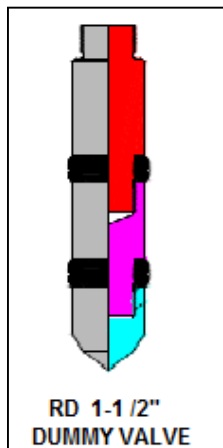
The latch utilizes a rotating spring loaded cam to lock in place when the latch reaches the recess in the mandrel receiver pocket. The latch also has 2 O-Rings to provide a better top seal and debris barrier. A pin is sheared to release the locking mechanism allowing the cam to rotate inside the latch housing and permitting the retrieval of the valve or dummy.

ENGINEERING DATA FOR LATCHES						
Type	Pulling Neck O.D. (Inch)	Running Neck O.D. (Inch)	Max O.D. (Inch)	Side Pocket Accessory O.D. (Inch)	Running Tool	Pulling Tool
GRK	1.185	0.936	1.787	1.5	RK-1	1 5/8 JDS/PTG
GBK-2	0.875	0.75	1.358	1	JK	1 1/4 JDC/MP
GRA	1.344	1.359	1.75	1.5	JC-3	2" JDC

## RD DUMMY VALVE (BI 04-20-1000)

The RD Dummy Valve is 1 ½” Wireline Retrievable Isolation Tool which is used to seal of the M / TP series Mandrel (B2M) preventing communication between the Casing & Tubing. The Dummy valve with the appropriate Latch may be Wireline installed or retrieved prior to or after completion for various procedures which include following:

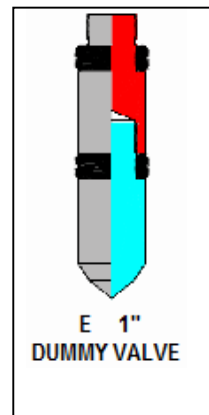
1. To blank off the tubing for production until gas lift valves are required.
2. To allow for pressurizing the tubing in various procedures.
3. To isolate Tubing & Casing flow during single alternative production and
4. To isolate Tubing & Casing flow for test purpose during multi-point water or gas injection floods.



## E DUMMY VALVE (BI 04-01-1000)

The E Dummy Valve is 1 Wireline Retrievable Isolation Tool which is used to seal of the K / TMP series Mandrel (B1M) preventing communication between the Casing & Tubing. The Dummy valve with the appropriate Latch may be Wireline installed or retrieved prior to or after completion for various procedures which include following:

1. To blank off the tubing for production until gas lift valves are required.
2. To allow for pressurizing the tubing in various procedures.
3. To isolate Tubing & Casing flow during single alternative production and
4. To isolate Tubing & Casing flow for test purpose during multi-point water or gas injection floods.



ENGINEERING DATA FOR E & RD DUMMY VALVES								
Type	Nominal O.D. (Inch)	Packing O.D. (Inch)		Latch or End Conn.	Kick Over Tool	Running Tool Type	Pulling Tool Type	Mandrel Type
		Upper	Lower					
E	1	1 1/32	1 1/32	GBK-2	BK-5	JK	1 1/4 JDC/MP	B1M/TMP
RD	1 1/2	1 9/16	1 1/2	GRK	BM-1	RK-1	1 5/8 JDS/PTG	B2M/TP

## 'O' SERIES ORIFICE VALVES Product No. BI 820-06

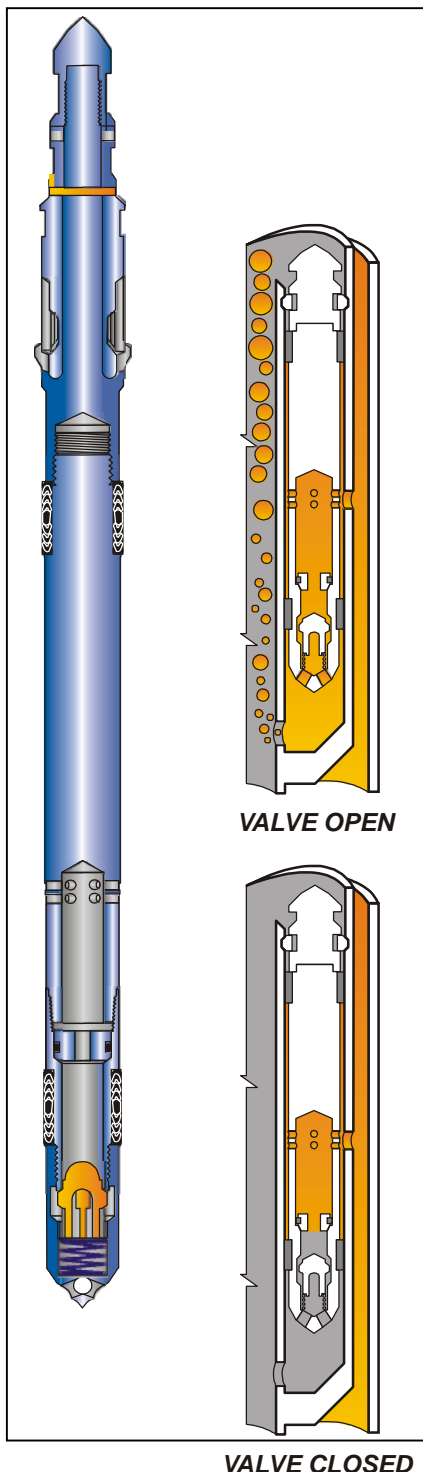
BOTIL O Series 1" & 1-1/2" valves are designed for circulating operations and provide means for communication between the tubing and the tubing/casing annulus.

### FEATURES & BENEFITS

- Flow capacity determined by orifice sizing.
- Integral reverse flow check valve provides large flow capacities. Positive sealing feature of back check valve provides protection from intrusion of production fluids into casing annulus.
- Various orifice materials (SS, Monel, Inconel, tungsten carbide) available to meet application requirements.
- Temperature rating of 250° F (121° C) (Standard Service).
- Standard Neoprene packing with other materials available.
- Compatible with other manufacturers side Pocket Mandrel (TMP/TP).

### APPLICATIONS

The Wireline retrievable orifice valves are used to establish communication between the tubing & annulus during circulating, gas or fluid injection operations. They are utilized in single point injection continuous flow completions. These valve have no closing function and are commonly used to control stable injection at the operating valve depth.



### ENGINEERING DATA FOR ORIFICE VALVES

Type	Nominal OD (inch)	Packing OD (inch)		Port Size (inch)		Latch Or End Conn.	Running Tool Type	Pulling Tool Type	Mandrel Type
		Upper	Lower	Min.	Max.				
GRO-40	1	1-1/32	1-1/32	1/8	7/16	GBK-2	JK	JDC	B1M/B1HO
GRO-20	1-1/2	1-9/16	1-1/2	1/8	51/64	GRK	RK-1	JDS	B2M/B2HO



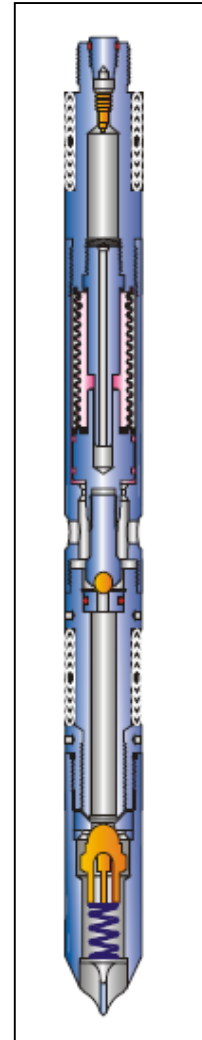
## GAS LIFT EQUIPMENT

**GR-40 INJECTION PRESSURE OPERATED GAS LIFT VALVE**  
**Product No. BI 01-40-1000**

BOTIL G Series valve utilizes nitrogen charged bellow configuration designed for either continuous or intermittent flow applications. They are especially suitable for use as unloading and operating valves in areas where high gas lift pressures are available. Since the charge pressure above the bellows is affected by temperature, it is important that the operating temperatures at the valve be known. These valves are available in Wireline installations.

**ADVANTAGES**

Vibration protected 3-ply Monel bellow are designed to withstand hydrostatic pressure up to 5000 psi. Nitrogen dome charge, acting on the O.D. of the bellow, permits bellows to expand uniformly without stacking, thus prolonging bellow's life. The multiple port size availability, make this valve series appropriate for a wide range of operating conditions. Reversible seat are available in several different materials.



ENGINEERING DATA FOR INJECTION PRESSURE OPERATED VALVES									
Type	Nominal O.D. (Inch)	Packing O.D. (Inch)		Port Size (Inch)		Latch or End Conn.	Running Tool Type	Pulling Tool Type	Mandrel Type
		Upper	Lower	Min.	Max.				
GR-40	1	1 1/32	1 1/32	1/8	3/8	GBK-2	JK/BC-1	1 1/4 JDC/MP	B1M/TMP



## GAS LIFT EQUIPMENT

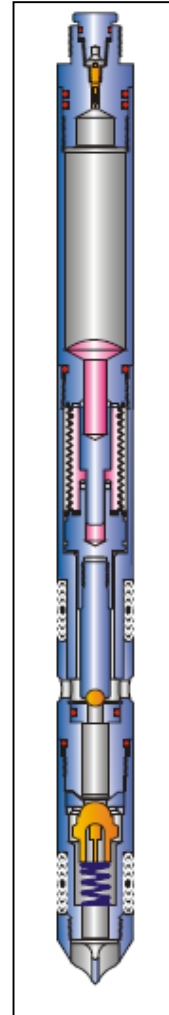
### GR-20 INJECTION PRESSURE OPERATED GAS LIFT VALVE Product No. BI 01-20-1000

#### DESCRIPTION

BOTIL G Series valve utilizes nitrogen charged bellow configuration designed for either continuous or intermittent flow applications. They are especially suitable for use as unloading and operating valves in areas where high gas lift pressures are available. Since the charge pressure above the bellows is affected by temperature, it is important that the operating temperatures at the valve be known. These valves are available in Wireline installations.

#### ADVANTAGES

Vibration protected 3-ply Monel bellow are designed to withstand hydrostatic pressure up to 5000 psi. Nitrogen dome charge, acting on the O.D. of the bellow, permits bellows to expand uniformly without stacking, thus prolonging bellow's life. The multiple port size availability, make this valve series appropriate for a wide range of operating conditions. Reversible seat are available in several different materials.



ENGINEERING DATA FOR INJECTION PRESSURE OPERATED VALVES									
Type	Nominal O.D. (Inch)	Packing O.D. (Inch)		Port Size (Inch)		Latch or End Conn.	Running Tool Type	Pulling Tool Type	Mandrel Type
		Upper	Lower	Min.	Max.				
GR-20	1 1/2	1 9/16	1 1/2	1/8	1/2	GRK	RK-1/BC-1	1 5/8 JDS/PTG	B2M/TP



## GAS LIFT EQUIPMENT

### RETRIEVABLE CHEMICAL INJECTION VALVE

Product No. BI 820-09

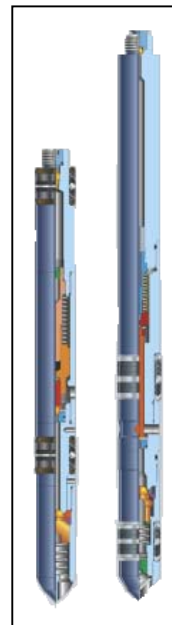
BOTIL BCLK & BCLK-1 Chemical injection valves are 1" OD valve designed to control chemicals injected in to the production fluid at valve depth. A Nitrogen charged bellows provides the force necessary to maintain each valve in its normally closed position. The BCLK contain a 3 ply Inconel bellows, which suits this valve for high pressure service. The BCLK-1 contains a 3 ply Monel bellows and is used for lower pressure applications. Bellow area is 0.26 square inch for both valves. Valves contain spring loaded reverse flow checks, required GBK-2 top latch & are run in the appropriate B1M series mandrels. Port size available for the BCLK & BCLK-1 valves are 1/8" & 3/16".

#### OPERATION

Injected chemicals enter the valves from the annulus in an open injection system. Chemicals also may enter the valve from a separate injection line as in a closed injection system. The hydraulic pressure of

BOTIL also design BCLK-2 & BCLK-3 Chemical injection valve which are Side pocket valves designed to control chemicals injected in to the production fluid at valve depth. An Inconel spring provides the force necessary to maintain each valves in its normally closed position. The BCLK-2 is for 1" OD & BCLK-3 is for 1-1/2" OD. The BCLK-2 to utilize a GBK-2 top latch (B1M SPM) & BCLK-3 to utilize a GR series latch(B2M SPM). Reverse flow checks are included as an integral port of these valves. Port size available for the BCLK-2 & BCLK-3 valves are 1/8" & 3/16".

the injected chemicals compresses the bellow/spring & lift the stem tip of the seat & open the valve. Chemicals then flow through the valve into the production conduit.





## GAS LIFT EQUIPMENT

ENGINEERING DATA								
Type	Nominal O.D. (Inch)	Packing O.D. (Inch)		Latch or End Conn.	Kick Over Tool	Running Tool Type	Pulling Tool Type	Mandrel Type
		Upper	Lower					
BCLK	1	1 1/32	1 1/32	GBK-2	BK-5	JK	1 1/4 JDC/MP	B1M/TMP
BCLK-1	1	1 1/32	1 1/32	GBK-2	BK-5	JK	1 1/4 JDC/MP	B1M/TMP
BCLK-2	1	1 1/32	1 1/32	GBK-2	BK-5	JK	1 1/4 JDC/MP	B1M/TMP
BCLK-3	1-1/2	1 9/16	1 1/2	GRK	BM-1	RK-1	1 5/8 JDS/PTG	B2M/TP



## GAS LIFT EQUIPMENT

### KICKOVER TOOL

PRODUCT NO. BI 820-01

#### Introduction and Application

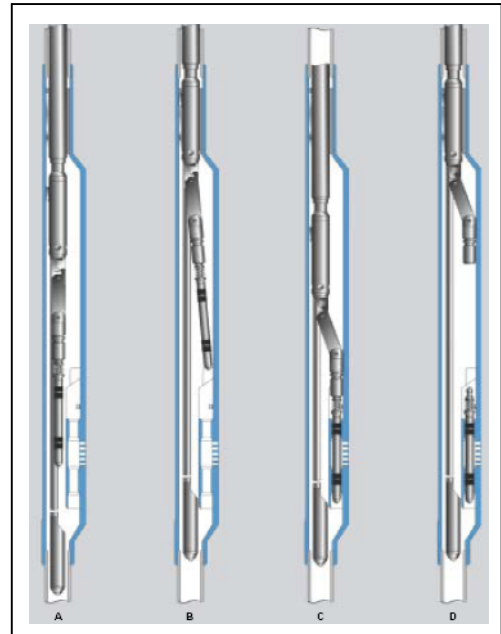
The BOTIL BK-5 & BM-1 kickover tools are used to install and retrieve 1" and 1-1/2" O.D flow control devices in BOTIL B1M/B1HO and B2M/B2HO series side pocket mandrels.

The kickover tool is lowered into the well by standard wireline techniques until the tool is below the selected mandrel. As the tool string is raised, the locator finger of the kickover tool contacts the top of the

slot in the orienting sleeve in the mandrel, and the kick spring pivots the lower section of the kickover tool, the pulling or running tool and the valve into the kickover position. The orienting sleeve in the mandrel provides positive installation and retrieval of the flow control device by the kickover tool. Once the flow control device is installed or retrieved, and the wireline operator raises the kickover tool the latch spring is compressed thus permitting the kickover tool to pass through all mandrels above the one in which the wireline operation was performed.

SPECIFICATIONS FOR TYPE BK-5				
	2"	2-1/2"	3"	4-1/2"
FISHNECK OD	1.375	1.375	1.375	1.375
MAX OD	1.75	2.063	2.5	3.5
LENGTH	72.844	72.844	70.031	70.562
TOP PIN THREAD	15/16-10	15/16-10	15/16-10	15/16-10
VALVE SIZE	1"			
MANDREL TYPE	B1M/B1HO/TMP			

SPECIFICATIONS FOR TYPE BM-1				
	2-1/2"	3"	4-1/2"	5-1/2"
FISHNECK OD	1.375	1.375	1.375	2.31
MAX OD	2.218	2.734	3.71	4.25
LENGTH	81.75	81.875	82	78.125
TOP PIN THREAD	15/16-10	15/16-10	15/16-10	1 9/16-10
VALVE SIZE	1-1/2"			
MANDREL TYPE	B2M/TP			





## GAS LIFT EQUIPMENT

### G-40 Gas Lift Valve Product No. BI 02-40-1000

#### Introduction

The G-40 conventional gas lift valve is a 1" O.D pressure operated valve. It can be used for either continuous or intermitting flow and is installed with a reverse check valve on the conventional tubing retrievable gas lift mandrel. Botil gas lift valve is available in 1/8" to 3/8" Port sizes or as required.

#### Product Description

The 1" OD (G-40) conventional valves are Nitrogen charged gas lift valves which can be used as an intermittent valve or a continuous flow valve. N<sub>2</sub> dome pressure is set in a shop at a reference temperature and corrected to an operating depth temperature. The N<sub>2</sub> charge inside the bellow provides a downward force tending to hold the valve on its seat.

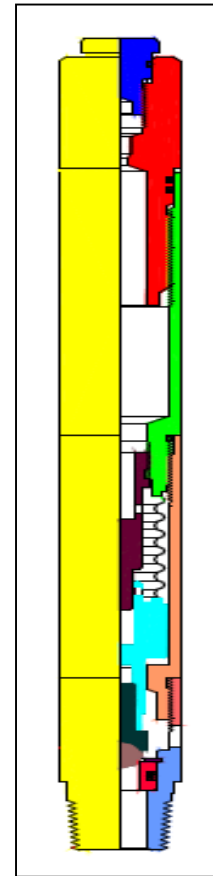
The upward forces necessary to open the valve are casing pressure acting on the bellow area is less than seat area & tubing pressure acting on the seat area.

When these combined pressures are sufficient, the valve will open. Once opened it will remain open until casing and tubing pressure are reduced to/ or below set dome pressure. The difference between opening and closing pressure is called Spread. It is controlled by tubing pressure sensitivity of the valve. Larger

the seat port area, the more is the tubing sensitive valve.

#### Valve Specifications:

1. Material: Stainless Steel Standard.
2. Pressure Rating: High range as per API 11V1 1200 Psi and above.
3. Temperature Rating: 300°F.





## GAS LIFT EQUIPMENT

STEM TIP ASSEMBLY		
PORT SIZE	FRACTION EQUIVALENT	PART NUMBER COMPLETE
0.125	1/8"	BI 01-10-1111
0.156	5/32"	BI 01-10-1211
0.188	3/16"	BI 01-10-1311
0.218	7/32"	BI-101885-00
0.250	1/4"	BI 01-10-1411
0.313	5/16"	BI 01-10-1511
0.375	3/8"	BI 01-10-1611

FLOATING SEAT ASSEMBLY		
PORT SIZE	FRACTION EQUIVALENT	PART NUMBER COMPLETE
0.125	1/8"	BI 01-10-1114
0.156	5/32"	BI 01-10-1214
0.188	3/16"	BI 01-01-1314
0.218	7/32"	BI-101866-00
0.250	1/4"	BI 01-01-1414
0.313	5/16"	BI 01-01-1514
0.375	3/8"	BI 01-01-1614

TECHNICAL DATA					
Available Port Sizes I. D. (Inches)	(Ab) Effective Bellows Area (Square Inches)	Area of Port with Bevel (Av) (Square Inches)	Av/Ab	(1-Av/Ab)	TEF = $\frac{Av/Ab}{1-Av/Ab}$ Tubing Effect Factor
1/8"	0.31	0.0129	0.042	0.958	0.043
5/32"	0.31	0.0201	0.065	0.935	0.069
3/16"	0.31	0.0291	0.094	0.906	0.104
7/32"	0.31	0.0395	0.127	0.873	0.145
1/4"	0.31	0.0511	0.164	0.836	0.196
5/16"	0.31	0.0792	0.255	0.745	0.342
3/8"	0.31	0.1134	0.365	0.635	0.575

ENGINEERING DATA	
Maximum outside Diameter	1.000 inches
Overall length	13.53"
Connecting Thread	1/2 -14 NPT
Mandrel series required	(B Series) JR Mandrel
Check Valve	G-40/GCF-40

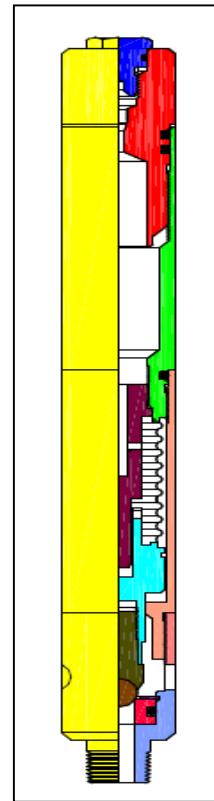


## GAS LIFT EQUIPMENT

### G-20 Gas Lift Valve Product No. BI 02-20-1000

3. Temperature Rating:  
300°F.

The G-20 conventional gas lift valve is a 1-1/2" O.D Pressure operated nitrogen charged valve. It can be used for either continuous or intermitting flow and is installed with a reverse check valve on the conventional tubing retrievable class mandrels. Port sizes available 1/8" to 1/2" or as required. N<sub>2</sub> dome pressure is set in a shop at a reference temperature and corrected to an operating depth temperature. The N<sub>2</sub> charge inside the bellow provides a downward force tending to hold the valve on its seat. The upward forces necessary to open the valve are casing pressure acting on the bellow area is less than seat area & tubing pressure acting on the seat area. When these combined pressures are sufficient, the valve will open. Once opened it will remain open until casing and tubing pressure are reduced to/ or below set dome pressure. The difference between opening and closing pressure is called Spread. It is controlled by tubing pressure sensitivity of the valve. Larger the seat port area, the more is the tubing sensitive valve.



#### Valve Specifications:

1. Material: Stainless Steel Standard.
2. Pressure Rating: High range as per API 11V1 1200 Psi and above.



## GAS LIFT EQUIPMENT

STEM TIP ASSEMBLY		
PORT SIZE	FRACTION EQUIVALENT	PART NUMBER COMPLETE
0.125	1/8"	BI 02-20-1212
0.156	5/32"	BI-101978-00
0.188	3/16"	BI 02-20-1312
0.218	7/32"	BI-101979-00
0.250	1/4"	BI 02-20-1412
0.313	5/16"	BI 02-20-1512
0.375	3/8"	BI 02-20-1612
0.438	7/16"	BI 02-20-1712
0.500	1/2"	BI-107131-00

FLOATING SEAT ASSEMBLY		
PORT SIZE	FRACTION EQUIVALENT	PART NUMBER COMPLETE
0.125	1/8"	BI 01-20-1215
0.156	5/32"	BI-101980-00
0.188	3/16"	BI 01-20-1315
0.218	7/32"	BI-101981-00
0.250	1/4"	BI 01-20-1415
0.313	5/16"	BI 01-20-1515
0.375	3/8"	BI 01-20-1615
0.438	7/16"	BI 01-20-1715
0.500	1/2"	BI-107132-00

TECHNICAL DATA					
Available Port Sizes	Ab Effective Bellows Area (Square Inches)	Area of Port with Bevel (Av) (Square Inches)	Av/Ab	(1-Av/Ab)	TEF = $\frac{Av}{Ab} \cdot 1 - \frac{Av}{Ab}$ Tubing Effect Factor
1/8"	0.77	0.0129	0.017	0.983	0.017
5/32"	0.77	0.0201	0.026	0.974	0.027
3/16"	0.77	0.0291	0.038	0.962	0.040
7/32"	0.77	0.0395	0.051	0.949	0.054
1/4"	0.77	0.0395	0.067	0.933	0.072
5/16"	0.77	0.0792	0.104	0.896	0.116
3/8"	0.77	0.1134	0.148	0.852	0.174
7/16"	0.77	0.1532	0.201	0.799	0.252
1/2"	0.77	0.1955	0.254	0.746	0.342

ENGINEERING DATA	
Maximum outside Diameter	1.500"
Overall length	14-5/16"
Connecting Thread	1/2" -14 NPT
Mandrel series required	(C Series) SR Mandrel
Check Valve	G-20/GCF-20

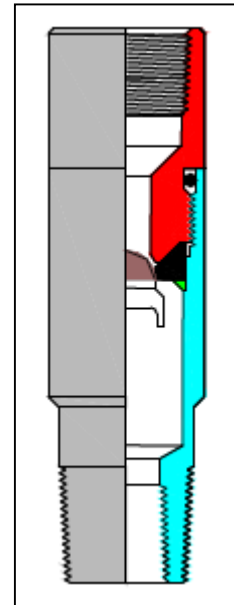
**G-40 CHECK VALVE**  
**Product No. BI 02-90-1000**

G-40 check valves are used with G-40 conventional gas lift valve to protect the casing from backflow, allowing the tubing to be pressurizing in various procedures, and prevent any commingling of fluids in dual installation. The conventional check assemblies utilizes the same metal to metal seal as well as metal dart to soft hy-car pad seal as does the retrievable valve checks. The G-40 check is a velocity type check requiring flow pressure to force the dart on seat but is also available in a normally closed variation with a spring attachment.

G-40 check valves are of the same design as the G-20 but designed for used with the 1" conventional G-40 valve the dart, seal and pad are of the same design as the K series, retrievable valves.

GCF-40 is a reverse flow check with all the characteristics of the G-40 check but

designed for use with the 1" conventional casing flow valve.



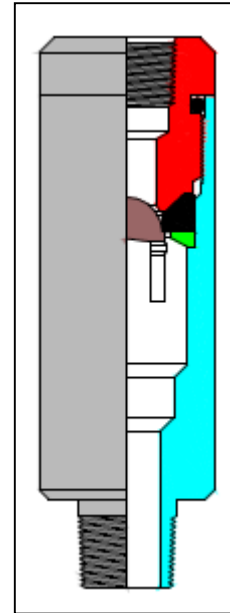
CONVENTIONAL CHECK VALVE SPECIFICATIONS				
Model	Check O.D	Length	Equivalent Port Size	Connecting Thread
G-40	1"	3- 9/16"	5/16"	1/2" NPT

### G-20 CHECK VALVE

**Product No. BI 02-70-1000**

G-20 Check valves are used with G-20 conventional gas lift valve to protect the casing from backflow, allow for pressurizing the tubing in various procedures, and prevent any commingling of flow in dual installation. The conventional check assemblies utilize the same metal to metal seal as well as metal dart to soft hy – car pad seal as does the retrievable valve checks. The G-20 check is a velocity type check requiring flow pressure to force the dart on seal but is also available in a normally closed variation with a spring attachment.

G-20 is a reverse flow check with all the characteristics of the G-20 check but designed for use with the 1 ½" conventional casing flow valve.



CONVENTIONAL CHECK VALVE SPECIFICATIONS				
Model	Check Valve O.D	Length	Equivalent Port Size	Connecting Thread
G-20	1- 1/2"	4 -3/4"	9/16"	1/2" NPT

## MODEL 'B' CONVENTIONAL GAS LIFT MANDREL

Product No. BI 06-115-601

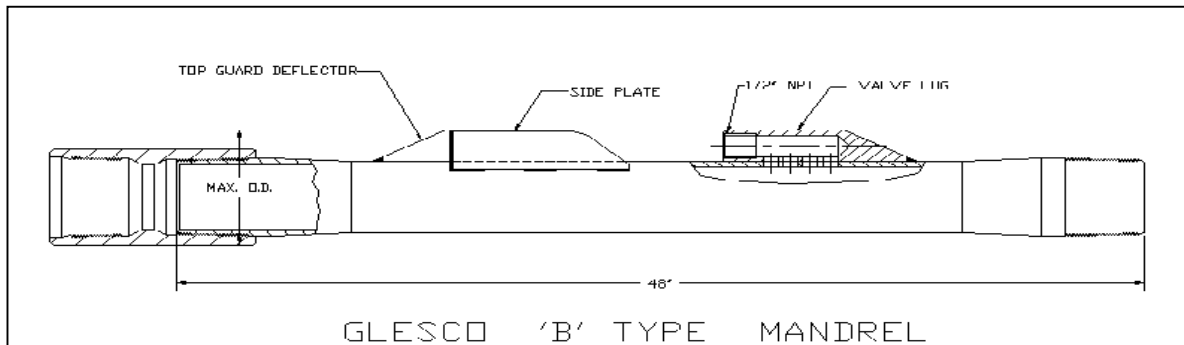
The Model 'B' mandrels are designed to accept the 1" conventional G-40 pressure operated gas lift valve and G-40 tubing flow check Valve. The Mandrels are manufactured with side guards to protect the valve when running or pulling the tubing string.

These mandrels are available in various tubing grades such as J-55, N-80, L-80, P-110 & other grades of material as per customer requirement.

### ENGINEERING DATA

Tubing Size Inch	Max. O.D. Inch	I.D. Inch	Length Ft.
2-3/8	3.781	1.995	4
2-7/8	4.396	2.441	4
2-7/8	4.396	2.259	4
3-1/2	5.062	2.992	4

Maximum O.D, thread Connection & other PPF can be furnished as required.





## GAS LIFT EQUIPMENT

### MODEL 'C' CONVENTIONAL GAS LIFT MANDREL

Product No. BI 06-535-501

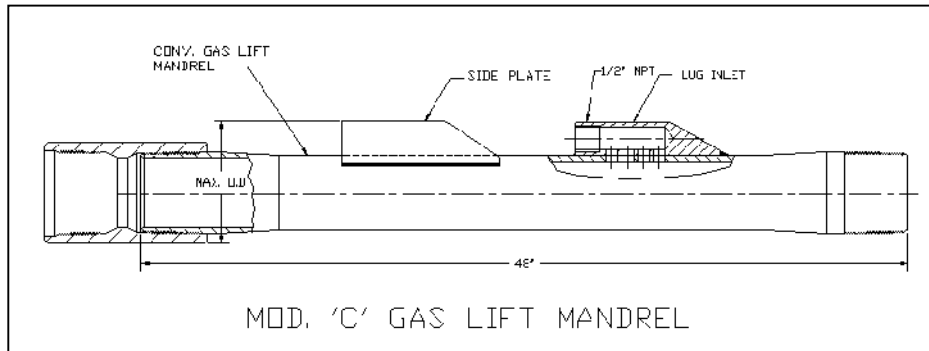
The Model 'C' mandrels are designed to accept the 1-1/2" conventional G-20 pressure operated gas lift valve and G-20 tubing flow check Valve. The Mandrels are manufactured with side guards to protect the valve when running or pulling the tubing string.

These mandrels are available in various tubing grades such as J-55, N-80, L-80, P-110 & other grades of material as per customer requirement.

### ENGINEERING DATA

Tubing Size Inch	Max. O.D. Inch	I.D. Inch	Length Ft.
2-3/8	4.375	1.995	4
2-7/8	4.929	2.441	4
2-7/8	4.929	2.259	4
3-1/2	5.655	2.992	4
4-1/2	6.875	3.958	4

Maximum O.D, thread Connection & other PPF can be furnished as required.





## GAS LIFT EQUIPMENT

### BOTIL JK RUNNING TOOL

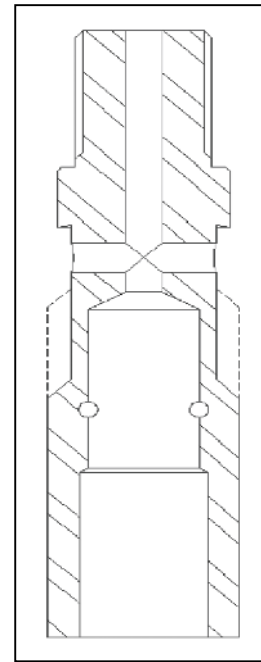
Product No.- BI 820-04

#### PURPOSE:

Running “BK/GBK-2 side pocket mandrel latches assembled to subsurface controls.

#### DESCRIPTION:

The “JK” Running tools are simple in design, consisting of one part. The inside is machined with two different inside diameters allowing the running tool to shoulder on the side pocket mandrel latch being run. The upper portion of the body has a set of 1/8” shear pin holes on the outer circumference to permit pinning the running tool to the side pocket control latch. The “JK” running tool is run in conjunction with the appropriate kick over tool.



Nominal size	1.00”
Upper thread connection	0.938” – 10 UN
Max O.D.	1.33”
Fishneck Size	1.188”



## GAS LIFT EQUIPMENT

### **BOTIL RK-1 RUNNING TOOL**

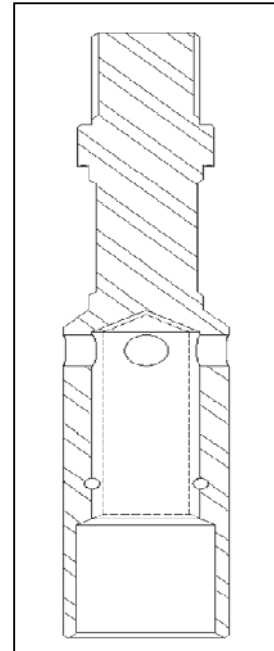
**Product No. - BI 820-05**

#### **Purpose**

Running “RK-1/RKP” side pocket mandrel latches assembled to sub surface controls.

#### **Description**

The “RK” running tools are simple in design, consisting of one part. The inside is machined with two different inside diameters allowing the running tool to shoulder on the side pocket mandrel latch being run. The upper portion of the body has a set of 1/8” shear pin holes on the outer circumference to permit pinning the running tool to the side pocket control latch. The “RK” running tool is run in conjunction with the appropriate kick over tool.



Nominal Size	1.50”
Upper Thread Connection	0.938”-10 UN
Max. O.D.	1.43”
Fishneck Size	1.188”



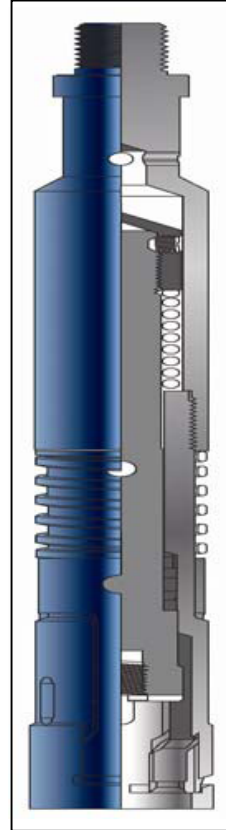
## GAS LIFT EQUIPMENT

### **BOTIL MODEL "JDC/JDS" PULLING TOOL**

Product No. BI 811-90 & BI 811-97

The "JDC/JDS" Pulling Tool is a wireline service tool designed to remove retrievable subsurface devices with external fishing necks from well. This tool has collet-type dogs with large latching area. It is also available with different length cores which make the reach of the tool adaptable to retrieve subsurface devices with fishing necks of different lengths.

The "JDC/JDS" Pulling Tool utilizes the top sub which is made up to the skirt of the tool. The dogs, which are mounted on the skirt, are inserted into the vertical openings in the skirt. The "JDC/JDS" Series Pulling Tool can be released, if necessary from the retrievable device by downward jarring. In the Pulling Tool nomenclature, the second letter is used to designate the direction of shear release. A "JDC/JDS" is a "jar down" release tool. The third letter designates core length with a "C" being a "long" core and an "S" core being a "short" core.





## GAS LIFT EQUIPMENT

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SIZE	TYP E	TO ENGAGE FISHING NECK O.D.	REAC H	MAX O.D.	TOP THREAD CONNEC TION
1 1/4"	JDC	.875"	1.937"	1.281"	15/16-10
1 3/8"	JDC	1.000"	1.875"	1.375"	15/16-10
1 1/2"	JDC	1.187"	1.093"	1.422"	15/16-10
1 1/2"	JDS	1.187"	1.843"	1.422"	15/16-10
1 1/2"	JUC	1.187"	1.093"	1.422"	15/16-10
1 1/2"	JUS	1.187"	1.843"	1.422"	15/16-10
1 5/8"	JDC	1.187"	1.093"	1.625"	15/16-10
2"	JDC	1.375"	1.437"	1.859"	15/16-10
2"	JDS	1.375"	2.125"	1.859"	15/16-10
2"	JUC	1.375"	1.437"	1.859"	15/16-10
2"	JUS	1.375"	2.125"	1.859"	15/16-10
2 1/2"	JDC	1.750"	1.312"	2.250"	15/16-10
2 1/2"	JDS	1.750"	2.187"	2.250"	15/16-10
2 1/2"	JUC	1.750"	1.312"	2.250"	15/16-10
2 1/2"	JUS	1.750"	2.187"	2.250"	15/16-10
3"	JDC	2.312"	1.437"	2.796"	1 1/16-10
3"	JDS	2.312"	2.125"	2.796"	1 1/16-10
3"	JUC	2.312"	1.437"	2.796"	1 1/16-10
3"	JUS	2.312"	2.125"	2.796"	1 1/16-10
4"	JDC	3.125"	2.312"	3.750"	1 1/16-10
4"	JUC	3.125"	2.312"	3.750"	1 1/16-10