

American Completion Tools

Global Partners for Oilfield Equipment

Completion Equipment, Flow Control Equipment &
Gas Lift Equipment

American Completion Tools

American Completion Tools (ACT) is a joint venture, started by acquiring Allco Services Inc., at Burleson, Texas, to manufacture high quality oilfield equipment in the USA. In 2010, American Completion Tools, Houston, was set up to serve customers more closely the complete line of American Completion Tools products for stock-n-sale.

The Houston office with a warehouse helps in providing quality customer service to their clients by enabling prompt delivery, easy billing and after sales service. Since its inception, American Completion Tools has been providing high quality products worldwide to distributors and service companies.

At American Completion Tools, quality and customer service are given utmost importance.



Flow Product Division Office, at Houston



Houston, TX Office



Opening by March 2015, Plant at Houston



Burleson, TX Office

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Upcoming Plant at Houston by, March 2015:

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Note: Elder, Baker, Alpha, Viton, Aflas, Otis, Go, and/or any other trade name mentioned in this catalogue are for reference purpose only.

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COMPLETION EQUIPMENT

ACT offers full set of downhole well completion strings with equipment like:

1. Standard hardware items like Fluted Swage, Adapters, Flow Coupling, Blast Joint, Cross Overs, Perforated Joints, Wireline Re-entry Guide, Pump Out Plug etc.
2. Safety Valve Systems both Tubing and Wireline Retrievable type with all required accessories, tools and wireline operating tools
3. Expansion joints
4. Side Pocket Mandrels with all accessories, tools, wireline tools including Gas Lift and chemical injection requirements
5. Sliding Sleeves with all tools, accessories and wireline tools
6. All types of Packers, Permanent & Retrievable Mechanical, Hydraulic, Wireline setting options with all accessories and setting tools like, Locator Anchor Seal assembly with different types of seal systems for Permanent Packers, Pump Out Plug, Mill Out Extension, Seal Bore Extension, Packer Milling and Retrieving Tools
7. Polished Bore Receptacles, accessories, tools
8. Landing Nipples both ported (for safety valves) and non-porting with all accessories and tools like Blanking Plugs, Instrument Hangers, standing valves with all required accessories and wireline operating tools
9. All completion accessories like control lines, Banding Strap, Banding Buckles etc.

TUBING AND PACKER CONFIGURATIONS:

Well completion with Packer permits a number of configurations. Packers are run to isolate the casing from corrosive fluids and / or high pressure.

- To stabilize and control flow from pay zones.
- In conjunction with artificial lift system.
- To selectively produce multiple zones.
- Selective stimulation becomes feasible.
- Wireline and downhole operations become feasible.

ANNULUS/TUBING SEALS:

Apart from Tubing Head, Tubing Connections, sealing between annulus and tubing rests with Packer and other equipment, such as, Anchor Seals, Locator Seals, Telescopic Joint, Tubing Seal Receptacles and Sliding Sleeves.

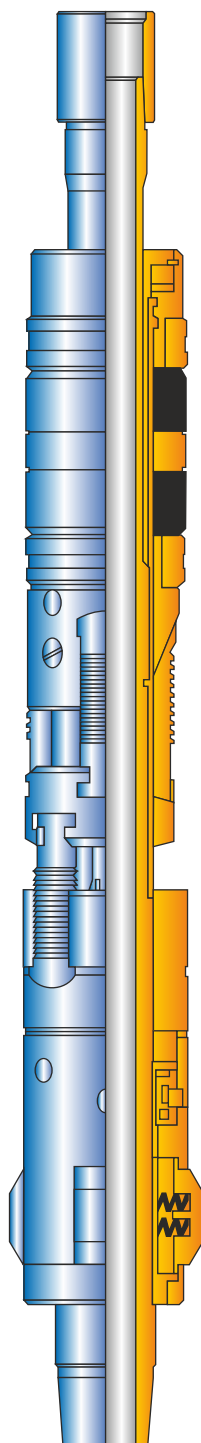
CIRCULATION AND COMMUNICATION DEVICES:

These are needed to establish Tubing Annulus communication, in order to equalize pressures and circulate fluid. These devices are Sliding Sleeves, Side Pocket Mandrels and Ported Nipples.

SAFETY VALVES:

Safety Valve provides final control of the well, when other controls have ceased to function.

MECHANICAL PRODUCTION PACKERS "SURE-LOK" PACKER: (LARGE BORE)



**"Sure-Lok"
Packer
(Large Bore)**

The ACT Large Bore "Sure-Lok" is a compression set, retrievable packer that allows the tubing to be left in a tension, compression, or neutral condition.

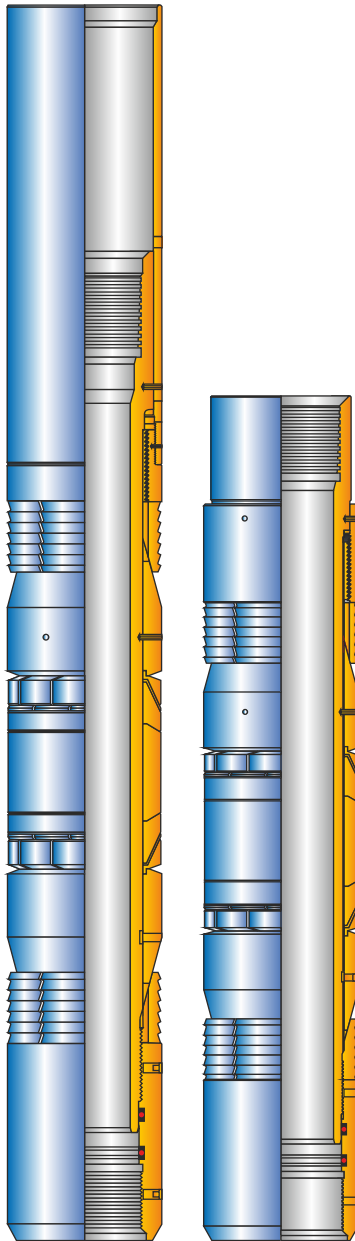
Applications include: most production, injection and zone isolation operations.

Features:

- Internal by-pass
- Opposed dovetail slips for positive set
- Holds pressure from above or below
- Can leave tubing in a tension, compression, or neutral condition
- Right hand rotation sets and releases the packer retracted dovetail slips
- Converts to mechanical bridge plug with the addition of a valve Optional packing element stems
- Large Bore

MECHANICAL PRODUCTION PACKERS "SURE-LOK" PACKER: (LARGE BORE)						
CASING				PACKER		
OD.	WT.	MIN.	MAX.	SIZE	MAX OD.	BOX THREAD UP
5-1/2	20 - 23	4.625	4.778	45A2 X 2-3/8	4.500	2-7/8 EU 8 RND
5-1/2	15.5 - 20	4.778	4.950	45A4 X 2-3/8	4.641	2-7/8 EU 8 RND
5-1/2	13 - 15.5	4.950	5.190	45B X 2-3/8	4.781	2-7/8 EU 8 RND
6	26	4.950	5.190	45B X 2-3/8	4.781	2-7/8 EU 8 RND
7	26 - 29	6.136	6.276	47B2 X 3.00	5.968	3-1/2 EU 8 RND
7	23 - 26	6.276	6.366	47B4 X 3.00	6.078	3-1/2 EU 8 RND
7	17 - 20	6.456	6.578	47C2 X 3.00	6.266	3-1/2 EU 8 RND
7-5/8	33.7 - 39	6.579	6.797	47C4 X 3.00	6.453	3-1/2 EU 8 RND
7-5/8	24 - 28.7	6.798	7.025	47D2 X 3.00	6.672	3-1/2 EU 8 RND
7-5/8	20 - 24	7.025	7.125	47D4 X 3.00	6.812	3-1/2 EU 8 RND

MODEL 'D' & 'F' PERMANENT PACKERS



Model 'D'

Model 'F'

ACT'S Model 'D' & 'F' Production Packers are available to fit your needs and provide the versatility of our excellent pack-off system for a positive secure set in the well bore.

These packers assist in the economical operation of a variety of completion and production jobs. These are designed to accommodate seal bore extensions used in deep wells requiring a longer seal bore interval. Seal Nipples are available with either automatic square-thread latch or locating shoulder. These packers can be used as test tools. Full opening bores allow the passage of perforating guns used to perforate a zone below for testing. If the zone proves to be non-productive, the packer can be used as a squeeze tool.

The packers are designed to provide high-impact resistance and a dependable seal. The high quality packing system will conform to the casing and close off any extrusion of rubber, as the packer is set, even at high temperatures and pressures.

ACT'S Model 'D' Production Packers provide excellent clearance for run-in while the ACT'S Model 'F' Production Packers offer a larger seal bore. The two models carry different pressure ratings noted later in this document.

R22 is the designation for standard service that ACT puts on the equipment listed below. Equipment for service other than standard can be specified upon request from the customer.

For additional information, please contact ACT or an authorised representative.

Features:

- One piece slips hardened to depth of wicker only
- Sets in any grade casing including P-10
- Choice of bottom to fit your application - specified when ordering
- Re-attaching lock ring holds setting force

MODEL 'D' & 'F' PERMANENT PACKERS

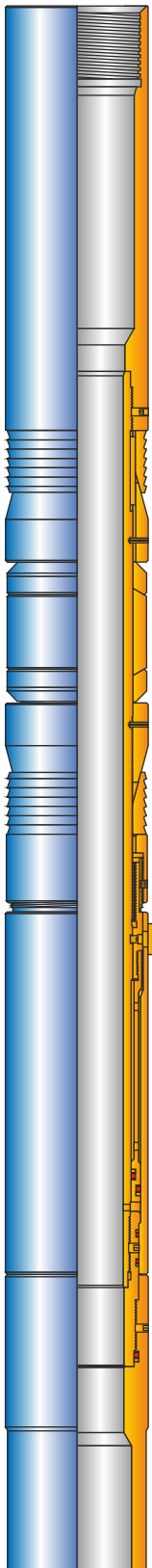
MODEL 'D' SPECIFICATION GUIDE Rated 10,000 psi @ 300 Degrees F										
CASING		SETTING RANGE		PACKER DATA					SEAL ASSY.	
OD	Wt./ft.	Min.	Max.	Max. OD	Thd. Dia.	Seal Bore	Part No.	Size	Size	ID Thru
4.1/2	9.5-13.5	3.920	4.090	3.750	3.250	2.687	070-3750-100*	37-26	40-26	1.937
5	15-21	4.125	4.436	3.968	3.250	2.687	070-3968-100*	39-26	40-26	1.937
5.1/2	20-23	4.625	4.811	4.328	3.250	2.687	070-4328-000	43-26	40-26	1.937
5.1/2	13-17	4.812	5.044	4.500	3.250	2.687	070-4500-000	45-26	40-26	1.937
6	14-26	5.140	5.552	4.937	3.500	3.000	070-4937-100**	49-30	42/62-30	2.375
6.5/8	17-20	6.049	6.366	5.687	4.000	3.250	070-5687-000	56-32	80-32	2.375
7	23-32	6.049	6.366	5.687	4.000	3.250	070-5687-000	56-32	80-32	2.375
7	17-20	6.456	6.765	6.187	4.000	3.250	070-6187-000	61-32	80-32	2.375
7.5/8	33.7-39	6.456	6.765	6.187	4.000	3.250	070-6187-000	61-32	80-32	2.375
8.5/8	36-49	7.500	7.825	7.125	4.500	4.000	070-7125-000**	71-40	80-40	3.000
9.5/8	29.3-53.5	8.438	9.063	8.125	4.000	3.250	070-8125-000	81-32	190-32	2.375
9.5/8	29.3-53.5	8.438	9.063	8.125	4.500	4.000	070-8125-060	81-40	80-40	3.000

- * - Rated 7,500 psi @ 300 degrees with HRC 18-22 Steel Body (Standard).
 - Rated 10,000 psi @ 300 degrees with HRC 28-32 Steel Body (Optional). Specify when ordering.

MODEL 'F' SPECIFICATION GUIDE Rated 7,500 psi @ 300 Degrees F										
CASING		SETTING RANGE		PACKER DATA					SEAL ASSY.	
OD	Wt./ft.	Min.	Max.	Max. OD	Thd. Dia.	Seal Bore	Part No.	Size	Size	ID Thru
5.1/2	20-23	4.625	4.811	4.437	3.500	3.000	080-4437-100	44-30	42/62-30	2.375
5.1/2	14-17	4.812	5.012	4.562	3.500	3.00	0080-4562-100	45-30	42/62-30	2.375
5.1/2	13-14	4.976	5.126	4.750	3.500	3.000	080-4750-100	47-30	42/62-30	2.375
6.5/8	20-24	5.875	6.094	5.687	4.500	4.000	080-5687-100	56-40	80-40	3.000
7	32-38	5.875	6.094	5.687	4.500	4.000	080-5687-100	56-40	80-40	3.000
6.5/8	17	6.095	6.276	5.875	4.500	4.000	080-5875-000	58-40	80-40	3.000
7	26-29	6.095	6.276	5.875	4.500	4.000	080-5875-000	58-40	80-40	3.000
7	20-23	6.277	6.456	6.000	4.500	4.000	080-6000-000	60-40	80-40	3.000
7	17-20	6.456	6.765	6.250	4.500	4.000	080-6250-000	62-40	80-40	3.000
7.5/8	33.7-42.8	6.456	6.765	6.250	4.500	4.000	080-6250-000	62-40	80-40	3.000

The shoe type must be specified upon placing sales order
 The figures contained herein are subject to change without notice.

MODEL DB HYDRAULIC SET PERMANENT PACKER



ACT Hydraulic-Set Dual Bore Permanent Production Packers are the hydraulically set one-trip completion packers, ideal for high volume production in high angle, extremely deviated well. These packers feature the largest possible bore through combined packer and seal accessory. The packer is run on the hydro-set anchor latch seal unit which is made up in the top of the packer via the left-hand threads on the latch and is set by applied tubing pressure. The DB packer requires some type of temporary plugging device such as a shear out plug or wireline blanking plug located close to the end of the tubing.

Advantages:

- Slim-line design
- Solid construction enables 50% faster run-in without fear of impact damage or premature setting, making significant rig-time savings possible
- Two opposed sets of full-circle, full-strength slips ensure packer will remain properly set
- Packing element resists swab-off and packs off securely when packer is set
- Unique interlocking, expandable, metal backup rings contact casing, creating a positive barrier to packing element extrusion

Additional Information:

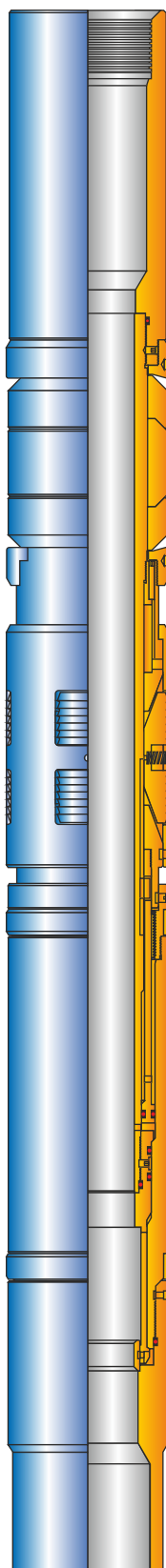
The Dual Bore Permanent Hydraulic Set Packers have been designed to give maximum strength, uniformity of setting pressure and standardization of all alloy materials for H2S service.

MODEL DB HYDRAULIC SET PERMANENT PACKER						
CASING		SETTING RANGE	TOOL O.D.	LOWER SEAL BORE	UPPER SEAL BORE	PART NO.
SIZE (inches)	WEIGHT (lbs/ft)					
7	20-35	6.004-6.456	5.687	3.250	4.0000	90-5687-XXXX
9.5/8	43.5-58.5	8.435-8.755	8.125	4.750	6.0000	90-8125-XXXX

'XXXX' is changed as per material / elastomer / end connection

**Model DB
Hydraulic Set
Permanent
Packer**

RHP- DB DUAL BORE HYDRAULIC SET RETRIEVABLE PACKER



The ACT MODEL RHP-DB Retrievable Packer delivers high performance with simplicity of design and desirable economics. The dual bore packer allows for a large ID through the packer by sealing in an upper seal bore. No tubing rotation required to fully set the packer. It has one-piece, self energizing packing element and features bidirectional slips below the packing element for maximum protection from debris fouling. This location protects the slips from being lost during retrieval or milling. A retrieving tool is required to retrieve these packers.

FEATURES:

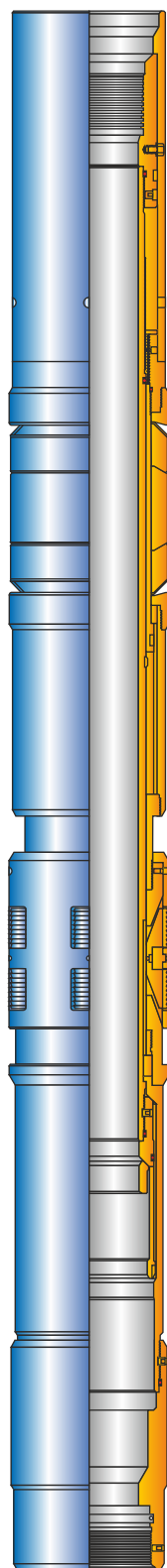
- Simple design
- Easy to retrieve
- Large seal bore
- Hydraulic setting
- Hydraulically setting the packer avoids the need to rotate the work string in running or retrieving the packer, which simplifies procedures, improves efficiency, and saves rig time.
- The ECNER array system reduces the swab-off effect and facilitates center pack off by enabling supporting force to be applied to the outer elements

RHP- DB DUAL BORE HYDRAULIC SET RETRIEVABLE PACKER						
CASING		SETTING RANGE (inches)	TOOL O.D. (inches)	LOWER SEAL BORE (inches)	UPPER SEAL BORE	PART NO.
SIZE (inches)	WEIGHT (lbs/ft)					
6.5/8	24-28	5.791-5.921	5.500	3.250	4.000	130-5500-XXXX
7	26-29	6.184-6.276	5.968	3.875	4.750	130-5968-XXXX
7	29-35	6.004-6.184	5.820	3.875	4.750	130-5820-XXXX
9.5/8	43.5-53.5	8.535-8.755	8.312	4.750	6.000	130-8312-XXXX

'XXXX' is changed as per material / elastomer / end connection

**RHP- DB
Dual Bore
Hydraulic Set
Retrievable
Packer**

ERD RETRIEVABLE SEAL BORE PACKER (DEVIATED WELL)



ACT Model ERD Retrivable Hydraulic Seal Bore Packer is a Retrivable Packer. Hydraulically set by pressure in the tubing. It is run with Hydraulic Setting Tool & retrieving is done independently from the Tubing, using a Retrieving Tool manipulated on a work string. This packer is ideally suited **for highly deviated well both onshore & offshore**.

Applications:

- Model ERD Retrivable Hydraulic Seal Bore Packer can be use in oil production wells or in water or gas injection wells.

Features, Advantages and Benefits:

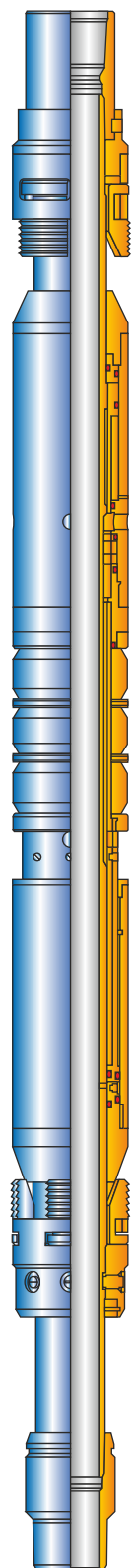
- Run & set with the Production Tubing
- Hydraulically setting eliminates the requirements for spacing out & opening & closing with the help of Sliding Sleeves for the displacement of fluids
- Effects on tubing (compression & tension) are transmitted to slips- there is no shear ring with limits these stresses
- Retrieval independent of the tubing using a Retrieving Tool. It can be lift to the bottom of the well with a By-Pass Blanking Plug in a Nipple to isolate the formation

ERD RETRIEVABLE SEAL BORE PACKER						
CASING		ERD PACKER				PART No.
OD (IN)	WEIGHT (lbs/ft)	PACKER SEAL BORE (IN)	OUT SIDE DIAMETER (IN)	THREAD CONN. (IN)	TYPICAL ID THRU SEALS	
5	18-21.4	2.562	3.938	SPECIAL / BLANK	1.937	140-3938-XXXX
7	26-29	3.000	5.968	SPECIAL / BLANK	2.375	140-5968-XXXX
		4.000			3.000	
8.5/8	24-32	4.750	7.687	SPECIAL / BLANK	3.00	140-7687-XXXX
9.5/8	40-47	4.000	8.465	SPECIAL / BLANK	3.000	140-8465-XXXX
		4.750				

'XXXX' is changed as per material / elastomer / end connection

**ERD
Retrivable
Seal Bore
Packer**

RHP-SPR HYDRAULIC SET RETRIEVABLE PACKER



**RHP-SPR
Hydraulic
Set
Retrievable
Packer**

The ACT RHP-SPR Packer is a hydraulic set single-string retrievable packer and may be used in virtually any production application. Tubing pump pressure is used to set the packer and the setting force is locked into the packer by a body lock ring. A large internal by-pass reduces swabbing when running and retrieving. The by-pass closes when the packer is set, and opens during the releasing process to allow pressure equalization. Shear screws are used to control the packer release. The shear release value is adjustable by adding or removing screws from the shear housing or by use of steel screws. The standard ACT Packers are designed for differential pressures up to 7,500 psi.

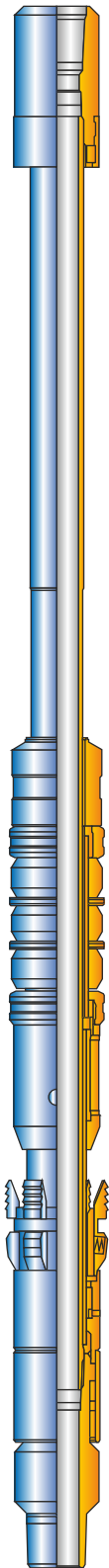
Features:

- The straight-pull, shear-release pins are unaffected by differential pressure, enabling easy changes to the release force before running
- The double-grip system enables the packer to hold differential pressures securely from above and below, preventing packing-element movement and ensuring proper pack off
- All components are locked to prevent pressure build up or debris from pre-setting the packer, improving reliability when running the packer in the wellbore
- Adjustable shear release
- Straight pull release

RHP-SPR HYDRAULIC SET RETRIEVABLE PACKER						
CASING		RECOMMENDED HOLE SIZE (inches)	TOOL OD MAX. (inches)	TOOL ID MIN. (inches)	THREAD CONNECTION BOX UP / PIN DOWN	PART NO.
SIZE (inches)	WEIGHT (lbs/ft)					
4.1/2	9.5-13.5	3.920-4.090	3.750	1.94	2.3/8" EUE	135-3750-XXXX
	15.1	3.826	3.656	1.94	2.3/8" EUE	135-3656-XXXX
5	11.5-15	4.408-4.560	4.125	1.94	2.3/8" EUE	135-4125-XXXX
	18-21	4.154-4.276	4.000	1.94	2.3/8" EUE	135-4000-XXXX
5.1/2	14-20	4.778-5.012	4.625	2.00	2.3/8" EUE	135-4625-XXXX
				2.38	2.7/8" EUE	135-4625-XXXX
	20-23	4.670-4.778	4.500	2.00	2.3/8" EUE	135-4500-XXXX
				2.38	2.7/8" EUE	135-4500-XXXX
6.5/8	17-24	5.921-6.135	5.750	2.50	2.7/8" EUE	135-5750-XXXX
				3.00	3.1/2" EUE	135-5750-XXXX
	24-32	5.675-5.921	5.500	2.50	2.7/8" EUE	135-5500-XXXX
				3.00	3.1/2" EUE	135-5500-XXXX
7	17-26	6.276-6.538	6.000	2.50	2.7/8" EUE	135-6000-XXXX
				3.00	3.1/2" EUE	135-6000-XXXX
	26-29	6.184-6.276	5.968	2.50	2.7/8" EUE	135-5968-XXXX
				3.00	3.1/2" EUE	135-5968-XXXX
	29-35	6.004-6.184	5.812	3.00	3.1/2" EUE	135-5812-XXXX
7.5/8	24-29.7	6.875-7.025	6.672	2.50	2.7/8" EUE	135-6672-XXXX
				3.00	3.1/2" EUE	135-6672-XXXX
	33.7-39	6.625-6.765	6.453	2.50	2.7/8" EUE	135-6453-XXXX
9.5/8	32.3-43.5	8.755-9.001	8.500	3.00	3.1/2" EUE	135-8500-XXXX
				4.00	4.1/2" EUE	135-8500-XXXX
	43.5-53.5	8.535-8.755	8.250	3.00	3.1/2" EUE	135-8250-XXXX
				4.00	4.1/2" EUE	135-8250-XXXX

'XXXX' is changed as per material / elastomer / end connection

SINGLE GRIP RETRIEVABLE PACKER MODEL 'R'



**Single Grip
Retrievable
Packer
Model 'R'**

ACT Model-R Single-Grip Mechanical Production Packer is a retrievable packer set by compression that isolates the annulus from the production conduit in most production, stimulation, and testing operations. The field-proven design includes rocker slips and a three-element packing system that helps to ensure correct setting and pack off.

Features, Advantages and Benefits:

- The packer parts are interchangeable with equipment from other manufacturers, reducing costs and inventory
- The large bypass enables fluids to equalize quickly and reduces the swabbing effect during run-in and retrieval for faster running
- The standard one-quarter right turn for packer setting provides simple operation on the rig
- A differential lock helps to keep the bypass to the mandrel closed and locked during high-pressure operations to maintain integrity and prevent production loss and the need for a work over to pull out of the hole and redress the packer
- The long-stroke mandrel simplifies fluid circulation without packer release
- The packer automatically returns to the run-in position when moved up the hole to enable circulation through and around it

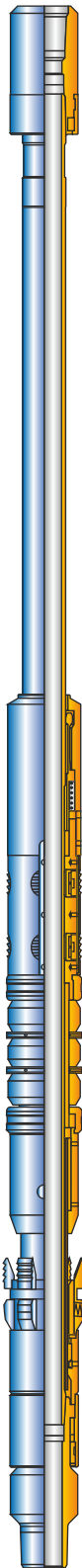
Options:

- The packer is available with an optional left turn for setting

SINGLE GRIP RETRIEVABLE PACKER MODEL 'R'						
CASING		RECOMMENDED HOLE SIZE (inches)	TOOL OD MAX. (inches)	TOOL ID MIN. (inches)	THREAD CONNECTION BOX UP / PIN DOWN	PART NO.
SIZE (inches)	WEIGHT (lbs/ft)					
4.1/2	9.5-13.5	3.920-4.090	3.771	1.920	2.3/8" EUE	242-3750-XXXX
5	11.5-15	4.408-4.560	4.250	1.920	2.3/8" EUE	242-4250-XXXX
	15-18	4.250-4.408	4.125	1.920	2.3/8" EUE	242-4125-XXXX
5.1/2	20-23	4.625-4.778	4.500	1.930	2.3/8" EUE	242-4625-XXXX
				2.36	2.7/8" EUE	242-4625-XXXX
	15.5-20	4.778-4.950	4.641	1.93	2.3/8" EUE	242-4500-XXXX
				2.36	2.7/8" EUE	242-4500-XXXX
	13-15.5	4.950-5.044	4.781	1.93	2.3/8" EUE	242-4781-XXXX
				2.36	2.7/8" EUE	242-4781-XXXX
6.5/8	28-32	5.675-5.791	5.490	1.93	2.3/8" EUE	242-5490-XXXX
	24	5.830-5.937	5.656	2.37	2.7/8" EUE	242-5656-XXXX
	17-20	6.456-6.538	5.812	2.37		242-5812-XXXX
7	32-35	6.004-6.094	5.812	2.37	2.7/8" EUE	242-5812-XXXX
	26-29	6.184-6.276	5.968		2.7/8" EUE	242-5968-XXXX
	20-26	6.276-6.456	6.078		3.1/2" EUE	242-5968-XXXX
	17-20	6.456-6.538	6.266		2.7/8" EUE	242-6078-XXXX
						242-6266-XXXX
7.5/8	33.7-39	6.625-6.765	6.453	2.37	2.7/8" EUE	242-6453-XXXX
	24-29.7	6.875-7.025	6.672			242-6672-XXXX
	20-24	7.025-7.125	6.812			242-6812-XXXX
9.5/8	47-53.5	8.535-8.681	8.218	2.97	3.1/2" EUE	242-8218-XXXX
	40-47	8.681-8.835	8.437	2.37	2.7/8" EUE	242-8437-XXXX
				2.97	3.1/2" EUE	242-8437-XXXX

'XXXX' is changed as per material / elastomer / end connection

DOUBLE GRIP RETRIEVABLE PACKER MODEL 'R'



**Double
Grip
Retrievable
Packer
Model 'R'**

ACT Model-R Double-grip Mechanical Production Packer is a retrievable packer set by compression that isolates the annulus from the production conduit in most production, stimulation, and testing operations. The field-proven design includes rocker slips and a three-element packing system that helps to ensure correct setting and pack off. A hydraulic hold down controls differential pressure from below.

Features, Advantages and Benefits:

- The packer parts are interchangeable with equipment from other manufacturers, reducing costs and inventory
- The large bypass enables fluids to equalize quickly and reduces the swabbing effect during run-in and retrieval for faster running
- The standard one-quarter right turn for packer setting provides simple operation on the rig
- A differential lock helps to keep the bypass to the mandrel closed and locked during high-pressure operations to maintain integrity and prevent production loss and the need for a workover to pull out of the hole and redress the packer
- The long-stroke mandrel simplifies fluid circulation without packer release
- The packer automatically returns to the run-in position when moved up the hole to enable circulation through and around it
- Rocker type Slips
- Slips with Carbide inserts available
- Hydraulic hold down button unit with large internal flow path located below the bypass valve to reduce element swabbing and button wicker dulling
- Surface controlled combination bypass and equalizing valve

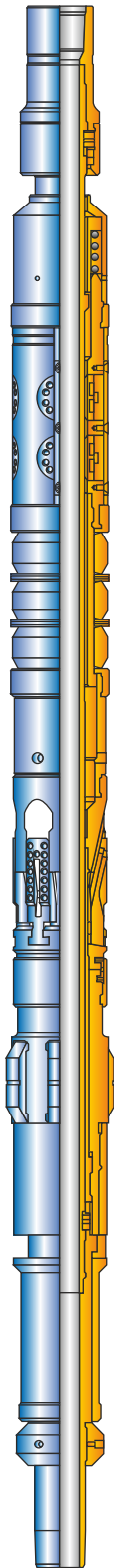
Options:

- The packer is available with an optional left turn for setting

DOUBLE GRIP RETRIEVABLE PACKER MODEL 'R'						
CASING		RECOMMENDED HOLE SIZE (inches)	TOOL OD MAX. (inches)	TOOL ID MIN. (inches)	THREAD CONNECTION BOX UP / PIN DOWN	PART NO.
SIZE (inches)	WEIGHT (lbs/ft)					
4.1/2	9.5 -13.5	3.920 - 4.090	3.771	1.920	2.3/8" EUE	240-3750-XXXX
5	11.5 -15	4.408 - 4.560	4.250	1.920	2.3/8" EUE	240-4250-XXXX
	15-18	4.250-4.408	4.125	1.920	2.3/8" EUE	240-4125-XXXX
5.1/2	20-23	4.625-4.778	4.500	1.930	2.3/8" EUE	240-4625-XXXX
				2.36	2.7/8" EUE	240-4625-XXXX
	15.5-20	4.778-4.950	4.641	1.93	2.3/8" EUE	240-4500-XXXX
				2.36	2.7/8" EUE	240-4500-XXXX
	13-15.5	4.950-5.044	4.781	1.93	2.3/8" EUE	240-4781-XXXX
				2.36	2.7/8" EUE	240-4781-XXXX
6.5/8	28-32	5.675-5.791	5.490	1.93	2.3/8" EUE	240-5490-XXXX
	24	5.830-5.937	5.656	2.37	2.7/8" EUE	240-5656-XXXX
	17-20	6.456-6.538	5.812	2.37	2.7/8" EUE	240-5812-XXXX
7	32-35	6.004-6.094	5.812	2.37	2.7/8" EUE	240-5812-XXXX
	26-29	6.184-6.276	5.968		2.7/8" EUE	240-5968-XXXX
					3.1/2" EUE	240-5968-XXXX
	20-26	6.276-6.456	6.078		2.7/8" EUE	240-6078-XXXX
	17-20	6.456-6.538	6.266		2.7/8" EUE	240-6266-XXXX
	33.7-39	6.625-6.765	6.453		2.7/8" EUE	240-6453-XXXX
7.5/8	24-29.7	6.875-7.025	6.672	2.37	2.7/8" EUE	240-6672-XXXX
	20-24	7.025-7.125	6.812		2.7/8" EUE	241-6812-XXXX
	47-53.5	8.535-8.681	8.218	2.97	3.1/2" EUE	240-8218-XXXX
9.5/8	40-47	8.681-8.835	8.437	2.37	2.7/8" EUE	240-8437-XXXX
				2.97	3.1/2" EUE	240-8437-XXXX

'XXXX' is changed as per material / elastomer / end connection

MODEL "TST-1" MECHANICAL SET PACKER



"TST-1"
Mechanical
Set Packer

The ACT TST-1 Retrievable Packer is a heavy duty service packer ideally suited for all types of squeeze cementing, formation fracturing, high pressure acidizing, etc. It is a large opening compression set packer with hydraulic button-type hold down. It withstands high pressure from above or below and uses a three-element packing system, L-slot, and a drag block mechanism for easy setting. The tool features a proven three element packing system and hydraulically controlled balance sleeve designed to keep the by-pass valve closed when set.

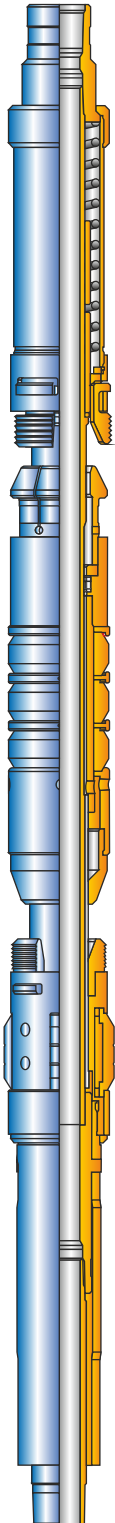
FEATURES:

- Sets securely in any hardness casing, including premium grades
- Three piece packing element systems with metal backups accommodate low and high pressure applications for the broadest range of services
- Hydraulic hold down button unit with large internal flow path located below the bypass valve to reduce element swabbing and button wicker dulling. These hold down piston type slips are set by pressure from below
- Surface controlled combination bypass and equalizing valve
- Automatic L-slot Unit, setting the packer is accomplished by running to depth rotating 3/4 turns to the right and setting down
- Straight pickup of the tubing will first open the bypass valve and equalize pressure continued pickup will release the packer and automatically engage the packer in the running position for further operations up or down the hole
- All Thread connection comes standard in API IF/EUE thread form
- All Pressure bearing o-rings for higher pressure resistance
- Load and pressure resistance designed to meet high load applications
- P110 body, coupling and sub for heavier duty jobs

MODEL "TST-1" MECHANICAL SET PACKER						
CASING		SETTING RANGE (inches)	TOOL OD MAX. (inches)	TOOL ID MIN. (inches)	THREAD CONNECTION BOX UP / PIN DOWN	PART NO.
SIZE (inches)	WEIGHT (lbs/ft)					
4.1/2	9.5-13.5	3.920-4.090	3.75	1.88	2.3/8"-EUE	250-3750-XXXX
	11.6-15.1	3.826-4.000	3.656	1.75		250-3656-XXXX
5	11.5-15	4.408-4.560	4.125	1.88	2.3/8"-EUE	250-4125-XXXX
	18-21	4.154-4.276	3.969			250-3969-XXXX
5.1/2	14-20	4.778-5.012	4.625	2.000	2.3/8"-EUE	250-4625-XXXX
	20-23	4.670-4.778	4.500			250-4500-XXXX
6.5/8	24.0-32.0	5.675-5.921	5.50	2.50	2.7/8"-EUE	250-5500-XXXX
	29-35	6.004-6.538	5.812			250-5812-XXXX
7	26-32	6.094-6.276	5.875	2.375	2.7/8"-EUE	250-5875-XXXX
	17-26	6.276-6.538	6.000			250-6000-XXXX
7.5/8	33.7-39	6.625-6.765	6.453	2.500	2.7/8"EUE	250-6453-XXXX
8.5/8	44-49	7.511-7.625	7.310	3.000	3.1/2"-EUE	250-7310-XXXX
	32-40	7.725-7.921	7.530			250-7530-XXXX
	20-28	8.017-8.191	7.780			250-7780-XXXX
	57.4-60.7	7.062-7.250	6.980			250-6980-XXXX
9.5/8	43.5-53.5	8.755-8.535	8.25	3.000	3.1/2"-EUE	250-8250-XXXX
	32-43.5	8.755-9.001	8.50	3.000	3.1/2"-EUE	250-8500-XXXX
10.3/4	40.5-55.5	9.75-10.05	9.50	3.000	3.1/2"-EUE	250-9500-XXXX
13.3/8	54.5-72	12.615-12.347	12.00	3.000	4.1/2"-EUE	250-1200-XXXX
16	75.0-102	14.75-15.125	14.50	3.75	4.1/2"-EUE	250-1450-XXXX

'XXXX' is changed as per material / elastomer / end connection

AS1-XHP MECHANICAL PACKER



**AS1-XHP
Mechanical
Packer**

The ACT AS1-XHP Packer is the most versatile of the mechanically set retrievable packers and may be used in any production application. Treating, testing, injecting, pumping wells, flowing wells, deep or shallow, the AS1-XHP is suited. The packer can be left in tension or compression, depending on well conditions and the required application.

A large internal by-pass reduces swabbing when running and retrieving. The by-pass closes when the packer is set and opens prior to releasing the upper slips when retrieving to allow pressure equalization.

The J-slot design allows easy setting and releasing; 1/4 turn right-hand set, right-hand release. A patented upper-slip releasing system reduces the force required to release the packer. A non directional slip is released first, making it easier to release the other slips.

The AS1-XHP packer can withstand 10,000 psi (69 MPa) of differential pressure above or below.

Features, Advantages and Benefits:

- The design holds high differential pressure from above or below, enabling the packer to meet most production, stimulation, and injection needs
- The packer can be set with compression, tension, or wire line, enabling deployment in shallow and deep applications
- The packer can be set and released with only a one-quarter turn of the tubing
- The bypass valve is below the upper slips so that debris are washed from the slips when the valve is opened, reducing the times for circulation and total retrieval
- The full opening enables unrestricted flow and the passage of wire line tools and other packer systems
- The packer can be run with the T-2 on-off tool, which enables the tubing to be disconnected and retrieved without retrieving the packer

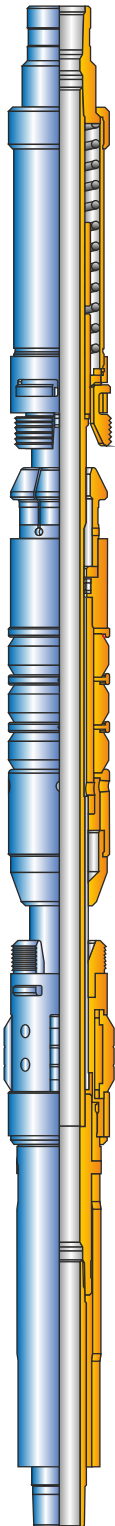
Options:

- Elastomer options are available for hostile environments.
- Optional safety releases are available.

AS1-XHP MECHANICAL PACKER						
CASING		RECOMMENDED HOLE SIZE (inches)	TOOL OD MAX. (inches)	TOOL ID MIN. (inches)	THREAD CONNECTION BOX UP / PIN DOWN	PART NO.
SIZE (inches)	WEIGHT (lbs/ft)					
4.1/2	9.5-13.5	3.920-4.090	3.750	1.938	2.3/8" EUE	261-3750-XXXX
4.1/2	13.5-15.1	3.826-3.920	3.650	1.938	2.3/8" EUE	261-3650-XXXX
5	11.5-15	4.408-4.560	4.125	1.938	2.3/8" EUE	261-4125-XXXX
5	18-20.8	4.154-4.276	4.000	1.938	2.3/8" EUE	261-4000-XXXX
5.1/2	14-20	4.778-5.012	4.625	2.00	2.3/8" EUE	261-4625-XXXX
5.1/2	14-20	4.778-5.012	4.625	2.38	2.7/8" EUE	261-4625-XXXX
5.1/2	20-23	4.670-4.778	4.500	2.00	2.3/8" EUE	261-4500-XXXX
5.1/2	20-23	4.670-4.778	4.500	2.38	2.7/8" EUE	261-4500-XXXX
6.5/8	20-24	5.921-6.094	5.750	3.00	3.1/2" EUE	261-5750-XXXX
7	17-26	6.276-6.538	6.000	2.50	2.7/8" EUE	261-6000-XXXX
7	17-26	6.276-6.538	6.000	3.00	3.1/2" EUE	261-6000-XXXX
7	26-32	6.094-6.276	5.875	2.50	2.7/8" EUE	261-5875-XXXX
7	26-32	6.094-6.276	5.875	3.00	3.1/2" EUE	261-5875-XXXX
7	29-35	6.004-6.184	5.812	3.00	3.1/2" EUE	261-5812-XXXX
7.5/8	24-29.7	6.875-7.025	6.672	2.50	2.7/8" EUE	261-6672-XXXX
7.5/8	24-29.7	6.875-7.025	6.672	3.00	3.1/2" EUE	261-6672-XXXX
7.5/8	33.7-39	6.625-6.765	6.453	2.50	2.7/8" EUE	261-6453-XXXX
7.5/8	33.7-39	6.625-6.765	6.453	3.00	3.1/2" EUE	261-6453-XXXX
9.5/8	32.3-43.5	8.755-9.001	8.500	3.00	3.1/2" EUE	261-8500-XXXX
9.5/8	32.3-43.5	8.755-9.001	8.500	4.00	4.1/2" EUE	261-8500-XXXX
9.5/8	43.5-53.5	8.535-8.755	8.250	3.00	3.1/2" EUE	261-8250-XXXX
9.5/8	43.5-53.5	8.535-8.755	8.250	4.00	4.1/2" EUE	261-8250-XXXX

'XXXX' is changed as per material / elastomer / end connection

AS1-X MECHANICAL PACKER



**AS1-X
Mechanical
Packer**

The ACT AS1-X Packer is the most versatile of the mechanically set retrievable packers and may be used in any production application. Treating, testing, injecting, pumping wells, flowing wells, deep or shallow, the AS1-X is suited for all. The packer can be left in tension or compression, depending on well conditions and the required application.

A large internal by-pass reduces swabbing when running and retrieving. The by-pass closes when the packer is set and opens prior to releasing the upper slips when retrieving to allow pressure equalization.

The J-slot design allows easy setting and releasing; 1/4 turn right-hand set, right-hand release. A patented upper-slip releasing system reduces the force required to release the packer. A non directional slip is released first, making it easier to release the other slips.

The AS1-X packer can withstand 7,000 psi (48 MPa) of differential pressure above or below.

Features, Advantages and Benefits:

- The design holds high differential pressure from above or below, enabling the packer to meet most production, stimulation, and injection needs
- The packer can be set with compression, tension, or wire line, enabling deployment in shallow and deep applications
- The packer can be set and released with only a one-quarter turn of the tubing
- The bypass valve is below the upper slips so that debris are washed from the slips when the valve is opened, reducing the times for circulation and total retrieval
- The full opening enables unrestricted flow and the passage of wire line tools and other packer systems
- The packer can be run with the T-2 on-off tool, which enables the tubing to be disconnected and retrieved without retrieving the packer

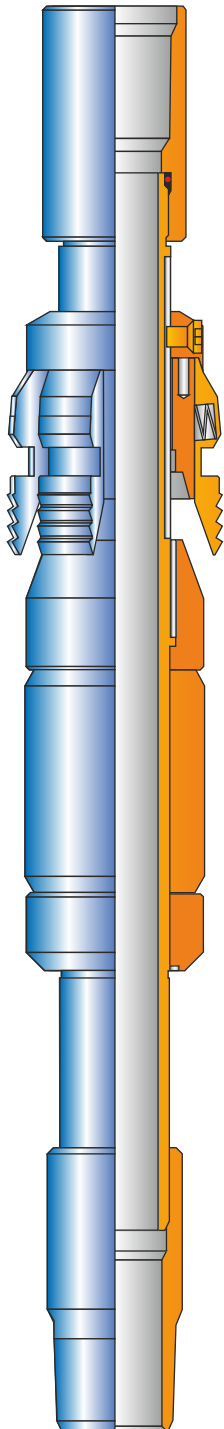
Options:

- Elastomer options are available for hostile environments
- Optional safety releases are available

AS1-X MECHANICAL PACKER						
CASING		RECOMMENDED HOLE SIZE (inches)	TOOL OD MAX. (inches)	TOOL ID MIN. (inches)	THREAD CONNECTION BOX UP / PIN DOWN	PART NO.
SIZE (inches)	WEIGHT (lbs/ft)					
4.1/2	9.5-13.5	3.920-4.090	3.750	1.938	2.3/8" EUE	260-3750-XXXX
4.1/2	13.5-15.1	3.826-3.920	3.650	1.938	2.3/8" EUE	260-3650-XXXX
5	11.5-15	4.408-4.560	4.125	1.938	2.3/8" EUE	260-4125-XXXX
5	18-20.8	4.154-4.276	4.000	1.938	2.3/8" EUE	260-4000-XXXX
5.1/2	14-20	4.778-5.012	4.625	2.00	2.3/8" EUE	260-4625-XXXX
5.1/2	14-20	4.778-5.012	4.625	2.38	2.7/8" EUE	260-4625-XXXX
5.1/2	20-23	4.670-4.778	4.500	2.00	2.3/8" EUE	260-4500-XXXX
5.1/2	20-23	4.670-4.778	4.500	2.38	2.7/8" EUE	260-4500-XXXX
6.5/8	20-24	5.921-6.094	5.750	3.00	3.1/2" EUE	260-5750-XXXX
7	17-26	6.276-6.538	6.000	2.50	2.7/8" EUE	260-6000-XXXX
7	17-26	6.276-6.538	6.000	3.00	3.1/2" EUE	260-6000-XXXX
7	26-32	6.094-6.276	5.875	2.50	2.7/8" EUE	260-5875-XXXX
7	26-32	6.094-6.276	5.875	3.00	3.1/2" EUE	260-5875-XXXX
7	29-35	6.004-6.184	5.812	3.00	3.1/2" EUE	260-5812-XXXX
7.5/8	24-29.7	6.875-7.025	6.672	2.50	2.7/8" EUE	260-6672-XXXX
7.5/8	24-29.7	6.875-7.025	6.672	3.00	3.1/2" EUE	260-6672-XXXX
7.5/8	33.7-39	6.625-6.765	6.453	2.50	2.7/8" EUE	260-6453-XXXX
7.5/8	33.7-39	6.625-6.765	6.453	3.00	3.1/2" EUE	260-6453-XXXX
9.5/8	32.3-43.5	8.755-9.001	8.500	3.00	3.1/2" EUE	260-8500-XXXX
9.5/8	32.3-43.5	8.755-9.001	8.500	4.00	4.1/2" EUE	260-8500-XXXX
9.5/8	43.5-53.5	8.535-8.755	8.250	3.00	3.1/2" EUE	260-8250-XXXX
9.5/8	43.5-53.5	8.535-8.755	8.250	4.00	4.1/2" EUE	260-8250-XXXX

'XXXX' is changed as per material / elastomer / end connection

AD-1 TENSION PACKER



Tension Packer

The ACT AD-1 Tension Packer is a retrievable, single grip tension set packer, used in water flood, oil production or treating applications. This compact, economical packer is used for shallow wells where sufficient set down weight is not available to utilize a set down packer. It is set by left hand rotation and has three release methods.

Features

- Sets securely in any hardness casing, including premium grades
- Compact, short, easy to transport and run
- Full opening enables maximum fluid circulation
- Rocker type slips eliminates the need for extra drag block
- Easy to operate – a simple and reliable J-Slot mechanism, actuated from the surface by tubing rotation, makes the packer easy to set and release
- One piece packing
- Three release methods, normal release, shear release and safety joint release

Operation

Run the packer to desired setting depth, and make the last movement down before attempting actual set. Rotate the tubing to the left one-quarter turn at the tool, and pick-up on the tubing string to obtain pack-off.

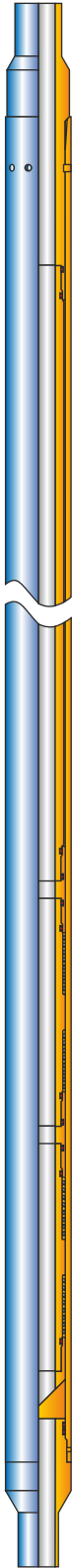
To release the packer, Lower the tubing string at least one foot more than is necessary to remove the applied tension (this will move the J-Pin to the top of the J-Slot) and rotate to the right sufficiently to obtain one-quarter turn at the packer.

Should the Packer fail to release with normal procedures, an upward pull of the tubing string weight, plus 25,000 to 50,000 lbs. tension (dependent on strength of the shear ring) will release the packer.

If it is not desirable or practical to pull 50,000 lbs. through the tubing, apply approximately 10,000 lbs. strain and rotate the tubing 15 to 20 turns to the right. This unscrews the left-hand safety thread between the Top Sub and the Body and allows removal of the tubing string and the Top Sub. To remove the remaining portion of the Packer, install a set of Jars made up above an overshot, or spear, engage the Packer Body, and actuate the Jars to free the Packer Body from the casing. Tension Packers are available for 4.1/2" to 9.5/8" casing sizes.

AD-1 TENSION PACKER					
CASING				PACKER	
O.D.	WT.	MIN.	MAX.	MAX. O.D.	STANDARD BOX X PIN
4.1/2"	9.5 - 13.5	3.910	4.160	3.771	2.3/8" - EUE
5"	15 - 18	4.161	4.408	4.125	2.3/8" - EUE
5"	11.5 - 15	4.408	4.560	4.250	2.3/8" - EUE
5.1/2"	26	4.408	4.560	4.250	2.3/8" - EUE
5.1/2"	20 - 23	4.625	4.778	4.500	2.3/8" - EUE
5.1/2"	15.5 - 20	4.778	4.950	4.641	2.3/8" - EUE
5.1/2"	13 - 15.5	4.950	5.190	4.781	2.3/8" - EUE
5.3/4"	22.5	4.950	5.190	4.781	2.3/8" - EUE
6"	26	4.950	5.190	4.781	2.3/8" - EUE
6"	20 - 23	5.191	5.390	5.062	2.3/8" - EUE
6"	15 - 18	5.391	5.560	5.156	2.3/8" - EUE
6.5/8"	34	5.561	5.595	5.406	2.3/8" - EUE
6.5/8"	28 - 32	5.596	5.791	5.484	2.3/8" - EUE
6.5/8"	24	5.830	5.921	5.656	2.3/8" - EUE
6.5/8"	17 - 20	5.922	6.135	5.812	2.3/8" - EUE
7"	38	5.830	5.921	5.656	2.3/8" - EUE
7"	32 - 35	5.922	6.135	5.812	2.3/8" - EUE
7"	26 - 29	6.136	6.276	5.968	2.7/8" - EUE
7"	20 - 26	6.276	6.456	6.078	2.7/8" - EUE
7"	17 - 20	6.456	6.538	6.266	2.7/8" - EUE
7.5/8"	33.7 - 39	6.539	6.765	6.453	2.7/8" - EUE
7.5/8"	24 - 29.7	6.766	7.025	6.672	2.7/8" - EUE
7.5/8"	20 - 24	7.025	7.125	6.812	2.7/8" - EUE
8.5/8"	40 - 49	7.511	7.725	7.312	2.7/8" - EUE
8.5/8"	32 - 40	7.725	7.921	7.531	3.1/2" - EUE
8.5/8"	20 - 28	7.922	8.191	7.781	3.1/2" - EUE
9.5/8"	47 - 53.5	8.300	8.681	8.218	3.1/2" - EUE
9.5/8"	40 - 47	8.681	8.835	8.437	4.1/2" - LTC
9.5/8"	29.3 - 36	8.836	9.063	8.593	4.1/2" - LTC

POLISHED SEAL BORE RECEPTACLE



The ACT Polished Seal Bore Receptacle is designed for applications where a large ID must be maintained through the completion while accommodating extreme tubing movements. The ACT Polished Seal Bore Receptacle modular design allows tool to be easily converted from tension release to hydraulic release. The tension release and the hydraulic release incorporate a Polished Seal Bore Receptacle as well as a PBR seal assembly including 2 sets of working seal units and a debris barrier above and below the working seals. Both versions when combined with a hydraulic or hydraulic/ hydrostatic set can be run in and set in one trip. The polished seal bore receptacle can be retrieved in two trips. The seal assembly is retrieved when the tubing string is recovered. The PBR seal bore is retrieved with a PBR retrieving tool. The Polished Seal Bore Receptacle is available in varying lengths of up to 25 ft. in stroke. An adjustable shear mechanism locks the outer housing and seal mandrel together during run-in. Once the seal assembly is released, it is free to move in the bore, compensating for tubing movement. The PBR assembly can be pinned in the fully stroked, closed or midway position to accommodate pre-spacing in one-trip completions.

Features:

- One-piece polished bore housing
- Full bore-seal mandrel allows passage of intervention tools
- Adjustable shear-release mechanism
- Available with premium materials and connections
- Available in stroke lengths up to 25 ft.
- Metal-to-metal connections for hostile environments
- Debris barrier above and below seals for long life
- Seals are retrieved on the tubing string
- Threaded receptacle on top for PBR retrieval on workstring

Benefits:

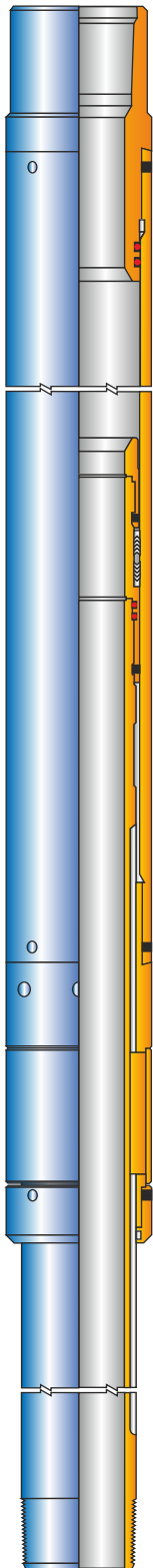
- Maximum-flow capability
- Retrieves separately from the packer, simplifying removal
- Rugged design for rotating into liner tops and horizontal sections
- No tubing manipulation required to set
- Reduces installation time
- Can be pinned in the fully stroked, closed or midway position
- CRA materials available for hostile environments

Applications:

- One-trip installations in deviated or horizontal wells
- Large-bore, high-flow-rate applications
- Production, injection, or stimulation
- Monobore completions

***Polished
Seal Bore
Receptacle***

SPLINED EXPANSION JOINT ASSY.



**Splined
Expansion
Joint Assy.**

ACT's Splined Expansion joint (Model – PSE) is designed for use in single string completions to accommodate tubing movement. This type of expansion joint is suited for use with packers or other tools which will require rotation, since the splines allow the operator to rotate the string through the expansion joint at any position of the stroke.

The model PSE expansion joint may be shear pinned at middle, fully open & closed stroke or 1 foot in full stroke. This expansion joint is available in 6 foot, 10 foot and 20 foot lengths. It is available in a wide variety of materials (may affect ratings) and with several choices of seal materials to meet virtually any requirements.

Features:

- Rotationally locked at all times for transmitting torque when required
- Easily adjustable shear system
- Both short & long top sub available depends on handling
- Splined through entire stroke
- Available in materials for H₂S or Co₂ services
- No internal shoulders obstructing running wire line through the tool
- One piece mandrel and barrel (No welded components)
- Multiple V-ring sealing system
- Can be pinned at middle, fully open & closed stroke or 1 foot in full stroke

Applications:

- Completion where extreme tubing movements are expected and where packer is set after the well is flanged up.
- Production, injection or stimulation.

SPLINED EXPANSION JOINT ASSY.					
TUBING ^a		O.D. (INCH)	I.D. (INCH)	STROKE (Ft)	W.P. ^c (psi)
SIZE (INCH)	WEIGHT (lbs/Ft)				
2.3/8"	4.7	3.50"	1.995"	6 10 20	7,500
2.7/8"	6.5	4.27"	2.441"		
3.1/2"	9.3	4.77"	2.992"		
4.1/2"	12.75	6.10"	3.958"		
CASING ^b		6.88"	4.276"		
SIZE (INCH)	WEIGHT (lbs/Ft)				
5"	18				
5.1/2"	20			7.38"	4.778"

a - Top Box x Bottom Pin EUE 8RD connection / customer to specify tubing conn.

b - Top Box x Bottom Vam Top connection / customer to specify casing conn.

c - W.P = T.P.

d - Other sizes, stroke & w.p are available on request.

OVERSHOT EXPANSION JOINT(OEJ) ASSEMBLY



ACT Overshot Expansion Joint (OEJ) Assembly is designed for applications where extreme tubing movements are expected due to stimulation or production of the well and when a tubing separation device is also required.

The OEJ assembly is a one-trip system, which allows the well to be flanged up prior to setting the packer. The OEJ assembly incorporates a slick joint sub as well as housing - packing set including working seal units and a debris barrier above the working seals. The plain receptacle, housing - packing set and seals can be retrieved when the tubing string is recovered for maintenance or the entire completion can be retrieved by straight pull after ensuring that J-pin engaged with J-slot, thus allowing the packer to be retrieved.

The OEJ assembly is available in varying lengths of up to 20 ft. stroke. Adjustable shear pins lock the inner & outer assembly together during run-in. Once the shear screw gets sheared by applying load, the outer assembly gets disengaged and it is free to move on the inner assembly, compensating for tubing movement.

Features:

- One-trip required to run in and actuate
- Available in stroke lengths up to 20 ft.
- Debris barrier above the working seals
- Seating nipple located at the upper end of the slick joint sub
- Seals can be retrieved for redress
- One-trip retrieval – J-pin J-slot assembly allows the entire completion to be retrieved with straight pick up of the tubing once engaged

Benefits:

- No tubing manipulation required to set
- One-trip system saves rig time
- Seals can be retrieved for redress without removing packer

Applications:

- Completions in which the packer is set after the well is flanged up

OVERSHOT EXPANSION JOINT(OEJ) ASSEMBLY							
TUBING _b		RUN IN CASING		MAX OD	NIPPLE SEAL BORE _a	STROKE	W.P. _c
OD (inch)	WT (lbs/ft)	SIZE (inch)	WT (lbs/ft)	(inch)	(inch)	(ft)	(psi)
2.3/8	4.7	4.1/2	11.6 – 15.1	3.60	1.875	15 up / 5 down = 20 total 7.5 up / 7.5 down = 15 total 5 up / 5 down = 10 total	5000
2.3/8	4.7	4.1/2	15.1 – 20	3.50	1.875		5000
2.7/8	6.5	5.1/2	20 – 23	4.50	2.313		7500
3.1/2	9.3	7	32 – 38	5.65	2.813		7500
4.1/2	12.75	7.5/8	24 – 33.70	6.50	3.813		7500

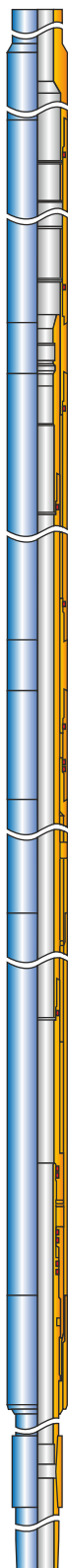
_a - OTIS type "X" size given; however OTIS "R" type & Baker "F" type profile can also be provided

_b - Top box X bottom pin EUE 8 RD Connection / customer to specify tubing Connection

_c - W.P. = T.P

**Overshot
Expansion
Joint (OEJ)
Assembly**

HYDRAULIC OVERSHOT EXPANSION JOINT (HOEJ) ASSEMBLY



ACT Hydraulic Overshot Expansion Joint (HOEJ) Assembly is designed for applications where extreme tubing movements are expected due to stimulation or production of the well and when a tubing separation device is also required.

The HOEJ assembly is a one-trip system, which allows the well to be flanged up prior to setting the packer. The HOEJ assembly incorporates a slick joint sub as well as housing - packing set including working seal units and a debris barrier above the working seals. The plain receptacle, housing - packing set and seals can be retrieved when the tubing string is recovered for maintenance or the entire completion can be retrieved by straight pull after ensuring that J-pin is engaged with J-slot, thus allowing the packer to be retrieved.

The HOEJ assembly is available in varying lengths of up to 20 ft. stroke. Hydraulic release mechanism locks the inner & outer assembly together during run-in. Once the shear screw gets sheared by hydraulic tubing pressure the outer assembly gets disengaged and it is free to move on the inner assembly, compensating for tubing movement.

Features:

- One-trip required to run in and actuate
- Adjustable hydraulic release mechanism
- Available in stroke lengths up to 20 ft.
- Debris barrier above the working seals
- Seating nipple located at the upper end of the slick joint sub
- Seals can be retrieved for redress
- One-trip retrieval – J-pin J-slot assembly allows the entire completion to be retrieved with straight pick up of the tubing once engaged

Benefits:

- No tubing manipulation required to set
- One-trip system saves rig time
- Seals can be retrieved for redress without removing packer

Applications:

- Completions in which the packer is set after the well is flanged up

HYDRAULIC OVERSHOT EXPANSION JOINT(HOEJ) ASSEMBLY

TUBING ^b		RUN IN CASING		MAX OD	NIPPLE SEAL BORE ^a	STROKE	W.P. ^c
OD (inch)	WT (lbs/ft)	SIZE (inch)	WT (lbs/ft)	(inch)	(inch)	(ft)	(psi)
2.7/8	6.5	5.1/2	14 – 23	4.40	2.313	15 up / 5 down = 20 total	7500
3.1/2	9.3	7	23 – 38	5.68	2.813	7.5 up / 7.5 down = 15 tota	7500
						15 up / 5 down = 10 total	

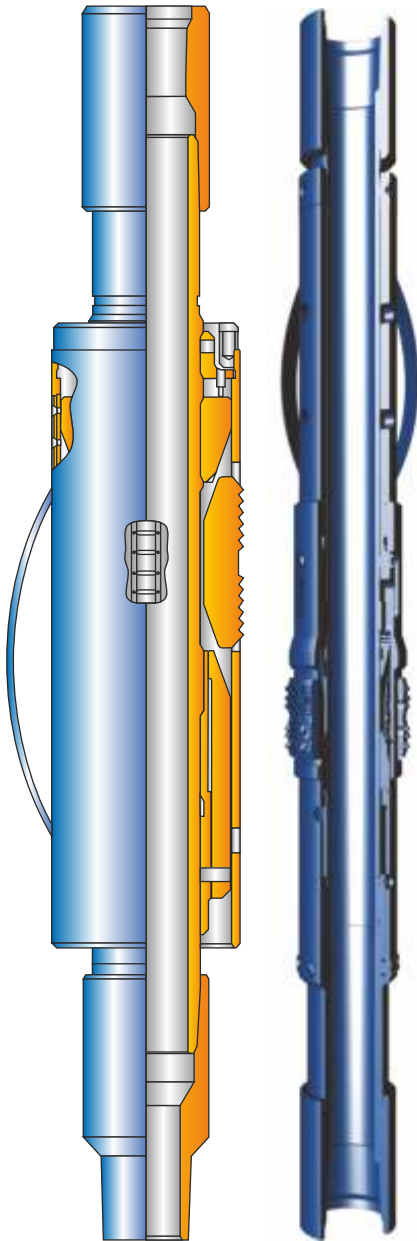
^a - OTIS type "X" size given; however OTIS "R" type & Baker "F" type profile can also be provided

^b - Top box X bottom pin EUE 8 RD Connection / customer to specify tubing Connection

^c - W.P. = T.P

**Hydraulic
Overshot
Expansion
Joint (HOEJ)
Assembly**

TUBING ANCHOR CATCHER (TAC)



**Tubing Anchor
Catcher**

The Tubing Anchor Catcher (TAC) is one of the most important tools in achieving efficient rod pumping operation. Run below a sucker rod pump, it acts as an anchor to the lower end of the tubing string to maintain tension in the tubing string and eliminates tubing movement during the pump cycle. It also acts as a tubing catcher to prevent parted pipe from falling into the well.

Rod pumping operation, with the tubing hanging free, causes problems like excessive wear of the rods, tubing, casing, and pump, reduced pumping efficiency, increased operating costs such as increased requirements of power consumption etc. The elongation and contraction of the tubing string along with the rod string reduces the effective pump stroke and thus reduces the production rate. This also causes tubing buckling which results in tubing and casing wear, tubing collar leaks, and metal fatigue causing the tubing to part.

When set with proper tension, the tubing anchor catcher reduces buckling, effectively cuts operating cost incurred from excessive rod, tubing, and casing wear, which results in fewer pulling jobs. Elimination of buckling increases production by lengthening the effective stroke of the pump, thereby increasing volumetric efficiency.

Features

- Increases pump efficiency
- Reduces operating cost by reducing maintenance and down time caused by casing, tubing or sucker rod wear
- Simple operation: Rotates left to set, right to release
- Double grip slip prevents upward and downward movement
- Catches parted tubing
- Straight pull emergency release with adjustable shear pin force
- Easy and inexpensive to redress.

Operation

Install the Anchor Catcher in the Tubing String just below or above the pump for best results. Run to desired depth and rotate the tubing to the left to set the Anchor Catcher. To ensure the Anchor Slips are solidly engaged with the casing, hold left hand torque on the tubing and pick up and set down several times to be sure the Anchor Slips are properly set in the casing. The tubing will torque up when the slips have set. Release the torque and apply the required amount of tubing tension.

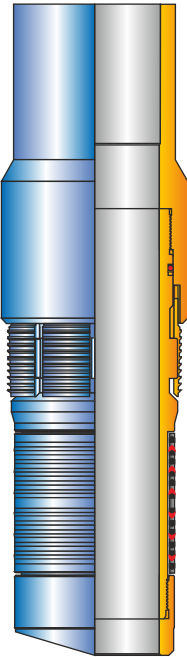
During this slip setting operation, the strain should be at least equal to the final strain that will be needed plus full tubing set-down weight.

To pull the Anchor Catcher, lower the tubing to release the tension and rotate to the right while working the tubing up and down slightly. Should the Anchor Catcher fail to release with normal procedures, an upward pull of the tubing string weight, plus the total value of the Shear Pins will release the Anchor.

Tubing Anchor Catchers are available for 4.1/2" to 9.5/8" casing sizes.

TUBING ANCHOR CATCHER (TAC)					
CASING				PACKER	
O.D.	WT.	MIN.	MAX.	MAX. O.D.	STANDARD BOX X PIN
4"	99.5 - 12.6	3.250	3.562	2.875	2.3/8" EU 8RND
4.1/2"	9.5 - 13.5	3.826	4.090	3.750	2.3/8" EU 8RND
5"	11.5 - 18	4.276	4.560	4.000	2.3/8" EU 8RND
5.1/2"	13 - 23	4.670	5.044	4.500	2.3/8" EU 8RD or 2.7/8" EU 8RND
6"	18 - 23	5.240	5.424	4.812	
6.5/8"	17 - 32	5.675	6.456	5.500	
7"	20 - 38	5.675	6.456	5.500	
7"	17 - 20	6.413	7.125	6.250	
7.5/8"	20 - 39	6.413	7.125	6.250	3.1/2" EU 8RND
6.5/8"	17 - 32	5.675	6.538	5.500	
7"	17 - 38	5.675	6.538	5.500	3.1/2" EU 8RND
8.5/8"	24 - 49	7.250	8.093	7.000	3.1/2" EU 8RND
9.5/8"	32.3 - 47	8.681	9.001	8.000	3.1/2" EU 8RND

ANCHOR LATCH SEAL ASSEMBLY



**Anchor Latch
Assembly**

The ACT Anchor Latch Seal Assembly positions the seal units in the polished bore of the packer at the bottom of the available stroke. With a slight amount of set-down weight, the anchor latch will snap into the top thread of the packer. This feature allows the upward pull to be applied to the tubing string to positively confirm proper location and operation.

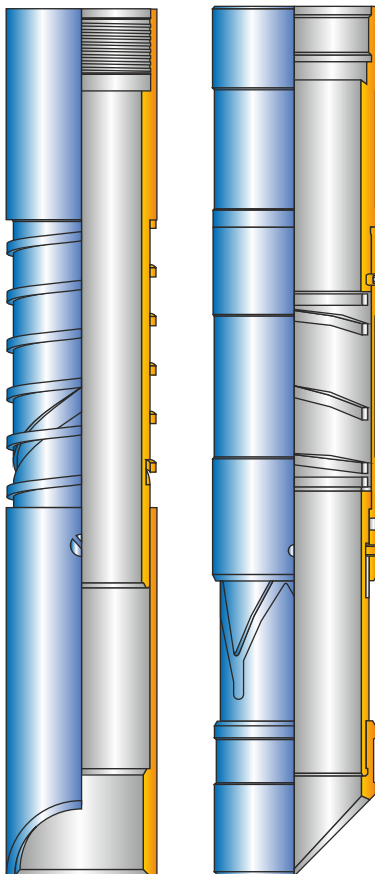
The process to release the anchor is an upward pull combined with right hand turns of the tubing at the latch. The releasing mechanism of the anchor makes it ideal for completions where tubing movement is not desirable.

Standard anchor latch assemblies are manufactured from materials that comply with NACE MR0175 standards for sulfide stress cracking-resistant metallic materials and fitted with seal stacks with metal backups. Viton, Aflas, and Chevron seals are available for hostile conditions, such as high-temperature, high-pressure, and sour environments.

FEATURES

- Easy snap-in-snap-out procedure
- Prevention of seal movement
- High-performance seals available for hostile environments

INDEXING MULE SHOE



**Indexing
Mule Shoe**

**Indexing
Mule Shoe With
Protracted Spring**

The ACT Indexing Mule Shoe facilitates stab in of seals into seal bores, even in deviated wells. The work string does not need to be rotated to orient the mule shoe. Axial movement of the work string against an obstruction rotates the mule shoe. If it still fails to enter the bore, the work string is lifted to re-engage the internal J-mechanism and the mule shoe will again rotate when set down load is applied.

Key Benefits:

- Protected spring. Spring is not exposed either in the inner or outer portion of the tool
- Spring cannot be overstressed, as set down weight is taken through a load shoulder in the tool
- Internal bearings prevent spring wind-up during the indexing process

Application:

- Stabbing in seals into seal bore in deviated wells

LOCATOR TUBING SEAL ASSEMBLY

ACT'S Locator Tubing Seal Assembly is the most basic packer sealing system for packers incorporating a sealing bore. It is run in the well on the production tubing string until its No-Go shoulder locates on the top of the packer. This positions one or more seal stacks in the packer's seal bore and establishes a seal between the packer and tubing. When a locator tubing-seal assembly is landed in a packer, the tubing is normally set in compression to compensate for any contraction of the tubing during treating operations. However, it is not always possible or desirable to slack off sufficient weight, particularly in deep deviated wells. In such cases, additional length must be added to the packer's seal bore using seal bore extensions and to the locator tubing-seal assembly using a combination of spacer tubes and additional seal units.

SEAL BORE EXTENSION

ACT'S Seal Bore Extension is used in completions where seal bore packer is used as a production packer and tubing movement is expected. Seal Bore Extension provides sufficient seal bore length so that long seal assemblies accommodate tubing movement while always remaining in the seal bore. Multiple seal bore extension can be coupled together using a concentric coupling to obtain more seal bore length. Seal Bore Extensions are available for all sizes of seal bore packer.

Seal Bore Extensions are manufactured from materials that comply with NACE MR0175 STD. For SSC resistant metallic material.

Application:

- Completions with seal bore production packers where tubing movement is expected

Benefits:

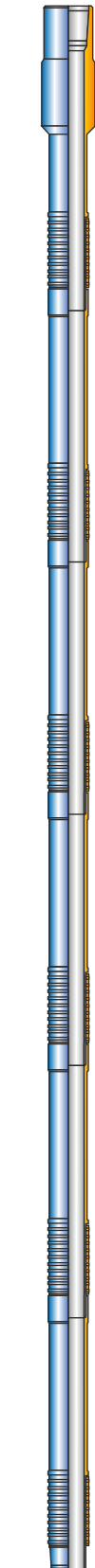
- Easy to install
- Low cost solution
- Facilitates tubing replacement

SEAL BORE EXTENSION			
SIZE (inches)	MAX. OD (inches)	MIN. ID (inches)	LENGTH
2.688	3.750	2.688	As per requirement
3.000	4.000	3.000	
3.250	4.250	3.250	
4.000	5.000	4.000	
4.750	5.750	4.750	
6.000	7.000	6.000	

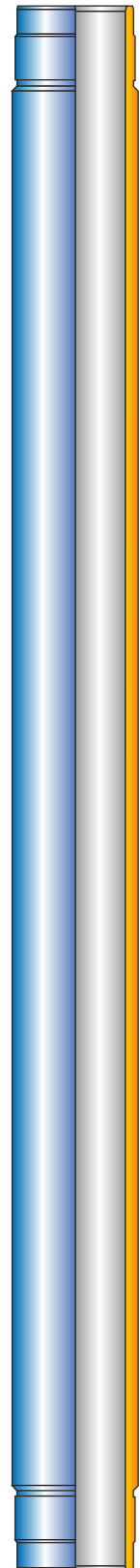
MILLOUT EXTENSION

Millout Extension provide a larger ID below the packer to protect the seals. The larger ID is also useful when a packer milling and retrieving tool is employed. The extension ID should be greater than the packer ID to furnish an adequate shoulder for retrieving the packer after milling procedure is completed.

These are available in various sizes and lengths for pressure up to 10,000 psi, with API or Premium Threads and comply with NACE MR0175 standards.

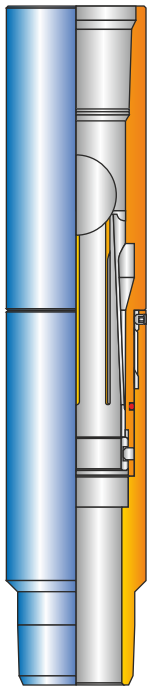


**Locator
Tubing
Seal
Assembly**



**Seal Bore
Extension**

HYDRO TRIP PRESSURE SUB

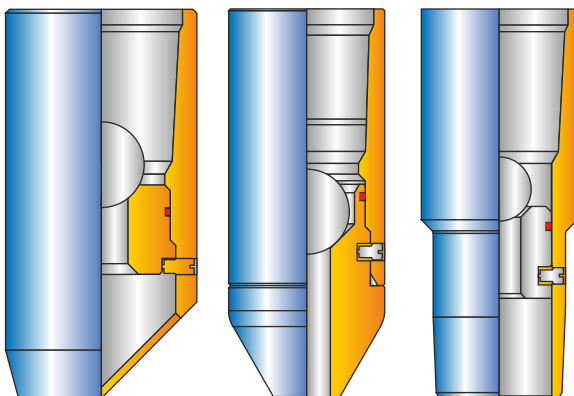


**Hydro Trip
Pressure Sub**

The Hydro Trip Pressure Sub is designed to provide a temporary tubing plug in order to set a hydraulically actuated packer. To actuate a hydraulic set packer a ball is dropped or circulated to its seat in the hydro-trip sub. To set the packer, the appropriate pressure differential is applied to the tubing. After the packer is set, a continued increase in pressure is applied to shear the shear screws in shear ring, allowing the ball seat collet to move down in to the collet relief area and allowing the ball to pass down the hydro-trip sub through the tubing, leaving a “full open” sub with no restrictions to production. After a hydro-trip sub has been pulled from well, it can be redressed and utilized again.

HYDRO TRIP PRESSURE SUB				
SIZE INCH MM	BALL SIZE INCH MM	BALL SEAT ID		END CONNECTION SPECIFICATION INCH
		BEFORE SHIFTING INCH MM	AFTER SHIFTING INCH MM	
1.900 48.26	1.438 36.51	1.250 31.75	1.516 38.51	1.900 EU or NU
2.375 60.33	1.500 38.10	1.375 34.93	1.860 47.24	2-3/8 EU or NU
	1.750 44.45	1.625 41.28	1.906 48.41	
2.875 73.03	2.125 53.98	2.000 50.80	2.375 60.33	2-7/8 EU or NU
3.500 88.90	2.500 63.50	2.312 58.72	2.781 70.64	3-1/2 EU or NU
	2.750 69.85	2.380 60.50	2.885 73.25	
4.500 114.30	3.063 77.79	2.734 69.44	3.615 91.82	4-1/2 EU or NU
	3.375 85.73	2.958 75.13	3.865 98.17	

PUMP OUT PLUGS



Pump Out Plugs

The Pump out Plug is a temporary tubing plug. It allows the tubing to be pressured up for setting a device such as a packer. After the production string is landed or the well is prepared for production, the brass screws shear out when appropriate differential pressure is applied to the tubing, leaving a full opening with a wire line re-entry guide shoe on the tailpipe.

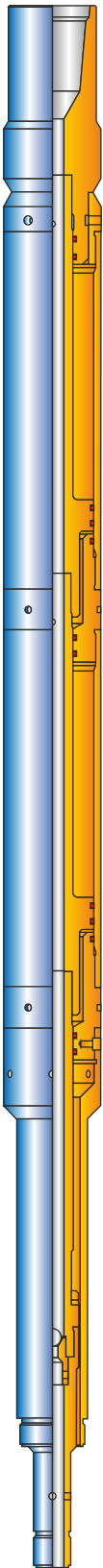
APPLICATIONS

- Setting a hydraulic packer
- Temporary plugging of the tubing during stimulation, acidizing, or testing
- Applying pressure to tubing

FEATURES, ADVANTAGES AND BENEFITS

- The simple, field-proven design enables the application of pressure to the tubing to set a hydraulic packer reliably
- Easily accessible shear screws enable shear values to be readily adjusted in the field, saving time
- Full bore ID is realized once shearing has occurred
- Available in different materials, styles and threads

HYDRAULIC SETTING TOOL



Hydraulic Setting Tool

ACT MODEL D, F AND ERD PACKER, can be set on tubing or drillpipe using a wireline adapter kit and a hydraulic setting assembly. These setting assemblies are particularly useful for setting permanent packers in high-angle, deviated wells such as those drilled offshore.

The hydraulic setting tool assembly and packer are run to setting depth on the tubing string and a ball is dropped to the ball seat in the setting tool. Sufficient tubing pressure is then applied to set and pack off the packer. The pressure or combined pressure and tubing tension, parts the release stud in the adapter kit and frees the setting assembly from the packer for retrieval. The HST has a bottom connection that accepts common wireline-setting tool adapter kits.

Applications:

- Deviated or horizontal wells
- Large-casing packers
- Wireline-set seal bore packer completions

Features, Advantages and Benefits:

- The HST accepts common wireline adapter kits, enabling it to set all ACT permanent and retrievable seal bore packers
- The HST enables the well to be circulated before the packer is set, preventing debris accumulation
- The heavy-duty HST construction enables the packer assembly to be pushed into place in high-angle and horizontal wells, enabling the packer to be set where wireline deployment is difficult or impractical

ACT MODEL “H” HYDRAULIC SETTING TOOL

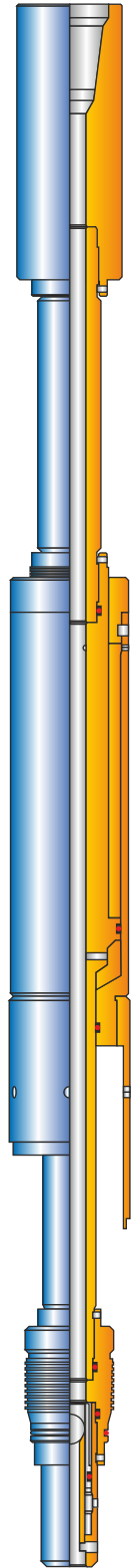
ACT Model “H” Hydraulic setting tool is designed to enable the setting of ACT Model ‘D’ and Model ‘F’ type packers on drill pipe. The model ‘H’ setting tool can develop a force of up to 126,000lb. Over stroke of 10 inches. The tensile rating is 150,000 lbs.

The Model ‘H’ setting tool is attached directly to the packer by setting nut, which screw in to left hand thread at top of packer. Pressure applied through the drill pipe, forces the setting sleeve on to the packer to set the upper slips, and an upwards pull sets off the packing element and lower slips.

The setting tool is designed to run and set packers in 7” to 9.5/8” casing. It is possible to use the tool in casing as small as 6.5/8” 32 lb/ft

Feature / Benefits:

- Drill pipe connection supplied as standard
- Tool is fitted with tubular extension for gripping in tong, slips and elevator
- 10” stroke ensures setting of slips
- Tool can be dressed with captive setting ball , or ball may dropped in to drill pipe after running to depth
- Pressure testing can be carried out through the drill pipe before releasing from packer
- Tensile load capacity 150,000lb
- Pressure rating 10,000lb/in² in burst and collapse
- Special shear feature prevents the setting nut from being up too tightly



Model “H” Hydraulic Setting Tool

PACKER RETRIEVING TOOL (RHP - DB PACKER, ERD PACKER, PBR PACKER)

The ACT Packer Retrieving Tool is required to retrieve seal bore hydraulic set retrievable packer. Each packer has a unique retrieving tool but all have same basic design. Latch feature latch into the top thread of the packer. A pull shear the shear screw of collet support and release the packer. If packer cannot be released with the help of right hand rotation collet will be free from safety nut and latch can be backed out.

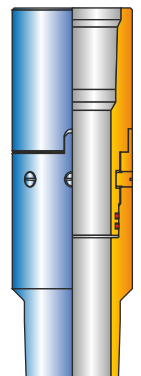
DUAL BORE HYDRAULIC RETRIEVABLE PACKER					
PACKER SIZE	PACKER BORE (inches)	TOOL O.D. (inches)	TOOL I.D. (inches)	PART NUMBER	THREAD CONNECTION BOX UP
6.5/8	3.25	4.875	0.75	145-5500-211	3.1/2" IF
7	3.875	5.625	1.375	145-5875-215	3.1/2"-IF
9.5/8	4.750	7.250	2.000	145-8312-216	4.1/2"-IF

ERD PACKER					
PACKER SIZE	PACKER BORE (inches)	TOOL O.D. (inches)	TOOL I.D. (inches)	PART NUMBER	THREAD CONNECTION BOX UP
5	2.562	2.500	1.000	145-3938-209	2.3/8"-IF
7	3.000	4.750	0.875	145-5968-210	3.1/2"-IF
7	4.000	4.750	1.500	145-5968-214	3.1/2"-IF
8.5/8	4.750	6.000	2.250	145-7687-216	3.1/2"-IF
9.5/8	4.000	5.500	1.500	145-8465-214	3.1/2"-IF
9.5/8	4.750	6.000	2.250	145-8465-216	3.1/2"-IF

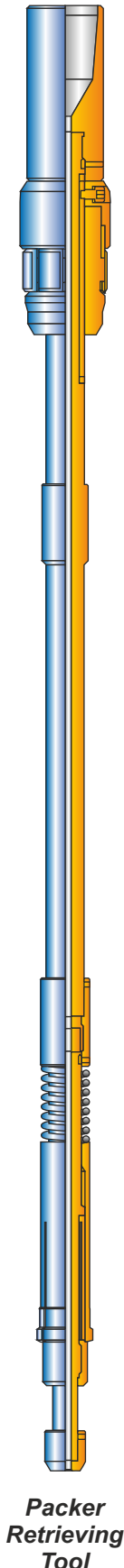
SHEAR-OUT SAFETY JOINT

ACT shear-out safety joint enables the positive release of the tubing string in completions with expected retrieval challenges. The joint is used between packers in single, dual, and triple completions. It is also used when rotational release is not wanted. The safety joint is easily adjusted in the field for various straight-pull release shear values. It can also be adjusted to compensate for hydraulic conditions that exist when the string is landed or conditions that are created by well treatment. These safety shear joints are keyed so torque through the tool does not load the shear screws. (Non-keyed versions are also available).

SHEAR-OUT SAFETY JOINT						
TUBING O.D. (IN / MM)	MAX. O.D. (IN / MM)	MIN. I.D. (IN / MM)	STANDARD THREAD CONNECTION (IN)	PART NO.	SHEAR VALUE FULLY LOADED (IB / KG)	SHEAR PINS
2.3/8	3.067	2.0	2-3/8 EU 8 RD	252-3067-200N	54,000	9
60.325	77.800	50.8	2-3/8 NU 10 RD		24,494	
2.7/8	3.875	2.5	2-7/8 EU 8 RD	252-3875-200N	54,000	9
73.025	98.425	63.5	2-7/8 NU 10 RD		24,494	
3.1/2	4.5	3.0	3-1/2 EU 8 RD	252-4500-200N	54,000	9
88.9	114.3	76.2	3-1/2 NU 10 RD		24,494	
4	5	3.5	4 NU 10 RD	252-5000-200N	60,000	10
101.6	127.00	88.9	4 NU 10 RD		27,215	
4.1/2	5.562	4	4-1/2 EU 8 RD	252-5562-200N	60,000	10
114.3	141.275	101.6	4-1/2 EU 8 RD		27,215	



Shear-Out Safety Joint



Packer Retrieving Tool

PACKER MILLING TOOL

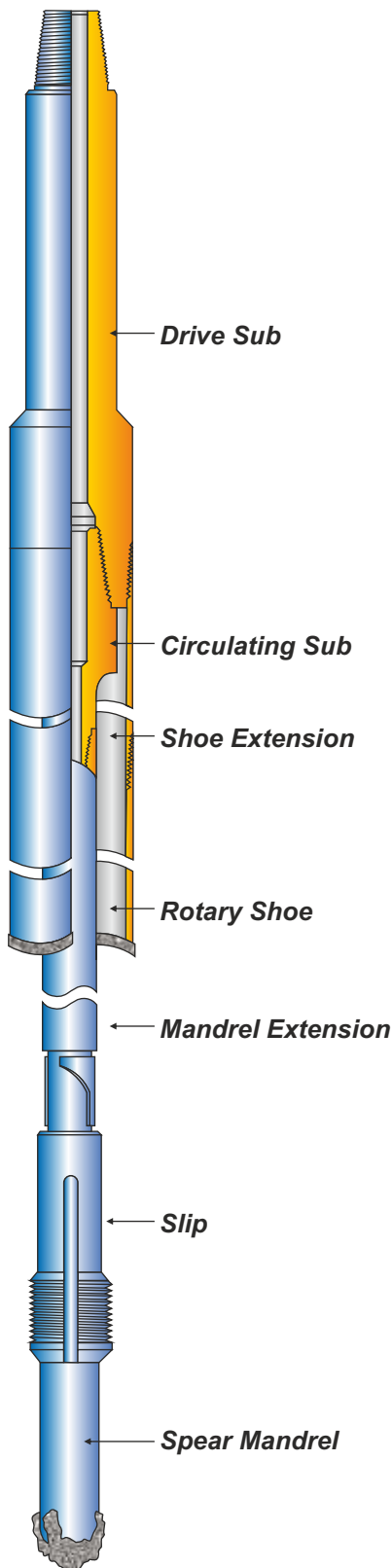
General Description

The ACT PRS Packer Milling Tools (Packer Retriever) is an internally engaging fishing tool designed for the retrieving of production packers. With its accessory components (Stinger, Bushing and Mill Shoe) it passes through the bore of the packer, mills the packer slips loose and pulls the packer after it has been milled over, all in one trip. A Packer Retriever is assembled with the proper size slip to engage the bottom of a specific bore packer, and made up on the lower end of sufficiently long stinger (extension) to permit the Retriever to be lowered completely through the packer during the milling operation. The Bushing is provided with a box connection at its lower end to attach the Stinger, also a pin connection at the lower end for attaching Mill Shoe, and a pin or box connection at its upper end for connection to the run-in or fishing string.

Operation

Make up a complete ACT PRS Packer Milling Tools consisting of Retriever, Stinger, Bushing and Mill Shoe. Make sure that the tool is compatible with Casing and Packer sizes and will permit proper and safe operations of the milling and retrieving operations.

Lower the fishing string until the Mill Shoe contacts the slips of the packer. Milling operations may begin until drill off conditions are established. Generally, light drill loads should be used to start to enable the shoe to cut the thin bevel upper parts of most packers away until full mill shoe face contact is established. Additional weight may be added to establish optimum conditions. Rotary Speeds must be established that are sufficient with a given weight, to burn or abrade the carbide particle matrix away to expose the successive new cutting edges of carbide particles. When this condition is established the Mill Shoe will cut almost any metal with maximum efficiency. Start circulation and right-hand rotation to mill away the slips and seating element of packer. When the packer begins to slide down the hole, stop rotation, raise the fishing string to engage Packer Retriever with packer and then pull the assembly and fish from the hole. The best condition of removal for most makes of full bore production packers is to mill up the upper slips and approx. half of the packing element before retrieval is attempted.



PACKER MILLING TOOL

To Release the Retriever

For any of several reasons, it may be required to release the Retriever from the packer. Release of the Retriever is accomplished by elevating the fishing string until weight is indicated. Lower the fishing string about three to four inches. Rotate the string right hand and slowly elevate the string to withdraw the Retriever from the packer.

Confirm the following:

- 1) That the Retriever is assembled with the correct size slip for the packer to be caught.
- 2) That the Stringer is sufficiently long to permit the Retriever to pass completely through the packer.
- 3) That the Bushing and Mill Shoe are the correct size for the casing specifications.

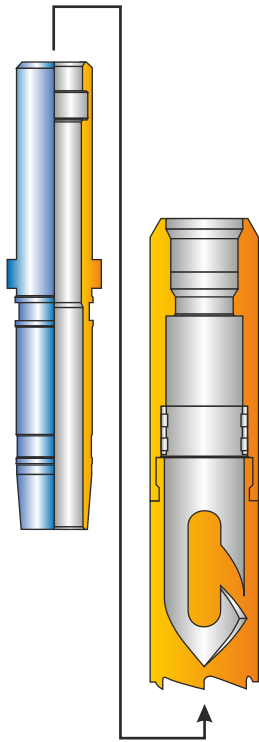
Make up complete assembly to the fishing string. (Scrapers or drift tools should be run prior to running the Milling Tool to depth. The casing in which the packer is to be removed should be washed clean to the packer top and a fluid and pump equipment must be selected that will clean the mill shoe and remove all cuttings from the hole as the packer is mill-up) Lower the Retriever in to the hole on the fishing string and pass it through the packer. The Retriever must clear the packer bore and be in a free position below the packer before milling or rotating of the string. If there are restrictions below the packer such as perforated nipples, landing subs or tail pipe, extensions must be used to position the packer retriever well below these points so that the rotation of the string will not foul the Packer Retriever.

Now, raise the fishing string slowly and carefully until it takes weight. This ensures that the Retriever will engage the packer seat.

Maintenance

To guard against mis-runs and to prolong the life of the ACT PRS Packer Retriever it should be completely disassembled, thoroughly cleaned, lubricated and reassembled before storing. Exterior surfaces may be either painted or lubricated to prevent rust and deterioration.

T-2 ON/OFF TOOL



T-2 On/Off Tool

ACT T-2 On-Off Tool enables the tubing string to be disconnected above a packer for zonal isolation, tubing retrieval, and temporary zone abandonment. The tool contains an internal lock profile for landing a wireline plug to provide zonal isolation below the packer. The tool has two basic components, the overshoot mounted on the tubing string and the stinger mounted on the packer. The overshoot disengages with either a standard left release or an optional right quarter-turn release. Shear-up or shear-down positions are compatible with the packer setting and retrieving styles. The washover shoe on the overshoot cuts through debris. The seals in the tool are retrieved with the overshoot to enable redressing at the surface. Available with all common wireline profiles, the stinger works with industry standard blanking plugs, standing valves, and regulators.

Applications:

- Mechanical, hydraulic, or wireline-set packer completions
- Zonal isolation above the packer
- Temporary abandonment of lower zones
- Tubing retrieval without disturbing the packer

Features, Advantages and Benefits:

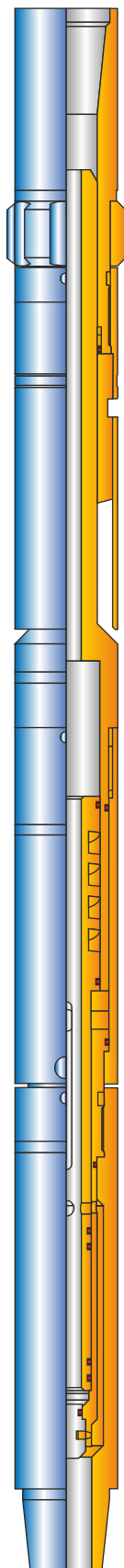
- The tool enables the packer to be used as a bridge plug for zonal isolation or the temporary abandonment of lower zones, saving rig costs
- The tool can be full-pressure tested at the surface to save rig time
- The tool can be pinned in a shear-up or shear-down position, providing compatibility with the packer setting and retrieving style
- The standard left or optional right quarter-turn release provides simple operation on the rig
- Bonded seals enable multiple disconnections without costly retrieval
- The rugged, dependable design enables tubing retrieval without disturbing the packer
- The washover shoe cuts through debris to release stuck equipment in the wellbore

Options:

- The tool is available in a variety of materials
- An optional right quarter-turn release is available for the overshoot disengagement
- The stinger is available with all common wireline profiles

T-2 ON/OFF TOOL				
CASING SIZE (inches)	OVERSHOT LENGTH	TOOL OD (inches)	THREAD CONNECTION BOX UP / PIN DOWN	PART NO.
4.1/2	16.25	3.75	2.3/8	272-3750-200
5.1/2	16.25	4.50	2.3/8	272-4500-200
5.1/2	17.375	4.50	2.7/8	272-4500-201
7	17.875	5.875	2.7/8	272-5875-220
7	19.44	5.875	3.1/2	272-5875-202
9.5/8	19.44	8.000	3.1/2	272-8000-202

STORM VALVE



ACT Storm Valve is run above the TST-1 compression set service packer to isolate the tubing below the packer for disconnection during a weather emergency or surface equipment repair.

The valve has a J overshot running tool, which a quarter turn disconnects. This quick, safe, cost-effective well closing requires no tubing pulling. The valve can be repeatedly opened and closed, independent of the disconnection feature, enabling packer-pressure testing before disconnection.

The heavy-duty bearing assembly enables free valve operation with the running string in compression, easing operation on floating rigs. Before packer retrieval, the string can be reconnected and the valve opened to equalize pressure.

Applications:

Weather emergencies
Wellhead repair

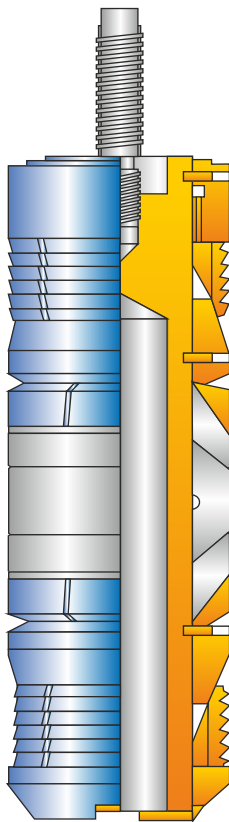
Features, Advantages and Benefits:

- The rugged alloy-steel construction ensures dependability
- The internal-flush (IF) drillpipe tool-joint thread connections provide exceptional, field-proven torsional strength for rigs
- The simple, field-proven design eases valve operation and redressing
- The J-tool disconnects with a quarter turn of the running string, providing fast, efficient valve placement
- The valve can be opened and closed repeatedly with two quick turns, independent of the disconnection feature, enabling the packer to be pressure tested before disconnection to ensure its integrity
- The expandable plug provides through-bore access for circulation and wirelines

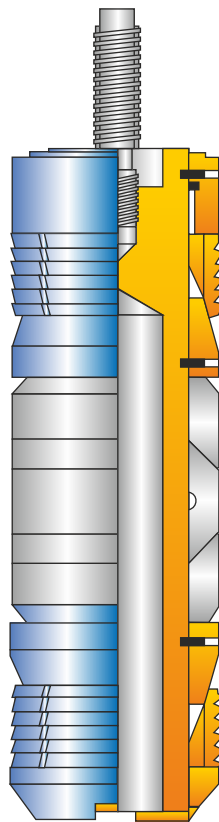
STORM VALVE					
CASING O.D. (in)	TOOL SIZE (mm)	MAX. O.D.	MIN. I.D.	STD THREAD CONNECTION	PART NO.
7	178	5.500	1.500	3-1/2" IF	251-5500-200
7.5/8	194	6.380	1.500	3-1/2" IF	251-6380-200
9.5/8	243	8.000	1.500	3-1/2" IF	251-8000-200
9.5/8	244	8.000	2.130	4-1/2" IF	251-8000-200
11.3/4	298	10.250	2.130	4-1/2" IF	251-1025-200
13.3/8	340	11.500	2.130	4-1/2" IF	251-1150-200
16	406	14.000	2.130	4-1/2" IF	251-1400-200

Storm Valve

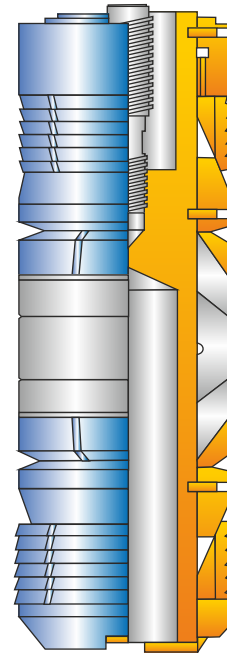
DRILLABLE BRIDGE PLUGS - WIRELINE SET



***ACT Model A
Premium
Bridge Plug***



***ACT Model A
Lite
Bridge Plug***



***ACT Model BKR
Premium
Bridge Plug***

The ACT Model A Premium Bridge Plug is a wireline set, high pressure plug constructed of drillable cast-iron that uses Alpha Big Boy setting sleeves and adapter rods. It can be set on any GO or Baker type wireline pressure setting tool or pipe/coil tubing with an ACT Hydraulic Setting Tool. The upper slips remain in the set position during the drilling operation to allow gas pressure to equalize. Available in 2-3/8" thru 20" tubing/casing sizes.

The ACT Model A Lite Bridge Plug is a wireline set, medium pressure plug constructed of drillable cast-iron that uses Alpha Big Boy setting sleeves and adapter rods. It can be set on any GO or Baker type wireline pressure setting tool or pipe/coil tubing with an ACT Hydraulic Setting Tool. The upper slips remain in the set position during the drilling operation to allow gas pressure to equalize. Available in 2-3/8" thru 7" tubing/casing sizes.

The ACT Model BKR Premium Bridge Plug is a wireline set, high pressure plug constructed of drillable cast-iron that uses Bolt, Elder or Baker K-1 type setting sleeves, no tension mandrel is required. It can be set on any Baker type wireline pressure setting tool or pipe/coil tubing with an ACT Hydraulic Setting Tool. This plug will not vent gas pressure prior to plug moving unless provisions are made. Available in 4-1/2" thru 13-3/8" casing sizes.

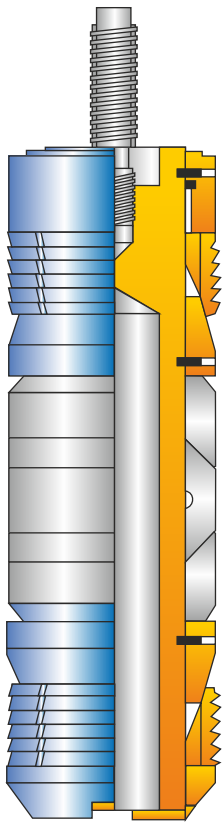
MODEL A PREMIUM BRIDGE PLUG - WIRELINE SET / DRILLABLE

The ACT Model A Premium Bridge Plug is a high pressure plug constructed of drillable cast-iron that uses Alpha Big Boy setting sleeves and adapter rods. It can be set on any GO or Baker type wireline pressure setting tool or pipe/coil tubing with an ACT Hydraulic Setting Tool. When set, opposing slips are located above and below the rubber packing elements. The packing elements are contained by rocker action back-up rings that eliminate extrusion of the elements at high temperatures and pressures. A one way ratchet lock ring retains the setting force applied to the opposing slips and rubber to maintain a pressure tight seal. One-piece slips keep the plug securely set in premium grade casings including P-110. The slip wickers are sharp and hardened to the wicker depth only allowing the slip to grip the casing wall while maintaining a soft cast-iron inside for easier drilling. The upper slips remain in the set position during the drilling operation to allow gas pressure to equalize. This plug is ideal for zone isolation where squeeze cementing, fracturing or plug abandonment operations are being performed. Optional packing systems of Viton or Aflas are available on special order. Special application tools can be custom designed to fit your specific needs.

Specification Guide

Casing		ACT Premium Bridge Plug		Setting Range		Model A Wireline Setting Equipment			Rating			
OD	WT	Part Number	OD	Min	Max	Setting Sleeve Baker	Setting Sleeve GO	Adapter Rod GO	psi	Temp		
2.3/8	4.0-5.9	010-1710-002 Baker 010-1710-004 GO	1.710	1.867	2.041	010-1710-200 Baker No.05	010-1710-100 GO 1-11/16	Not Reqd	10,000	325 Deg F		
2.7/8	6.4-6.5	010-2160-002 Baker 010-2160-004 GO	2.160	2.441	2.517	010-2160-200 Baker No.05	010-2160-100 GO 1-11/16	Not Reqd				
3.1/2	12.7-12.95	010-2500-002 Baker 010-2500-004 GO	2.500	2.640	2.750	010-2500-200 Baker No.05	010-2500-100 GO 1-11/16	Not Reqd				
3.1/2	5.7-10.2	010-2750-002 Baker 010-2750-004 GO	2.750	2.867	3.258	010-2750-200 Baker N0.05	010-2750-100 GO 1-11/16	Not Reqd				
4	5.6-14	010-312-002 Baker 010-3120-004 GO	3.125	3.340	3.732	010-3120-200 Baker No.10	010-3120-100 GO 2-1/8	Not Reqd				
4.1/2	9.5-16.6	010-3593-002 Baker 010-3593-004 GO	3.593	3.826	4.090	010-3593-200 Baker No.10	010-3593-100 GO 3-1/2	010-3593-106	8,000	300 Deg F		
5	11.5-18	010-3937-002 Baker 010-3937-004 GO	3.937	4.154	4.560	010-3937-200 Baker No.20	010-3937-100 GO 3-1/2					
5.1/2	13-25	010-4312-002 Baker 010-4312-004 GO	4.312	4.580	5.044	010-4312-200 Baker No.20	010-4312-100 GO 3-1/2					
6	10.5-12	010-5375-002 Baker 010-5375-004 GO	5.375	5.595	6.135	010-5687-200 Baker No.20	010-5687-100 GO 3-1/2					
6.5/8	17-34											
7	32-38											
7	17-35	010-5687-002 Baker 010-5687-004 GO	5.687	6.004	6.538	010-6312-200 Baker No.20	010-6312-100 GO 3-1/2	010-5687-106			5,000	200 Deg F
7.5/8	20-39	010-6312-002 Baker 010-6312-004 GO	6.312	6.625	7.263							
8.5/5	24-49	010-7125-002 Baker 010-7125-004 GO	7.125	7.511	8.248							
9.5/8	29.3-53.5	010-8125-002 Baker 010-8125-004 GO	8.125	8.435	9.063							
10.3/4	60.7-81	010-9000-002 Baker 010-9000-004 GO	9.000	9.250	9.660							
10.3/4	32.75-60.7	010-9437-002 Baker 010-9437-004 GO	9.437	9.660	10.192							
13.3/8	77-102	010-1156-002 Baker 010-1156-004 GO	11.562	11.633	12.464							
13.3/8	48-72	010-1200-002 Baker 010-1200-004 GO	12.000	12.175	12.715							
16	65-109	010-1425-002 Baker 010-1425-004 GO	14.250	14.688	15.250							
18.5/8	76-96.5	010-1725-002 Baker 010-1725-004 GO	17.250	17.655	18.730				010-1725-200 Baker No.20	010-1725-100 GO 3-1/2		
20	133-169											

MODEL A LITE BRIDGE PLUG - WIRELINE SET / DRILLABLE



Features

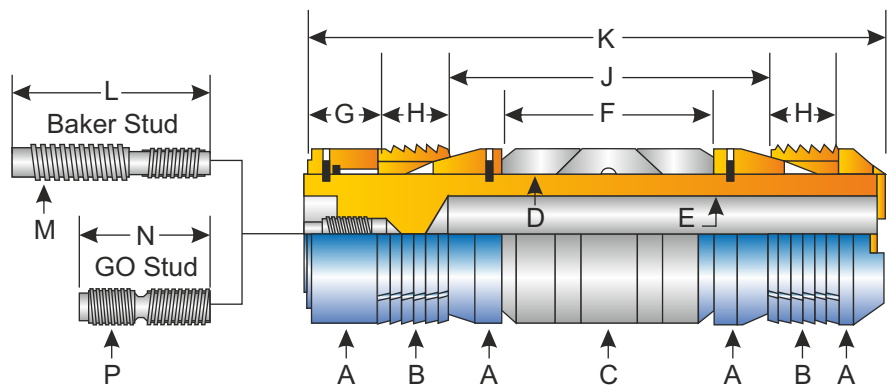
- Drillable cast iron construction
- Uses Alpha Big Boy Setting Sleeves and Adapter Rods
- Wireline set on GO or Baker Wireline Pressure Setting Tool
- Hydraulic set on ACT Hydraulic Setting Tool
- Small OD's for extra clearance in heavy viscous fluids
- One-piece slips set in premium grade casings including P-110
- Multi-Durometer packing system
- Plug remains set until gas pressure equalizes during drill out
- For temporary or permanent service

The ACT Model A Lite Bridge Plug is a medium pressure plug constructed of drillable cast-iron that uses Alpha Big Boy setting sleeves and adapter rods. It can be set on any GO or Baker type wireline pressure setting tool or pipe/coil tubing with an ACT Hydraulic Setting Tool. When set, opposing slips are located above and below the rubber packing elements. A one way ratchet lock ring retains the setting force applied to the opposing slips and rubber to maintain a pressure tight seal. One-piece slips keep the plug securely set in premium grade casings including P-110. The slip wickers are sharp and hardened to the wicker depth only allowing the slip to grip the casing wall while maintaining a soft cast-iron inside for easier drilling. The upper slips remain in the set position during the drilling operation to allow gas pressure to equalize. This plug is ideal for zone isolation where squeeze cementing, fracturing or plug abandonment operations are being performed. It is also good in horizontal applications because there are no back-up rings. Optional packing systems of Viton or Aflas are available on special order. Special application tools can be custom designed to fit your specific needs.

Specification Guide

Casing		Premium Bridge Plug		Setting Range		Model A Wireline Setting Equipment			Rating	
OD	WT	Part Number	OD	Min	Max	Setting Sleeve Baker	Setting Sleeve GO	Adapter Rod GO	psi	Temp
2.3/8	4.0-5.9	010-1710-003 Baker 010-1710-005 GO	1.710	1.867	2.041	010-1710-200 Baker No.05	010-1710-100 GO 1-11/16	Not Req'd		250 Deg F
2.7/8	6.4-6.5	010-2160-003 Baker 010-2160-005 GO	2.160	2.441	2.517	010-2160-200 Baker No.05	010-2160-100 GO 1-11/16	Not Req'd		
3.1/2	12.7-12.95	010-2500-003 Baker 010-2500-005 GO	2.500	2.640	2.750	010-2500-200 Baker No.05	010-2500-100 GO 1-11/16	Not Req'd		
3.1/2	5.7-10.2	010-2750-003 Baker 010-2750-005 GO	2.750	2.867	3.258	010-2750-200 Baker N0.05	010-2750-100 GO 1-11/16	Not Req'd		
4	5.6-14	010-312-003 Baker 010-3120-005 GO	3.125	3.340	3.732	010-3120-200 Baker No.10	010-3120-100 GO 2-1/8	Not Req'd	7,500	
4.1/2	9.5-16.6	010-3593-003 Baker 010-3593-005 GO	3.593	3.826	4.090	010-3593-200 Baker No.10	010-3593-100 GO 3-1/2			
5	11.5-18	010-3937-003 Baker 010-3937-005 GO	3.937	4.154	4.560	010-3937-200 Baker No.20	010-3937-100 GO 3-1/2	010-3593-106		
5.1/2	13-25	010-4312-003 Baker 010-4312-005 GO	4.312	4.580	5.044	010-4312-200 Baker No.20	010-4312-100 GO 3-1/2			
6	10.5-12	010-5375-003 Baker 010-5375-005 GO	5.375	5.595	6.135	010-5687-200 Baker No.20	010-5687-100 GO 3-1/2	010-5687-106		
6.5/8	17-34									
7	32-38									
7	17-35	010-5687-003 Baker 010-5687-005 GO	5.687	6.004	6.538					

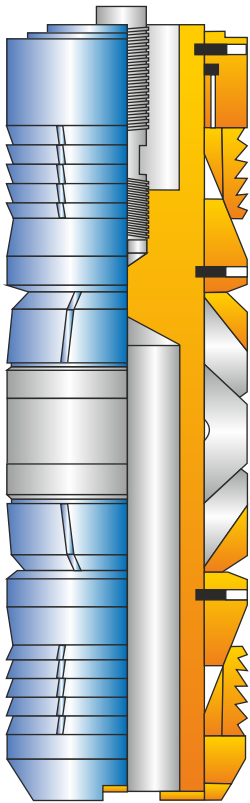
MODEL A LITE BRIDGE PLUG - WIRELINE SET / DRILLABLE



Dimensional Data

A Max OD	B	C	D	E	F	G	H	J	K	L	M	N	P
1.710	1.695	1.687	1.125	.375	2.125	1.250	1.093	4.617	9.000				
2.160	2.125	2.125	1.375	.500	3.250	1.250	1.000	5.930	10.000	7.187	5/8-18	3.937	11/16-16
2.500	2.468	2.437	1.375	.500	3.750	1.250	1.062	6.000	11.000				
2.750	2.718	2.687	1.875	.750	3.440	1.500	1.125	6.430	11.500				
3.125	3.093	3.062	1.875	.750	3.440	1.500	1.125	6.367	12.000	8.750	1" 8	5.000	11/16-16
3.593	3.531	3.531	2.500	1.250	5.375	2.000	2.187	8.200	16.687	6.500	1" 8	3.375	7/8-14
3.937	3.875	3.875	2.500	1.250	5.375	2.000	2.187	8.200	16.687				
4.312	4.187	4.218	2.750	2.000	5.625	1.875	1.625	8.500	15.812				
5.375	5.312	5.281	3.687	2.250	6.687	2.250	2.187	10.125	19.000	8.375	1-1/8 7	3.250	1-1/4 12
5.687	5.625	5.593	3.687	2.250	6.687	2.250	2.187	10.125	19.000				

MODEL BKR PREMIUM BRIDGE PLUG - WIRELINE SET / DRILLABLE



Features

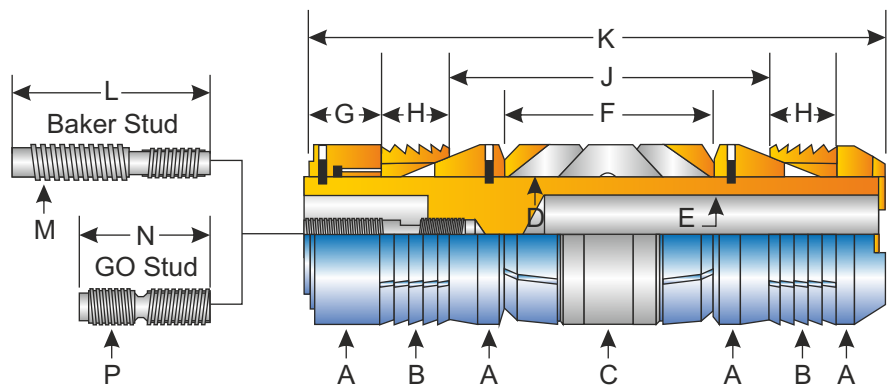
- Drillable cast iron construction
- Uses Bolt, Elder or Baker K-1 Setting Sleeves
- Wireline set on Baker Type Wireline Pressure Setting Tool
- Hydraulic set on ACT Hydraulic Setting Tool
- Small OD's for extra clearance in heavy viscous fluids
- One-piece slips set in premium grade casings including P-110
- Rocker action back-up prevent rubber extrusion
- For temporary or permanent service

The ACT Model BKR Premium Bridge Plug is a high pressure plug constructed of drillable cast-iron that uses Bolt, Elder or Baker K- 1 type setting sleeves, no tension mandrel is required. It can be set on any Baker type wireline pressure setting tool or pipe/coil tubing with an ACT Hydraulic Setting Tool. When set, opposing slips are located above and below the rubber packing elements. The packing elements are contained by rocker action back-up rings that eliminate extrusion of the elements at high temperatures and pressures. A one way ratchet lock ring retains the setting force applied to the opposing slips and rubber to maintain a pressure tight seal. One piece slips keep the plug securely set in premium grade casings including P-110. The slip wickers are sharp and hardened to the wicker depth only allowing the slip to grip the casing wall while maintaining a soft cast-iron inside for easier drilling. This plug is ideal for zone isolation where squeeze cementing, fracturing or plug abandonment operations are being performed. Optional packing systems of Viton or Aflas are available on special order. This plug will not vent gas pressure prior to plug moving unless provisions are made. Special application tools can be custom designed to fit your specific needs.

Specification Guide

Casing		Model BKR Premium Bridge Plug		Setting Range		Model BKR Wireline Setting Sleeve		Rating	
OD	WT	Part Number	OD	Min	Max	Sleeve Part Number	Baker No.	psi	Temp
4.1/2	9.5-16.6	010-3593-000	3.593	3.826	4.090	050-3593-200	10	10,000	325 Deg F
5	11.5-18	010-3937-000	3.937	4.154	4.560	050-3937-200	20		
5.1/2	13-25	010-4312-000	4.312	4.580	5.044	050-4312-200	20		
6	10.5-12	010-5375-000	5.375	5.595	6.135	050-5687-200	20		
6.5/8	17-34	010-5687-000	5.687	6.004	6.538	050-6312-200	20		
7	32-38								
7	17-35								
7.5/8	20-39	010-6312-000	6.312	6.625	7.263	050-7125-200	20	8,000	300 Deg F
8.5/5	24-49	010-7125-000	7.125	7.511	8.248				
9.5/8	29.3-53.5	010-8125-000	8.125	8.435	9.063	050-8125-200	20		
10.3/4	60.7-81	010-9000-000	9.000	9.250	9.660	050-9000-200	20		
10.3/4	32.75-60.7	010-9437-000	9.437	9.660	10.192	050-9437-200	20		
13.3/8	77-102	010-1156-000	11.562	11.633	12.464	050-1156-200	20	3,000	
13.3/8	48-72	010-1200-000	12.000	12.175	12.715	050-1200-200	20		

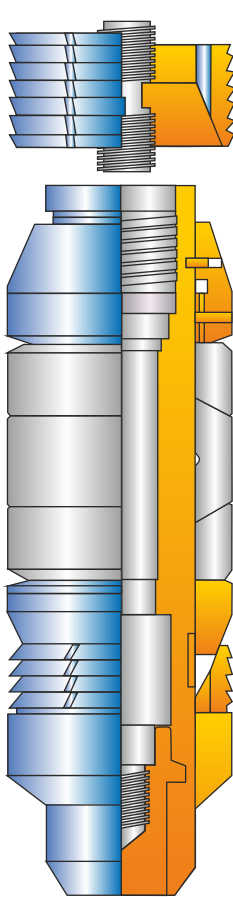
MODEL BKR PREMIUM BRIDGE PLUG - WIRELINE SET / DRILLABLE



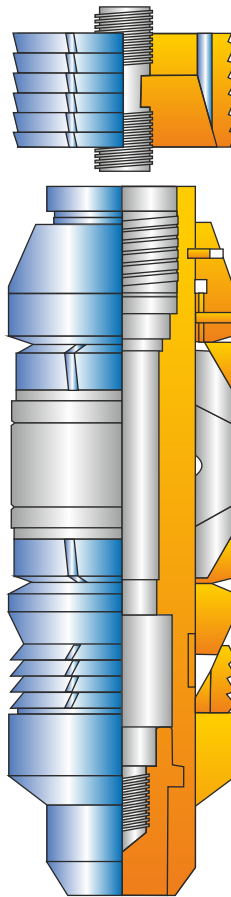
Dimensional Data

A Max OD	B	C	D	E	F	G	H	J	K	L	M	N	P
3.593	3.531	3.531	2.500	1.250	5.375	2.000	2.187	8.200	16.687	6.500	1" 8	3.375	7/8-14
3.937	3.875	3.875	2.500	1.250	5.375	2.000	2.187	8.200	16.687				
4.312	4.187	4.218	2.750	2.000	5.625	1.875	1.625	8.500	15.812				
5.375	5.312	5.281	3.687	2.250	6.687	2.250	2.187	10.125	19.000				
5.687	5.625	5.593	3.687	2.250	6.687	2.250	2.187	10.125	19.000				
6.312	6.250	6.250	4.125	2.625	6.562	NA	2.187	10.812	18.500				
7.125	7.062	7.000	4.625	3.125	6.562	NA	2.500	11.250	19.250	8.375	1-1/8 7	3.250	1-1/4 12
8.125	8.000	8.000	5.125	3.500	6.562	NA	2.750	11.250	19.250				
9.000	8.875	8.875	5.687	4.000	6.000	NA	3.250	14.906	23.250				
9.437	9.375	9.375	6.750	5.000	8.875	NA	3.125	14.906	23.250				
11.562	11.500	11.500	9.000	7.125	8.875	NA	3.250	15.000	24.000				
12.000	11.875	11.875	9.000	7.125	8.875	NA	3.250	15.000	24.000				

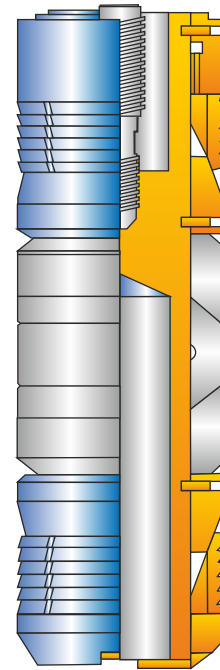
DRILLABLE BRIDGE PLUGS - WIRELINE SET



**ACT Model BKR 1
Lite Bridge Plug**



**ACT Model BKR 1
Premium
Bridge Plug**



**ACT Model BKR
Lite Bridge Plug**

The ACT Model BKR-1 Premium Bridge Plug is a wireline set, high pressure plug constructed of drillable cast-iron that uses Bolt, Elder or Baker K-1 type setting sleeves and tension mandrels. It has a Model BKR Cement Retainer body and a BKR-1 Bridge Plug bottom. It can be set on any Baker Wireline Pressure Setting Tool or on pipe/coil tubing with an ACT Hydraulic Setting Tool. It can also be converted and run on a Baker K-1 Mechanical Setting Tool. This plug will not vent gas pressure prior to plug moving unless provisions are made. Available in 4-1/2" thru 13-3/8" casing sizes.

The ACT Model BKR-1 Lite Bridge Plug is a wireline set, medium pressure plug constructed of drillable cast-iron that uses Bolt, Elder or Baker K-1 type setting sleeves and tension mandrels. It has a Model BKR Cement Retainer body and a BKR-1 Bridge Plug bottom. It can be set on any Baker Wireline Pressure Setting Tool or on pipe/coil tubing with an ACT Hydraulic Setting Tool. It can also be converted and run on a Baker K-1 Mechanical Setting Tool. This plug will not vent gas pressure prior to plug moving unless provisions are made. Available in 4-1/2" thru 13-3/8" casing sizes.

The ACT Model BKR Lite Bridge Plug is a wireline set, medium pressure plug constructed of drillable cast-iron that uses Bolt, Elder or Baker K-1 type setting sleeves, no tension mandrel is required. It can be set on any Baker type wireline pressure setting tool or pipe/coil tubing with an ACT Hydraulic Setting Tool. This plug will not vent gas pressure prior to plug moving unless provisions are made. Available in 4-1/2" thru 13-3/8" casing sizes.

MODEL BKR-1 PREMIUM BRIDGE PLUG SPECIFICATION GUIDE

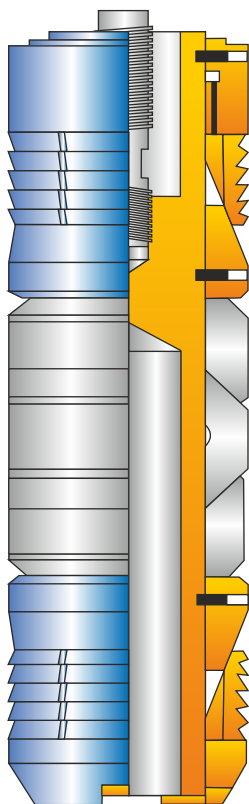
Specification Guide

Casing		Model BKR-1 Premium Bridge Plug (WS)		Setting Range		Model BKR Wireline Setting Equipment				Rating	
OD	WT	Part Number	OD	Min	Max	Sleeve Part Number	Tension Mandrel	Stub Bushing	Baker No.	psi	Temp
4.1/2	9.5-16.6	050-3593-002	3.593	3.826	4.090	050-3593-200	050-3593-205	Not Required	10	10,000	325 Deg F
5	11.5-18	050-3937-002	3.937	4.154	4.560	050-3937-200	050-3937-205		20		
5.1/2	13-25	050-4312-002	4.312	4.580	5.044	050-4312-200	20				
6	10.5-12	050-5375-002	5.375	5.595	6.135	050-5687-200	20				
6.5/8	17-34										
7	32-38										
7	17-35	050-5687-002	5.687	6.004	6.538				20		
7.5/8	20-39	050-6312-002	6.312	6.625	7.263	050-6312-200			20		
8.5/5	24-49	050-7125-002	7.125	7.511	8.248	050-7125-200		20	8,000		
9.5/8	29.3-53.5	050-8125-002	8.125	8.435	9.063	050-8125-200	050-5687-205	050-8125-210	20		300 Deg F
10.3/4	60.7-81	050-9000-002	9.000	9.250	9.660	050-9000-200			20	5,000	
10.3/4	32.75-60.7	050-9437-002	9.437	9.660	10.192	050-9437-200			20		
13.3/8	77-102	050-1156-002	11.562	11.633	12.464	050-1156-200			20	3,000	
13.3/8	48-72	050-1200-002	12.000	12.175	12.715	050-1200-200			20		
16	65-109	050-1425-002	14.250	14.688	15.250	050-1425-200			20	2,000	200 Deg F
18.5/8	76-96.5	050-1725-002	17.250	17.655	18.73	050-1725-200			20		
20	133-169	050-1725-002	17.250	17.655	18.73	050-1725-200			20		

Specification Guide

Casing		Model BKR-1 Premium Bridge Plug (MS)		Setting Range		Model BKR Mechanical Setting Equipment		Rating	
OD	WT	Part Number	OD	Min	Max	Assembly	Seal Bore	psi	Temp
4.1/2	9.5-16.6	050-3593-003	3.593	3.826	4.090	060-3593-000	1.345	10,000	325 Deg F
5	11.5-18	050-3937-003	3.937	4.154	4.560	060-3937-000			
5.1/2	13-25	050-4312-003	4.312	4.580	5.044	060-4312-000			
6	10.5-12	050-5375-003	5.375	5.595	6.135	060-5687-000	2		
6.5/8	17-34								
7	32-38								
7	17-35	050-5687-003	5.687	6.004	6.538				
7.5/8	20-39	050-6312-003	6.312	6.625	7.263	060-6312-000			
8.5/8	24-49	050-7125-003	7.125	7.511	8.248	060-7125-000		8,000	300 Deg F
9.5/8	29.3-53.5	050-8125-003	8.125	8.435	9.063	060-8125-000		5,000	
10.3/4	60.7-81	050-9000-003	9.000	9.250	9.660	060-9000-000			
10.3/4	32.75-60.7	050-9437-003	9.437	9.660	10.192	060-9437-000			
13.3/8	77-102	050-1156-003	11.562	11.633	12.464	060-1156-000	3,000		
13.3/8	48-72	050-1200-003	12.000	12.175	12.715	060-1200-000	2,000		
16	65-109	050-1425-002	14.250	14.688	15.250	060-1425-000			
18.5/8	76-96.5	050-1725-002	17.250	17.655	18.730	060-1725-000			
20	133-169	050-1725-002	17.250	17.655	18.730	060-1725-000			

MODEL BKR LITE BRIDGE PLUG - WIRELINE SET / DRILLABLE



Features

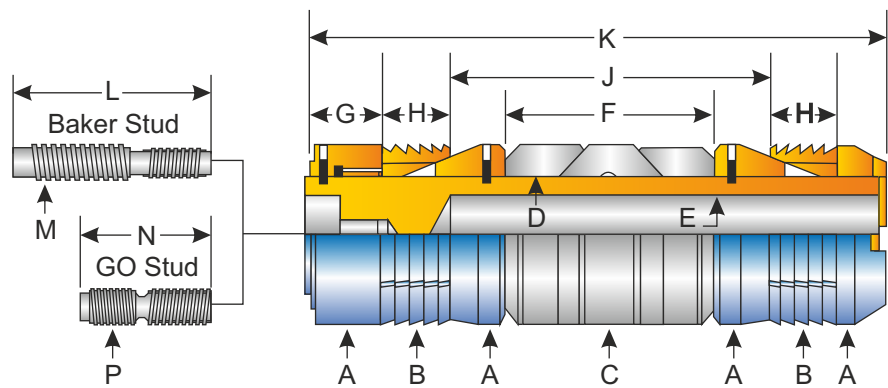
- Drillable cast iron construction
- Uses Bolt, Elder or Baker K-1 Setting Sleeves
- Wireline set on Baker Type Wireline Pressure Setting Tool
- Hydraulic set on ACT Hydraulic Setting Tool
- Small OD's for extra clearance in heavy viscous fluids
- One-piece slips set in premium grade casings including P-110
- Multi-Durometer packing system
- For temporary or permanent service

The ACT Model BKR Lite Bridge Plug is a medium pressure plug constructed of drillable cast-iron that uses Bolt, Elder or Baker K-1 type setting sleeves, no tension mandrel is required. It can be set on any Baker type wireline pressure setting tool or pipe/coil tubing with an ACT Hydraulic Setting Tool. When set, opposing slips are located above and below the rubber packing elements. A one way ratchet lock ring retains the setting force applied to the opposing slips and rubber to maintain a pressure tight seal. One-piece slips keep the plug securely set in premium grade casings including P-110. The slip wickers are sharp and hardened to the wicker depth only allowing the slip to grip the casing wall while maintaining a soft cast-iron inside for easier drilling. The upper slips remain in the set position during the drilling operation to allow gas pressure to equalize. This plug is ideal for zone isolation where squeeze cementing, fracturing or plug abandonment operations are being performed. It is also good in horizontal applications because there are no back-up rings. Optional packing systems of Viton or Aflas are available on special order. This plug will not vent gas pressure prior to plug moving unless provisions are made. Special application tools can be custom designed to fit your specific needs.

Specification Guide

Casing		Model BKR Premium Bridge Plug		Setting Range		Model BKR Wireline Setting Sleeve		Rating	
OD	WT	Part Number	OD	Min	Max	Sleeve Part Number	Baker No.	psi	Temp
4.1/2	9.5-16.6	010-3593-001	3.593	3.826	4.090	050-3593-200	10	7,500	250 Deg F
5	11.5-18	010-3937-001	3.937	4.154	4.560	050-3937-200	20		
5.1/2	13-25	010-4312-001	4.312	4.580	5.044	050-4312-200	20		
6	10.5-12	010-5375-001	5.375	5.595	6.135	050-5687-200	20		
6.5/8	17-34								
7	32-38								
7	17-35								

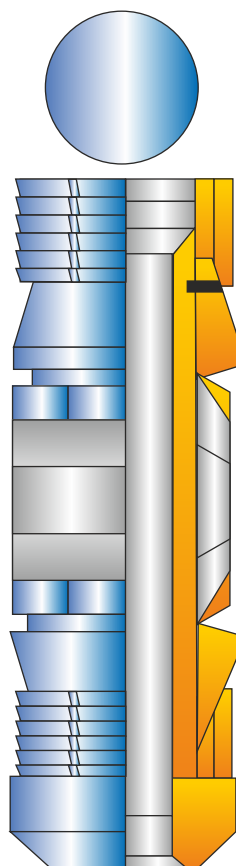
MODEL BKR LITE BRIDGE PLUG - WIRELINE SET / DRILLABLE



Dimensional Data

A Max OD	B	C	D	E	F	G	H	J	K	L	M	N	P
3.593	3.531	3.531	2.500	1.250	5.375	2.000	2.187	8.200	16.687	6.500	1" 8	3.375	7/8-14
3.937	3.875	3.875	2.500	1.250	5.375	2.000	2.187	8.200	16.687				
4.312	4.187	4.218	2.750	2.000	5.625	1.875	1.625	8.500	15.812				
5.375	5.312	5.281	3.687	2.250	6.687	2.250	2.187	10.125	19.000	8.375	1-1/8 7	3.250	1-1/4 12
5.687	5.625	5.593	3.687	2.250	6.687	2.250	2.187	10.125	19.000				

FRAC PLUGS WIRELINE SET - STANDARD FRAC PLUG



Frac Plug

The Standard Frac Plug provides an economical means of temporary zone isolation for fracturing or other treatments. The plug can be set on different types of wireline pressure setting tools.

The Standard Frac Plug is supplied with a shear ring to give an accurate and secure set. Also supplied is a ball that will seat on the top of Frac Plug during a fracturing operation. This plug sustains moderate pressures and temperatures.

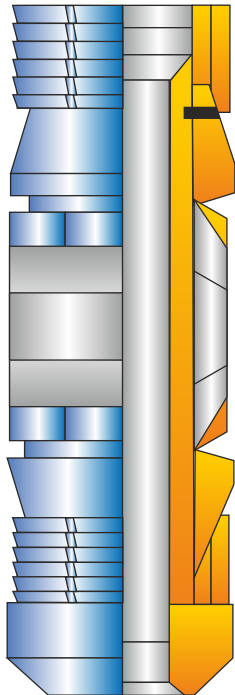
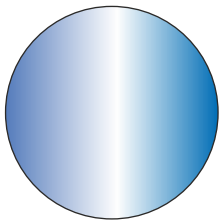
Features:

- Electric wireline set
- Drillable
- Cast iron construction
- One piece slips - hardened to depth of wicker only
- Sets in any grade casing including P-110
- Bottom set with shear ring
- For temporary or permanent service
- Ratcheting lock ring holds setting force
- Small O.D.'s for speed and safety when running

SPECIFICATIONS

Casing		Plug		Setting Range		Setting Tool	
OD	Wt. (Lbs/Ft)	Part No.	O.D.	Min.	Max.	Baker	Go
4.1/2	9.5 - 16.6	020-3593-000	3.593	3.826	4.090	10	3.1/2
4.1/2	9.5 - 13.5	020-3937-000	3.937	3.920	4.560	10	3.1/2
5	11.5 - 21	020-3937-000	3.937	3.920	4.560	10	3.1/2
5.1/2	13 - 25	020-4312-000	4.312	4.580	5.047	20	3.1/2
5.3/4	22.5 - 25.2	020-4312-000	4.312	4.580	5.047	20	3.1/2
6.5/8	17 - 22	020-5687-000	5.687	5.989	6.655	20	3.1/2
7	17 - 35	020-5687-000	5.687	5.989	6.655	20	3.1/2

FRAC PLUGS WIRELINE SET - BIG BORE FRAC PLUG



Frac Plug

The Big Bore Frac Plug is designed for frac jobs in which a large hole through the plug is required. The plug is supplied with a shear ring to give an accurate and secure set. Also supplied is a ball that will seat on the top of Frac Plug during a fracturing operation. This plug sustains moderate pressures and temperatures.

Features:

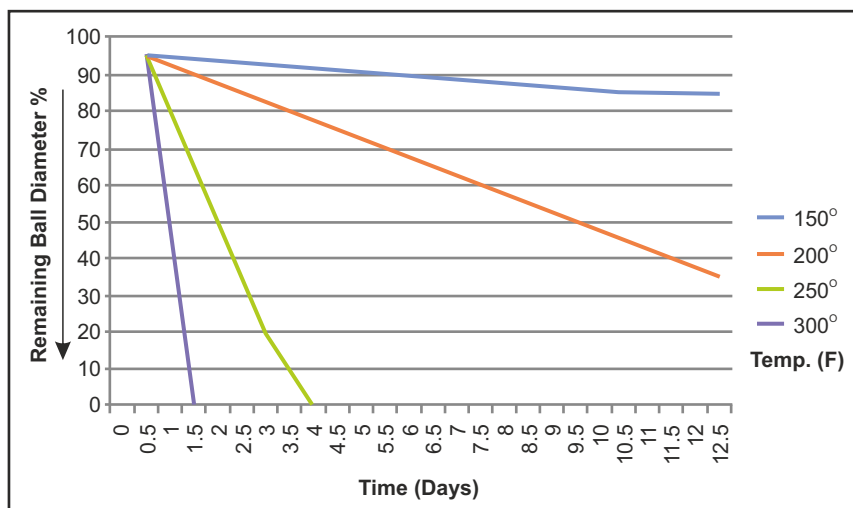
- Electric wireline set
- Drillable
- One piece slips - hardened to depth of wicker only
- Sets in any grade casing including P-110
- Top set with shear ring
- For temporary or permanent service
- Ratcheting lock ring holds setting force

SPECIFICATIONS

Casing		Plug		Setting Range		Setting Tool	
OD	Wt. (Lbs/Ft)	Part No.	O.D.	Min.	Max.	Baker	Go
4.1/2	9.5 - 13.5	020-3718-000	3.718	3.920	4.090	10	3.1/2
5.1/2	13 - 17	020-4500-000	4.500	4.812	5.044	20	3.1/2
6.5/8	17 - 20	020-5687-000	5.687	6.004	6.366	20	3.1/2
7	23 - 35	020-5687-000	5.687	6.004	6.366	20	3.1/2

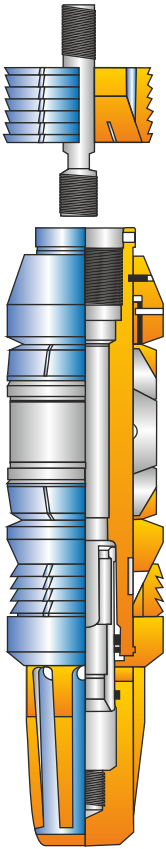
DISSOLVABLE FRAC BALLS

ACT Dissolvable frac balls eliminates the need for intervention to remove it after the fracturing operation, and thereby saving time and operational costs. The ball dissolves in a few days in the presence of elevated temperature in any fluid environment. Dissolvable frac balls allow to hold pressure during fracing operations. After exposing to the well bore conditions, the balls completely dissolve, preventing production blockage and eliminating debris.



Effect of temperature and time for dissolution of the ball

DRILLABLE CEMENT RETAINERS - WIRELINE SET

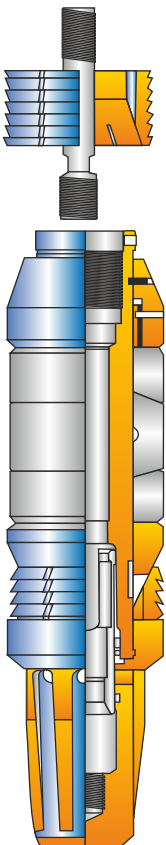


The ACT Model BKR Premium Cement Retainer (W/L) is a wireline set, high pressure retainer constructed of drillable cast-iron that uses Bolt, Elder or Baker K-1 type setting sleeves and tension mandrels. It can be set on any Baker type wireline pressure setting tool or pipe/coil tubing with an ACT Hydraulic Setting Tool. When set, opposing slips are located above and below the rubber packing elements. The packing elements are contained by rocker action back-up rings that eliminate extrusion of the elements at high temperatures and pressures. A one way ratchet lock ring retains the setting force applied to the opposing slips and rubber to maintain a pressure tight seal. One-piece slips keep the retainer securely set in premium grade casings including P-110. The slip wickers are sharp and hardened to the wicker depth only allowing the slip to grip the casing wall while maintaining a soft cast-iron inside for easier drilling. It features a pressure balanced two way valve located in the bottom shoe. The operator controls the two way valve from the surface to hold the final squeeze pressure under the retainer or test tubing or keep hydrostatic pressure off the squeeze. Straight pick up closes the valve and set down weight opens the valve. This retainer is ideal for where squeeze cementing operations are being performed. Optional packing systems of Viton or Aflas are available on special order. Special application tools can be custom designed to fit your specific needs. Available in 4-1/2" thru 13-3/8" casing sizes.

After the ACT BKR Cement Retainer is set on wireline a BKR Seal Unit is required to perform the squeeze job. These seal units are available in two types, a locator seal unit or a snap latch seal unit. The seal unit is installed on the bottom of the workstring to control the two way valve in the set retainer.

Features

- Drillable cast iron construction
- Uses Bolt, Elder or Baker K-1 Setting Sleeves
- Wireline set on Baker Type Wireline Pressure Setting Tool
- Hydraulic set on ACT Hydraulic Setting Tool
- Small ODs for extra clearance in heavy viscous fluids
- One-piece slips set in premium grade casings including P-110
- Rocker action back-up prevents rubber extrusion
- Pressure balanced two way valve
- Set down weight to open valve, pick up to close
- Optional Mechanical or BKR-1 Bridge Plug conversion kits



The ACT Model BKR Lite Cement Retainer (W/L) is a wireline set, medium pressure retainer constructed of drillable cast-iron that uses Bolt, Elder or Baker K-1 type setting sleeves and tension mandrels. It can be set on any Baker type wireline pressure setting tool or pipe/coil tubing with an ACT Hydraulic Setting Tool. When set, opposing slips are located above and below the multi-durometer packing elements. A one way ratchet lock ring retains the setting force applied to the opposing slips and rubber to maintain a pressure tight seal. One-piece slips keep the retainer securely set in premium grade casings including P-110. The slip wickers are sharp and hardened to the wicker depth only allowing the slip to grip the casing wall while maintaining a soft cast-iron inside for easier drilling. It features a pressure balanced two way valve located in the bottom shoe. The operator controls the two way valve from the surface to hold the final squeeze pressure under the retainer or test tubing or keep hydrostatic pressure off the squeeze. Straight pick up closes the valve and set down weight opens the valve. This retainer is ideal for where squeeze cementing operations are being performed. Optional packing systems of Viton or Aflas are available on special order. Special application tools can be custom designed to fit your specific needs. Available in 4-1/2" thru 13-3/8" casing sizes.

After the ACT BKR Cement Retainer is set on wireline a BKR Seal Unit is required to perform the squeeze job. These seal units are available in two types, a locator seal unit or a snap latch seal unit. The seal unit is installed at the bottom of the workstring to control the two way valve in the set retainer.

Features

- Drillable cast iron construction
- Uses Bolt, Elder or Baker K-1 Setting Sleeves
- Wireline set on Baker Type Wireline Pressure Setting Tool
- Hydraulic set on ACT Hydraulic Setting Tool
- Small ODs for extra clearance in heavy viscous fluids
- One-piece slips set in premium grade casings including P-110
- Multi-Durometer Packing Elements
- Pressure balanced two way valve
- Set down weight to open valve, pick up to close
- Optional Mechanical or BKR-1 Bridge Plug conversion kits

SUGGESTED ROTARY DRILLING TECHNIQUES **DRILLABLE CEMENT RETAINERS - BRIDGE PLUGS**

Suggested Rotary Drilling Techniques for ACT Cement Retainers and Bridge Plugs

When drilling a cast iron cement retainer or bridge plug the same considerations should be used as when drilling a medium hard formation. Drilling with a medium tooth medium hard formation rock bit is usually the best combination. Spudding the work string and variations in rotary speed and set down weight should be used to aid in breaking up large metal parts and preventing bit tracking. One or more junk baskets should be used above the bit when normal circulation is employed.

Bit - Medium tooth medium hard formation rock bit.

Rotary Speed - 75 to 120 RPM is suggested.

Weight on bit - Apply 5,000-7,000 lbs. until top end of bridge plug or cement retainer body is drilled away, 4-1/2 thru 7 (3-5 inches) 7-5/8 and larger (5-9 inches). An additional 3,000 lbs. of weight can now be applied per inch of bit diameter to drill the remainder of the cast iron product. Example: 4-1/2 bit will use 9,000-13,500 lbs. of weight.

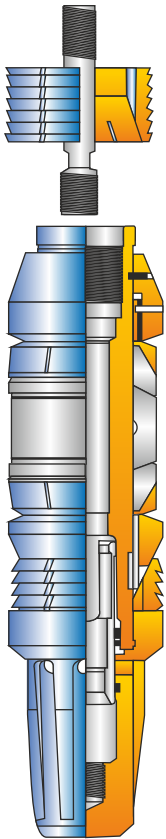
Drill Collars - Should be used for weight on bit and bit stabilization.

Example: 4-1/2 thru 5-1/2 (8-min.) 7 and larger (12 min.).

Junk Baskets - One or more junk baskets should be used above the bit.

Annular Velocity - 120 feet per minute is suggested.

MODEL BKR PREMIUM CEMENT RETAINER - WIRELINE SET / DRILLABLE



Features

- Drillable cast iron construction
- Uses Bolt, Elder or Baker K-1 Setting Sleeves
- Wireline set on Baker Type Wireline Pressure Setting Tool
- Hydraulic set on ACT Hydraulic Setting Tool
- Small OD's for extra clearance in heavy viscous fluids
- One-piece slips set in premium grade casings including P-110
- Rocker action back-up prevent rubber extrusion
- Pressure balanced two way valve
- Set down weight to open valve, pick up to close
- Optional Mechanical or BKR-1 Bridge Plug conversion kits

The ACT Model BKR Premium Cement Retainer (W/L) is a wireline set, high pressure retainer constructed of drillable cast-iron that uses Bolt, Elder or Baker K-1 type setting sleeves and tension mandrels. It can be set on any Baker type wireline pressure setting tool or pipe/coil tubing with an ACT Hydraulic Setting Tool. When set, opposing slips are located above and below the rubber packing elements. The packing elements are contained by rocker action back-up rings that eliminate extrusion of the elements at high temperatures and pressures. A one way ratchet lock ring retains the setting force applied to the opposing slips and rubber to maintain a pressure tight seal. One-piece slips keep the retainer securely set in premium grade casings including P-110. The slip wickers are sharp and hardened to the wicker depth only allowing the slip to grip the casing wall while maintaining a soft cast-iron inside for easier drilling. It features a pressure balanced two way valve located in the bottom shoe. The operator controls the two way valve from the surface to hold the final squeeze pressure under the retainer or test tubing or keep hydrostatic pressure off the squeeze. Straight pick up closes the valve and set down weight opens the valve. This retainer is ideal for where squeeze cementing operations are being performed. Optional packing systems of Viton or Aflas are available on special order. Special application tools can be custom designed to fit your specific needs.

After the ACT BKR Cement Retainer is set on wireline a BKR Seal Unit is required to perform the squeeze job. These seal units are available in two types, a locator seal unit or a snap latch seal unit. The seal unit is installed on the bottom of the workstring to control the two way valve in the set retainer.

Specification Guide

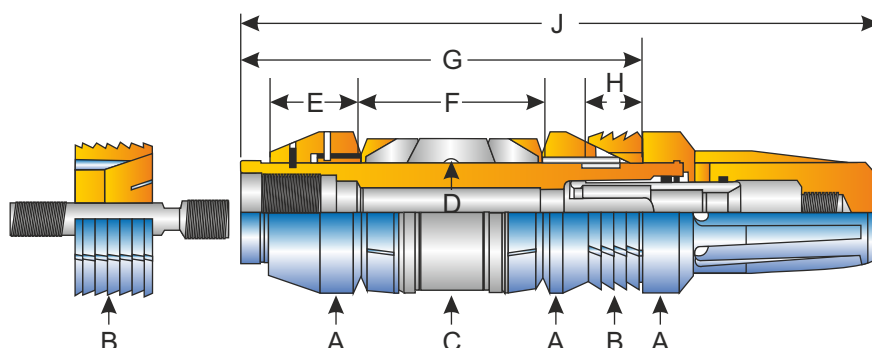
Casing		Model BKR Premium Cement Retainer (WS)		Setting Range		Model BKR Wireline Setting Equipment				Rating					
OD	WT	Part Number	OD	Min	Max	Sleeve Part Number	Tension Mandrel	Stub Bushing	Baker No.	psi	Temp				
4.1/2	9.5-16.6	050-3593-000	3.593	3.826	4.090	050-3593-200	050-3593-205	Not Required	10	10,000	325 Deg F				
5	11.5-18	050-3937-000	3.937	4.154	4.560	050-3937-200	050-3937-205		20						
5.1/2	13-25	050-4312-000	4.312	4.580	5.044	050-4312-200	050-5687-200		20						
6	10.5-12	050-5375-000	5.375	5.595	6.135	050-6312-200			20						
6.5/8	17-34								050-5687-000			5.687	6.004	6.538	20
7	32-38														
7	17-35	050-6312-000	6.312	6.625	7.263		050-7125-200		20	8,000					
8.5/5	24-49	050-7125-000	7.125	7.511	8.248	050-8125-200	20								
9.5/8	29.3-53.5	050-8125-000	8.125	8.435	9.063	050-9000-200	20		300 Deg F						
10.3/4	60.7-81	050-9000-000	9.000	9.250	9.660	050-9437-200	20								
10.3/4	32.75-60.7	050-9437-000	9.437	9.660	10.192	050-1156-200	20								
13.3/8	77-102	050-1156-000	11.562	11.633	12.464	050-1200-200	20								
13.3/8	48-72	050-1200-000	12.000	12.175	12.715	050-1425-200	20	2,000							
16	65-109	050-1425-002	14.250	14.688	15.250	050-1725-200	20								
18.5/8	76-96.5	050-1725-002	17.250	17.655	18.73	050-1725-200	20		200 Deg F						
20	133-169	050-1725-002	17.250	17.655	18.73	050-1725-200	20								

Note : odd sizes such as 17" , 22" , & 24" are available on request

MODEL BKR PREMIUM CEMENT RETAINER - WIRELINE SET / DRILLABLE

Specification Guide

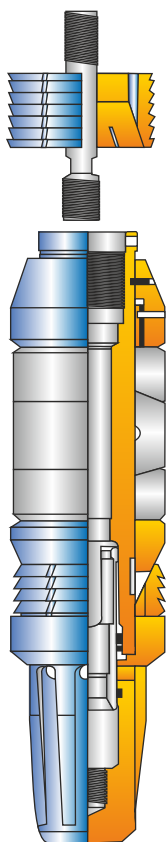
Casing		Model BKR Premium Cement Retainer (MS)		Setting Range		Model BKR Mechanical Setting Equipment		Rating	
OD	WT	Part Number	OD	Min	Max	Assembly	Seal Bore	psi	Temp
4.1/2	9.5-16.6	050-3593-001	3.593	3.826	4.090	060-3593-000	1.345	10,000	325 Deg F
5	11.5-18	050-3937-001	3.937	4.154	4.560	060-3937-000			
5.1/2	13-25	050-4312-001	4.312	4.580	5.044	060-4312-000			
6	10.5-12	050-5375-001	5.375	5.595	6.135	060-5687-000			
6.5/8	17-34								
7	32-38								
7	17-35	050-5687-001	5.687	6.004	6.538	060-6312-000 060-7125-000 060-8125-000 060-9000-000 060-9437-000 060-1156-000 060-1200-000 060-1425-000 060-1725-000 050-1725-000	8,000	300 Deg F	
7.5/8	20-39	050-6312-001	6.312	6.625	7.263				
8.5/5	24-49	050-7125-001	7.125	7.511	8.248				
9.5/8	29.3-53.5	050-8125-001	8.125	8.435	9.063				
10.3/4	60.7-81	050-9000-001	9.000	9.250	9.660		5,000	200 Deg F	
10.3/4	32.75-60.7	050-9437-001	9.437	9.660	10.192		060-9437-000		
13.3/8	77-102	050-1156-001	11.562	11.633	12.464		060-1156-000		3,000
13.3/8	48-72	050-1200-001	12.000	12.175	12.715		060-1200-000		2,000
16	65-109	050-1425-001	14.250	14.688	15.250		060-1425-000		
18.5/8	76-96.5	050-1725-001	17.250	17.655	18.730		060-1725-000		
20	133-169	050-1725-001	17.250	17.655	18.730	050-1725-000			



Dimensional Data

A Max OD	B	C	D	E	F	G	H	J	Seal Bore
3.593	3.531	3.531	2.500	2.437	5.375	12.437	2.187	20.312	1.345
3.937	3.875	3.875	2.500	2.437	5.375	12.437	2.187	20.312	
4.312	4.187	4.218	2.750	2.875	5.625	12.437	1.625	20.312	
5.375	5.312	5.281	3.687	2.687	6.687	14.032	2.187	22.000	2.000
5.687	5.625	5.593	3.687	2.687	6.687	14.032	2.187	22.000	
6.312	6.250	6.250	4.125	3.062	6.562	14.125	2.187	22.062	
7.125	7.062	7.000	4.625	2.750	6.562	15.093	2.500	22.781	
8.125	8.000	8.000	5.125	3.062	6.562	15.093	2.750	22.781	
9.000	8.875	8.875	5.687	3.500	6.000	19.500	3.250	23.125	
9.437	9.375	9.375	6.750	3.500	8.875	19.500	3.125	23.125	
11.562	11.500	11.500	9.000	4.625	8.875	21.343	3.250	23.875	
12.000	11.875	11.875	9.000	4.625	8.875	12.343	3.250	23.875	

MODEL BKR LITE CEMENT RETAINER - WIRELINE SET / DRILLABLE



Features

- Drillable cast iron construction
- Uses Bolt, Elder or Baker K-1 Setting Sleeves
- Wireline set on Baker Type Wireline Pressure Setting Tool
- Hydraulic set on ACT Hydraulic Setting Tool
- Small OD's for extra clearance in heavy viscous fluids
- One-piece slips set in premium grade casings including P-110
- Multi-Durometer Packing Elements
- Pressure balanced two way valve
- Set down weight to open valve, pick up to close
- Optional Mechanical or BKR-1 Bridge Plug conversion kits

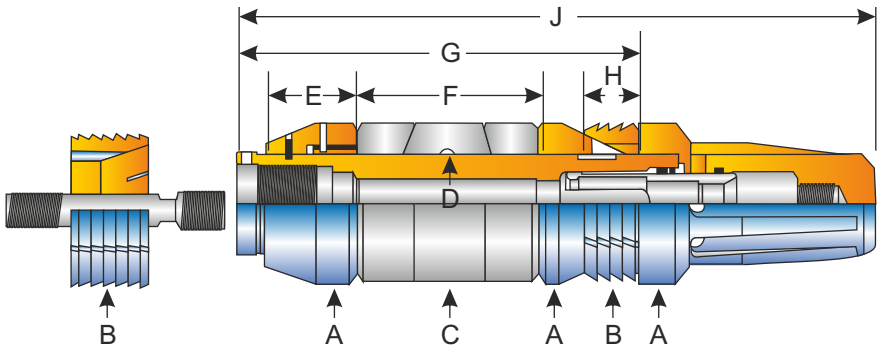
The ACT Model BKR Lite Cement Retainer (W/L) is a wireline set, medium pressure retainer constructed of drillable cast-iron that uses Bolt, Elder or Baker K-1 type setting sleeves and tension mandrels. It can be set on any Baker type wireline pressure setting tool or pipe/coil tubing with an ACT Hydraulic Setting Tool. When set, opposing slips are located above and below the multi-durometer packing elements. A one way ratchet lock ring retains the setting force applied to the opposing slips and rubber to maintain a pressure tight seal. One-piece slips keep the retainer securely set in premium grade casings including P-110. The slip wickers are sharp and hardened to the wicker depth only allowing the slip to grip the casing wall while maintaining a soft cast-iron inside for easier drilling. It features a pressure balanced two way valve located in the bottom shoe. The operator controls the two way valve from the surface to hold the final squeeze pressure under the retainer or test tubing or keep hydrostatic pressure off the squeeze. Straight pick up closes the valve and set down weight opens the valve. This retainer is ideal for where squeeze cementing operations are being performed. Optional packing systems of Viton or Aflas are available on special order. Special application tools can be custom designed to fit your specific needs.

After the ACT BKR Cement Retainer is set on wireline a BKR Seal Unit is required to perform the squeeze job. These seal units are available in two types, a locator seal unit or a snap latch seal unit. The seal unit is installed on the bottom of the workstring to control the two way valve in the set retainer.

Specification Guide

Casing		Model BKR Lite Cement Retainer		Setting Range		Model BKR Wireline Setting Sleeve			Rating	
OD	WT	Part Number	OD	Min	Max	Sleeve Part Number	Tension Mandrel	Baker No.	psi	Temp
4.1/2	9.5-16.6	050-3593-004	3.593	3.826	4.090	050-3593-200	050-3593-205	10	7,500	250 Deg F
5	11.5-18	050-3937-004	3.937	4.154	4.560	050-3937-200	050-3937-205	20		
5.1/2	13-25	050-4312-004	4.312	4.580	5.044	050-4312-200		20		
6	10.5-12	050-5375-004	5.375	5.595	6.135	050-5687-200		20		
6.5/8	17-34									
7	32-38									
7	17-35	050-5687-004	5.687	6.004	6.538					

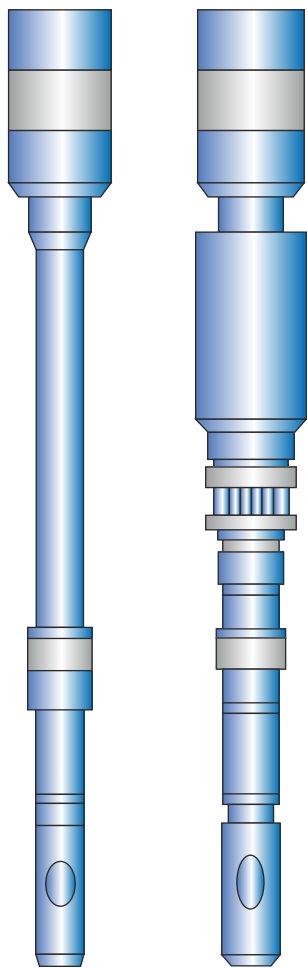
MODEL BKR LITE CEMENT RETAINER - WIRELINE SET / DRILLABLE



Dimensional Data

A Max OD	B	C	D	E	F	G	H	J	Seal Bore
3.593	3.531	3.531	2.500	2.437	5.375	12.437	2.187	20.312	1.345
3.937	3.875	3.875	2.500	2.437	5.375	12.437	2.187	20.312	
4.312	4.187	4.218	2.750	2.875	5.625	12.437	1.625	20.312	
5.375	5.312	5.281	3.687	2.687	6.687	14.032	2.187	22.000	2.000
5.687	5.625	5.593	3.687	2.687	6.687	14.032	2.187	22.000	

MODEL BKR SEAL NIPPLES - BKR SLEEVE VALVE CEMENT RETAINERS



BKR Locator & Latching Type Seal Units

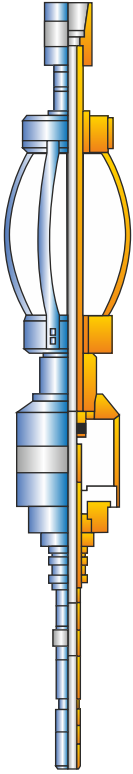
Locator Type:
This unit provides positive control of the sleeve valve and seals the tubing to the retainer during pressuring operations when the need for anchoring is not warranted.
The tubing can be tested by stinging into the retainer, then raising the tubing approximately 4" at the retainer, which allows the valve to be closed and the stinger to remain sealed off in the retainer bore. Pressure can then be applied to the tubing string for testing.
To remove the stinger from the retainer, simply raise the tubing to free the stinger from the retainer bore.
A centralizing unit should be run above to assure the seal nipple stings in accurately.

Latching Type:
This unit provides positive control of the sleeve valve and seals the tubing to the retainer during pressuring operations while effectively anchoring the tubing in the retainer.
The tubing can be tested by stinging into the retainer, then raising the tubing approximately 4" at the retainer, which allows the valve to be closed and the stinger to remain sealed off in the retainer bore. Pressure can then be applied to the tubing string for testing.
Release is accomplished by taking an upward pull of approximately 8,000 lbs. which will collapse the snap latch and free the seal unit from the retainer. After repeated usage the snap-in and snap-out values will decrease to 2,500 lbs. snap-in and 5,000 lbs. snap-out force.
A centralizing unit should be run above to assure the seal nipple stings in accurately.

Specifications

	Retainer Size	
	3.593 - 4.312	5.375 - 12.00
BKR Locator Type	060-3593-070	060-5687-070
BKR Latching Type	060-3593-080	060-5687-080

MODEL BKR MECHANICAL SETTING TOOL FOR “BKR” SLEEVE VALVE CEMENT RETAINERS AND “B-1” BRIDGE PLUGS



**Mechanical
Setting Tool**

The Model BKR Mechanical Setting Tool is designed to run and set a Model BKR Sleeve Valve Cement Retainer and Model BKR-1 Bridge Plug. It is easy to operate and has low maintenance.

This tool incorporates both a stinger seal and built-in snap latch allowing the tool to be latched into the retainer with set-down weight and released with up-strain and/or right hand rotation. This tool can be run time after time by simply moving the drive housing into the running position. Disassembly is not required every time.

The setting tool can be converted for 4 1/2 through 13 3/8” casing sizes.

Specifications

Casing		BKR Setting Tool		Setting Range		Matching Tool	
OD	WT. (LBS/FT)	Part No.	O.D.	Min.	Max.	BKR Retainer	BKR-1 Plug
4.1/2	9.5 - 16.6	060-3593-000	3.593	3.826	4.090	050-3593-000	050-3593-001
5	11.5 - 18	060-3593-000	3.937	4.154	4.560	050-3937-000	050-3937-001
5.1/2	13 - 23	060-4312-000	4.312	4.580	5.044	050-4312-000	050-4312-001
6	10.5 - 12	060-5687-000	5.375	5.595	6.135	050-5375-000	050-5375-001
6.5/8	17 - 34	060-5687-000	5.375	5.595	6.135	050-5375-000	050-5375-001
7	32 - 38	060-5687-000	5.375	5.595	6.135	050-5375-000	050-5375-001
7	17 - 35	060-5687-000	5.687	6.004	6.538	050-5687-000	050-5687-001
7.5/8	20 - 39	060-6312-000	6.312	6.625	7.263	050-6312-000	050-6312-001
8.5/8	24 - 49	060-7125-000	7.125	7.511	8.248	050-7125-000	050-7125-001
9.5/8	29.3 - 53.5	060-8125-000	8.125	8.435	9.063	050-8125-000	050-8125-001
10.3/4	54 - 81	060-9000-000	9.000	9.250	9.660	050-9000-000	050-9000-001
10.3/4	32.7 - 51	060-9437-000	9.437	9.660	10.192	050-9437-000	050-9437-001
13.3/8	77 - 102	060-1156-000	11.562	11.633	12.464	050-1156-000	050-1156-001
13.3/8	48 - 72	060-1200-000	12.000	12.175	12.715	050-1200-000	050-1200-001
16	65 - 109	060-1425-000	14.250	14.688	15.250	050-1425-001	050-1425-003
18.5/8	76 - 96.5	060-1725-000	17.250	17.655	18.730	050-1725-001	050-1725-003
20	133 - 169	060-1725-000	17.250	17.655	18.73	050-1725-001	050-1725-003

MODEL BKR MECHANICAL SETTING TOOL FOR “BKR” SLEEVE VALVE CEMENT RETAINERS

The Model BKR Mechanical Setting Tool is designed to run and set the Model BKR Sleeve Valve Cement Retainer. Easy to operate and low maintenance are evident in the design. The tool incorporates both a stinger seal and built-in snap latch allowing the tool to be latched into the retainer with set down weight and released with up-strain or right-hand rotation. This tool can be run time after time by simply moving the drive housing (slip nut on smaller sizes) into place and installing new shear screws. Disassembly is not required between runs on the same location, but is recommended upon returning to the shop. Tool sizes are available from 4 1/2 to 13 3/8 casing. Fewer moving parts and ease of operation make this tool a good addition to your line. The Model BKR-1 Mechanical Set Bridge Plug can be run with this tool as well by removing items 23 through 27 and replacing item 1 with item 30.

Installation of Retainer or Bridge Plug on the Model BKR Mechanical Setting Tool

- Place the top cone of the retainer or bridge plug in the vise and tighten
- Apply grease to the stinger section of the setting tool.
- Stab the stinger section of the setting tool into the retainer or plug using a quick motion. If necessary place a block of wood across the end of setting tool and strike with a sledge hammer. The stinger needs to go in until the latch threads snap into the retainer threads.
- Place a pipe wrench on the drive housing (slip nut on smaller sizes) and turn to the left screwing the latch farther into the retainer. Stop when the holes in the latch align with the holes in the body of retainer.
- Install torque screws furnished with the retainer.
- Align the holes in the drive housing (slip nut in smaller sizes) with the groove in the lower mandrel.
- Install shear screws in setting tool.
- Place the mechanical slips over the slip nut. With the drag housing butted against the stop ring, rotate the slip retaining sleeve down over the mechanical slips. Tighten the set screw in slip retaining sleeve.

Running Instructions

- The tool should be run at a moderate speed avoiding sudden stops.
- Avoid right-hand rotation transmitted to the setting tool. As a precaution, after every 10 stands the tubing or drill pipe can be rotated to the left by hand until torque is felt.
- At desired setting depth, rotate tubing to the right a minimum of seven turns, releasing the slips onto the cone.
- Pull into the tubing in one continuous pull. See chart below to view the recommended tension. It is important to calculate this tension through tubing stretch. Do not rely on weight indicators.
- After desired pull is reached, lock down the break on rig to allow setting force to reach retainer. Hold the tension approximately five minutes, then slack off pipe and set approximately five to ten thousand pounds weight down insuring retainer or plug is securely set.

Retainer Size	Minimum Tension	Maximum Tension
3.593-4.312	22,000 lbs.	30,000 lbs.
5.375-6.312	30,000 lbs.	45,000 lbs.
7.125-12.00	35,000 lbs.	48,000 lbs.

Test Options

- The tubing or drill pipe can be pressure tested by simply pulling up five thousand pounds at the tool and applying pump pressure to the tubing.
- The retainer can now be tested for seal-off by applying pressure down the annulus or by slacking off five thousand pounds weight on retainer and applying pump pressure down the tubing and pumping into formation
- These tests are performed before the setting tool is released from the retainer
- If seal-off has not been accomplished, up-strain on the tubing can again be applied and the tools can be retested until seal-off is accomplished

MODEL BKR MECHANICAL SETTING TOOL FOR “BKR” SLEEVE VALVE CEMENT RETAINERS

Releasing Retainer

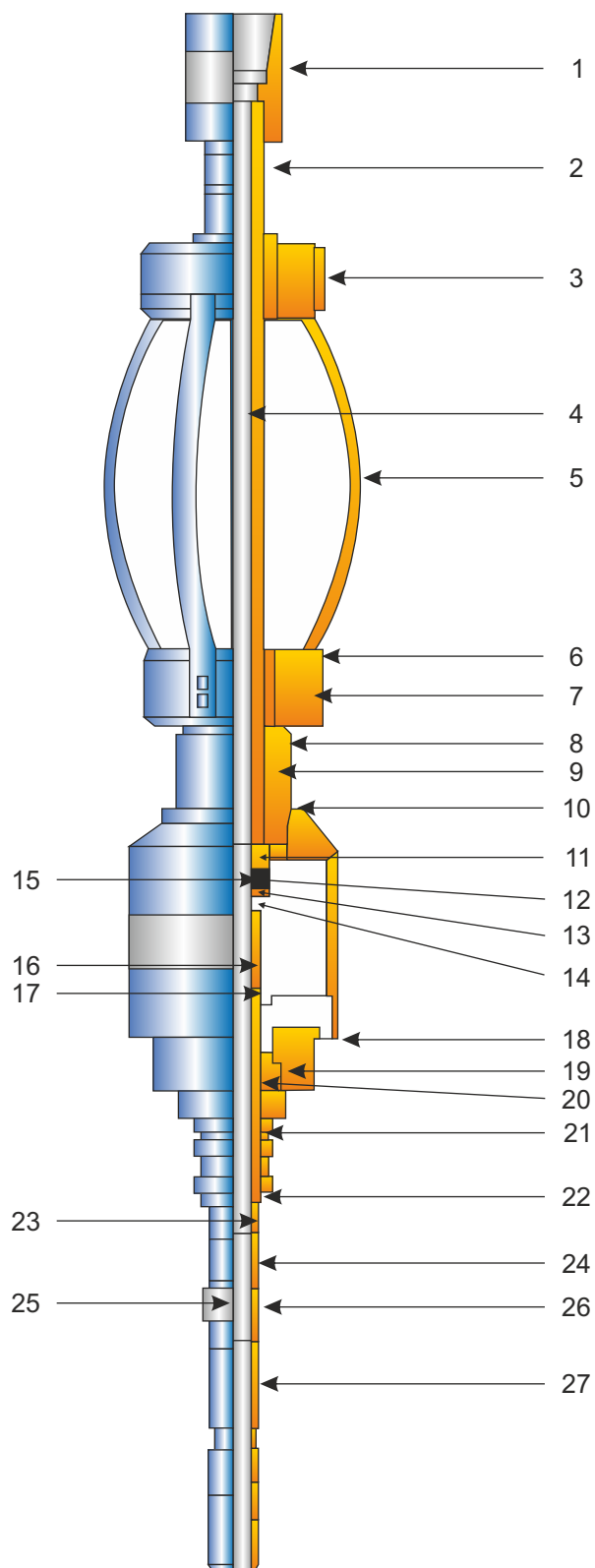
- Hold an up-strain of approximately one thousand pounds on the tubing.
- Apply torque to the right until torque screws are sheared. Each screw requires 200 - 400 foot-pounds.
- Continue right-hand rotation for ten turns or until latch is felt releasing
- After releasing from retainer, the setting tool can be relatched into the retainer with three to five thousand pounds set-down weight. This stabilizes at two thousand five hundred pounds with repetition.
- The valve will open when the stinger is fully engaged into the retainer and will close with a 2 inch upstroke at the tool. The stinger will remain sealed in the bore as long as snap-out force is not exceeded.

Assembly Instructions

(Note: grease all threaded connections and o-ring surfaces)

- Slide the Upper Mandrel (item 2) through the Drag Housing (item 4), entering at the end of drag housing with external threads.
- Screw the Top Coupling (item 1) onto the Upper Mandrel (item 2). Place the Top Coupling in the vise and tighten with wrench placed in the groove on the Upper Mandrel.
- Slide on the Stop Ring (item 11). Screw on the Lock Nut (item 14). Install the Set Screw (item 13).
- Screw the Drag Housing (item 4) toward the Stop Ring (item 11). Turn the Stop Ring with the Drag Housing until maximum butting surface is obtained. Make certain it will not jam by backing off the Drag Housing one round. If holes in the Stop Ring and the Upper Mandrel are not aligned at this point, turn the Stop Ring to the right until alignment is obtained. Install the Set Screws (item 12). for 7" and Larger Sizes only
- Slide the Upper Drag Bushing (item 3) over the Drag Housing (item 4) to the far end and insert the Set Screws (item 31). Repeat with the Lower Drag Bushing (item 6).
- Screw the Adjuster Sleeve (item 8) onto the Drag Housing (item 4) as far as it can go. Start the Set Screw (item 9) and tighten.
- Screw the Slip Retaining Sleeve (item 18) onto the Adjuster Sleeve (item 8) as far as it can go. Start the Set Screw (item 10), but do not tighten. for 4 1/2 and 5 1/2 Sizes only Place the O-Ring (item 15) on outside of the Crossover (item 28). Place another O-Ring (item 29) on inside of the Crossover. Slide the Slip Nut (item 19) over the Lower Mandrel (item 22) and screw the Lower Mandrel into Crossover. Screw the Crossover into the Upper Mandrel and tighten. For 7" and Larger Sizes only Screw the Slip Nut (item 19) onto the Drive Housing (item 16). Slide the Drive Housing over the Lower Mandrel (item 22). Install the O-Ring (item 15) on the Lower Mandrel and then screw the Lower Mandrel into the Upper Mandrel and tighten.
- Screw the Latch (item 21) into the Slip Nut or Drive Housing, depending on size, and install Set Screws (item 20).
- Place the O-Ring (item 23) in the Seal Sub (item 24) and screw onto the Lower Mandrel.
- Place the O-Ring (item 26) in the Molded Seal (item 25) and slide onto Seal Sub.
- Screw the Shifter Sub (item 27) onto Seal Sub and tighten. Pipe wrench placement for shifter sub is just above groove.
- Shear Screws (item 17) are installed after the setting tool is stabbed into retainer or plug.
- Slide the Drag Spring (item 5) under the cover on the Upper Drag Bushing (item 3) and then align holes in the Drag Spring and the Lower Drag Bushing (item 6). Install Screws (item 7).

MODEL BKR MECHANICAL SETTING TOOL



Mechanical Setting Tool

MODEL BKR MECHANICAL SETTING TOOL

Specification Guide

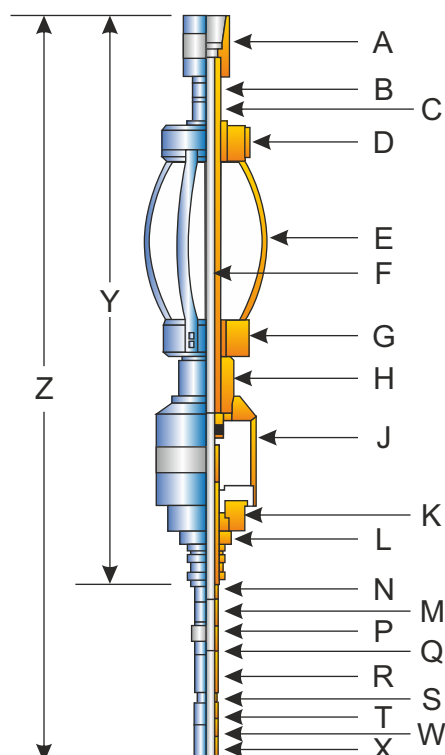
Item	Qty.	Description	3.593-3.937	4.312	5.375-5.687	6.312	7.125	8.125	9	9.437	10.437	12
		Assy. Complete - BKR Mech. Setting Tool	060-3593-000	060-4312-000	060-5687-000	060-6312-000	060-7125-000	060-8125.000	060-9000-000	060-9437-000	060-1043-000	060-1200-000
1	1	Top Coupling	060-3593-015		060-3593-016				060-5687-015			
2	1	Upper Mandrel	060-3593-016						0603593-016			
3	1	Upper Drag Bushing	Not Required		060-5687-019		060-7125-019	060-8125-019	060-9000-019	060-9437-019	060-9437-020	060-1200-019
4	1	Drag Housing	0603593-017						060-3593-017			
5	*	Drag Spring	060-3593-021 (3)	0604312-021 (3)		060-4312-021 (6)			060-4312-021 (6)			
6	1	Lower Drag Bushing	Not Required		060-5687-023		060-7125-023	0608125-023	060-9000-023	060-9437-023	060-9437-022	060-1200-023
7	*	Button Head Cap Screw	5/16 - 18 x 5/16 (6)		5/16 - 18 x 1/2 (6)	5/16 - 18 x 1/2 (12)						
8	1	Adjuster Sleeve	Not Required		060-5687-022							
9	1	Socket Head Set Screw	Not Required		5/16 - 18 x 3/8							
10	1	Socket Head Set Screw	5/16 - 18 x 3/16	5/16 - 18 x 3/8	5/16 - 18 x 5/8							
11	1	Stop Ring	060-3593-025									
12	4	Socket Head Set Screw	5/16 - 18 x 3/8									
13	1	Socket Head Set Screw	5/16 - 18 x 3/8									
14	1	Lock Nut	060-3593-026									
15	1	O-Ring	000-224N-090									
16	1	Drive Housing	Not Required		060-5687-037							
17	3	Shear Screw	016-3500-040									
18	1	Slip Retaining Sleeve	060-3593-024	060-4312-024	060-5687-024	060-6312-024	060-7125-024	060-8125-024	060-9000-024	060-9437-024	060-1043-024	060-1200-024
19	1	Slip Nut	060-3593-029		060-5687-029	060-6312-029	060-7125-029	060-8125-029	060-9000-029	060-9437-029	060-1043-029	060-1200-029
20	4	Socket Head Set Screw	5/16 - 18 x 3/8		5/16 - 18 x 3/8				5/16 - 18 x 3/8			
21	1	Latch	060-3593-031		060-3593-031							
22	1	Lower Mandrel	060-3593-028		060-5678-028							
23	1	O-Ring	000-023N-090		100-130N-090							
24	1	Seal Sub	060-3593-032		060-5687-032							
25	1	Molded Seal	060-3593-033		060-5687-033							
26	1	O-Ring	000-024N-090		000-130N-090							
27	1	Shifter Sub	060-3593-034		060-5687-034							
28**	1	Cross- Over	060-3593-035		Not Required							
29**	1	O-Ring	000-122N-090		Not Required							
30**	1	Porter Coupling (Option)***	060-3593-014		006-5687-014							
31**	*	Cap Screw for Drag Bushings	Not Required		1/2 - 20 x 1"		1/2 - 20 x 1"	Not Required	1/2 - 20 x 1"	1/2 - 20 x 2"	1/2 - 20 x2"	1/2 - 20 x 3"
32**	*	Set Screws fo Drag Bushing	Not Required		Not Required		Not Required	1/2 - 20 x 1"	7/8	1/4	3/4	1/2

* - Quantity for this item is noted beside the part number.

** - Not shown in illustration.

*** - Used for tubing filling when running mechanical set bridge plugs. It replaces item 1.

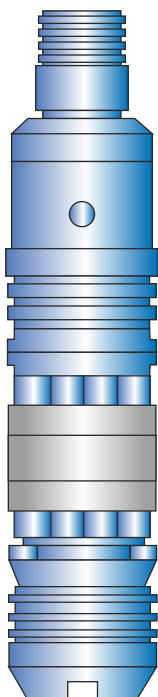
MODEL BKR MECHANICAL SETTING TOOL



Dimensional Data

Callout	3.593/ 3.937	4.312	5.375/ 5.687	6.312	7.125	8.125	9.000	9.437	10.437	12.00
A	3.062		3.672							
B	2.250									
C	2.375									
D	3.500		5.000		5.875	7.218	7.812	8.656	9.593	11.156
E	6.250	6.959	8.374		9.260	10.600	11.194	12.038	12.960	14.535
F	1.500									
G	3.375		4.875		5.750	7.093	7.687	8.531	9.468	11.031
H	3.125		4.375							
J	3.745	4.312	5.375	6.312	7.125	8.125	9.000	9.437	10.437	12.000
K	2.750		4.125	4.593	5.593	6.593	7.593			10.093
L	2.000		2.900							
M	1.320		1.990							
N	1.250		1.875							
P	1.320		1.990							
Q	1.320		1.990							
R	1.250		1.875							
S	1.062		1.562							
T	1.218		1.750							
W	1.156		1.687							
X	.750		1.250							
Y	45.031		47.640							
Z	58.250		61.062							

PREMIUM & LITE HM BRIDGE PLUG - TUBING SET



**Hydro Mechanical
Bridge Plug**

The Model HM Bridge Plug is set using hydraulic power to set the top slips and then mechanical pull to complete the set. The Premium is for high pressure and temperature while the Lite sustains moderate temperature and pressure.

The need for a mechanical setting tool does not exist because the setting mechanism is built-in. A ball is placed in the tubing string plugging off the built-in equalizing ports. Pressure is then applied to set the top slip and then mechanical pull is applied to finish the set. Releasing the tubing string from the plug is done by simply turning to the right.

Full tubing I.D. is available after releasing from the plug allowing other equipment to extend through the end of the tubing string.

Features:

- Drillable
- Cast iron construction
- One piece slip
- Sets in any grade casing including P-110
- Metal back-up to prevent rubber extrusion
- For temporary or permanent service
- Ratcheting lock ring holds setting force
- Excellent for deviated wells

SPECIFICATIONS

Casing		HM Bridge Plug			Setting Range	
O.D.	Wt. (Lbs/Ft)	Premium	Lite	O.D.	Min.	Max.
4.1/2	9.5 - 16.6	010-3593-055	010-3593-065	3.593	3.826	4.090
5	11.5 - 18	010-3937-055	010-3937-065	3.937	3.920	4.560
5.1/2	13 - 25	010-4312-055	010-4312-065	4.312	4.580	5.047
5.3/4	22.5 - 25.2	010-4312-055	010-4312-065	4.312	4.580	5.047
6	14 - 26	010-4937-055	-	4.937	5.140	5.595
6.5/8	34	010-4937-055	-	4.937	5.140	5.595
6	10.5 - 12	010-5375-055	010-5375-065	5.375	5.595	6.366
6.5/8	17 - 34	010-5375-055	010-5375-065	5.375	5.595	6.366
7	23 - 40	010-5375-055	010-5375-065	5.375	5.595	6.366
6.5/8	17 - 22	010-5687-055	010-5687-065	5.687	5.989	6.655
7	17 - 35	010-5687-055	010-5687-065	5.687	5.989	6.655
7.5/8	20 - 39	010-6312-055	-	6.312	6.625	7.263
8.5/8	24 - 49	010-7125-055	-	7.125	7.511	8.248
9.5/8	29.3 - 61.1	010-8125-055	-	8.125	8.375	9.063
10.3/4	54 - 81	010-9000-055	-	9.000	9.250	9.784
10.3/4	32.7 - 51	010-9437-055	-	9.437	9.850	11.150
11.3/4	38 - 60	010-9437-055	-	9.437	9.850	11.150
13.3/8	77 - 102	010-1156-055	-	11.562	11.633	12.464
13.3/8	48 - 72	010-1200-055	-	12.000	12.347	12.715
16	65-109	010-1425-055	-	14.250	14.688	15.250
18-5/8	76-96.5	010-1725-055	-	17.250	17.655	18.730
20	133-169	010-1725-055	-	17.250	17.655	18.730

MODEL PREMIUM & LITE HM BRIDGE PLUG - TUBING SET

Guidelines for Running HM Bridge Plugs:

Recommended Procedure Before Running HM Bridge Plug:

- Run a casing scraper (if necessary) to clean inner wall of casing and free any debris or obstructions.
- Circulate well to clean well of debris and junk.
- Check casing I.D. 2 ft.-3 ft. below setting depth to insure no restrictions exist.

Make-up Procedure:

- Make up tubing on tubing adapter by placing back-up on tubing adapter and rotate tubing to the right until tight.
- Do not remove tubing adapter from plug to make-up!!

Running In:

- Run into well at uniform rate - no faster than 30 seconds per 90 foot stand. Be certain tubing is free of debris and excessive scale.
- Avoid unnecessary right-hand rotation of tubing string.
- Use slow starts and stops when moving tubing string - no jerking.

Setting HM Plug:

- Run tubing to desired setting point. Never set in collars or where milling has occurred. Set in static conditions (no fluid or gas movement).
- Drop ball down tubing string - the ball should be 1 1/4 diameter. Allow approximately 5 minutes per 1010 feet for ball to travel in water. More time is needed in mud or viscous fluids.
- Apply pump pressure to tubing string until 2000 p.s.i. is reached. This pressure will stroke cylinder down into slip. The slip will break into segments and make contact with casing.

NOTE: If you lose pressure before reaching 2000 p.s.i., go on to the next step. In heavier weights of casing, slip and hydro sleeve travel is limited which prevents pressure loss. Simply stop at 2000 p.s.i. and proceed to the next step.

- Bleed pressure and pull recommended tension above the pipe weight at the tool, to complete setting the plug. Hold tension for 3 to 5 minutes. It is recommended to calculate tubing stretch versus using weight indicator for true pull. See formula below.
- The tubing string may be released from the H-M Plug by pulling 500 lbs. tension at the tool and rotating the workstring 9 turns to the right at the tool.

Plug Size OD	Setting Forces	
	Minimum Tension	Maximum Tension
2.750	9,010 lbs.	12,010 lbs.
3.125	20,010 lbs.	25,010 lbs.
3.593-4.937	22,010 lbs.	30,010 lbs.
5.375-6.312	30,010 lbs.	45,010 lbs.
7.125-8.125	35,010 lbs.	48,010 lbs.
9.000-9.437	35,010 lbs.	48,010 lbs.
11.562-12.00	35,010 lbs.	48,010 lbs.
14.25-17.25	40,010 lbs.	48,010 lbs.

MODEL PREMIUM & LITE HM BRIDGE PLUG - TUBING SET

Special Note: For low fluid level wells

In low fluid level wells, any fluids placed in the tubing after the setting ball has reached it's seat, will tend to shear the cylinder downward on the HM Bridge Plug. Chart #1 shows the pressure created in psi per barrel of fluid added, and Chart #2 shows the feet of fill-up per barrel of fluid added. Since 2010 psi pressure in favor of the tubing at the tool is required to initiate the setting sequence, we suggest the following method for calculating the required applied pump pressure.

- Determine fluid weight in pounds per gallon (#/gal) or p.s.i. per foot (psi/ft).
- Estimate fluid level from surface of well. NOTE: The tubing string will fill during running in through the fluid fill ports.
- From Chart #1, select the appropriate column for the size of tubing string and line for appropriate fluid weight.
- From Chart #2, select the appropriate column for the size of tubing string and determine the lineal feet per barrel of fluid.
- Multiply the depth of fluid level from surface by the lineal feet per barrel from Chart #2 to determine the required amount of barrels of fluid to fill the tubing string.
- Multiply the barrels required to fill the tubing string by the psi. barrel figure from Chart #1. This figure will give you the total hydrostatic head exerted by the fluid in the tubing string when completely filled. If this figure is less than the required 2010 psi., sufficient pump pressure must be added to achieve the 2010 p.s.i. required pressure. In those cases where the calculated pressure for the fluid to fill the tubing string exceeds the required 2010 p.s.i., you need only to add or fill with the necessary barrels of fluid to achieve the required 2010 p.s.i. This may be calculated by dividing 2010 p.s.i. by the psi. per barrel figure from Chart #1. Over pressuring cannot occur since the tool will be activated at 2010 p.s.i. and the downward travel of the cylinder will vent the excess fluid into the annulus above the plug before damage occurs. Once the required pressure is created at the plug, sufficient tension must be applied as shown in step #4 under setting H-M plug. Complete setting sequence as described in step #5.

MODEL FURY 05 HYDRAULIC SETTING TOOL OPERATIONAL PROCEDURE

Operational Procedure:

1. Run the Model Fury 05 Hydraulic Setting Tool and BP/CR several feet below the setting depth. Note: The Fury circulation ports are located below the ball seat. These ports will allow the tubing to fill going in the hole or for circulating a maximum rate of ¼ BPM while going in the hole. Well fluid must clean and free of debris (sand) for the HST to work properly. Warning: The setting sequence will begin at 1,000 psi differential pressure in the tubing “at the tool” (see step 4).
2. Pick up slowly to setting depth to remove slack from tubing string.
3. Drop a 3/8” diameter brass ball and slowly pump down until it has seated (pressure increase).
4. Slowly pressure workstring to establish a 1,000 psi (1,500 psi max) differential pressure inside the tubing “at the tool” to begin the setting sequence.
5. Continue pressuring workstring to establish a 2,500 psi differential pressure inside the tubing “at the tool” to anchor the BP/CR against the casing wall. Pick up tubing to the neutral position. Hold pressure for 5 minutes.
6. Continue pressuring workstring to establish a 3,100 psi (3,600 psi max) differential pressure inside the tubing “at the tool” to complete the set. Pick up on tubing to determine if disconnected from BP/CR. If the HST has not disconnected from BP/CR then Pick up 1,000 pounds over tubing weight and pressuring workstring again to establish 3,100 psi (3,600 psi max) inside the tubing “at the tool” to complete set. Over pressuring HST will cause damage to tool.
7. Apply 1,000 pounds of set down weight to determine if BP/CR is securely set.
8. The Fury 5 HST will automatically dump pressure when fully stroked out. Clean and re-dress Hydraulic Setting Tool and Setting Adapter Kit.

Troubleshooting:

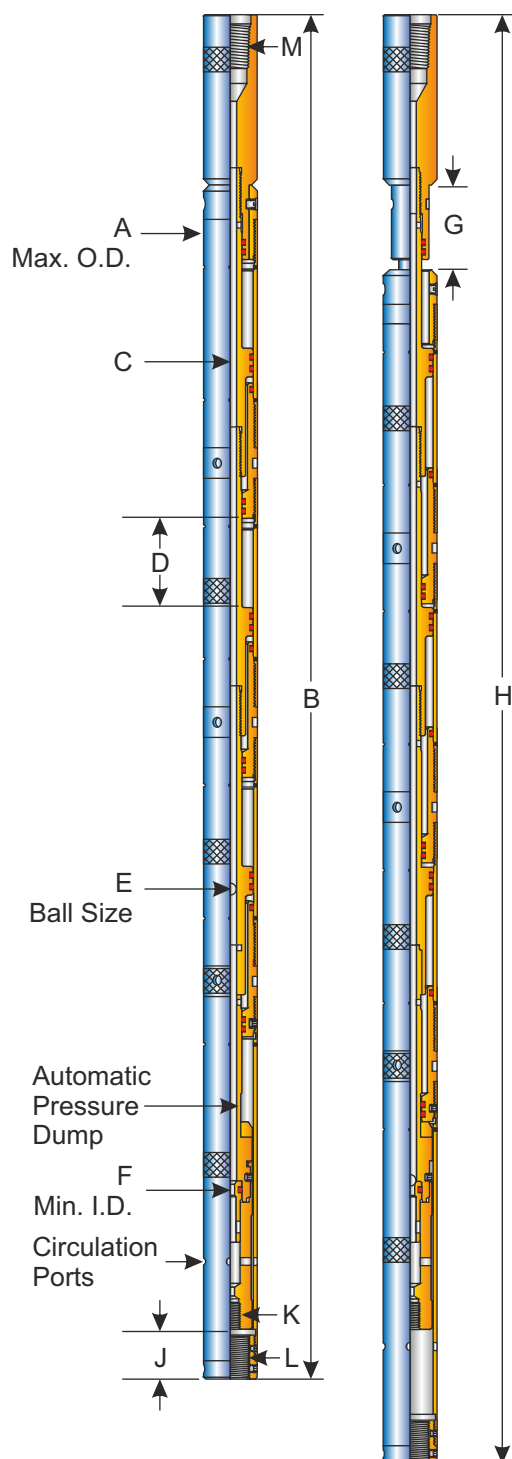
CONDITION: HST does not disconnect from BP/CR

Pull 1,000 pounds over tubing weight and pressure workstring again to establish a 3,100 psi (3,600 psi max) inside the tubing “at the tool” to disconnect from BP/CR.

If unsuccessful, then bleed off pressure, return tubing to the neutral point and reverse circulate capacity of the tubing (+10 BBL) to remove debris that may be inside the tubing and tool. Circulate Ball back to the Ball Seat then pull 1,000 pounds over tubing weight and pressure workstring again to establish a 3,100 psi (3,600 psi max) inside the tubing “at the tool” to disconnect from BP/CR.

If unsuccessful, then bleed off pressure and pull 12,000 pounds over tubing weight to disconnect from BP/CR. Over pressuring HST will cause damage to tool.

MODEL FURY 05 HYDRAULIC SETTING TOOL DIMENSIONAL DATA & SPECIFICATIONS



Dimensional Data

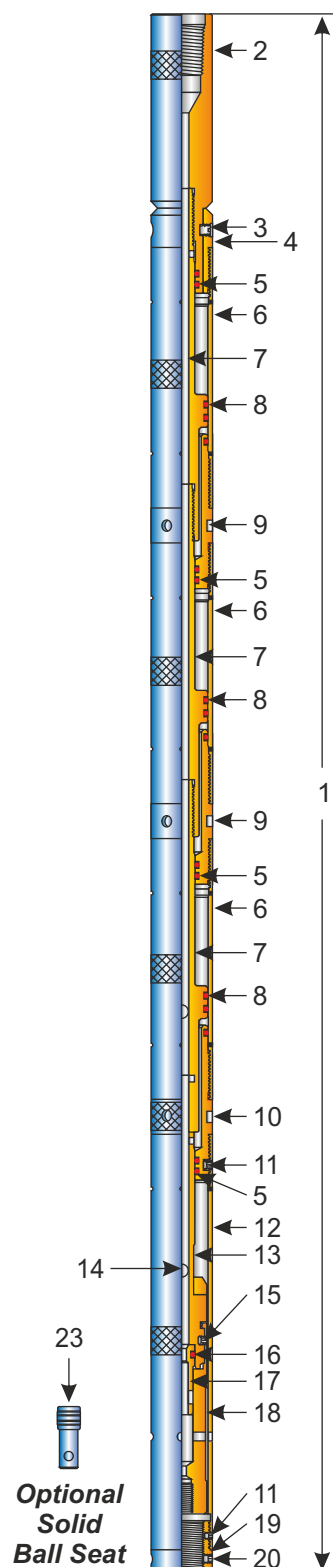
Ref.	Fury 5 HST
A	1.750
B	53.000
C	.406
D	4.500 Stroke
E	.375 Dia. Ball
F	.281
G	4.875
H	57.875
J	1.437
K	.625 18P VEE
L	1.250 16P VEE
M	1" MT Box UP

Specifications

Item	Fury 5 HST
Part Number	120-1750-200
Lower End of Tool	BT-05 WLPSA
Max. Running O.D.	1.750
Min. I.D. Thru Ball Seat	.281
Internal Pressure Rating	5,000 psi
Temperature Rating (Nitrile O-Ring Kit)	200°F
Temperature Rating (Viton O-Ring Kit)	350°F
Ball Size (Bronze or Phenolic)	.375 Dia
Total Hydraulic Chambers	3
Total Piston Area	3.978
psi Required to Begin Setting Sequence	1,000 psi (2-2,000# Pins)
psi Required at Tool to Shear 12,000#	3,016 psi (12,000#)
Tool Length (Running Position)	53.000
Tool Length (Fully Stroked)	4.500
Joint Strength @ Piston	25,860 LBS

All dimension are in US inches

MODEL FURY 05 HYDRAULIC SETTING TOOL PART LIST



Parts List

Item	Description	Qty	Part Number
1	Assembly ACT Fury 5 Hydraulic Setting Tool	1	120-1750-200
2	Top Sub 1" MT Box UP	1	120-1750-220
3	Brass Shear Screw (2,000 LBS)	2	090-5687-042
4	Cylinder Cap	1	120-1750-221
5	Nitrile O-Ring - 70 Duro (200°F)	8	000-210N-070
	Viton O-Ring - 90 Duro (350°F)	8	00-210V-090
6	Cylinder	3	120-1750-222
7	Piston	3	120-1750-223
8	Nitrile O-Ring - 70 Duro (200°F)	9	000-218N-070
	Viton O-Ring - 90 Duro (350°F)	9	000-218V-090
9	Upper Connection	2	120-1750-224
10	Lower Connection	1	120-1750-225
11	Socket Head Set Screw	2	#10-32 x 1/4 LG
12	Push Sleeve	1	120-1750-226
13	Ball Seat Housing	1	120-1750-227
14	.375 Dia Bronze Ball	1	120-1750-236
15	Socket Head Set Screw	1	1/4-20 x 1/4 LG
16	Nitrile O-Ring - 70 Duro (200°F)	1	000-206N-09
	Viton O-Ring - 90 Duro (350°F)	1	000-206V-090
17	Ball Seat (.281 ID)	1	120-1750-228
18	Bottom Adapter SUB	1	120-1750-235
19	Bottom Adapter Sleeve	1	120-1750-232
20	Socket Head Set Screw	2	1/4-20 x 1/4 LG

All Dimensions are in US inches

Optional Parts

Item	Description	Qty	Part Number
21	Nitrile O-Ring - Kit (200°F)	1	120-1750-215
22	Viton O-Ring - Kit (200°F)	1	120-1750-216
23	Solid Ball Seat	1	120-1750-248
24	.375 Dia. Phenolic Ball (Not Shown)	1	120-1750-237

MODEL FURY 05 HYDRAULIC SETTING TOOL ASSEMBLY INSTRUCTIONS

Assembly Instructions:

Reference: Model Fury 05 Hydraulic Setting Tool Parts List.

Drift Cylinder (item 6) with Piston (item 7). Install all O-Rings. Lubricate all O-Rings, Threads, Sealing and Sliding Surfaces with Mobil Grease HP. Wrench only where indicated. File away wrench marks. Note: Never use pipe wrench or vise on Cylinder (item 6) at midpoint. Make Cylinders (item 6) strap wrench tight by locating strap on knurled area of cylinder. Spanner wrench tight means hand tight then striking spanner handle with rubber mallet two or three times. Screwdriver tight means hand tight with a medium blade 6" long screwdriver.

1. Place Top Sub (item 2) in vise at box connection. Slide Cylinder Cap (item 4) on Top Sub. Install (2) Brass Shear Screws (item 3) in flat bottom holes screwdriver tight then back-off 1/8 turn.

2. Screw first Piston (item 7) in Top Sub wrench tight. Lubricate entire ID of first Cylinder (item 6) with Mobil Grease HP. Slide Cylinder (item 6) over Piston and screw to Cylinder Cap (item 4). Make strap wrench tight. Screw first Upper Connector (item 9) in Cylinder and make spanner wrench tight.

3. Screw second Piston (item 7) in previous Piston wrench tight. Lubricate entire ID of second Cylinder (item 6) with Mobil Grease HP. Slide Cylinder (item 6) over Piston and screw to Upper Connector (item 9). Make strap wrench tight. Screw second Upper Connector (item 9) in Cylinder and make spanner wrench tight.

4. Screw third Piston (item 7) in previous Piston wrench tight. Lubricate entire ID of third Cylinder (item 6) with Mobil Grease HP. Slide Cylinder (item 6) over Piston and screw to Upper Connector (item 9). Make strap wrench tight. Screw Lower Connector (item 10) in Cylinder and make spanner wrench tight. Note: The Lower Connector (item 10) differs from the Upper Connector (item 9) with a flat bottom spot face in the lower thread and the OD is knurled.

5. Slide upper end of Ball Seat Housing (item 13) through Lower Connector (item 10) then screw to lower end of previous Piston wrench tight. Wrench at knurled area on Ball Seat Housing.

6. Internally test 3-hydraulic chambers with air to check for cut or missing o-rings. Temporally install solid ball seat (item 23) in lower end of Ball Seat Housing (item 13). Screw Bottom Adapter Sub (item 18) on Ball Seat Housing (item 13) wrench tight. Wrench at knurled area on Ball Seat Housing. Make sure Top Sub (item 2) is secure in pipe vise, tighten both brass shear screws (item 3) then connect air test fixture. Make 1" MT connection wrench tight and close on/off valve. Clear the area for test. Do not stand at lower end of tool. Connect airline, open on/off valve and allow air to fill HST, then close valve. If gage is steady for 2-minutes and no flow of air can be heard then HST is tested. If a steady air test cannot be achieved then HST must be disassembled to find the cause. Bled air pressure to zero and remove Bottom Adapter Sub (item 18) by placing a back up at knurled area on Ball Seat Housing. Remove Solid Ball Seat (item 23). Install Ball Seat (item 17) in lower end of Ball Seat Housing (item 13). Screw Bottom Adapter Sub (item 18) on Ball Seat Housing (item 13) wrench tight. Install Socket Head Set Screw (item 15).

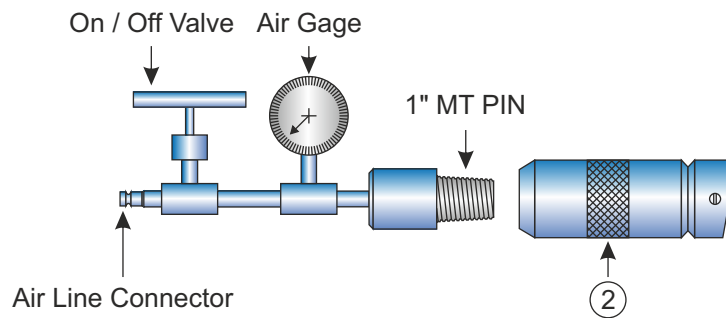
7. If it is desired to run HST with a solid seat "no ball" then install Optional Solid Seat (item 23) in lower end of Ball Seat Housing.

8. Screw Push Sleeve (item 12) to Lower Connector (item 10). Make spanner wrench tight. Install (1) Socket Head Set Screw (item 11).

9. Screw Bottom Adapter Sleeve (item 19) to Push Sleeve (item 12). Make spanner wrench tight. Install (1) Socket Head Set Screw (item 11). Install (2) Socket Head Set Screws (item 20) in Bottom Adapter Sleeve (item 19).

10. Re-tighten Brass Shear Screws (item 3). Connect airline, open on/off valve and allow air to flow through HST to insure the internal flow path is free and clear (no ball is in place). File away all wrench marks. Remove air test fixture.

MODEL FURY 05 HYDRAULIC SETTING TOOL ASSEMBLY INSTRUCTIONS



Air Test Fixture

Disassembly Instructions:

1. Drain all well fluids from Hydraulic Setting Tool and dispose of properly. Place Top Sub (item 2) in pipe vise and close setting stroke gap between Top Sub (item 2) and Cylinder Cap (item 4) by pushing outer components upward towards pipe vise. Keep hands clear of this area during procedure.
2. Disassembly is basically the reverse operation of the assembly with the exception of the Pistons (item 7), Cylinders (item 6) and Connectors (item 9 & 10). Occasionally these items break at locations other than intended. If this occurs remove Lower Connector and slide down enough to place a wrench on the previous pistons knurled area.
3. Visually inspect each component for wear especially the Ball Seat area. Remove all o-rings and discard properly. Clean all parts thoroughly then re-assembly Hydraulic Setting Tool complete with new o-rings. Label outside of Hydraulic Setting Tool with the description, part number, ball size and type o-ring kit.

MODEL FURY 10 HYDRAULIC SETTING TOOL OPERATIONAL PROCEDURE

Operational Procedure:

1. Run the Model Fury 10 Hydraulic Setting Tool and BP/CR several feet below the setting depth. Note: The Fury circulation ports are located below the ball seat. These ports will allow the tubing to fill going in the hole or for circulating a maximum rate of 1/4 BPM while going in the hole. Well fluid must clean and free of debris (sand) for the HST to work properly. Warning: The setting sequence will begin at 1,250 psi differential pressure in the tubing "at the tool" (see step 4).
2. Pick up slowly to setting depth to remove slack from tubing string.
3. Drop a 1/2" diameter brass ball and slowly pump down until it has seated (pressure increase).
4. Slowly pressure workstring to establish a 1,250 psi (1,750 psi max) differential pressure inside the tubing "at the tool" to begin the setting sequence.
5. Continue pressuring workstring to establish a 2,500 psi differential pressure inside the tubing "at the tool" to anchor the BP/CR against the casing wall. Pick up tubing to the neutral position. Hold pressure for 5 minutes.
6. Continue pressuring workstring to establish a 3,200 psi (3,700 psi max) differential pressure inside the tubing "at the tool" to complete the set. Pick up on tubing to determine if disconnected from BP/CR. If the HST has not disconnected from BP/CR then Pick up 1,000 pounds over tubing weight and pressuring workstring again to establish 3,200 psi (3,700 psi max) inside the tubing "at the tool" to complete set. Over pressuring HST will cause damage to tool.
7. Apply 1,000 pounds of set down weight to determine if BP/CR is securely set.
8. The Fury 10 HST will automatically dump pressure when fully stroked out. Clean and re-dress Hydraulic Setting Tool and Setting Adapter Kit.

Troubleshooting:

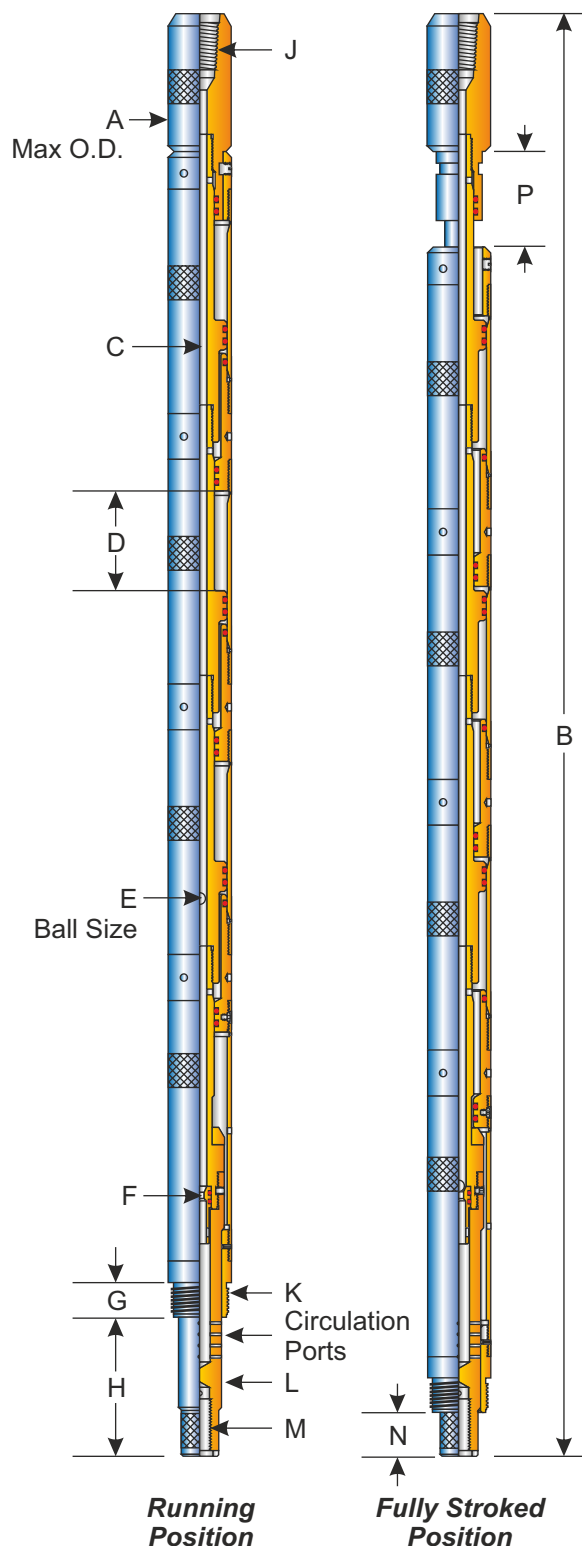
Condition: HST does not disconnect from BP/CR.

Pull 1,000 pounds over tubing weight and pressure workstring again to establish a 3,200 psi (3,700 psi max) inside the tubing "at the tool" to disconnect from BP/CR.

If unsuccessful, then bleed off pressure, return tubing to the neutral point and reverse circulate capacity of the tubing (+10 BBL) to remove debris that may be inside the tubing and tool. Circulate Ball back to the Ball Seat then pull 1,000 pounds over tubing weight and pressure workstring again to establish a 3,200 psi (3,700 psi max) inside the tubing "at the tool" to disconnect from BP/CR.

If unsuccessful, then bleed off pressure and pull 30,000 pounds over tubing weight to disconnect from BP/CR. Over pressuring HST will cause damage to tool.

MODEL FURY 10 HYDRAULIC SETTING TOOL DIMENSIONAL DATA & SPECS



Dimensional Data

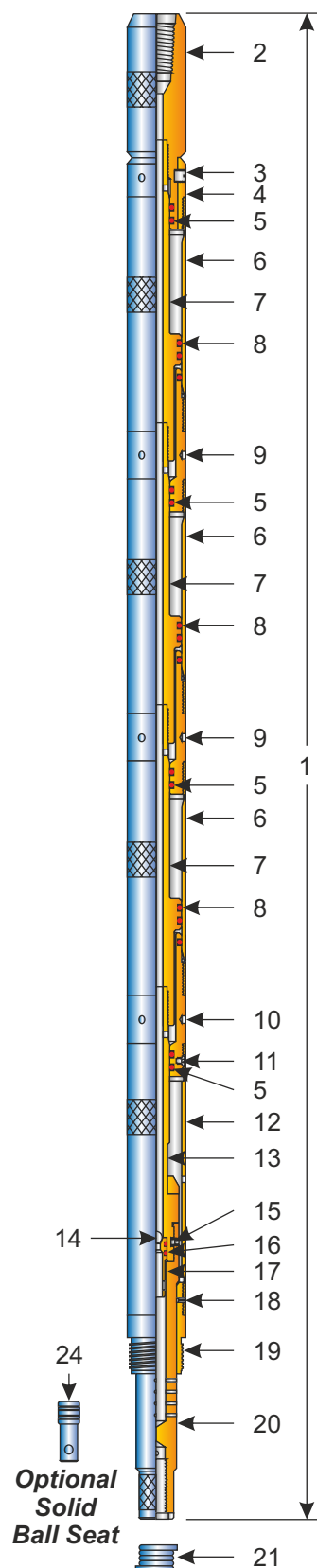
Ref	Fury 10 HST
A	2.750
B	74.875
C	.625
D	6.000 Stroke
E	.500 Dia. Ball
F	.500 Min. I.D.
G	1.500
H	7.500
J	1 - 1/2" MT Box Up
K	2.500 6P ACME
L	1.875
M	1.000 8UN VEE
N	.687
P	6.812

Specifications

Item	Fury 10 HST
Part Number	120-2750-200
Lower End of Tool	BT-10 WLPSA
Max. Running O.D.	2.750
Min. I.D. Thru Ball Seat	.312
Internal Pressure Rating	6,250 psi
Temperature Rating (Nitrile O-Ring Kit)	200°F
Temperature Rating (Viton O-Ring Kit)	350°F
Ball Size (Bronze or Phenolic)	.500 Dia.
Total Hydraulic Chambers	3
Total Piston Area	9.609
psi Required to Begin Setting	1,250 psi (2 - Sequence)
psi Required at Tool to Shear	3,200 psi (30,000 #)
Tool Length (Running Position)	74.875
Total Stroke	6.000
Joint Strength @ Piston	77,750 LBS

All dimensions are in US inches

MODEL FURY 10 HYDRAULIC SETTING TOOL PARTS LIST



Parts List

Item	Description	Qty	Part Number
1	Assembly ACT Fury 10 Hydraulic Setting Tool	1	120-2750-200
2	Top Sub 1-1/2 MT Box Up	1	120-2750-220
3	Brass Shear Screw (6.000 Lbs)	2	090-5687-042
4	Cylinder Cap	1	120-2750-221
5	Nitrile O-Ring - 70 Duro (200°F) Viton O-Ring - 90 Duro (350°F)	8	000-322N-070 000-322V-090
6	Cylinder	3	120-2750-222
7	Piston	3	120-2750-223
8	Nitrile O-Ring - 70 Duro (200°F) Viton O-Ring - 90 Duro (350°F)	9	000-329N-070 000-329V-090
9	Upper Connector	2	120-2750-224
10	Lower Connector	1	120-2750-225
11	Low Head Cap Screw	2	1/4-20 x 1/4 LG
12	Push Sleeve	1	120-2750-226
13	Ball Seat Housing	1	120-2750-227
14	.500 Dia. Bronze Ball	1	120-2125-236
15	Socket Head Set Screw	1	5/16-18 x 5/16 LG
16	Nitrile O-Ring - 70 Duro (200°F) Viton O-Ring - 90 Duro (350°F)	8	000-210N-090 000-210V-090
17	Ball Seat (.312 I.D.)	1	120-2750-228
18	Steel Pin	1	3/16 Dia. X 3/8 LG
19	Bottom Adapter Sleeve	1	120-2750-232
20	Bottom Adapter Sub	1	120-2750-235
21	Lock Spring	1	050-3500-203

All dimensions are in US inches

Optional Parts

Item	Description	Qty	Part Number
22	Nitrile O-Ring Kit (200°F)	1	120-2750-215
23	Viton O-Ring Kit (350°F)	1	120-2750-216
24	Solid Ball Seat	1	120-2750-248
25	.500 Dia. Delrin Ball (200°F)	1	120-2125-237

MODEL FURY 10 HYDRAULIC SETTING TOOL ASSEMBLY INSTRUCTIONS

Assembly Instructions:

Reference: Model Fury 10 Hydraulic Setting Tool Parts List.

Drift Cylinder (item 6) with Piston (item 7). Install all O-Rings. Lubricate all O-Rings, Threads, Sealing and Sliding Surfaces with Mobil Grease HP. Wrench only where indicated. File away wrench marks. Note: Never use pipe wrench or vise on Cylinder (item 6) at midpoint. Make Cylinders (item 6) strap wrench tight by locating strap on knurled area of cylinder. Spanner wrench tight means hand tight then striking spanner handle with rubber mallet two or three times. Screwdriver tight means hand tight with a medium blade 6" long screwdriver.

1. Place Top Sub (item 2) in vise at box connection. Slide Cylinder Cap (item 4) on Top Sub. Install (2) Brass Shear Screws (item 3) in groove screwdriver tight then back-off 1/8 turn.

2. Screw first Piston (item 7) in Top Sub wrench tight. Lubricate entire ID of first Cylinder (item 6) with Mobil Grease HP. Slide Cylinder (item 6) over Piston and screw to Cylinder Cap (item 4). Make strap wrench tight by holding back up at Cylinder Cap with spanner wrench. Screw first Upper Connector (item 9) in Cylinder and make spanner wrench tight.

3. Screw second Piston (item 7) in previous Piston wrench tight. Lubricate entire ID of second Cylinder (item 6) with Mobil Grease HP. Slide Cylinder (item 6) over Piston and screw to Upper Connector (item 9). Make strap wrench tight by holding back up at Cylinder Cap with spanner wrench. Screw second Upper Connector (item 9) in Cylinder and make spanner wrench tight.

4. Screw third Piston (item 7) in previous Piston wrench tight. Lubricate entire ID of third Cylinder (item 6) with Mobil Grease HP. Slide Cylinder (item 6) over Piston and screw to Upper Connector (item 9). Make strap wrench tight by holding back up at Cylinder Cap with spanner wrench. Screw Lower Connector (item 10) in Cylinder and make spanner wrench tight. Note: The Lower Connector (item 10) differs from the Upper Connector (item 9) with a spot face/tapped hole in the lower thread and the OD is knurled.

5. Slide upper end of Ball Seat Housing (item 13) through Lower Connector (item 10) then screw to lower end of previous Piston wrench tight. Wrench at knurled area on Ball Seat Housing.

6. Internally test 3-hydraulic chambers with air to check for cut or missing o-rings. Temporally install solid ball seat (item 24) in lower end of Ball Seat Housing (item 13). Screw Bottom Adapter Sub (item 20) on Ball Seat Housing (item 13) wrench tight. Wrench at knurled area on Ball Seat Housing. Make sure Top Sub (item 2) is secure in pipe vise, tighten both brass shear screws (item 3) then connect air test fixture. Make 1-1/2" MT connection wrench tight and close on/off valve. Clear the area for test. Do not stand at lower end of tool. Connect airline, open on/off valve and allow air to fill HST, then close valve. If gage is steady for 2-minutes and no flow of air can be heard then HST is tested. If a steady air test cannot be achieved then HST must be disassembled to find the cause. Bled air pressure to zero and remove Bottom Adapter Sub (item 20) by placing a back up at knurled area on Ball Seat Housing. Remove Solid Ball Seat (item 24). Install Ball Seat (item 17) in lower end of Ball Seat Housing (item 13). Screw Bottom Adapter Sub (item 20) on Ball Seat Housing (item 13) wrench tight. Install Socket Head Set Screw (item 15).

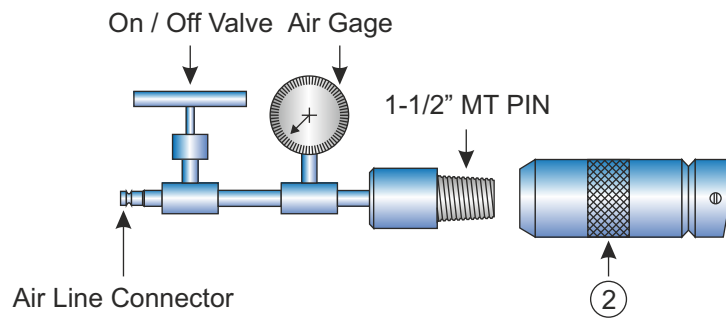
7. If it is desired to run HST with a solid seat "no ball" then install Optional Solid Seat (item 24) in lower end of Ball Seat Housing.

8. Screw Push Sleeve (item 12) to Lower Connector (item 10). Make spanner wrench tight. Install (2) Low Head Socket Cap Screws (item 11).

9. Apply Lok Tite to 8 pitch Stub Acme thread of Bottom Adapter Sleeve (item 19) then screw to Push Sleeve (item 12). Make spanner wrench tight. Install (1) Steel Pin (item 18). Bottom Adapter Sleeve must slide freely over Bottom Adapter Sub with steel pin in place.

9. Re-tighten Brass Shear Screws (item 3). Connect airline, open on/off valve and allow air to flow through HST to insure the internal flow path is free and clear (no ball is in place). File away all wrench marks. Remove air test fixture.

MODEL FURY 10 HYDRAULIC SETTING TOOL ASSEMBLY INSTRUCTIONS



Air Test Fixture

Disassembly Instructions:

1. Drain all well fluids from Hydraulic Setting Tool and dispose of properly. Place Top Sub (item 2) in pipe vise and close setting stroke gap between Top Sub (item 2) and Cylinder Cap (item 4) by pushing outer components upward towards pipe vise. Keep hands clear of this area during procedure.
2. Disassembly is basically the reverse operation of the assembly with the exception of the Pistons (item 7), Cylinders (item 6) and Connectors (item 9 & 10). Occasionally these items break at locations other than intended. If this occurs remove Lower Connector and slide down enough to place a wrench on the previous pistons knurled area.
3. Visually inspect each component for wear especially the Ball Seat area. Remove all o-rings and discard properly. Clean all parts thoroughly then re-assembly Hydraulic Setting Tool complete with new o-rings. Label outside of Hydraulic Setting Tool with the description, part number, ball size and type o-ring kit.

MODEL FURY 20 HYDRAULIC SETTING TOOL OPERATIONAL PROCEDURE

Operational Procedure:

1. Run the Model Fury 20 Hydraulic Setting Tool and BP/CR several feet below the setting depth. Note: The Fury circulation ports are located below the ball seat. These ports will allow the tubing to fill going in the hole or for circulating a maximum rate of 1/4 BPM while going in the hole. Well fluid must clean and free of debris (sand) for the HST to work properly. Warning: The setting sequence will begin at 1,250 psi differential pressure in the tubing "at the tool" (see step 4).

2. Pick up slowly to setting depth to remove slack from tubing string.

3. Drop a 5/8" diameter brass ball and slowly pump down until it has seated (pressure increase).

4. Slowly pressure workstring to establish a 1,250 psi (1,750 psi max) differential pressure inside the tubing "at the tool" to begin the setting sequence.

To Shear a 30,000 Pound Shear Stud (5-1/2" 6" Casing)

5. Continue pressuring workstring to establish a 1,400 psi differential pressure inside the tubing "at the tool" to anchor the BP/CR against the casing wall. Pick up tubing to the neutral position. Hold pressure for 5 minutes.

6. Continue pressuring workstring to establish a 2,090 psi (2,590 psi max) differential pressure inside the tubing "at the tool" to complete the set. Pick up on tubing to determine if disconnected from BP/CR. If the HST has not disconnected from BP/CR then Pick up 1,000 pounds over tubing weight and pressuring workstring again to establish 2,090 psi (2,590 psi max) inside the tubing "at the tool" to complete set. Over pressuring HST will cause damage to tool. To Shear a 50,000 Pound Shear Stud (7" & Larger Casing)

7. Continue pressuring workstring to establish a 2,500 psi differential pressure inside the tubing "at the tool" to anchor the BP/CR against the casing wall. Pick up tubing to the neutral position. Hold pressure for 5 minutes.

8. Continue pressuring workstring to establish a 3,482 psi (3,982 psi max) differential pressure inside the tubing "at the tool" to complete the set. Pick up on tubing to determine if disconnected from BP/CR. If the HST has not disconnected from BP/CR then Pick up 1,000 pounds over tubing weight and pressuring workstring again to establish 3,482 psi (3,982 psi max) inside the tubing "at the tool" to complete set. Over pressuring HST will cause damage to tool.

8. Apply 1,000 pounds of set down weight to determine if BP/CR is securely set.

9. The Fury 20 HST will automatically dump pressure when fully stroked out. Clean and re-dress Hydraulic Setting Tool and Setting Adapter Kit. Over pressuring HST will cause damage to tool.

Troubleshooting:

Condition: HST does not disconnect from BP/CR.

30,000 Pound Shear Stud (5-1/2" 6" Casing)

Pull 1,000 pounds over tubing weight and pressure workstring again to establish a 2,090 psi (2,590 psi max) inside the tubing "at the tool" to disconnect from BP/CR.

If unsuccessful, then bleed off pressure, return tubing to the neutral point and reverse circulate capacity of the tubing (+10 BBL) to remove debris that may be inside the tubing and tool. Circulate Ball back to the Ball Seat then pull 1,000 pounds over tubing weight and pressure workstring again to establish a 2,090 psi (2,590 psi max) inside the tubing "at the tool" to disconnect from BP/CR.

If unsuccessful, then bleed off pressure and pull 30,000 pounds over tubing weight to disconnect from BP/CR. Over pressuring HST will cause damage to tool.

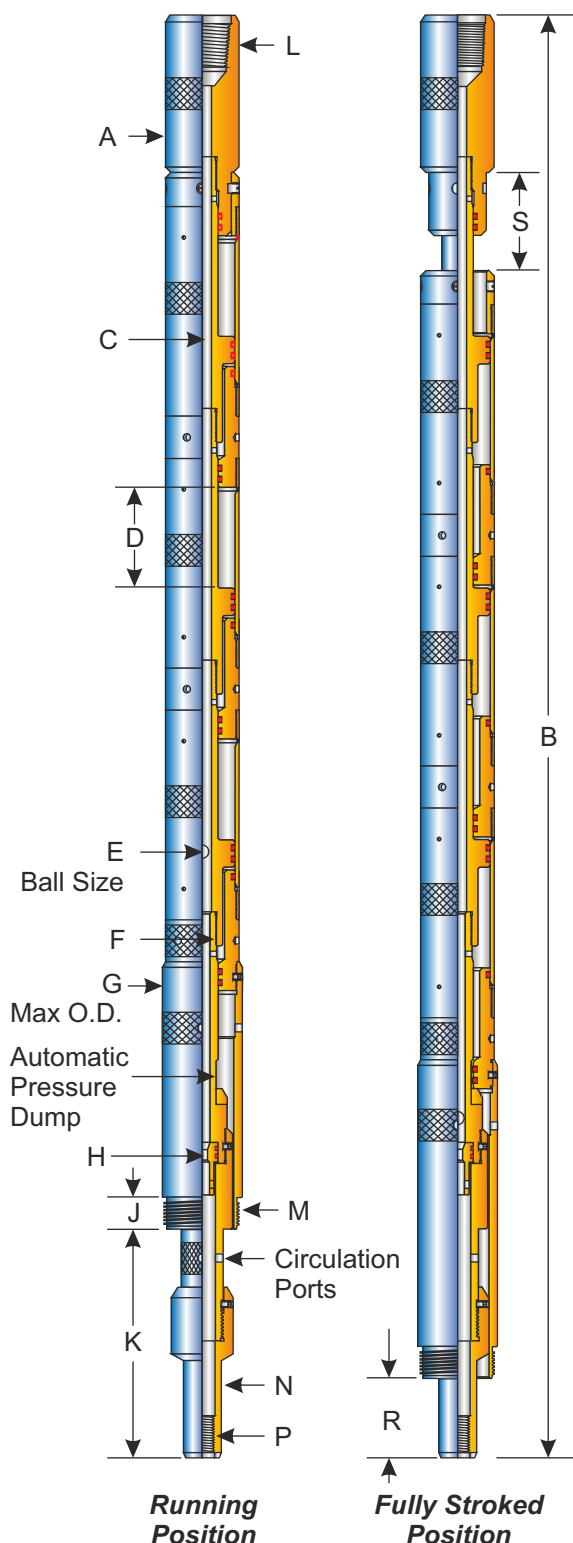
50,000 Pound Shear Stud (7" & Larger Casing)

Pull 1,000 pounds over tubing weight and pressure workstring again to establish a 3,482 psi (3,982 psi max) inside the tubing "at the tool" to disconnect from BP/CR.

If unsuccessful, then bleed off pressure, return tubing to the neutral point and reverse circulate capacity of the tubing (+10 BBL) to remove debris that may be inside the tubing and tool. Circulate Ball back to the Ball Seat then pull 1,000 pounds over tubing weight and pressure workstring again to establish a 3,482 psi (3,982 psi max) inside the tubing "at the tool" to disconnect from BP/CR.

If unsuccessful, then bleed off pressure and pull 50,000 pounds over tubing weight to disconnect from BP/CR. Over pressuring HST will cause damage to tool.

MODEL FURY 20 HYDRAULIC SETTING TOOL DIMENSIONAL DATA & SPECS



Dimensional Data

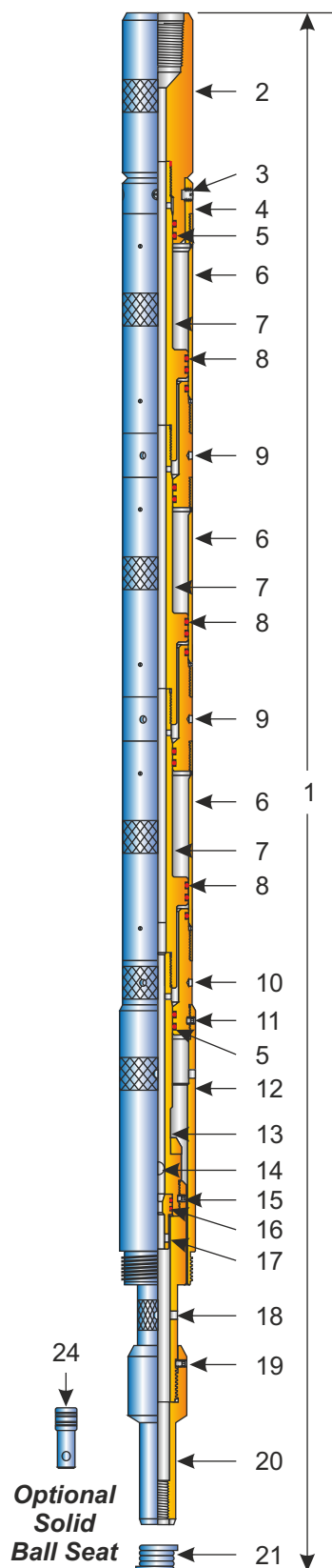
Ref	Fury 20 HST
A	3.812 Max. O.D.
B	76.312
C	.875
D	10.500 Stroke
E	.625 Dia. Ball
F	.812
G	3.812 Max. O.D.
H	.500 Min. I.D.
J	1.500
K	12.750
L	2-3/8" API Regular
M	3.500 6P ACME
N	1.812
P	1.125 7UN VEE
R	1.750
S	11.000

Specifications

Item	Fury 20 HST
Part Number	120-3812-200
Lower End of Tool	BT-20 WLPSA
Max. Running O.D.	3.812
Min. I.D. Thru Ball Seat	.500
Internal Pressure Rating	6,500 psi
Temperature Rating (Nitrile O-Ring Kit)	200°F
Temperature Rating (Viton O-Ring Kit)	350°F
Ball Size (Bronze or Phenolic)	.625 Dia.
Total Hydraulic Chambers	2
Total Piston Area	14.358
psi Required to Begin Setting Sequence	1250 psi (4 - 6,000# PINS)
psi Required at Tool to Shear 30.000 #	2,090 psi (30,000#)
psi Required at Tool to Shear 50.000 #	3,482 psi (50,000#)
Tool Length (Running Position)	76.312
Total Stroke	10.500
Joint Strength @ Piston	100,000 LBS

All dimensions are in US inches

MODEL FURY 20 HYDRAULIC SETTING TOOL PARTS LIST



Parts List

Item	Description	Qty	Part Number
1	Assembly ACT Fury 20 Hydraulic Setting Tool	1	120-3812-200
2	Top Sub 2-3/8 API Regular	1	120-3812-220
3	Brass Shear Screw (6.000 Lbs)	3	090-5687-042
4	Cylinder Cap	1	120-3812-221
5	Nitrile O-Ring - 70 Duro (200°F) Viton O-Ring - 90 Duro (350°F)	6	000-325N-070 000-325V-090
6	Cylinder	2	120-3812-222
7	Piston	2	120-3812-223
8	Nitrile O-Ring - 70 Duro (200°F) Viton O-Ring - 90 Duro (350°F)	6	000-337N-070 000-337V-090
9	Upper Connector	1	120-3812-224
10	Lower Connector	2	120-3812-225
11	Socket Head Set Screw	2	5/16-18 x 3/8 LG
12	Push Sleeve	1	120-3812-236
13	Ball Seat Housing	1	120-3812-227
14	.625 Dia. Bronze Ball	1	120-3812-236
15	Socket Head Set Screw	2	5/16-18 x 3/8 LG
16	Nitrile O-Ring - 70 Duro (200°F) Viton O-Ring - 90 Duro (350°F)	2	000-218N-090 000-218V-090
17	Ball Seat (.500 I.D.)	1	120-3812-228
18	Bottom Adapter Sub	1	120-3812-235
19	Socket Head Set Screw	1	5/16-18 x 3/8 LG
20	Adjuster Sub	1	010-4321-209
21	Lock Spring	1	010-5687-203

All dimensions are in US inches

Optional Parts

Item	Description	Qty	Part Number
22	Nitrile O-Ring Kit (200°F)	1	120-3812-215
23	Viton O-Ring Kit (350°F)	1	120-3812-216
24	Solid Ball Seat	1	120-3812-248
25	.625 Dia. Delrin Ball (200°F)	1	120-3812-237

MODEL FURY 20 HYDRAULIC SETTING TOOL ASSEMBLY INSTRUCTIONS

Assembly Instructions:

Reference: Model Fury 20 Hydraulic Setting Tool Parts List.

Drift Cylinder (item 6) with Piston (item 7). Install all O-Rings. Lubricate all O-Rings, Threads, Sealing and Sliding Surfaces with Mobil Grease HP. Wrench only where indicated. File away wrench marks. Note: Never use pipe wrench or vise on Cylinder (item 6) at midpoint. Make Cylinders (item 6) strap wrench tight by locating strap on knurled area of cylinder. Spanner wrench tight means hand tight then striking spanner handle with rubber mallet two or three times. Screwdriver tight means hand tight with a medium blade 6" long screwdriver.

1. Place Top Sub (item 2) in vise at box connection. Slide Cylinder Cap (item 4) on Top Sub. Install (4) Brass Shear Screws (item 3) in flat bottom holes screwdriver tight then back-off 1/8 turn.

2. Screw first Piston (item 7) in Top Sub wrench tight. Lubricate entire ID of first Cylinder (item 6) with Mobil Grease HP. Slide Cylinder (item 6) over Piston and screw to Cylinder Cap (item 4). Make strap wrench tight. Screw Upper Connector (item 9) in Cylinder and make spanner wrench tight.

3. Screw second Piston (item 7) in previous Piston wrench tight. Lubricate entire ID of second Cylinder (item 6) with Mobil Grease HP. Slide Cylinder (item 6) over Piston and screw to Upper Connector (item 9). Make strap wrench tight. Screw Lower Connector (item 10) in Cylinder and make spanner wrench tight. Note: The Lower Connector (item 10) differs from the Upper Connector (item 9) with a flat bottom spot face in the lower thread and the OD is knurled.

4. Slide upper end of Ball Seat Housing (item 13) through Lower Connector (item 10) then screw to lower end of previous Piston wrench tight. Wrench at knurled area on Ball Seat Housing.

5. Internally test 3-hydraulic chambers with air to check for cut or missing o-rings. Temporally install solid ball seat (item 24) in lower end of Ball Seat Housing (item 13). Screw Bottom Adapter Sub (item 18) on Ball Seat Housing (item 13) wrench tight. Wrench at knurled area on Ball Seat Housing. Make sure Top Sub (item 2) is secure in pipe vise, tighten both brass shear screws (item 3) then connect air test fixture. Make 2-3/8" API Regular connection wrench tight and close on/off valve. Clear the area for test. Do not stand at lower end of tool. Connect airline, open on/off valve and allow air to fill HST, then close valve. If gage is steady for 2-minutes and no flow of air can be heard then HST is tested. If a steady air test cannot be achieved then HST must be disassembled to find the cause. Bled air pressure to zero and remove Bottom Adapter Sub (item 18) by placing a back up at knurled area on Ball Seat Housing. Remove Solid Ball Seat (item 24). Install Ball Seat (item 17) in lower end of Ball Seat Housing (item 13). Screw Bottom Adapter Sub (item 18) on Ball Seat Housing (item 13) wrench tight. Install Socket Head Set Screw (item 11).

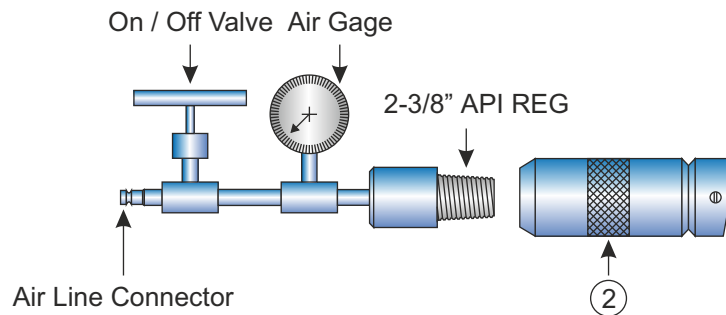
6. If it is desired to run HST with a solid seat "no ball" then install Optional Solid Seat (item 24) in lower end of Ball Seat Housing.

7. Screw Push Sleeve (item 12) to Lower Connector (item 10). Make spanner wrench tight. Install (2) Socket Head Set Screw (item 11).

8. Screw Adjuster Sub (item 20) to Bottom Adapter Sub (item 18). Make wrench tight. Install (1) Socket Head Set Screw (item 19).

9. Re-tighten Brass Shear Screws (item 3). Connect airline, open on/off valve and allow air to flow through HST to insure the internal flow path is free and clear (no ball is in place). File away all wrench marks. Remove air test fixture.

MODEL FURY 20 HYDRAULIC SETTING TOOL ASSEMBLY INSTRUCTIONS



Air Test Fixture

Disassembly Instructions:

1. Drain all well fluids from Hydraulic Setting Tool and dispose of properly. Place Top Sub (item 2) in pipe vise and close setting stroke gap between Top Sub (item 2) and Cylinder Cap (item 4) by pushing outer components upward towards pipe vise. Keep hands clear of this area during procedure.
2. Disassembly is basically the reverse operation of the assembly with the exception of the Pistons (item 7), Cylinders (item 6) and Connectors (item 9 & 10). Occasionally these items break at locations other than intended. If this occurs remove Lower Connector and slide down enough to place a wrench on the previous pistons knurled area.
3. Visually inspect each component for wear especially the Ball Seat area. Remove all o-rings and discard properly. Clean all parts thoroughly then re-assembly Hydraulic Setting Tool complete with new o-rings. Label outside of Hydraulic Setting Tool with the description, part number, ball size and type o-ring kit.

MODEL FURY 25 HYDRAULIC SETTING TOOL OPERATIONAL PROCEDURE

Operational Procedure:

1. Run the Model Fury 25 Hydraulic Setting Tool and BP/CR several feet below the setting depth. Note: The Fury circulation ports are located below the ball seat. These ports will allow the tubing to fill going in the hole or for circulating a maximum rate of 1/4 BPM while going in the hole. Well fluid must clean and free of debris (sand) for the HST to work properly. Warning: The setting sequence will begin at 1,509 psi differential pressure in the tubing "at the tool" (see step 4).

2. Pick up slowly to setting depth to remove slack from tubing string.

3. Drop a 1" diameter brass ball and slowly pump down until it has seated (pressure increase).

4. Slowly pressure workstring to establish a 1,509 psi (2,000 psi max) differential pressure inside the tubing "at the tool" to begin the setting sequence.

To Shear a 65,000 Pound Shear Stud

5. Continue pressuring workstring to establish a 2,000 psi differential pressure inside the tubing "at the tool" to anchor the BP/CR against the casing wall. Pick up tubing to the neutral position. Hold pressure for 5 minutes.

6. Continue pressuring workstring to establish a 2,724 psi (3,224 psi max) differential pressure inside the tubing "at the tool" to complete the set. Pick up on tubing to determine if disconnected from BP/CR. If the HST has not disconnected from BP/CR then Pick up 1,000 pounds over tubing weight and pressuring workstring again to establish 2,724 psi (3,224 psi max) inside the tubing "at the tool" to complete set. Over pressuring HST will cause damage to tool.

To Shear a 80,000 Pound Shear Stud

7. Continue pressuring workstring to establish a 2,500 psi differential pressure inside the tubing "at the tool" to anchor the BP/CR against the casing wall. Pick up tubing to the neutral position. Hold pressure for 5 minutes.

8. Continue pressuring workstring to establish a 3,353 psi (3,853 psi max) differential pressure inside the tubing "at the tool" to complete the set. Pick up on tubing to determine if disconnected from BP/CR. If the HST has not disconnected from BP/CR then Pick up 1,000 pounds over tubing weight and pressuring workstring again to establish 3,353 psi (3,853 psi max) inside the tubing "at the tool" to complete set. Over pressuring HST will cause damage to tool.

8. Apply 1,000 pounds of set down weight to determine if BP/CR is securely set.

9. The Fury 25 HST will automatically dump pressure when fully stroked out. Clean and re-dress Hydraulic Setting Tool and Setting Adapter Kit. Over pressuring HST will cause damage to tool.

Troubleshooting:

Condition: HST does not disconnect from BP/CR.

65,000 Pound Shear Stud

Pull 1,000 pounds over tubing weight and pressure workstring again to establish a 2,724 psi (3,224 psi max) inside the tubing "at the tool" to disconnect from BP/CR.

If unsuccessful, then bleed off pressure, return tubing to the neutral point and reverse circulate capacity of the tubing (+10 BBL) to remove debris that may be inside the tubing and tool. Circulate Ball back to the Ball Seat then pull 1,000 pounds over tubing weight and pressure workstring again to establish a 2,724 psi (3,224 psi max) inside the tubing "at the tool" to disconnect from BP/CR.

If unsuccessful, then bleed off pressure and pull 65,000 pounds over tubing weight to disconnect from BP/CR. Over pressuring HST will cause damage to tool.

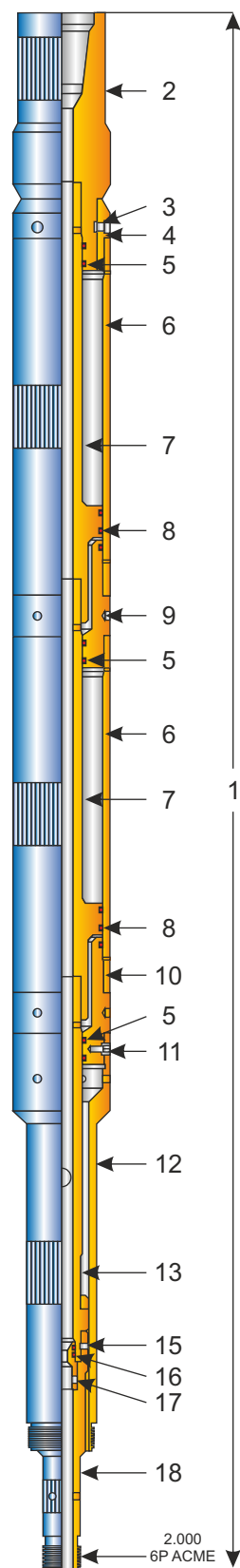
80,000 Pound Shear Stud

Pull 1,000 pounds over tubing weight and pressure workstring again to establish a 3,353 psi (3,853 psi max) inside the tubing "at the tool" to disconnect from BP/CR.

If unsuccessful, then bleed off pressure, return tubing to the neutral point and reverse circulate capacity of the tubing (+10 BBL) to remove debris that may be inside the tubing and tool. Circulate Ball back to the Ball Seat then pull 1,000 pounds over tubing weight and pressure workstring again to establish a 3,353 psi (3,853 psi max) inside the tubing "at the tool" to disconnect from BP/CR.

If unsuccessful, then bleed off pressure and pull 80,000 pounds over tubing weight to disconnect from BP/CR. Over pressuring HST will cause damage to tool.

MODEL FURY 25 HYDRAULIC SETTING TOOL PARTS LIST & SPECIFICATION



Parts List

Item	Description	Qty	Part Number 200°F	Part Number 200°F
1	Assembly: 5.250 OD. x 2 Stage-Fury 25 HST	1	120-5250-200N	120-5250-200V
2	Top Sub 3-1/2" IF Box Up	1	120-5250-220	
3	Brass Shear Screw (6.000 Lbs)	6	090-5687-042	
4	Cylinder Cap	1	120-5250-221	
5	O-Ring	6	000-331N-070	000-331V-090
6	Cylinder	2	120-5250-222	
7	Piston	2	120-5250-223	
8	O-Ring	6	000-346N-070	000-346V-090
9	Upper Cylinder Connector	1	120-5250-224	
10	Lower Cylinder Connector	1	120-5250-225	
11	Socket Head Set Screw	1	5/16-18 x 3/8 LG	
12	Push Sleeve	1	120-5250-226	
13	Ball Seat Housing	1	120-5250-227	
14	1.000 Dia. Bronze Ball	1	120-5250-236	
15	Socket Head Set Screw	1	5/16-18 x 3/8 LG	
16	O-Ring	2	000-218N-090	000-218V-090
17	Ball Seat (.625 I.D.)	1	120-5250-228	
18	Bottom Adapter Sub	1	120-5250-235	

All dimensions are in US inches

Specifications

Item	5.250 OD. x 2 Stage Fury 25 HST
Lower End of Tool	Baker No. 20
Max Running OD.	5.250
Min ID.	.625
Internal Pressure Rating	6,500 psi
External Pressure Rating	10,000 psi
Ball Size (Bronze)	1.000 Dia.
Cylinder OD.	5.250
Cylinder ID.	4.500 (15.904 sq. in.)
Piston OD.	2.250 (3.976 sq. in.)
Piston Area Each Hydraulic Chamber	11.928
Total Hydraulic Chambers	2
Total Piston Area	23.856
psi Required To Begin Setting Sequence	1,500 psi (6 - 6,000 # PINS)
psi Required At Tool To Shear 65,000 # Stud	2,724 psi
psi Required At Tool To Shear 80,000 # Stud	3,353 psi
Tool Length	84.625
Tool Stroke	10.500
Joint Strength @ Piston	150,000 LBS

All dimensions are in US inches

MODEL FURY 25 HYDRAULIC SETTING TOOL ASSEMBLY INSTRUCTIONS

Assembly Instructions:

Reference: Model Fury 25 Hydraulic Setting Tool Parts List.

Drift Cylinder (item 6) with Piston (item 7). Install all O-Rings. Lubricate all O-Rings, Threads, Sealing and Sliding Surfaces with Mobil Grease HP. Wrench only where indicated. File away wrench marks. Note: Never use pipe wrench or vise on Cylinder (item 6) at midpoint. Make Cylinders (item 6) strap wrench tight by locating strap on knurled area of cylinder. Spanner wrench tight means hand tight then striking spanner handle with rubber mallet two or three times. Screwdriver tight means hand tight with a medium blade 6" long screwdriver.

1. Place Top Sub (item 2) in vise at box connection. Slide Cylinder Cap (item 4) on Top Sub. Install (4) Brass Shear Screws (item 3) in flat bottom holes screwdriver tight then back-off 1/8 turn.

2. Screw first Piston (item 7) in Top Sub wrench tight. Lubricate entire ID of first Cylinder (item 6) with Mobil Grease HP. Slide Cylinder (item 6) over Piston and screw to Cylinder Cap (item 4). Make strap wrench tight. Screw Upper Connector (item 9) in Cylinder and make spanner wrench tight.

3. Screw second Piston (item 7) in previous Piston wrench tight. Lubricate entire ID of second Cylinder (item 6) with Mobil Grease HP. Slide Cylinder (item 6) over Piston and screw to Upper Connector (item 9). Make strap wrench tight. Screw Lower Connector (item 10) in Cylinder and make spanner wrench tight. Note: The Lower Connector (item 10) differs from the Upper Connector (item 9) with a flat bottom spot face in the lower thread and the OD is knurled.

4. Slide upper end of Ball Seat Housing (item 13) through Lower Connector (item 10) then screw to lower end of previous Piston wrench tight. Wrench at knurled area on Ball Seat Housing.

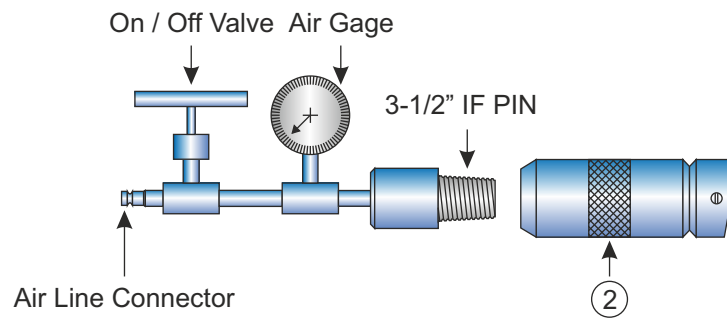
5. Internally test 3-hydraulic chambers with air to check for cut or missing o-rings. Temporally install solid ball seat (item 24) in lower end of Ball Seat Housing (item 13). Screw Bottom Adapter Sub (item 18) on Ball Seat Housing (item 13) wrench tight. Wrench at knurled area on Ball Seat Housing. Make sure Top Sub (item 2) is secure in pipe vise, tighten brass shear screws (item 3) then connect air test fixture. Make 3-1/2" API IF connection wrench tight and close on/off valve. Clear the area for test. Do not stand at lower end of tool. Connect airline, open on/off valve and allow air to fill HST, then close valve. If gage is steady for 2-minutes and no flow of air can be heard then HST is tested. If a steady air test cannot be achieved then HST must be disassembled to find the cause. Bled air pressure to zero and remove Bottom Adapter Sub (item 18) by placing a back up at knurled area on Ball Seat Housing. Remove Solid Ball Seat (item 24). Install Ball Seat (item 17) in lower end of Ball Seat Housing (item 13). Screw Bottom Adapter Sub (item 18) on Ball Seat Housing (item 13) wrench tight. Install Socket Head Set Screw (item 11).

6. If it is desired to run HST with a solid seat "no ball" then install Optional Solid Seat (item 24) in lower end of Ball Seat Housing.

7. Screw Push Sleeve (item 12) to Lower Connector (item 10). Make spanner wrench tight. Install (2) Socket Head Set Screw (item 11).

8. Re-tighten Brass Shear Screws (item 3). Connect airline, open on/off valve and allow air to flow through HST to insure the internal flow path is free and clear (no ball is in place). File away all wrench marks. Remove air test fixture.

MODEL FURY 25 HYDRAULIC SETTING TOOL ASSEMBLY INSTRUCTIONS

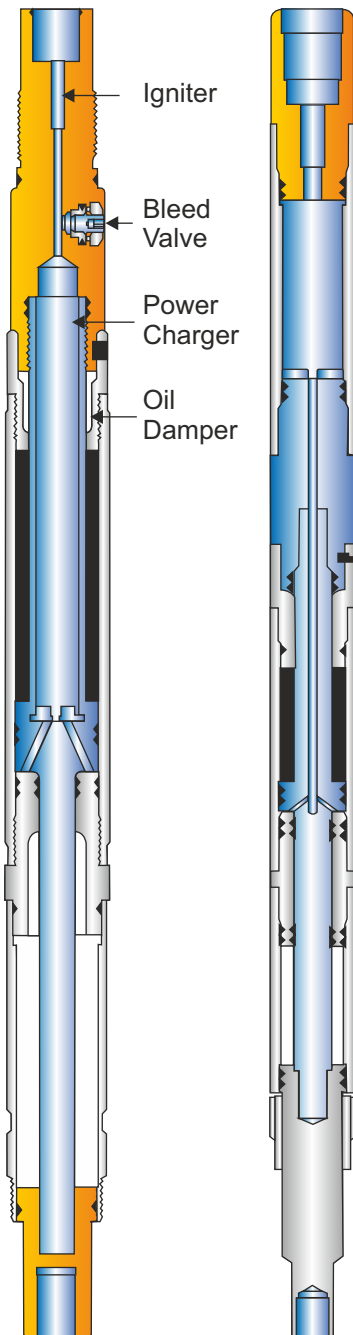


Air Test Fixture

Disassembly Instructions:

1. Drain all well fluids from Hydraulic Setting Tool and dispose of properly. Place Top Sub (item 2) in pipe vise and close setting stroke gap between Top Sub (item 2) and Cylinder Cap (item 4) by pushing outer components upward towards pipe vise. Keep hands clear of this area during procedure.
2. Disassembly is basically the reverse operation of the assembly with the exception of the Pistons (item 7), Cylinders (item 6) and Connectors (item 9 & 10). Occasionally these items break at locations other than intended. If this occurs remove Lower Connector and slide down enough to place a wrench on the previous pistons knurled area.
3. Visually inspect each component for wear especially the Ball Seat area. Remove all o-rings and discard properly. Clean all parts thoroughly then re-assembly Hydraulic Setting Tool complete with new o-rings. Label outside of Hydraulic Setting Tool with the description, part number, ball size and type o-ring kit.

MODEL "BP" WIRELINE SETTING TOOLS & COMPACT SINGLE STAGE



3-5/8" O.D. BP Setting Tool **1.50, 1.71, O.D. Shorty Setting Tool**

Model "BP" wire line pressure setting tools are compact tools inside which the ignition and burning of a pyrotechnic power charge (manufactured by TITAN SPECIALTIES, Pampa, Texas) produces gas pressure that elongates the tool. This provides the stroke and force necessary to set and anchor conventional bridge plugs, packers, and cement retainers provided by various manufacturers. The tools feature pressure balanced top and bottom pistons to eliminate presetting of the mentioned products caused by high hydrostatic well pressure.

Operation:

An electrically actuated high temperature rated igniter (also manufactured by TITAN SPECIALTIES) located at the upper end of the tool is ignited and produces a flash flame which, in turn, ignites the power charge that is located directly below the igniter. The power charge, which is constructed of carefully controlled combustible elements, begins a slow burn lasting approximately 30 seconds. The resultant gas derived from the burning charge gradually builds to high pressure and causes the tool to elongate.

The pressurized gas migrates down the center of the top piston and out into an annular cavity formed between the top piston and connector sub. The pressure acting on this area drives the outside of the tool (consisting of top and bottom cylinders) downward while the top and bottom pistons remain stationary. This motion anchors the bridge plug to the casing i.d. then pulls the shear stud of the bridge plug apart, freeing the setting tool for removal from the well.

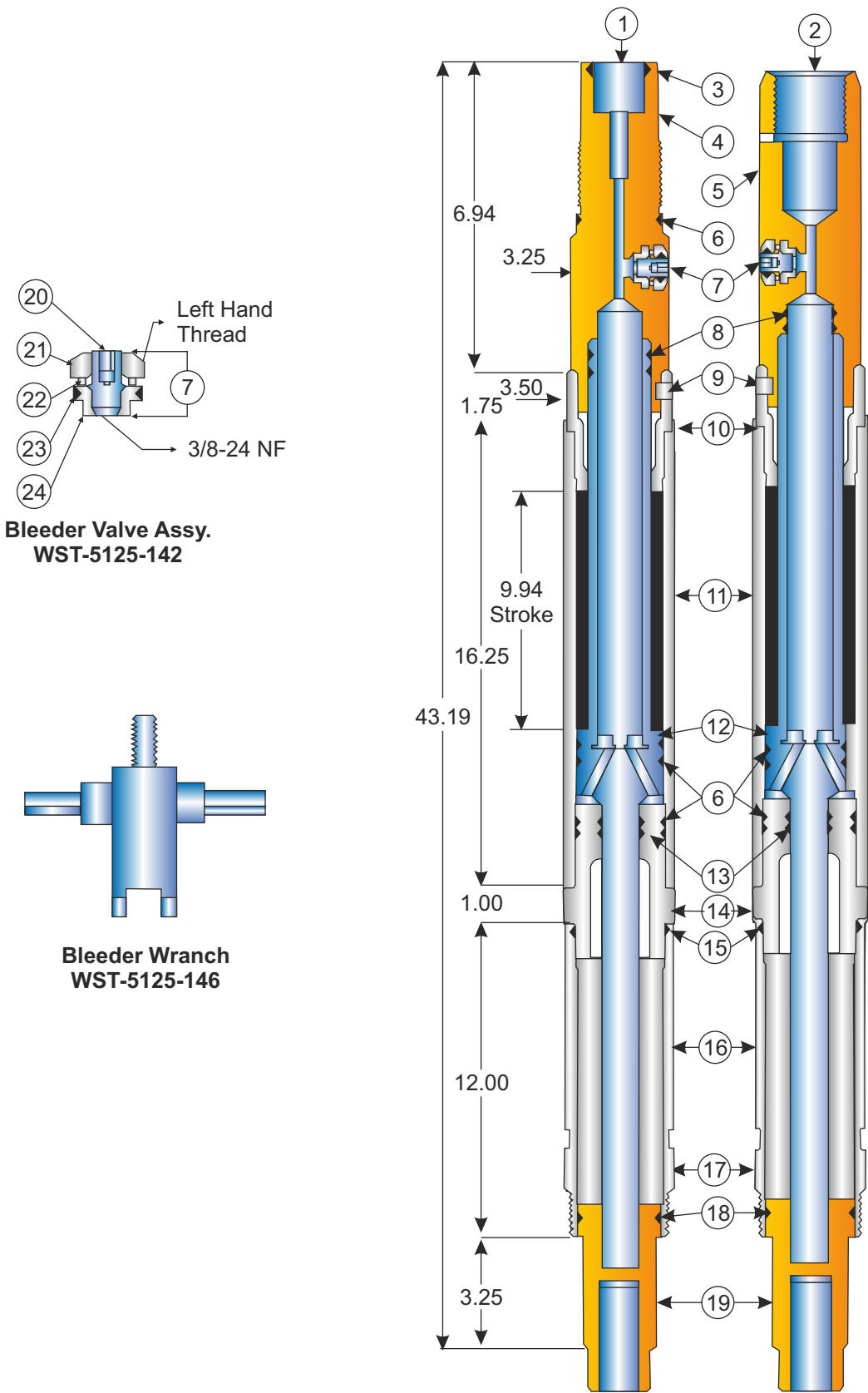
An oil damper system is built into the tool to control the speed at which the tool strokes. As the tool elongates, this oil is forced through an annular orifice and out of the tool at a controlled rate and prevents the tool from stroking too fast, causing damage to the tool once the shear stud has parted.

Note: It is mandatory that the tool be filled to capacity With oil each use or damage to the tool will result.

Excess oil will be purged out automatically during assembly. Likewise, oil expansion caused by high well temperature during running will be purged in the same manner.

In wells where hydrostatic pressure is less than 10,000 psi, all tool sizes are available with manual bleeder valve assemblies. This valve provides a safe, easy method of bleeding trapped gas pressure from the tool before disassembly is begun. When bottom hole pressures exceeding 10,000 psi are to be encountered, the manual bleeder valve and its corresponding sub are replaced by a portless sub. Bleeding is then accomplished by backing the firing head out of the setting tool. Both methods of bleeding pressure are illustrated in the disassembly steps found later in this manual.

3-5/8" OD "BP" SETTING TOOL



3-5/8" OD "BP" SETTING TOOL

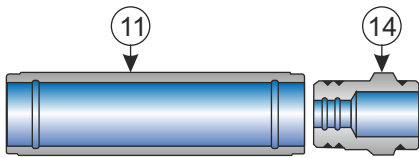
Part List

Item	Part Number	Req	Description
1	WST-3625-101		Assy. - 3-5/8" O.D. "BP" Setting Tool - Top Connection to Fit 3-1/4" Quick Change Assy.- incl. Items 3,4, and 6-24
2	WST-3625-102		Assy. - 3-5/8" O.D. "BP" Setting Tool Top Connection to Fit Baker Size #10 Firing Head- Incl. Items 5 and 7-24
3*	000-N569-328	1	O-RING- 90 Duro.
4	WST-3652-120	1	Top Sub - to fit 3-1/4' Quick Change Assy.
5	WST-3625-132	6	O-ring- 90 Duro.
7	WST-5125-142	1	Assy. -bleeder Valve- Incl. Items 20-24
8*	00-N569-226	2	O-Ring- 90 Duro.
9*	052-5303-003	1	Brass Shear Screw - Approx.. 6500 Lbs . Shear
10	WST-3625-121	1	Orifice Sub
11	WST-3625-125	1	Top Cylinder
12	WST-3625-122	1	Top Piston
13*	000-N569-322	2	O- Ring - 90 Duro.
14	WST-3625-126	1	Connector Sub
15*	000-N569-335	1	O- Ring - 90 Duro.
16	WST-3625-127	1	Bottom Cylinder
17	WST-3625-130	1	Lock Ring
18	WST-3625-128	1	Bottom Piston
19	WST-3625-131	1	Lock Nut
20	WST-5125-143	1	Stem - For Bleeder Valve
21	WST-5125-144	1	Retainer Nut - For Bleeder Valve
22	WST-5125-145	1	Seat - For Bleeder Valve
23*	000-N569-213	1	O- Ring - 90 Duro. - For Bleeder Valve
24*	000-N569-012	1	O- Ring - 90 Duro. - For Bleeder Valve
*	WST-3625-110		O- Ring Kit - 325° - For WST-3625-101 Incl. Items 3,6,8,9,13,15,23,24-
*	WST-3625-112		O- Ring Kit - 325° - For WST-3625-102 Incl. Items 3,6,8,9,13,15,23,24-

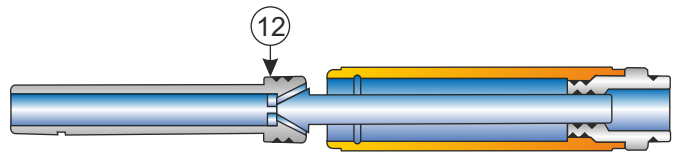
Vendor Power Charges And Igniters For Use With This Tool:

Tool Total Stroke: 9.94 In. Tool Piston Area: 5.26 In2 . Tool Max Pull: 55,000 Lbs. at 6.6 Inch Stroke Tool Max Hydrostatic Pressure: 10,000 psi	1.Power Charges: Titan Specialties, Ltd. Pt. No. 6000-000-170-4 2. Igniters: Titan Specialties, Ltd. Pt. No. 6035-000-050 Owen Oil Tools, Inc. Pt. No. Det - 5306-074
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3-5/8" OD "BP" SETTING TOOL ASSEMBLY INSTRUCTIONS



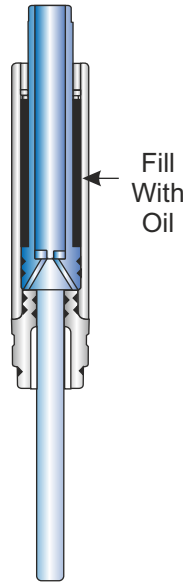
1. Screw Connector Sub (item 14) to either end of Top Cylinder (item 11).



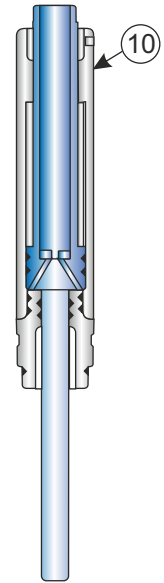
2. Place Top Piston (item 12), lower end first, inside Top Cylinder and Connector Sub.



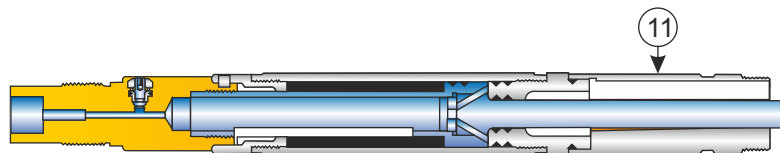
3. Bump Top Piston fully closed inside Top Cylinder and Connector Sub. Bump on wooden block only.



4. Turn tool upright and fill reservoir with motor oil to bottom of threads.



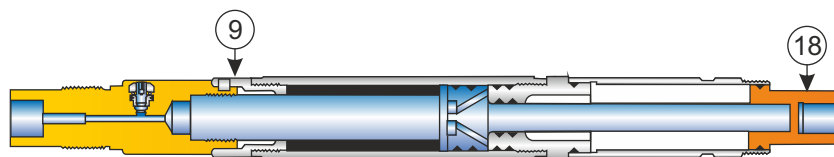
5. Screw Orifice Sub (item 10) to Top Cylinder



6. Install Bleeder Valve (item 7) in Top Sub (item 4). Place Power Charge (open end up) inside Top Piston. Screw Top Sub to Top Piston. Do not allow oil to leak out of reservoir.

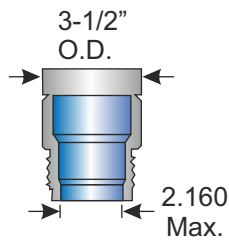


7. Screw Bottom Cylinder (item 16) to Connector sub.

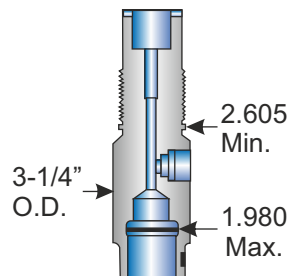


8. Screw Bottom Piston (item 18) to Top piston. Wrench tighten the Top Sub, Top Piston, and Bottom Piston by holding backup wrench on Top Sub and tightening Bottom Piston. Next, rotate Top Sub until the Shear Screw (item 9) can be installed into tapped hole of Orifice Sub and blind hole provided in Top Sub. Finally install Igniter Assembly and 3-1/4" o.d. Quick Change Assembly.

3-5/8" OD "BP" SETTING TOOL MINIMUM AND MAXIMUM WEAR DIA'S



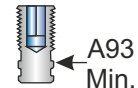
Orifice Sub



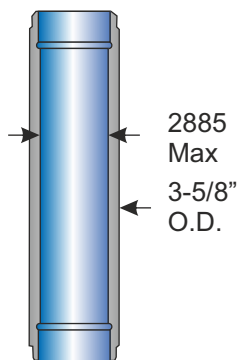
Top Sub



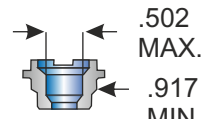
Retainer Nut



Bleeder Stem



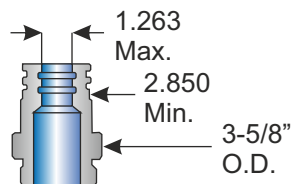
Top Cylinder



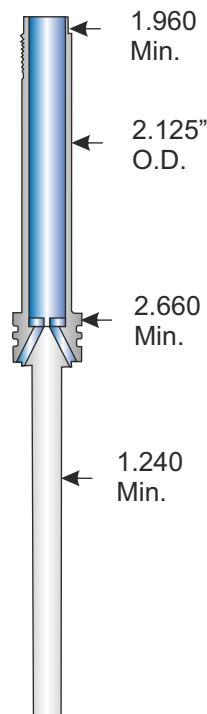
Bleeder Seat

Note:

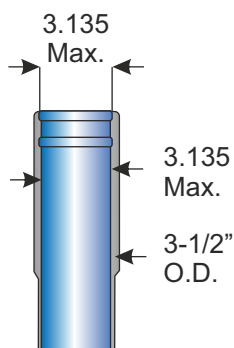
The retainer, stem, and seat must be replaced before 20 runs, or earlier if conditions warrant.



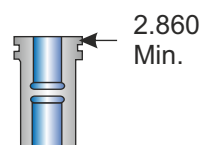
Connector Sub



Top Piston



Bottom Cylinder

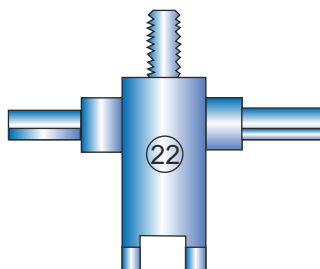


Bottom Piston

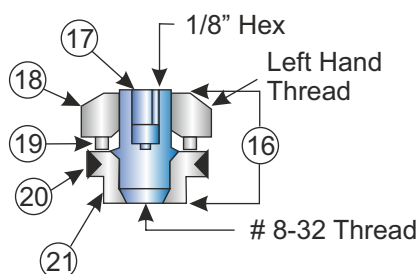
ACT, wire alloy steel with traceable heat numbers. Material hardness is also controlled.

The illustrations shown above list suggested critical minimum and maximum wear diameters

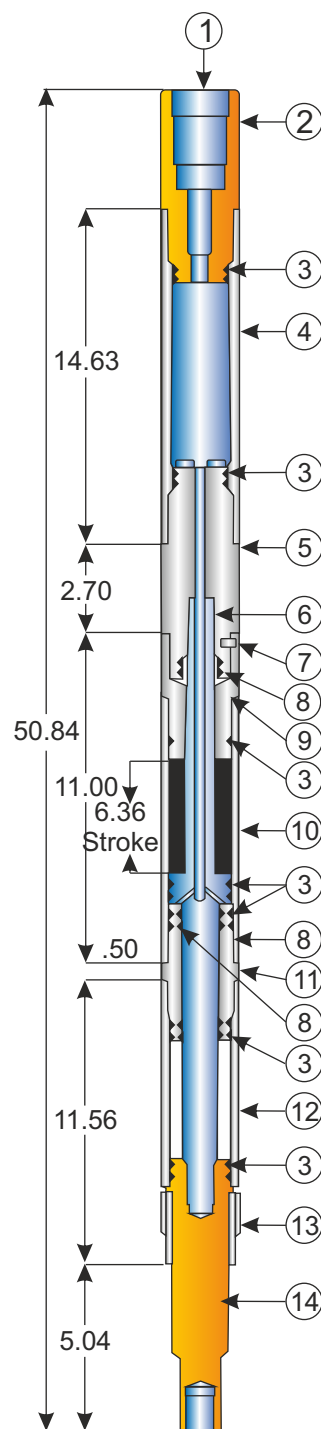
1.71" OD "SHORTY" SETTING TOOL



Bleeder Wrench
WST-2125-146



Bleeder Valve Assy.
WST-2125-142



1.71" OD "SHORTY" SETTING TOOL

Parts List

Item	Part Number	Req	Description
1	WST-1718-001		Assy. - 1.71" O.D. "Shortly" Setting Tool- Top Connection To Fit "GO" 1-7/6" O.D. High Pressure Firing Head- Incl. Items 2-14
2	WST-1718	1	Top Sub
3*	000-N569-216	13	O- Ring- 90 Duro
4	WST-1718-021	1	O- Ring - 90 Duro
5	WST-1718-028	1	Shear Sub - Non Ported
6	WST-1718-026	1	Tor Piston
7*	052-5304-003	1	Brass Shear Screw - Approx. 2300 Lbs Shear
8*	000-N569-115	6	O- Ring- 90 Duro
9	WST-1718-023	1	Orifice Sub
10	WST-1718-024	1	Top Cylinder
11	WST-1718-027	1	Tandem Sub
12	WST-1718-025	1	Bottom Cylinder
13	WST-1718-030	1	Lock Ring
14	WST-1718-029	1	Bottom Piston
*	WST-1718-010		O- Ring Kit - 325° - For WST-1718-001 Incl. Item 3,7,8-

Optional Equipment Not Included In Assy. WST-1718-001

Item	Part Number	Req	Description
15	WST-1718-022	1	Shear Sub - Ported For Bleeder Valve
16	WST-2125-142	1	Assy. - Bleeder Valve - Item 17-21
17	WST-2125-143	1	Stem
18	WST-2125-144	1	Retainer Nut
19	WST-2125-145	1	Seat
20	000-N569-111	1	O- Ring - 90 Duro
21	000-N569-006	1	O- Ring - 90 Duro.
22	WST-2125-146		Bleeder Wrench

Vendor Power Charges and Igniters for use with this tool:

- Power Charges: Titan Specialties, Ltd. Pt. No. 6000-000-171-1S
Owen Oil Tools, Inc. Pt. No. JEC-5302-041
- Igniters: Titan Specialties, Ltd. Pt. No. 6035-000-050
Owen Oil Tools, Inc. Pt. No. DET-5306-074

Tool total stroke: 6.36 in.

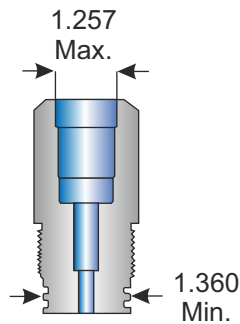
Tool piston area: 1.11 in.²

Tool max. Pull: 13,000 lbs. At 4.25 inch stroke

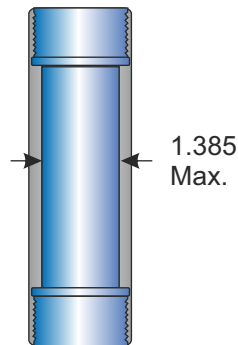
Unported tool max. Hydrostatic pressure: 15,000 P.S.I.

Ported tool max. Hydrostatic pressure: 10,000 P.S.I.

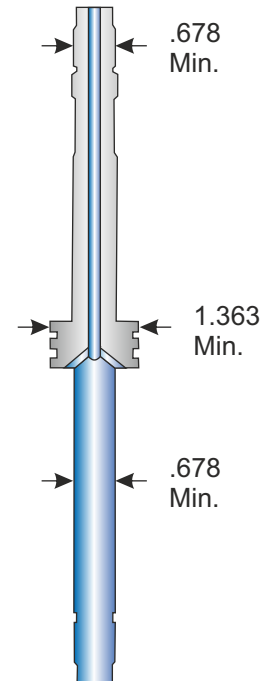
1.71" OD "SHORTY" SETTING TOOL MINIMUM AND MAXIMUM WEAR DIA'S



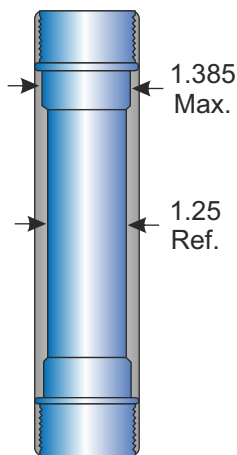
Top Sub



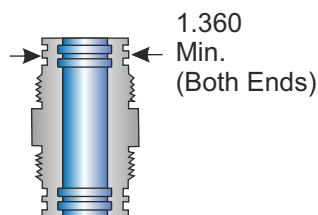
Top Cylinder



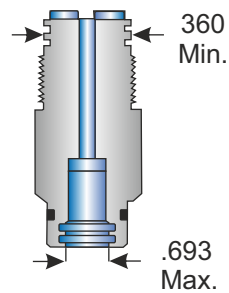
Top Piston



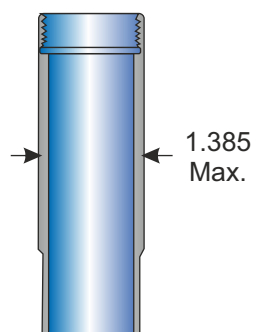
Power Chamber



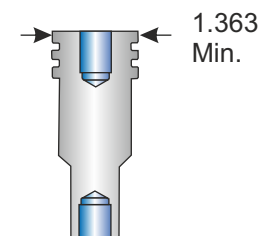
Tandem Sub



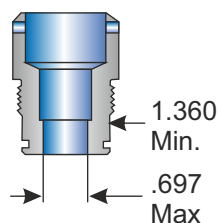
Shear Sub



Bottom Cylinder



Bottom Piston

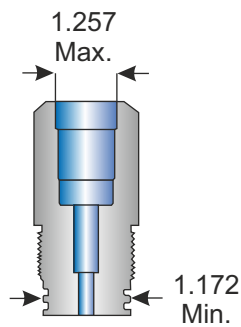


Orifice Sub

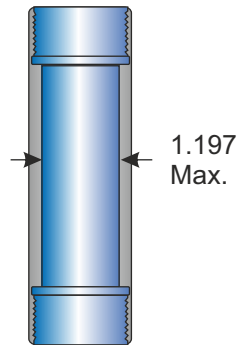
ACT, Wireline pressure setting tools are constructed from high quality alloy steel with traceable heat numbers. Material hardness is also controlled.

The illustrations shown above list suggested critical minimum and maximum wear diameters.

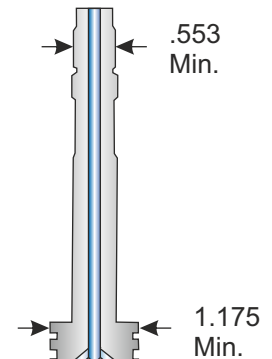
1.50" OD "SHORTY" SETTING TOOL MINIMUM AND MAXIMUM WEAR DIA'S



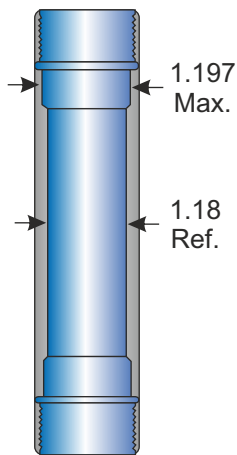
Top Sub



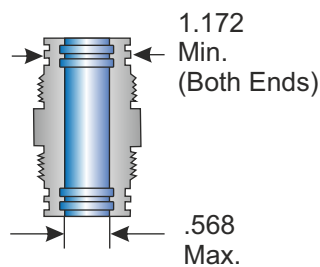
Top Cylinder



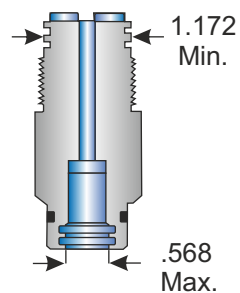
Top Piston



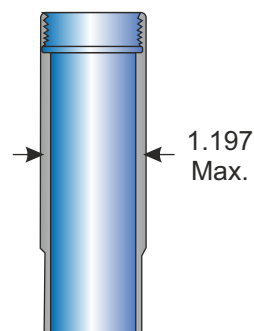
Power Chamber



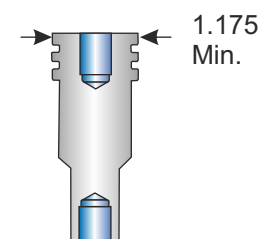
Tandem Sub



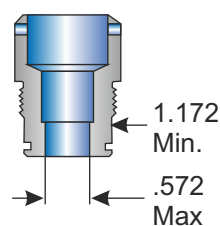
Shear Sub



Bottom Cylinder



Bottom Piston

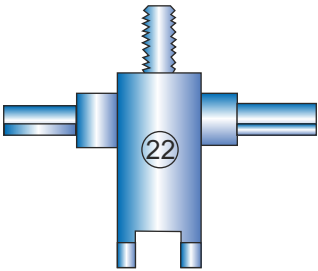


Orifice Sub

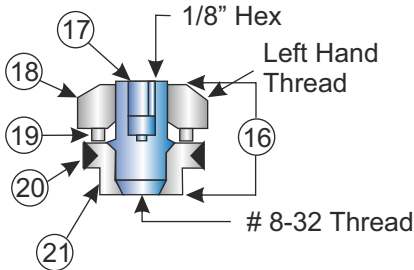
ACT, Wireline pressure setting tools are constructed from high quality alloy steel with traceable heat numbers. Material hardness is also controlled.

The illustrations shown above list suggested critical minimum and maximum wear diameters.

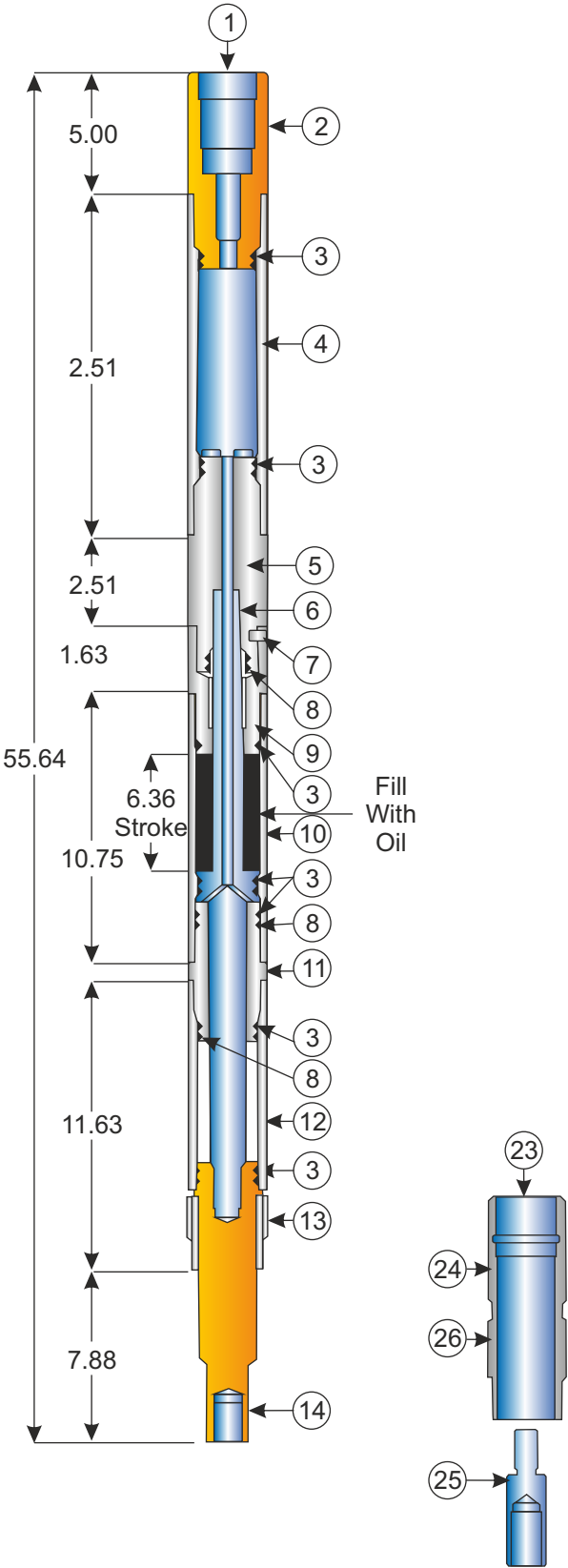
1.50" OD "SHORTY" SETTING TOOL



Bleeder Wrench
WST-2125-146



Bleeder Valve Assy.
WST-2125-142



1.50" OD "SHORTY" SETTING TOOL

Parts List

Item	Part Number	Req	Description
1	WST-1500-001		Assy. - 1.50" O.D. "Shortly" Setting Tool- Top Connection to Fit "GO" 1-7/16" O.D. High Pressure Firing Head- Incl. Items 2-14
2	WST-1500-020	1	Top Sub
3*	000-N569-213	13	O- Ring- 90 Duro
4	WST-1500-021	1	Power Chamber
5	WST-1500-028	1	Shear Sub - Non Ported
6	WST-1500-026	1	Tor Piston
7*	052-5304-003	1	Brass Shear Screw - Approx. 2300 Lbs Shear
8*	000-N569-113	6	O- Ring- 90 Duro
9	WST-1500-023	1	Orifice Sub
10	WST-1500-024	1	Top Cylinder
11	WST-1500-027	1	Tandem Sub
12	WST-1500-025	1	Bottom Cylinder
13	WST-1500-030	1	Lock Ring
14	WST-1500-029	1	Bottom Piston
*	WST-1500-010		O- Ring Kit - 325° - For WST-1718-001 Incl. Item 3,7,8-

Optional Equipment Not Included In Assy. WST-1500-001

Item	Part Number	Req	Description
15	WST-1500-022	1	Shear Sub - Ported For Bleeder Valve
16	WST-2125-142	1	Assy. - Bleeder Valve - Item 17-21
17	WST-2125-143	1	Stem
18	WST-2125-144	1	Retainer Nut
19	WST-2125-145	1	Seat
20	000-N569-111	1	O- Ring - 90 Duro
21	000-N569-006	1	O- Ring - 90 Duro
22	WST-2125-146		Bleeder Wrench
23	WST-1500-040		Assy. - Adapt. Kit - 10 To 1-11/16" O.D. Setting Tool Setting Adapters - Items 24,25,26
24	WST-1500-041	1	Adapter Sleeve
25	WST-1500-042	1	Adapter Rod
26	WST-1718-030	1	Lock Ring

Vendor Power Charges and Igniters for use with this tool:

- Power Charges: Titan Specialties, Ltd. Pt. No. 6000-000-171-1S
Owen Oil Tools, Inc. Pt. No. JEC-5302-041
- Igniters: Titan Specialties, Ltd. Pt. No. 6035-000-050
Owen Oil Tools, Inc. Pt. No. DET-5306-074

Tool total stroke: 6.36 in.

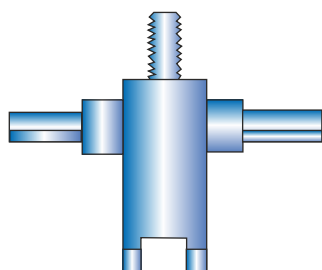
Tool piston area: 1.11 in.²

Tool max. Pull: 13,000 lbs. At 4.25 inch stroke

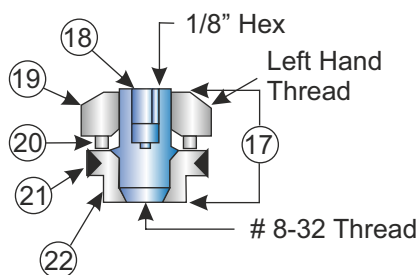
Unported tool max. Hydrostatic pressure: 15,000 P.S.I.

Ported tool max. Hydrostatic pressure: 10,000 P.S.I.

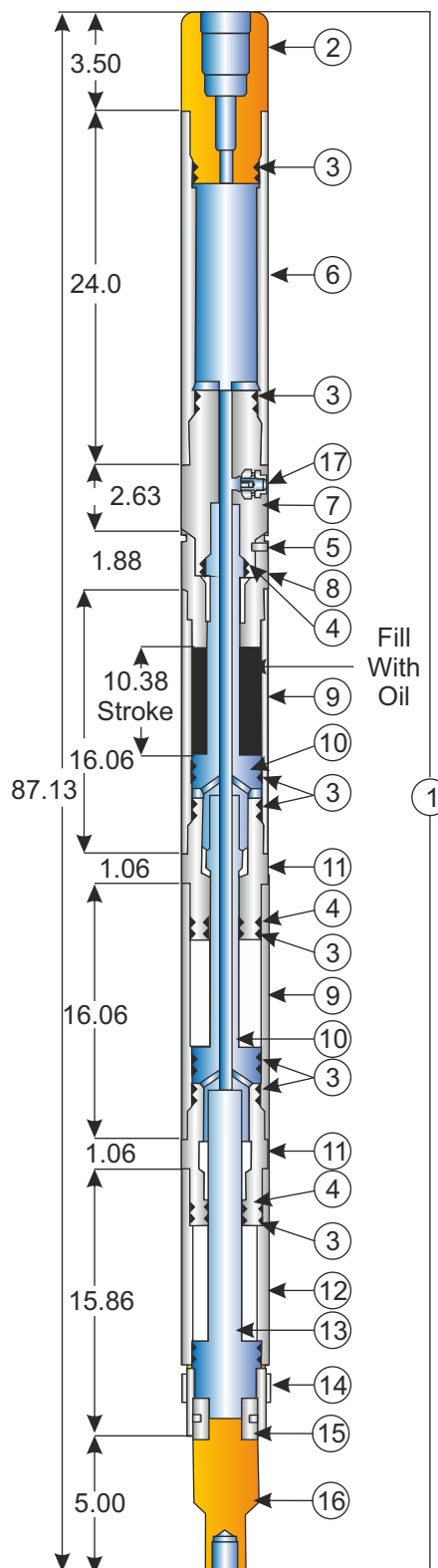
2-1/8" OD MULTI-STAGE SETTING TOOL



Bleeder Wrench
WST-2125-146



Bleeder Valve Assy.
WST-2125-142



2-1/8" OD MULTI-STAGE SETTING TOOL

Parts List

Item	Part Number	Req	Description
1	WST-2125-001		Assy. - 2-1/8" O.D. "Multi-Stage Setting Tool, Top Connection to Fit "GO" 1-7/16" O.D. High Pressure Firing Head- Incl. Items 2-17
2	WST-2125-020	1	Top Sub
3*	000-N569-222	18	O- Ring- 90 Duro
4*	000-N569-212	6	O- Ring- 90 Duro
5*	052-5304-003	1	Brass Shear Screw - Approx. 2300 Lbs Shear
6	WST-5304-121	1	Power Chamber
7*	WST-2125-122	1	Shear Sub - Ported For Bleeder Valve
	WST-2125-132		Shear Sub - Unported (not Bleeder Valve)
8	WST-2125-123	1	Orifice Sub
9	WST-2125-124	2	Top Cylinder
10	WST-2125-125	2	Top Piston
11	WST-2125-126	2	Connector Sub
12	WST-2125-127	1	Bottom Cylinder
13	WST-2125-128	1	Bottom Piston
14	WST-2125-029	1	Lock Ring
15	WST-2125-030	1	Safety Release Nut- 52,000 Lbs. Weak Point
16	WST-2125-131	1	Bottom Adapter
17	WST-2125-142	1	Assy. - Bleeder Valve - Items 18-22
18	WST-2125-143	1	Stem
19	WST-2125-144	1	Retainer Nut
20	WST-2125-145	1	Seat
21*	000-N569-111	1	O- Ring - 90 Duro
22*	000-N569-006	1	O- Ring - 90 Duro
23	WST-2125-146		Bleeder Wrench
*	WST-2125-110		O- Ring Kit -0 325° - For WST-2125-110 Incl. Items 3,4,5,21,22-

Tool total stroke: 10.36 in.

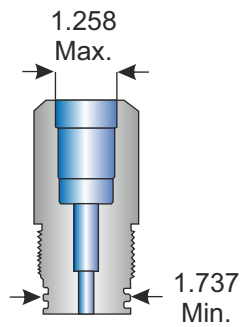
Tool piston area: 3.6 in.²

Tool max. Pull: 30,000 lbs. At 6.91 inch stroke

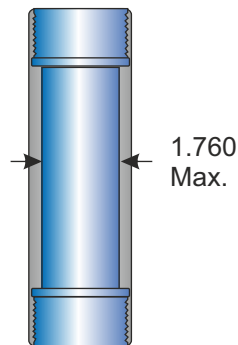
Unported tool max. Hydrostatic pressure: 15,000 P.S.I.

Ported tool max. Hydrostatic pressure: 10,000 P.S.I.

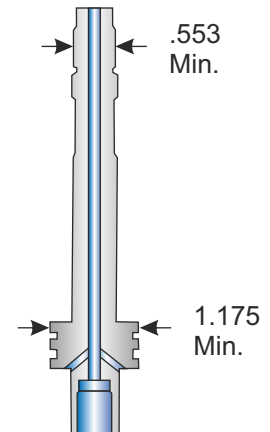
2-1/8" OD MULTI-STAGE SETTING TOOL MINIMUM AND MAXIMUM WEAR DIA'S



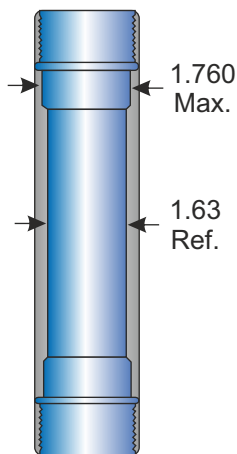
Top Sub



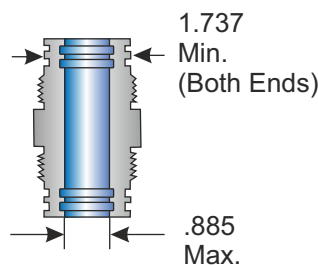
**Top Cylinder
(2-Req. "D")**



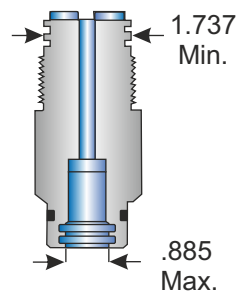
**Top Piston
(2-Req. "D")**



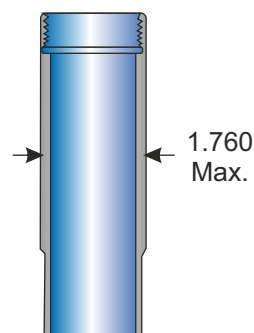
Power Chamber



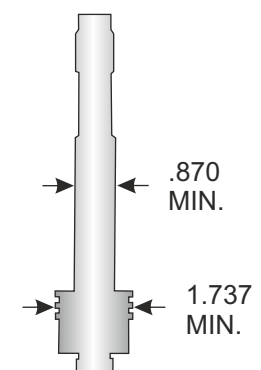
**Connector Sub
(2-Req. "D")**



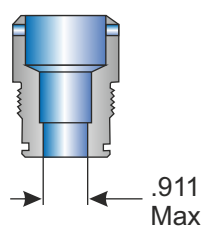
Shear Sub



Bottom Cylinder



Bottom Piston

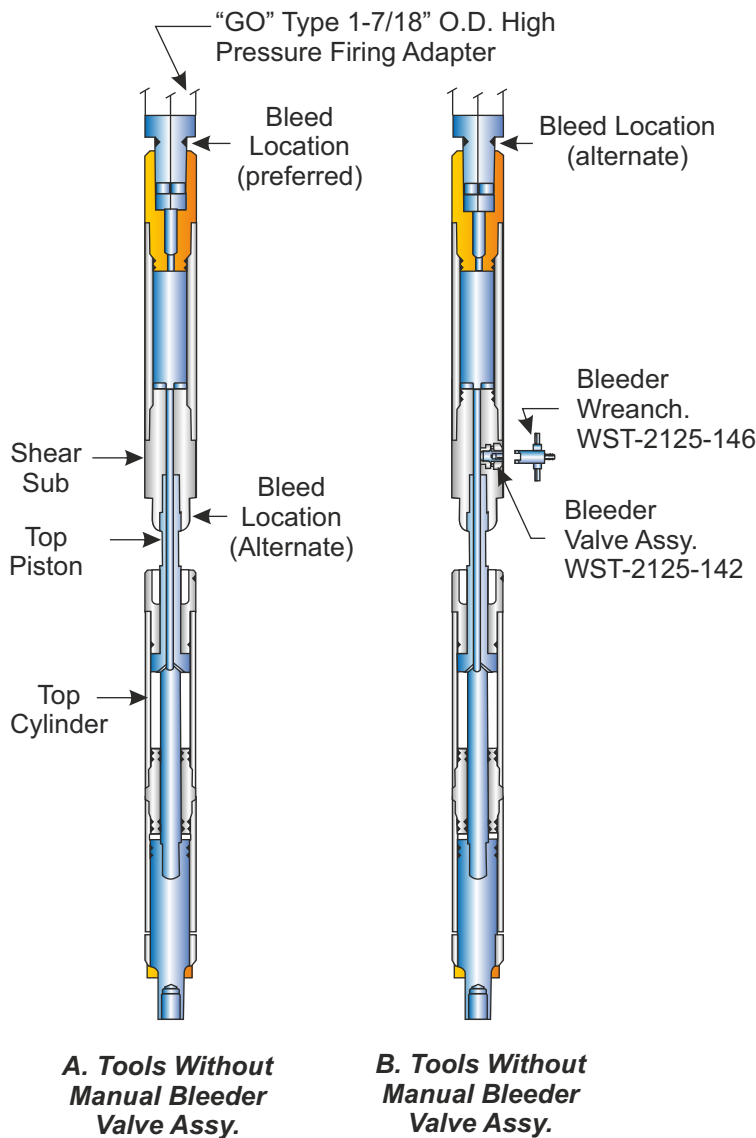


Orifice Sub

ACT, Wireline pressure setting tools are constructed from high quality alloy steel with traceable heat numbers. Material hardness is also controlled.

The illustrations shown above list suggested critical minimum and maximum wear diameters.

PRESSURE BLEEDING LOCATIONS 1-1/2" 2-1/8" OD SETTING TOOLS



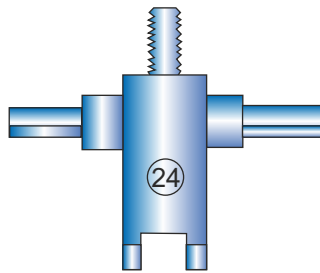
ACT, Inc. wireline pressure setting tools in O.D. sizes 1-1/2" through 2-1/8" do not contain a Baker style manual bleeder valve assembly (ACT pt. no. WST-2125-142) except when specifically ordered.

Two locations for bleeding pressure from tools less manual bleed valves are illustrated in drawing "A". The preferred method of bleeding pressure is to hold wrench on "GO" 1-1/2" O.D. high pressure firing adapter while turning the setting tool counter clockwise. Pressure will begin to bleed as soon as the lower o-ring on the firing adapter is uncovered. Ample threads are provided on the firing adapter. Should a bridge occur and pressure stops bleeding, screw the tool clockwise then begin the procedure again.

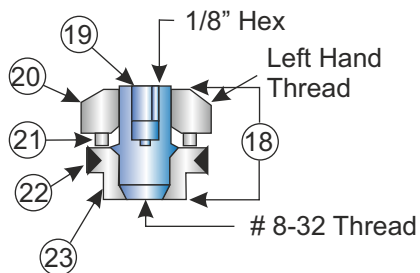
The alternate method shown in drawing "A" is accomplished by holding wrench on shear sub (see parts list) while turning the top cylinder counter clockwise. The top piston will back out of shear sub and pressure will begin to bleed. Again, if a bridge occurs screw the tool clockwise then begin the procedure again.

An indication that most of pressure has safely bled off is when the tool partially closes. This indicates that the trapped compressed atmosphere in bottom cylinder is overcoming what little gas pressure remains of the power charge

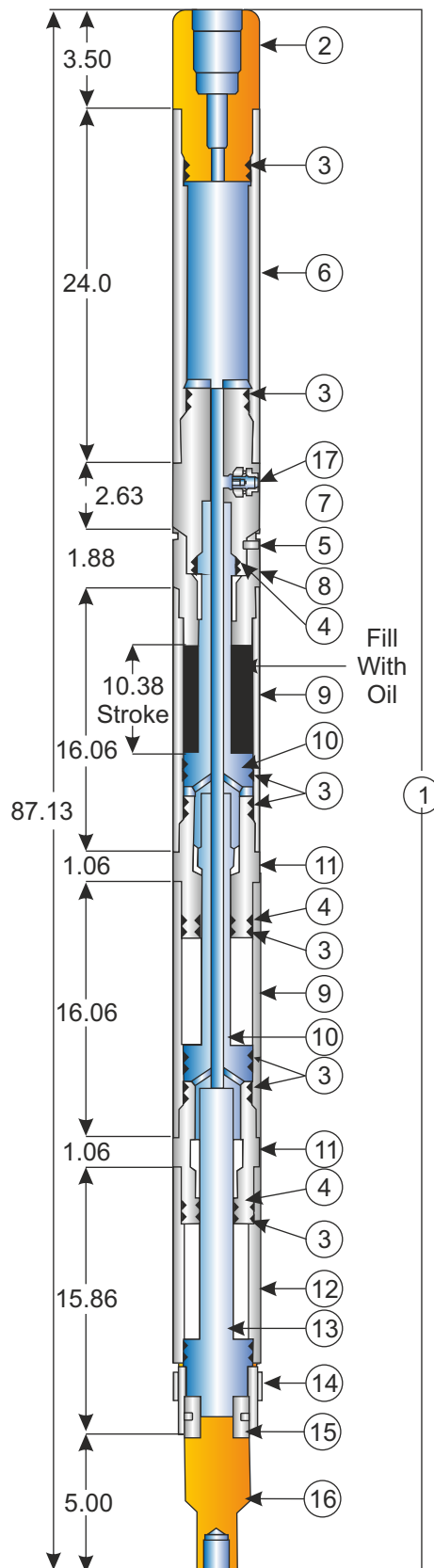
1.718" OD MULTI-STAGE SETTING TOOL



Bleeder Wrench
WST-2125-146



Bleeder Valve Assy.
WST-2125-142



1.718" OD MULTI-STAGE SETTING TOOL

Parts List

Item	Part Number	Req	Description
1	WST-1718-001		Assy. - 1.71" O.D. Multi Stage Setting Tool- Top Connection To Fit "GO" 1-7/16" O.D. High Pressure Firing Head- Incl. Items 2-16
2	WST-1718-020	1	Top Sub
3*	000-N569-216	18	O- Ring- 90 Duro
4*	000-N569-216	6	O- Ring- 90 Duro
5*	052-5304-003	1	Brass Shear Screw - Approx. 2300 Lbs Shear
6	WST-1718-021	1	Power Chamber
7	WST-1718-028	1	Shear Sub - Non Ported
8	WST-1718-023	1	Orifice Sub
9	WST-1718-024	2	Top Cylinder
10	WST-1718-025	2	Top Piston
11	WST-1718-126	2	Connector Sub
12	WST-1718-127	1	Bottom Cylinder
13	WST-1718-128	1	Bottom Piston
14	WST-1718-030	1	Lock Ring
15	WST-1718-1300	1	Safety Release Nut- 25,000 Lbs. Weak Point
16	WST-1718-131	1	Bottom Adapter
*	WST-1718-110		O- Ring Kit - 325° - For WST-1718-101 Incl. Items 3,4,5,22,23-

Optional Equipment Not Included In Assy. WST-1718-101

Item	Part Number	Req	Description
17	WST-1718-002	1	Shear Sub - Ported For Bleeder Valve
18	WST-2125-142	1	Assy. -bleeder Valve - Items 19-23
19	WST-2125-143	1	Stem
20	000-2125-144	1	Retainer Nut
21	WST-2125-145	1	Seat
22	000-N569-111	1	O- Ring - 901 Duro
23	000-N569-006	1	O- Ring - 901 Duro
24	WST-2125-146		Bleeder Wrench

Tool total stroke: 10.45 in.

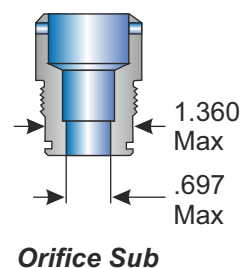
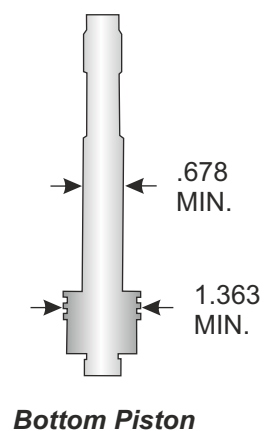
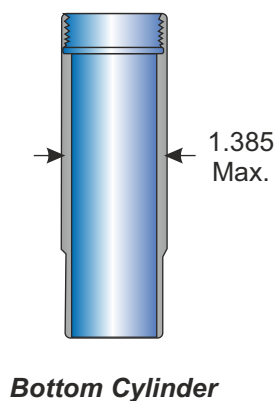
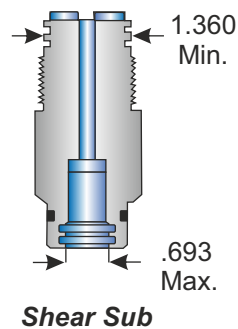
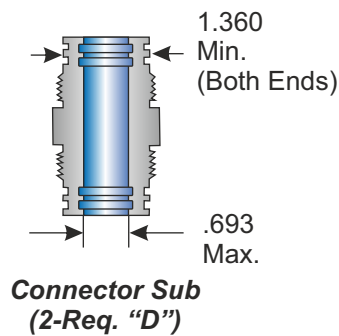
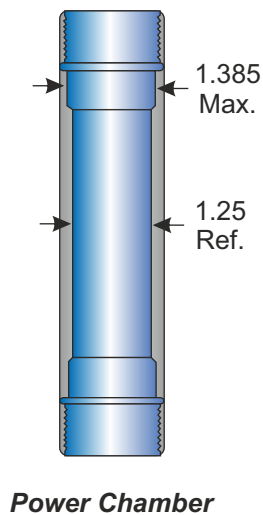
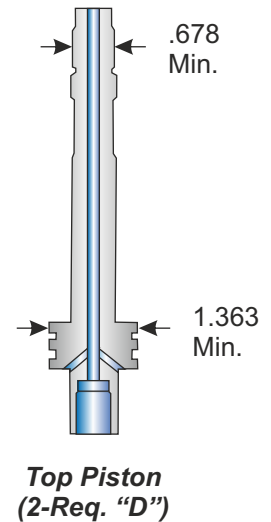
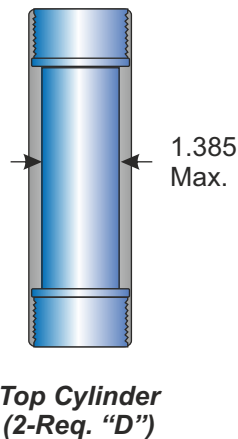
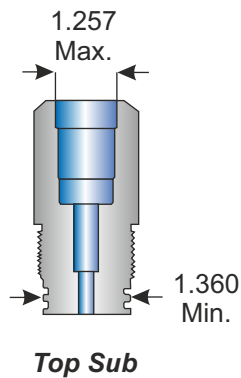
Tool piston area: 2.22 in.²

Tool max. Pull: 13,000 lbs. At 6.91 inch stroke

Unported tool max. Hydrostatic pressure: 15,000 P.S.I.

Ported tool max. Hydrostatic pressure: 10,000 P.S.I.

1.718" OD MULTI-STAGE SETTING TOOL MINIMUM AND MAXIMUM WEAR DIA'S



ACT, Wireline pressure setting tools are constructed from high quality alloy steel with traceable heat numbers. Material hardness is also controlled.

The illustrations shown above list suggested critical minimum and maximum wear diameters.

STRETCH TABLE

To Calculate Stretch To Set: $S = (F \times L \times 12) / (E \times A)$ = Elongation due to tension (inches)

F = Tension pulled over normal weight (pounds) L = Length of running-in string (feet)

E = 30,010,010 = Modulus of elasticity for steel A = Cross-sectional area of running-in string (square inches)

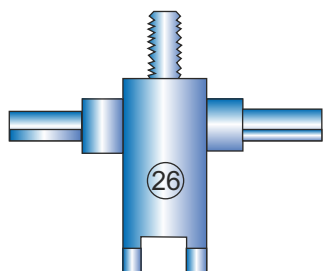
Chart 1

Mud Wt. API GR #/GAL.	psi/FT	2 3/8 EU Tubing 4.7 #/FT.	2 7/8 EU Tubing 6.5 #/FT.	2 7/8 IU Drill Pipe 10.4 #/FT.	3 1/2 IU Drill Pipe 13.3 #/FT.
8.34	.433	111.09	74.8	97.6	58.9
9.0	.468	120.8	80.7	105.4	63.6
9.2	.478	123.5	82.5	107.8	65.0
9.4	.488	126.1	84.3	110.1	66.4
9.6	.499	128.8	86.1	112.4	67.8
9.8	.509	131.5	87.9	114.8	69.2
10.0	.519	134.2	89.7	117.1	70.7
10.2	.530	136.9	91.4	119.5	72.1
10.4	.540	139.6	93.2	121.8	73.5
10.6	.551	142.2	95.0	124.2	74.9
10.8	.561	144.9	96.8	126.5	76.3
11.0	.571	147.6	98.6	128.8	77.7
11.2	.582	150.3	100.4	131.2	79.1
11.4	.592	153.0	102.2	133.5	80.5
11.6	.603	155.7	104.0	135.9	82.0
11.8	.613	158.3	105.8	138.2	83.4
12.0	.623	161.0	107.6	140.6	84.8
12.2	.634	163.7	109.4	142.9	86.2
12.4	.644	166.4	111.2	145.2	87.6
12.6	.655	169.1	113.0	147.6	89.0
12.8	.665	171.8	114.8	149.9	90.4
13.0	.675	174.5	116.5	152.3	91.8
13.2	.686	177.1	118.3	154.6	93.3
13.4	.696	179.8	120.1	157.0	94.7
13.6	.706	182.5	121.9	159.3	96.1
13.8	.717	185.2	123.7	161.6	97.5
14.0	.727	187.0	125.5	164.0	98.9
14.5	.753	194.6	130.0	169.8	102.4
15.0	.779	201.3	134.5	175.7	106.0
15.5	.805	208.0	139.0	181.6	109.5
16.0	.831	214.7	143.4	187.4	113.0
16.5	.857	221.4	147.9	193.3	116.6
17.0	.883	228.1	152.4	199.1	120.1
17.5	.909	234.8	156.9	205.0	123.6
18.0	.935	241.5	161.4	210.8	127.2
18.5	.961	248.3	165.8	216.7	130.7
19.0	.987	255.0	170.3	222.6	134.2
19.5	1.01	261.7	174.8	228.4	137.8
20.0	1.04	268.4	179.3	234.3	141.3

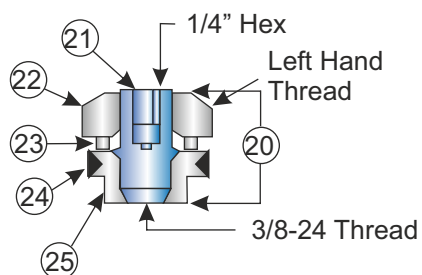
Chart 2

O.D.	Wt. (lbs./ft.)	Barrels per Lineal Ft.	Lineal Ft. per Barrel	A
2.3/8	4.7 EU	.003870	258.4	1.304
2.3/8	4.6 NU	.003870	258.4	1.304
2.7/8	6.5 EU	.005794	172.6	1.812
2.7/8	6.4 NU	.005794	172.6	1.812
2.7/8	10.4 IU DP	.004404	222.5	2.858
3.1/2	13.3 IU DP	.007421	134.7	2.915

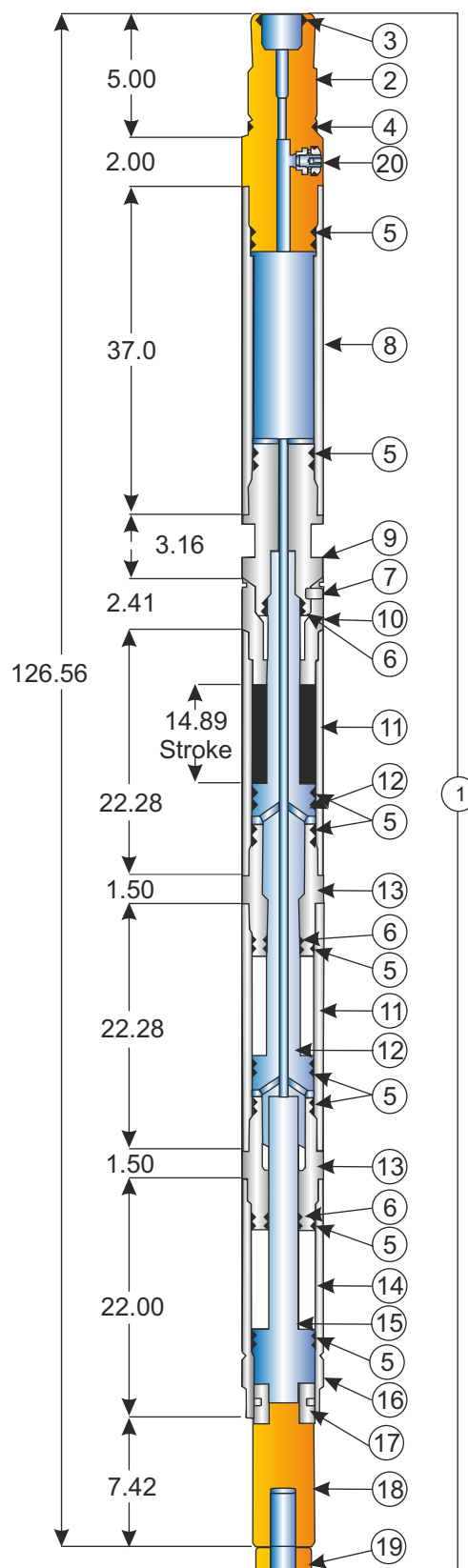
3-1/4" OD MULTI-STAGE SETTING TOOL



Bleeder Wrench
WST-2125-146



Bleeder Valve Assy.
WST-2125-142



3-1/4" OD MULTI-STAGE SETTING TOOL

PART LIST

Item	Part Number	Req	Description
1	WST-3250-001		Assy. -3-1/4" O.D. "Multi-Stage Setting Tool, Top Connection To Fit "GO"3-1/4" O.D Quick-High Pressure Firing Head- Incl. Items 214
2	WST-3250-020	1	Top Sub- Ported For Bleeder Valve
3*	000-N569-328	1	O- Ring- 90 Duro
4*	000-N569-332	1	O- Ring- 90 Duro
5*	000-N569-331	18	O- Ring- 90 Duro
6*	000-N569-325	6	O- Ring- 90 Duro
7*	052-5304-003	1	Brass Shear Screw - Approx. 2300 Lbs Shear
8	WST-3250-021	1	Power Chamber
9	WST-3250-022	1	Shear Sub
10	WST-3250-023	1	Orifice Sub
11	WST-3250-024	2	Top Cylinder
12	WST-3250-025	2	Top Piston
13	WST-3250-026	2	Connector Sub
14	WST-3250-027	1	Bottom Cylinder
15	WST-3250-028	1	Bottom Piston
16	WST-3250-029	1	Lock Ring
17	WST-3250-030	1	Safety Release Nut- 52,000 Lbs. Weak Point
18	WST-3250-031	1	Bottom Adapter
19	WST-3250-031	1	Lock Nut
20	WST-5125-042	1	Assy. -bleeder Valve - Items 21-25
21	WST-5125-043	1	Stem
22	WST-5125-044	1	Retainer Nut
23	WST-5125-145	1	Seat
24*	000-N569-213	1	O- Ring - 90 Duro
25*	000.N569-012	1	O- Ring - 90 Duro
26	WST-5125-146		Bleeder Wrench
*	WST-3250-010		O- Ring Kit - 325° - Fir Wst-3250-001 Incl. Items 3,4,5,6,7,24,25-

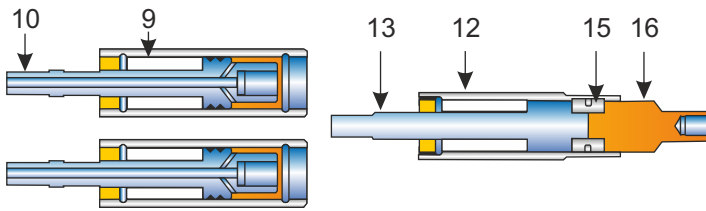
Tool total stroke: 14.8 in.

Tool piston area: 7.66 in.²

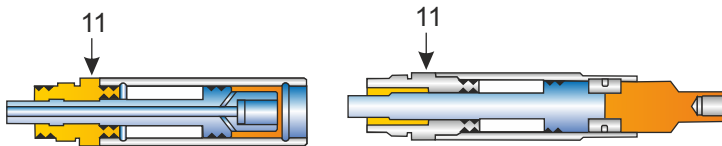
Tool max. Pull: 72,000 lbs. At 9.0 inch stroke

Ported tool max. Hydrostatic pressure: 10,000 P.S.I.

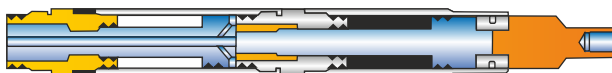
MULTI-STAGE SETTING TOOL ASSEMBLY INSTRUCTIONS



1. Install o-rings then lubricate o-rings and threads. Slide TOP PISTONS (10) in TOP CYLINDERS (9). Install RELEASE NUT and BOTTOM ADAPTER (15 & 16) to BOTTOM PISTON (13) then install this unit in BOTTOM CYLINDER (12).



2. Screw CONNECTOR SUBS (11) into BOTTOM CYLINDER and one of TOP CYLINDERS. Make wrench tight. Wrench only on wrenching areas provided. Do not wrench on pistons anywhere except in knurled areas.

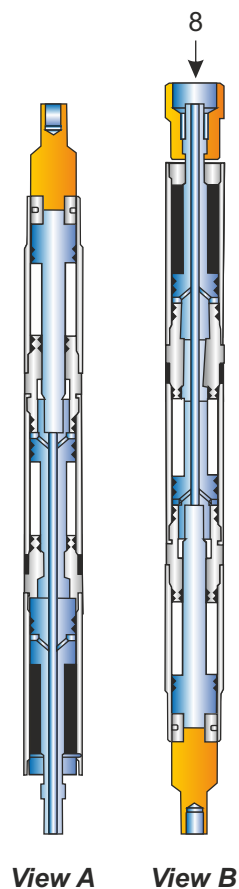


3. Join TOP CYLINDER / TOP PISTON unit to CONNECTOR SUB / TOP PISTON unit. Make wrench tight.



4. Join remaining TOP CYLINDER / TOP PISTON unit to CONNECTOR SUB / TOP PISTON unit. Make wrench tight.

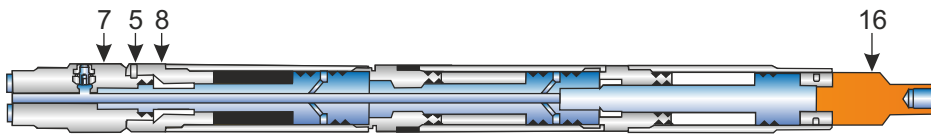
5. Remove tool from vise. Bump tool (view A) completely closed on wooden block). Next, turn tool Upright then fill TOP CYLINDER with motor oil until oil level reaches groove at lower end of thread. Install ORIFICE SUB (8). Excess oil will purge as sub is screwed in.



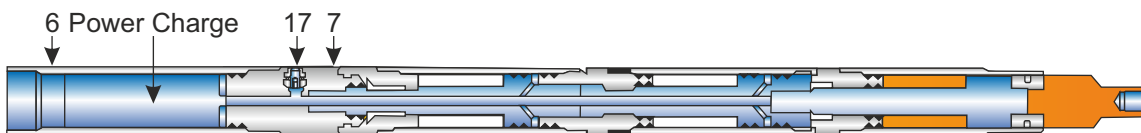
View A

View B

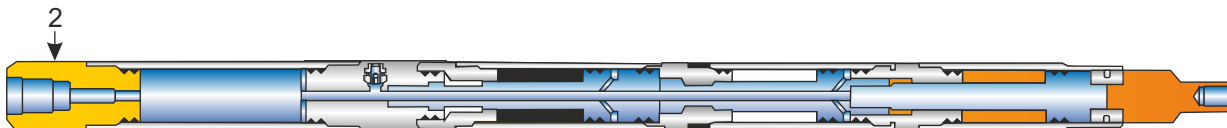
MULTI-STAGE SETTING TOOL ASSEMBLY INSTRUCTIONS



6. Return tool to vise. Make ORIFICE SUB (8) wrench tight to TOP CYLINDER. Screw SHEAR SUB (7) to TOP PISTON. Hold back-up wrench on BOTTOM ADAPTER (16) and tighten SHEAR SUB which will ensure all inside connections are tight. Rotate SHEAR SUB clockwise until SHEAR SCREW holes align then install SHEAR SCREW (5).

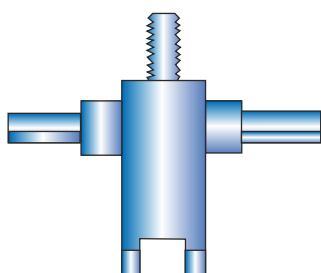


7. Install BLEEDER VALVE ASSY. (17) if used. Screw POWDER CHAMBER (6) to SHEAR SUB (7). Install POWER CHARGE. Make sure open end of power charge is facing up.

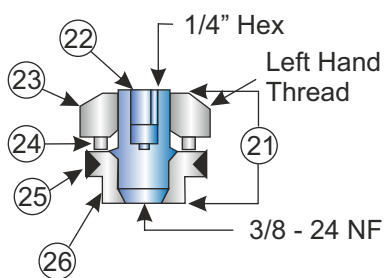


8. Screw TOP SUB (2) to POWDER CHAMBER wrench tight. Check IGNITOR by first removing ground wire from contact spring then checking resistivity (51 ohms) with blasting galvanometer. Next, wrap ground wire around case of ignitor body then place ignitor in firing head. Tool is now assembled. Attach appropriate firing adapter, collar locator, and setting adapters

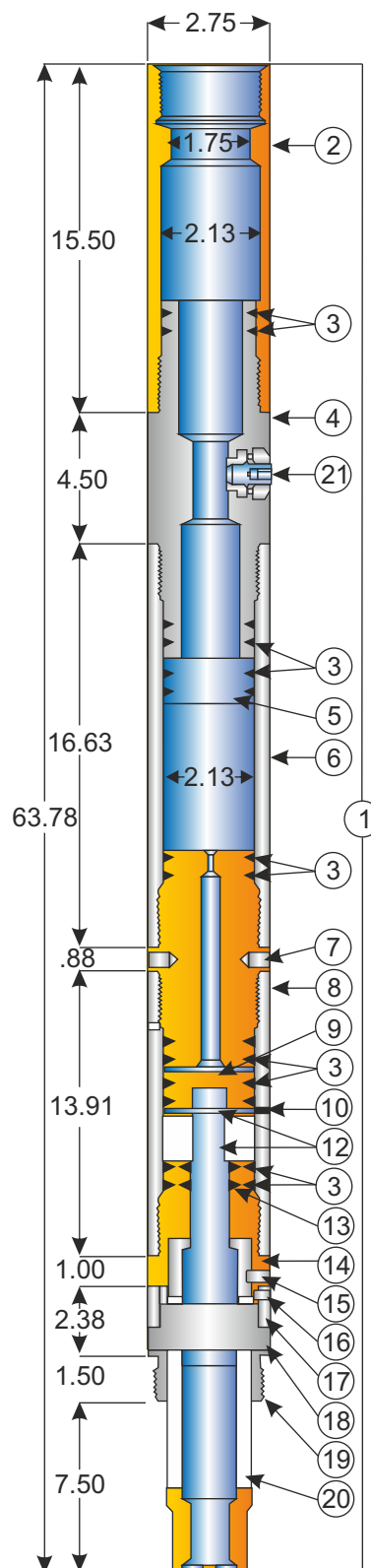
SIZE 10 WIRELINE PRESSURE SETTING TOOL



Bleeder Wrench
WST-5125-146
(optional Accessory)



Bleeder Valve Assy.
WST-5125-142

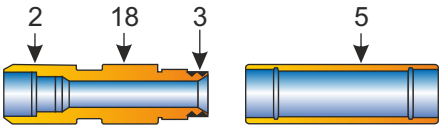


SIZE 10 WIRELINE PRESSURE SETTING TOOL

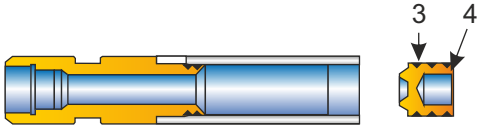
PART LIST

Item	Part Number	Req.	Description
1	WST-BK10-001		Assy. - Size 10 Wire line Pressure Setting Tool- Incl. Item 2-26
2	WST-BK10-020	1	Pressure Chamber
3*	000-N569-327	14	O-Ring - 90 Duro
4	WST-BK10-034	1	Bleeder Valve Sub
5	WST-BK10-022	1	Upper Piston
6	WST-BK10-021	1	Upper Cylinder
7	WST-BK10-023	1	Tandem Connector
8	WST-BK10-035	1	Lower Cylinder
9	WST-BK10-024	1	Lower Piston
10		1	Hex Socket Set Screw 1/4-20 N.C. x 3/8 L.G.
11	WST-BK10-025	1	Retaining Pin
12	WST-BK10-026	1	Piston Rod
13*	000-N569-221	2	O- Ring - 90 Duro
14	WST-BK10-027	1	Cylinder Head
15		1	Hex Socket Set Screw 3/8 - 16 N.C. x 3/8 L.G
16		1	Hex Socket Set Screw 3/8 - 16 N.C. x 3/8 L.G
17	WST-BK10-029	1	Retaining Ring
18	WST-BK10-031	1	Cross Link
19	WST-BK10-028	1	Cross Link Sleeve
20	WST-BK10-030	1	Setting Mandrel
21	WST-BK10-142	1	Assy. - Bleeder Valve - Incl. Item 22-26
22	WST-BK10-143	1	Stem For Bleeder Valve
23	WST-BK10-144	1	Retainer Nut For Bleeder Valve
24	WST-BK10-145	1	Seat For Bleeder Valve
25*	000-N569-213	1	O- Ring - 90 Duro for Bleeder Valve
26*	000-N569-012	1	O- Ring - 90 Duro for Bleeder Valve
*	WST-BK10-010		O- Ring Kit -325° For WST-BK10-001 Incl. Item 3,13,25, and 26-

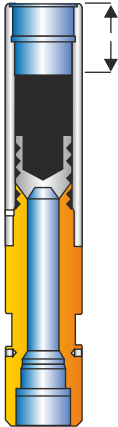
SIZE 20 WIRELINE SETTING TOOL ASSEMBLY INSTRUCTIONS



1. Install O-rings And Manual Bleeder Valve (3 And 18) In Pressure Chamber (2). Screw Chamber To Cylinder (5).

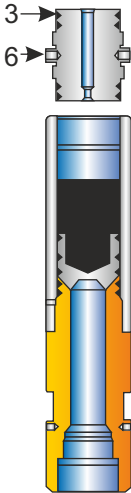


2. Install O-rings (3) On Upper Piston (4) Then Push Piston Through Cylinder Until It Contacts Pressure Chamber.

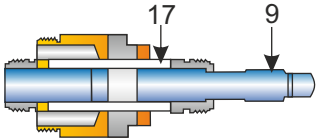


3. Fill Cylinder with SAE 10-40 Oil to Following Levels :

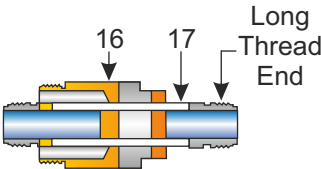
Well Temp.	Size 10	Size 20
20°F or Less	4-1/8IN.	4 IN
20°F - 275°F	4-3/8IN.	4-1/2 IN
275°F - 350°F	4-3/8 IN.	5 IN
350°F - 400°F	4-5/8 IN.	5-1/2 IN



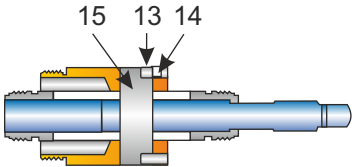
4. Install O-rings (3) On Tandem Connector (6) Then Screw Into Upper Cylinder With Small Orifice Toward Oil



6. Slide Piston Rod (9) Into Setting Mandrel (17)

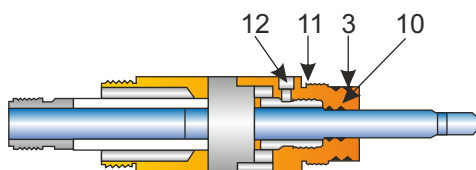


5. Slide Setting Mandrel (17) Inside Crosslink Sleeve (16). Long Threaded End Of Mandrel Positioned as Shown.

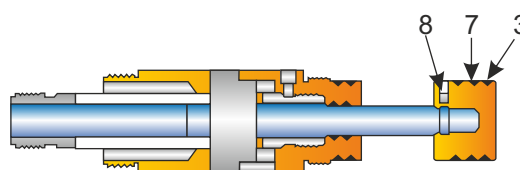


7. Align Slots In All Items And Insert Crosslink (15). Install Retaining Ring (13) And Cap Screw (14).

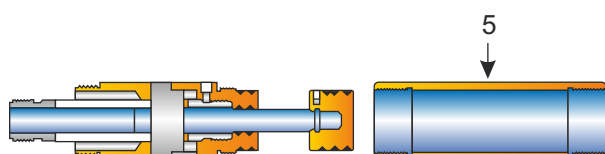
SIZE 20 WIRELINE SETTING TOOL ASSEMBLY INSTRUCTIONS



8. Install O-rings (3 And 10) To Cylinder Head (11). Slide Head On Piston Rod. Make Up Head Hand Tight To Setting Mandrel. Install Set Screw (12).



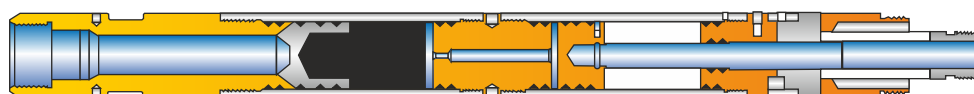
9. Install O-rings (3) On Lower Piston (7). Place Piston On Piston Rod. Install Lock Pin (8) And Tighten.



10. Lubricate Piston, Cylinder Head Threads, And Cylinder Bore. Slide Cylinder Over Piston And Make Up To Cylinder Head While Making Sure Cylinder Head Is Positioned Against Crosslink Sleeve While Cylinder Is Being Made Up.

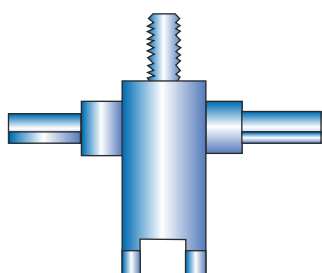


11. connect upper and lower halves of the tool together.

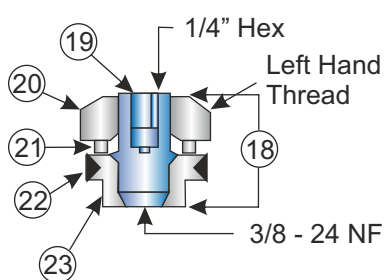


12. Place Tool In Vise And Tighten All Joints. Air Trapped In Cylinder During Tightening Should Make Crosslink Sleeve Stand Off From Cylinder Head No More Than 3/8".

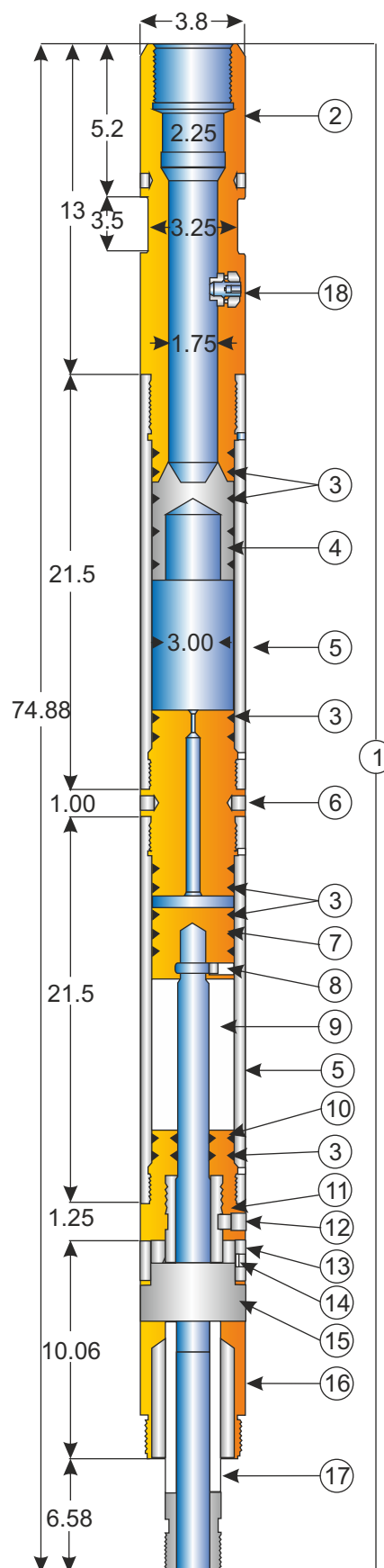
SIZE 20 WIRELINE PRESSURE SETTING TOOL



Bleeder Wrench
WST-5125-146
(optional Accessory)



Bleeder Valve Assy.
WST-5125-142

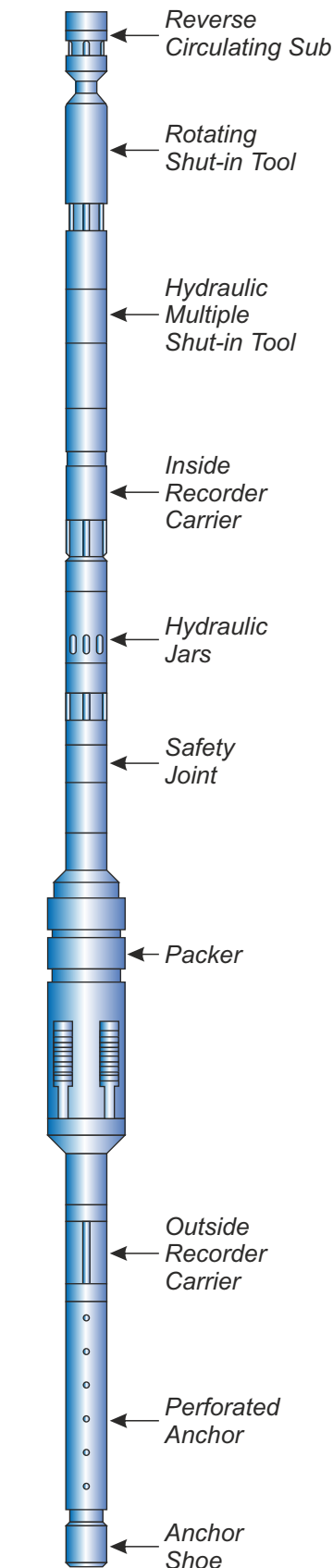


SIZE 20 WIRELINE PRESSURE SETTING TOOL

Part List

Item	Part Number	Req.	Description
1	WST-BK20-001		Assy. - Size 20 Wire line Pressure Setting Tool- Incl. Item 2-23
2	WST-BK20-020	1	Pressure Chamber
3*	000-N569-334	14	O-Ring - 90 Duro
4	WST-BK20-022	1	Upper Piston
5	WST-BK20-021	2	Cylinder
6	WST-BK20-023	1	Tandem Connector
7	WST-BK20-024	1	Lower Piston
8	WST-BK20-025	1	Lock Pin
9	WST-BK20-026	1	Piston Rod
10*	000-N569-216	2	O- Ring - 90 Duro
11	WST-BK20-027	1	Cylinder Head
12		1	Hex Socket Set Screw 3/8-16 N.C. x 1/2 L.G.
13	WST-BK20-029	1	Cross Link Retaining Ring
14		1	Hex Socket Set Screw 1/4-20 N.C. x 3/8 L.G.
15	WST-BK20-031	1	Cross Link
16	WST-BK20-028	1	Cross Link Sleeve
17	WST-BK20-030		Setting Mandrel
18	WST-BK20-142	1	Assy. Bleeder Valve Incl. Item 19-23
19	WST-BK20-143	1	Stem For Bleeder Valve
20	WST-BK20-144	1	Retainer Nut For Bleeder Valve
21	WST-BK20-145	1	Seat For Bleeder Valve
22*	000-N569-213	1	O- Ring - 90 Duro for Bleeder Valve
23*	000-N569-012	1	O- Ring - 90 Duro for Bleeder Valve
*	WST-BK20-010		O- Ring Kit -325° For WST-BK20-001 Incl. Items 3,10,22, and 23-

DRILL STEM TESTING TOOLS



**Drill Stem
Testing Tools**

Drill Stem Testing (DST) is a procedure for testing a well formation, with the drill string in the hole. It determines the fluid content of a reservoir and its ability to produce. These tests can be performed in both open and cased hole environment.

When drilling operations have been completed, it is important to determine whether to move on to the next phase – completion for production. Formation test ascertain if there are enough hydrocarbons to produce from the well, as it provides important information to design the well completion and production facilities. Drill Stem Testing is one of the various methods for formation testing.

In Drill Stem Test, the drill bit is removed from the drill string and a Drill stem testing tool assembly is attached. It is then lowered all the way to the formation and activated, measuring the flow of oil or gas. The amounts of hydrocarbons that flow into the drill string during the test and the recorded pressure are used to judge the production potential of the formation.

The Drill Stem Testing tool includes a perforated anchor at the bottom that allows the fluid to enter from the formation. A packer is used to isolate the formation from the rest of the bore hole, thereby forcing the fluid to enter the pipe. A series of valves open and close to control the flow of the hydrocarbons into the empty drill string. Additionally a Drill Stem Testing tool contains a pressure recording device that document pressure during the test.

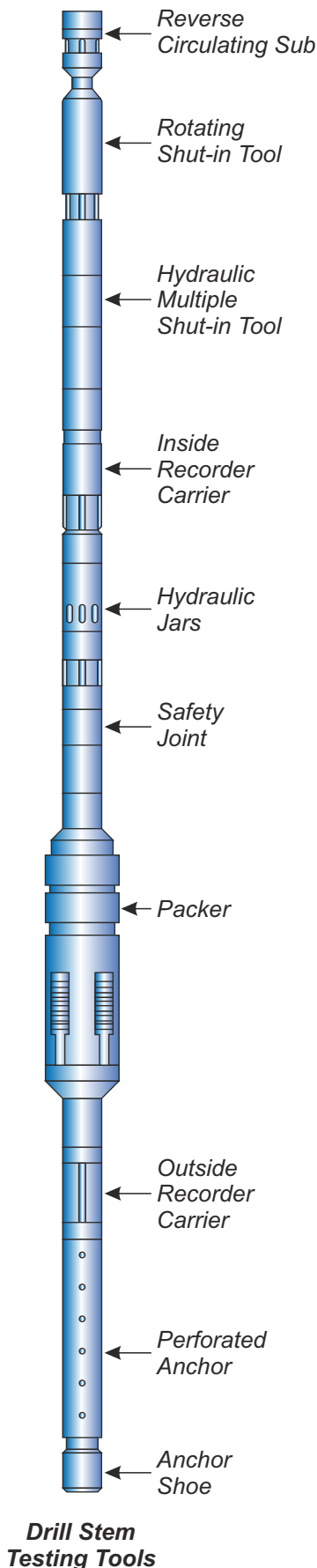
Tools commonly used with DST are:

Reverse circulating sub: It is used to circulate fluid from the drill string after DST has been completed and drill string is ready to be removed. There are two types of these subs – Pump out sub and knock out (Bar drop) sub. In pump out sub, the port is opened by applying pressure to the inside of the drill string and shearing out the rapture disc. In knock out sub, a heavy bar is dropped to break the pin in the sub to open the port.

Rotating shut-in tool: A rotating shut-in tool is used to obtain flow periods and shut in periods. Available in two flows and two shut-in periods or three flows and three shut in periods, it is run immediately above the hydraulic multiple shut-in tool and operated by right hand rotation of the pipe. The tool is run in open position, but the hydraulic multiple shut-in tool prevents any fluid from entering the test string. Once the testing depth is reached, the multiple shut-in tool is opened and the first flow period begins. Rotating right hand, the tool will shut off the flow for the first shut-in period and rotating again will start second flow period.

Hydraulic multiple shut-in tool: It is a downhole valve that allows multiple opening and closing. This tool allows running into the hole with an empty test string. This eliminates the hydrostatic pressure on the formation at setting depth. Multiple shut-in tool is opened by slacking weight on it, and it is a time delayed tool (E.g: 10,000 lbs for 5 minutes). This delayed tool opening avoids accidental opening while running through tight spots in the hole. Picking up the tool string to the neutral weight will close the valve immediately.

DRILL STEM TESTING TOOLS



Gauge (Recorder) carrier: It carries and protects downhole memory gauges. Gauge carriers can be run at multiple locations on the DST string. It contains two internal and two external recorder slots. The gauges are attached to the housing with metal seal connectors and are retained below the O.D. of the carrier to protect the gauges from damage while running the string. The carrier can be configured to provide outside and inside position electronic recorders

Hydraulic jar: Hydraulic jar is used to free the stuck section of drill string in cased and open hole testing operations. The jar provides a temporary resistance that allows the drill pipe to be stretched. When the resistance is released, the jar body will fire rapidly upward to free the stuck string below. The impact force is dependent on the amount of over pull on the jar as it opens. It is easily reset for repeated use by putting setting down weight on the string.

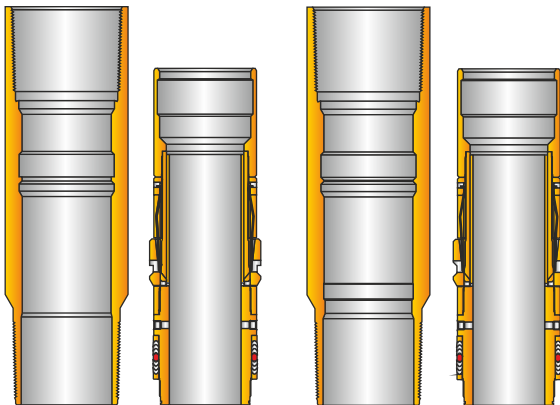
Safety joint: The safety joint provides a means for releasing the tool string from above the packer in the event that packer cannot be released after jarring. This ensures recovery of DST tool and memory gauge data recorded during the well test. The safety joint is released with left hand rotation. The lower portion of the DST string can then be recovered with larger jars or fishing tools.

Packer: A packer is used to isolate the formation from the rest of the bore hole, thereby forcing the fluid to enter the pipe. In Cased hole DST, a retrievable production packer is used and in open hole, an inflatable or compression set packer is used.

Perforated anchor: A perforated anchor is attached at the bottom of the tool string which allows the formation fluid or gas to enter the tool string pipes.

DST tools are available in sizes 3.125", 4.250" and 5.00" and suitable for 10,000 psi WP and H2S service per NACE MR-01-75.

LANDING NIPPLES AND LOCK MANDRELS



"X"
Landing Nipple
And Lock Mandrel

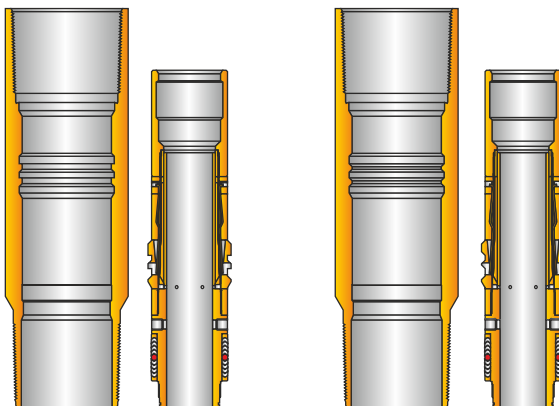
"XN" NO-GO
Landing Nipple
And Lock Mandrel

ACT'S 'X' and 'R' Landing Nipples and Lock Mandrels

ACT'S 'X' and 'R' Landing Nipples are run into the well on the completion tubing to provide a specific landing location for subsurface flow control equipment. The common internal profiles of these landing nipples make them universal. ACT'S 'X' Landing Nipple is used in standard weight tubing. ACT'S 'R' Landing Nipple is typically used with heavy weight tubing.

The completion can have as many selective nipples with the same ID in and sequence as desired on the tubing string. This versatility results in an unlimited number of positions for setting and locking subsurface flow controls. The flow control, which is attached to the required ACT'S 'X' or 'R' Lock Mandrel, is run in the well via the selective running tool on slickline.

The slickline operator using the selective running tool can set the flow control in any one of the landing nipples at the desired depth. If this location is unsatisfactory or if well conditions change, the flow control may be moved up or down the tubing string to another nipple location. These operations can be done by slickline under pressure without killing the well.



"R"
Landing Nipple
And Lock Mandrel

"RN" NO-GO
Landing Nipple
And Lock Mandrel

ACT'S 'XN' and 'RN' No-Go Landing Nipples and Lock Mandrels

This equipment is designed for use in single nipple installations or as the bottom nipple in a series of ACT'S 'X' or 'R' Landing Nipples. These Landing Nipples have the same packing bore ID for a particular tubing size and weight. ACT'S 'X' and 'XN' Landing Nipples are designed for use with standard weight tubing. ACT'S 'R' and 'RN' Landing Nipples are designed for use with heavy weight tubing (The 'N' designates No-Go Nipples)

Features:

- Landing Nipples
 - Large bore for minimum restriction
 - Universal nipple with one internal profile
- Lock Mandrels
 - Retractable locking keys
 - Locks designed to hold pressure from above or below from sudden reversal
- Optional hold down
 - Interference hold down for smaller locks
 - Shear pin hold down for larger locks

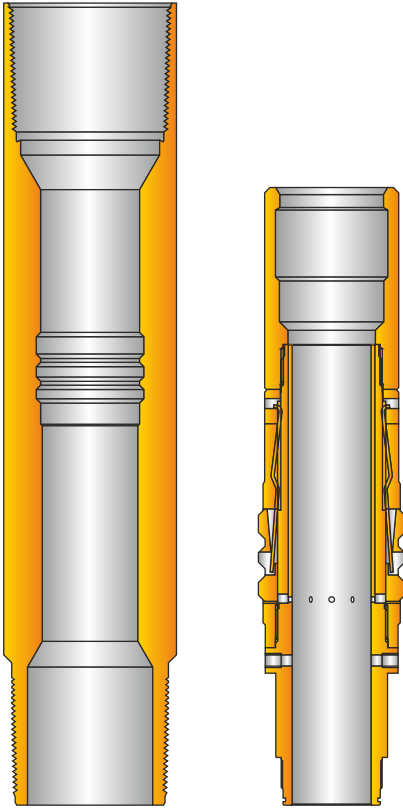
'X' AND 'XN' LANDING NIPPLES AND LOCK MANDRELS

TUBING								FOR STANDARD TUBING WEIGHTS							
								X PROFILE		XN PROFILE				LOCK	
								PACKING BORE		PACKING BORE		NO-GO ID		MANDREL ID	
SIZE		WEIGHT		ID		DRIFT		(in.)	(mm)	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)
(in.)	(mm)	lb/ft	(kg/m)	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)
1.050	26.67	1.20	1.79	0.824	20.93	0.730	18.54	AVAILABLE ON REQUEST							
1.315	33.40	1.80	2.68	1.049	26.64	0.955	24.26								
1.660	42.16	2.30	3.43	1.380	35.05	1.286	32.66	1.250	31.75	1.250	31.75	1.135	28.83	0.62	15.75
		2.40	3.57	1.380	35.05	1.286	32.66	1.250	31.75	1.250	31.75	1.135	28.83	0.62	15.75
		2.40	3.57	1.660	42.16	1.516	38.51	1.500	38.10	1.500	38.10	1.448	36.78	0.75	19.05
		2.76	4.11	1.610	40.89	1.516	38.51	1.500	38.10	1.500	38.10	1.448	36.78	0.75	19.05
		2.90	4.32	1.610	40.89	1.516	38.51	1.500	38.10	1.500	38.10	1.448	36.78	0.75	19.05
2.063	52.40	3.25	4.84	1.751	44.48	1.657	42.09	1.625	41.28	1.625	41.28	1.536	39.01	0.75	19.05
2.375	60.33	4.60	6.85	1.995	50.67	1.901	48.29	1.875	47.63	1.875	47.63	1.791	45.49	1.00	25.40
		4.70	7.00	1.995	50.67	1.901	48.29	1.875	47.63	1.875	47.63	1.791	45.49	1.00	25.40
2.875	73.03	6.40	9.53	2.441	62.00	2.347	59.61	2.313	58.75	2.313	58.75	2.205	56.01	1.38	35.05
		6.50	9.68	2.441	62.00	2.347	59.61	2.313	58.75	2.313	58.75	2.205	56.01	1.38	35.05
3.500	88.90	9.30	13.85	2.992	76.00	2.867	72.82	2.813	71.45	2.813	71.45	2.666	67.72	1.75	44.45
		10.30	15.34	2.992	74.22	2.797	71.04	2.750	69.85	2.750	69.85	2.635	66.93	1.75	44.45
4.000	101.60	11.00	16.38	3.476	89.29	3.351	85.12	3.313	84.15	3.313	84.15	3.135	79.63	2.12	53.85
4.500	114.30	12.75	18.99	3.958	100.53	3.833	97.36	3.813	96.85	3.813	96.85	3.725	94.62	2.62	66.55
5.000	127.00	13.00	19.36	4.494	114.15	4.369	110.97	4.313	109.55	4.313	109.55	3.987	101.27	2.62	66.55
5.500	139.70	17.00	25.32	4.892	124.26	4.767	121.08	4.562	115.87	4.562	115.87	4.455	113.16	3.12	79.25

'R' AND 'RN' LANDING NIPPLES AND LOCK MANDRELS

TUBING								FOR HEAVY TUBING WEIGHTS							
								R PROFILE		RN PROFILE				LOCK	
								PACKING BORE		PACKING BORE		NO-GO ID		MANDREL ID	
SIZE		WEIGHT		ID		DRIFT		(in.)	(mm)	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)
(in.)	(mm)	lb/ft	(kg/m)	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)
1.660	42.16	3.02	4.50	1.278	32.46	1.184	30.07	1.125	28.58	1.125	28.58	1.012	25.70	AVAILABLE ON REQUEST	
1.900	48.26	3.64	5.42	1.500	38.10	1.406	35.71	1.375	34.93	1.375	34.93	1.250	31.75	0.62	15.75
2.375	60.33	5.30	7.89	1.939	49.25	1.845	46.86	1.781	45.24	1.781	45.24	1.640	41.66	0.88	22.35
		5.95	8.86	1.867	47.42	1.773	45.03	1.710	43.43	1.710	43.43	1.560	39.62	0.75	19.05
		6.20	9.23	1.853	47.07	1.759	44.68	1.710	43.43	1.710	43.43	1.560	39.62	0.75	19.05
		7.70	11.47	1.703	43.26	1.609	40.87	1.500	38.10	1.500	38.10	1.345	34.16	0.62	15.75
2.857	73.03	7.90	11.77	2.323	59.00	2.229	56.62	2.199	55.58	2.188	55.58	2.010	51.05	1.12	28.45
		8.70	12.96	2.259	57.38	2.165	54.99	2.125	53.98	2.125	53.98	1.937	49.20	0.88	22.35
		8.90	13.26	2.243	56.97	2.149	54.58	2.125	53.98	2.125	53.98	1.937	49.20	0.88	22.35
		9.50	14.15	2.196	55.75	2.101	53.37	2.000	50.80	2.000	50.80	1.881	47.78	0.88	22.35
		10.40	15.49	2.151	54.64	2.057	52.25	2.000	50.80	2.000	50.80	1.881	47.78	0.88	22.35
		11.00	16.38	2.065	52.45	1.971	50.06	1.875	47.63	1.875	47.63	1.716	43.59	0.88	22.35
		11.65	17.35	1.995	50.67	1.901	48.29	1.875	47.63	1.875	47.63	1.716	43.59	0.88	22.35
3.500	89.90	12.95	19.29	2.750	69.85	2.625	66.68	2.562	65.07	2.562	65.07	2.329	59.16	1.38	35.05
		15.80	23.53	2.548	64.72	2.423	61.54	2.313	58.75	2.313	58.75	2.131	54.13	1.12	28.45
		16.70	24.87	2.480	62.99	2.355	59.82	2.313	58.75	2.313	58.75	2.131	54.13	1.12	28.45
		17.05	25.40	2.440	61.98	2.315	58.80	2.188	55.58	2.188	55.58	2.010	51.05	1.12	28.45
4.000	101.60	11.60	17.28	3.428	87.07	3.303	83.90	3.250	82.55	3.250	82.55	3.088	78.44	1.94	49.28
		13.40	19.96	3.340	84.84	3.215	81.66	3.125	79.38	3.125	79.38	2.907	73.84	1.94	49.28
4.500	114.30	12.75	18.99	3.958	100.53	3.833	97.36	3.813	96.85	3.813	96.85	3.725	94.62	2.12	53.85
		13.50	20.11	3.920	99.57	3.795	96.39	3.688	93.68	3.688	93.68	3.456	87.78	2.38	60.45
		15.50	23.09	3.826	97.18	3.701	94.01	3.688	93.68	3.688	93.68	3.456	87.78	2.38	60.45
		16.90	25.17	3.754	95.35	3.629	92.18	3.437	87.30	3.437	87.30	3.260	82.80	1.94	49.28
		19.20	28.60	3.640	92.46	3.515	89.28	3.437	87.30	3.437	87.30	3.260	82.80	1.94	49.28
5.000	127.00	15.00	22.34	4.408	111.96	4.283	108.79	4.125	104.78	4.125	104.78	3.913	99.39	2.75	69.85
		18.00	26.81	4.276	108.61	4.151	105.44	4.000	101.60	4.000	101.60	3.748	95.20	2.38	60.45
5.500	139.70	17.00	25.32	4.892	124.26	4.767	121.08	4.562	115.87	4.562	115.87	4.455	113.16	2.85	72.39
		20.00	29.79	4.778	121.36	4.653	118.19	4.562	115.87	4.562	115.87	4.455	113.16	2.85	72.39
		23.00	34.26	4.670	118.62	4.545	115.44	4.313	109.55	4.313	109.55	3.987	101.27	2.62	66.55
6.000	152.40	15.00	22.34	5.524	140.31	5.399	137.13	5.250	133.35	5.250	133.35	5.020	127.51	3.50	88.90
		18.00	26.81	5.424	137.77	5.299	134.59	5.250	133.35	5.250	133.35	5.020	127.51	3.50	88.90
6.625	168.28	24.00	35.75	5.921	150.39	5.796	147.22	5.625	142.88	5.625	142.88	5.500	139.70	3.50	88.90
		28.00	41.71	5.791	147.09	5.666	143.92	5.625	142.88	5.625	142.88	5.500	139.70	3.50	88.90
7.000	177.80	17.00	25.32	6.538	166.07	6.431	163.35	5.962	151.43	5.962	151.43	5.750	146.05	3.75	95.25
		20.00	29.79	6.456	163.98	6.331	160.81	5.962	151.43	5.962	151.43	5.750	146.05	3.75	95.25
		23.00	34.26	6.366	161.70	6.241	158.52	5.962	151.43	5.962	151.43	5.750	146.05	3.75	95.25
		26.00	38.73	6.276	159.41	6.151	156.24	5.962	151.43	5.962	151.43	5.750	146.05	3.75	95.25
		29.00	43.20	6.184	157.07	6.059	153.90	5.962	151.43	5.962	151.43	5.750	146.05	3.75	95.25
		32.00	47.66	6.094	154.79	6.969	177.01	5.962	151.43	5.962	151.43	5.750	146.05	3.75	95.25
		35.00	52.13	6.004	152.50	5.879	149.33	5.875	149.23	5.875	149.23	5.750	146.05	3.75	95.25
8.625	219.08	36.00	53.62	7.825	198.76	7.700	195.58	7.450	189.23	7.450	189.23	7.325	186.06	5.250	133.35
		36.00	53.62	7.825	198.76	7.700	195.58	7.250	184.15	7.250	184.15	7.125	180.98	5.250	133.35
		36.00	53.62	7.825	198.76	7.700	195.58	7.050	179.07	7.050	179.07	6.925	175.90	5.250	133.35

ACT 'RPT' NO-GO LANDING NIPPLE AND LOCK MANDREL



***"RPT" Type NO-GO Landing Nipple
And Lock Mandrel***

ACT'S 'RPT' No-Go Landing Nipple system provides a mean to run a series of positive location landing nipples in a tubing string with minimum restriction. ACT'S 'RPT' No-Go Landing Nipples are designed to accept ACT's 'RPT' Lock Mandrels with a rated working pressure of 10,000 psi (690 bar) differential from above and below.

ACT'S 'RPT' No-Go Lack Mandrel locates on top of the nipples polished bore, therefore there are no secondary restrictions normally associated with bottom No-Go profiles. This feature makes ACT'S 'RPT' system well suited for high pressure, high volume, large bore completions. ACT'S 'RPT' Lock Mandrels in any given size range are designed to use the same running tool and pulling tool.

Features:

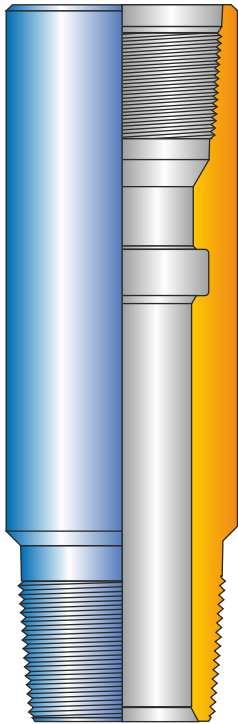
- Large bore
- Lock Mandrel locates on top of the nipples polished bore
- Landing nipples can accept ACT'S 'RPT' Lock Mandrel with a rated working pressure of 10,000 psi (690 bar) differential from above and below
- A series of profile ID's are established for common tubing strings by size and weight

ACT 'RPT' LANDING NIPPLES AND LOCK DIMENSIONS

TUBING SIZE		NIPPLE PROFILE		LOCK MANDREL			
		SEALBORE (MIN. ID)		ID		OD	
in.	mm	in.	mm	in.	mm	in.	mm
2.3/8	60.33	1.500	38.10	0.75	19.05	1.560	39.62
		1.625	41.28			1.685	42.80
		1.781	45.24			1.841	46.76
		1.875	47.63			1.935	49.15
		2.000	50.80			2.060	52.32
		2.125	53.98			2.185	55.5
2.7/8	73.03	2.000	50.80	1.12	28.45	2.060	52.32
		2.125	53.98			2.185	55.5
		2.188	55.58			2.248	57.10
		2.313	58.75			2.373	60.27
		2.482	63.04			2.542	64.57
3.1/2	88.90	2.562	65.07	1.50	38.10	2.622	66.6
		2.650	67.31			2.710	68.83
		2.750	69.85			2.810	71.37
		2.810	71.45			2.860	72.64
		2.875	73.03			2.935	74.55
4 - 4.1/2	101.6 - 114.3	3.000	76.20	1.75	44.45	3.060	77.72
		3.125	79.38	1.94	49.28	3.210	81.53
		3.125	79.38			3.210	81.53
		3.313	84.15			3.395	86.23
4.1/2 - 5	114.3 - 127	3.437	87.30	1.94	49.28	3.520	89.41
		3.562	90.47			3.650	92.71
		3.688	93.68			3.770*	95.76
		3.750	95.25			3.807	96.70
		3.813	96.85			3.895	98.93
		4.000	101.60			4.090	103.89
5.1/2	139.70	4.188	106.38	2.75	69.85	4.270*	108.46
		4.250	107.95			4.332*	110.03
		4.313	109.55			4.395	111.63
		4.437	112.70			4.520*	114.81
		4.500	114.30			4.550	115.57
		4.562	115.87			4.650	118.11
		4.688	119.08	3.12	79.25	4.760*	120.90
		4.688	119.08			4.760*	120.90
		4.750	120.65			4.825	122.56
		4.813	122.25			4.890	124.21
		5.250	133.35	3.68	93.47	5.334	135.48
		5.500	139.70			5.585	141.86
		5.625	142.88			5.710	145.03
		5.750	146.05			5.840*	148.34
		5.813	147.65			5.890*	149.61
		5.875	149.23			5.940	150.88
		5.963	151.46			6.025	153.04
		6.125	155.58			6.180	156.97
		6.250	158.75			6.330	160.78

* NO-GO OD may not be compatible with next larger size nipple.

MODEL 'F' NIPPLE



'F' Nipple

The model 'F' nipple provides a tubing lock profile with honed unrestricted seal bore to locate wireline flow control devices such as velocity safety valves, blanking plugs chokes, equalizing check valves and instrument hangers.

The number & location of model 'F' nipple should be carefully considered in the completion design stage to allow maximum versatility in position of various flow control devices.

'F' Nipple can accept Selective 'S' or Top No-Go 'W' locking devices attached to flow control accessories.

It is manufactured either from low alloy steel or 9 Cr, 1 Mo-steel with controlled hardness for H₂S/CO₂ service. It is available upto 15,000 psi WP

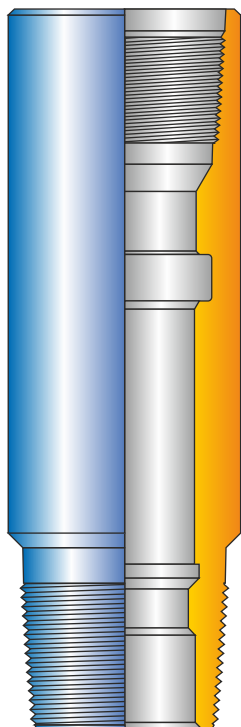
For ordering please specify:

- Nipple model
- Top & bottom thread connections
- Packing ID
- Working pressure & temperature
- Type of service
- Tubing size, weight & grade

'F' NIPPLE SPECIFICATIONS					
Tubing OD-in.	Nipple			Nipple Type	
	Seal Bore-in.	Size-in.	Min. OD-in.	Selective	Top No-Go
1.900	1.437	1.43	2.109	x	x
	1.500	1.50		x	-
2.1/16	1.562	1.56	2.250	x	x
	1.625	1.62		x	-
2.3/8	1.781	1.78	2.560	x	x
	1.812	1.81		x	x
	1.875	1.87		x	-
2.7/8	2.062	2.06	3.109	x	x
	2.250	2.25		x	x
	2.312	2.31		x	-
3.1/2	2.562	2.56	3.687	x	x
	2.750	2.75		x	x
	2.812	2.81		x	-
4.1/2	3.688	3.68	Coupling OD	x	x
	3.750	3.75		x	x
	3.812	3.81		x	-
5.00	4.000	4.00	Coupling OD	x	x
	4.125	4.12		x	x
	4.312	4.31		x	x
5.1/2	4.437	4.43	Coupling OD	x	-
	4.562	4.56		x	x
	4.750	4.75		x	x

- A. Other seal bore sizes are available in the various tubing sizes as per customer's requirement
- B. Equipment will be provided with OD. corresponding to coupling OD. for the type of the nipple unless specified otherwise
- C. Available with premium thread connections also

MODEL 'R' NIPPLE



'R' Nipple

ACT'S Model 'R' Nipple is a Bottom No-Go style nipple that provides a tubing lock profile with a honed seal bore to locate wireline flow control devices in tubing string.

Blanking plugs, chokes, equalizing check valves and instrument hangers which utilize a 'Z' lock may be landed in this type of nipple profile. The No-Go shoulder incorporated into the nipple allows positive locating of all flow control equipment used during wireline operations.

ACT nipple is manufactured from low alloy steel / 9 CR. 1MO steel with controlled hardness (17-22 HRC) for H₂S / CO₂ application. It is available up to 15,000 psi wp.

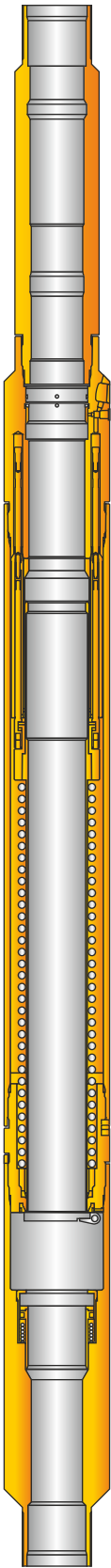
For ordering please specify:

- Nipple model
- Top & bottom thread connection
- Packing ID
- Working pressure & temperature
- Type of service
- Tubing size, weight & grade

'R' NIPPLE SPECIFICATIONS				
Tubing	Nipple			
OD-in.	Seal Bore-in.	Size-in.	No-Go ID-in.	Min. OD in.
1.900	1.437	1.43	1.385	2.109
	1.500	1.50	1.447	
2.1/16	1.562	1.56	1.510	2.250
	1.625	1.62	1.572	
2.3/8	1.781	1.78	1.728	2.560
	1.812	1.81	1.760	
	1.875	1.87	1.822	
2.7/8	2.062	2.06	1.978	3.109
	2.250	2.25	2.197	
	2.312	2.31	2.260	
3.1/2	2.562	2.56	2.442	3.687
	2.750	2.75	2.697	
	2.812	2.81	2.760	
4.1/2	3.688	3.68	3.625	Coupling OD
	3.750	3.75	3.700	
	3.812	3.81	3.759	
5.00	4.000	4.00	3.910	Coupling OD
	4.125	4.12	4.035	
	4.312	4.31	4.223	
5.1/2	4.562	4.56	4.472	Coupling OD
	4.750	4.75	4.660	

- A. Other seal bore sizes are available in the various tubing sizes as per customer's requirement
- B. Equipment will be provided with OD. corresponding to coupling OD. for the type of the nipple unless specified otherwise
- C. Available with premium thread connections also

ACT TUBING RETRIEVABLE SAFETY VALVE



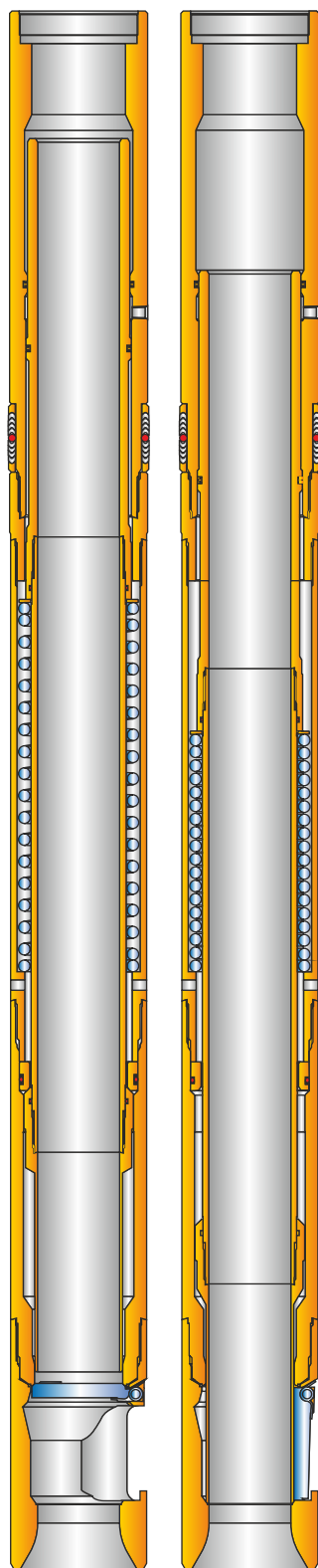
Tubing
Retrievable
Safety Valve

Tubing Retrievable Surface Controlled Sub Surface Safety Valves form part of production string. Hydraulic control line extending from the valve to the Wellhead connects to a part on the outside of the valve. The opposite end of the control line connects to the Wellhead. Hydraulic pressure applied through this control line acts on hydraulic pistons within the valve. The force generated moves the flow tube down against a power spring and tubing pressure, causing the flapper to open. Maintaining this hydraulic pressure allows unrestricted well production through the valve. Releasing the hydraulic pressure causes the flow tube to move up by the action of the power spring, thus allowing the flapper to the closed position.

TUBING RETRIEVABLE SAFETY VALVES			
TUBING SIZE (in. [mm])	Max. OD (in. [mm])	Min. ID (in. [mm])	WORKING PRESSURE psi
2.875 [73.0]	5.453 [138.5]	2.224 [56.9]	5,000 / 10,000
3.500 [88.9]	5.750 [146.1]	2.625 [66.8]	
4.500 x 3.500 [114.3 x 88.9]	5.945 [151.0]	2.562 [65.0]	
4.500 [114.3]	7.875 [200.0]	3.812 [96.8]	
5.500 [139.7]	8.375 [212.7]	4.562 [115.9]	5,000
7.000 [177.8]	9.437 [239.7]	6.000 [152.4]	

* Please check with factory for the metallurgy & pressure rating

SURFACE CONTROLLED SUBSURFACE SAFETY VALVES (SSSV)



**Flapper
Closed**

**Flapper
Open**

ACT model safety valves are installed in the upper wellbore to provide emergency closure of the producing conduits in the event of an emergency. The safety valve system is designed to be fail safe, so that the wellbore is isolated in the event of any system failure or damage to the surface production control facilities. ACT model safety valve is self equalizing, wireline retrievable, surface controlled and flapper type.

ACT model Safety Valves are installed in ACT model Landing Nipples.

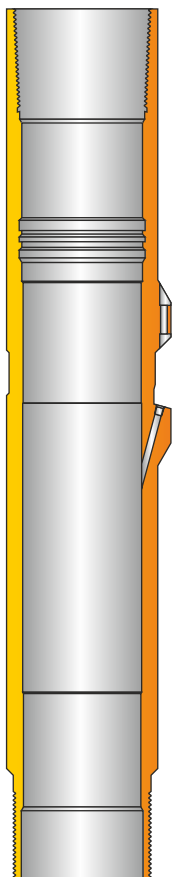
FEATURES:

- Self equalizing type
- Working pressure up to 10,000 psi
- Sealing and sealing surfaces are out of flow path, when valve is in the open position
- Solid construction of flapper made from bar stock

FLAPPER-TYPE WIRELINE-RETRIEVABLE SAFETY VALVES						
Tubing Size		Landing Nipple Seal bore		Valve ID		* Working Pressure
in.	mm.	in.	mm.	in.	mm.	psi
2.3/8	60.33	1.710	43.43	0.62	15.75	5,000 6,000 7,500 10,000
		1.875	47.63	0.75	19.05	
2.7/8	73.03	2.125	53.98	0.81	20.57	
		2.188	55.58	0.81	20.57	
		2.313	58.75	1.12	28.45	
3.1/2	88.90	2.562	65.07	1.00	25.40	
		2.750	69.85	1.50	38.10	
		2.813	71.45	1.50	38.10	
4	101.60	3.313	84.15	1.75	44.45	
4.1/2	114.30	3.437	87.30	1.75	44.45	
		3.688	93.68	1.87	47.50	
		3.813	96.85	2.12	53.85	
5	127.00	4.125	104.78	2.38	57.15	
5.1/2	139.70	4.562	115.87	2.56	65.02	
7	177.80	5.750	146.05	3.38	85.85	
		5.875	149.23	3.50	88.90	
		5.963	151.46	3.50	88.90	

* Please check with factory for the metallurgy & pressure rating

SAFETY VALVE LANDING NIPPLE



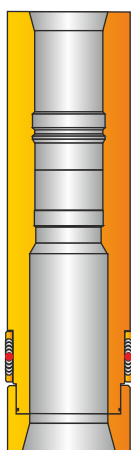
**Safety Valve
Landing Nipple**

Safety Valve Landing Nipples are used to accommodate ACT model wireline retrievable sub surface safety valves. These nipples have a locking recess and a hydraulic communication port located between the two polished bores. This nipple features an integral control line connection port which operates Sub Surface Safety Valve.

SAFETY VALVE LANDING NIPPLE				
Tubing Size		Landing Nipple Seal bore		* Working Pressure
in.	mm.	in.	mm.	psi
2.3/8	60.33	1.710	43.43	5,000 6,000 7,500 10,000
		1.875	47.63	
2.7/8	73.03	2.125	53.98	
		2.188	55.58	
		2.313	58.75	
3.1/2	88.90	2.562	65.07	
		2.750	69.85	
		2.813	71.45	
4	101.60	3.313	84.15	
4.1/2	114.30	3.437	87.30	
		3.688	93.68	
		3.813	96.85	
5	127.00	4.125	104.78	
5.1/2	139.70	4.562	115.87	
7	177.80	5.750	146.05	
		5.875	149.23	
		5.963	151.46	

* Please check with factory for the metallurgy & pressure rating

SEPARATION SLEEVE



**Separation
Sleeve**

ACT Separation Sleeve, when attached to an appropriate lock is a wireline Retrievable Tool, used to isolate the control line port of Safety Valve Landing Nipples.

LOCKOUT TOOL

Lockout Tool is used to shift the Lockout Sleeve of TRSSSV to establish secondary communication in the TRSSSV, thus allowing the WRSSSV to operate within TRSSSV. It is run on Standard Wireline Tool String with the capability of both upward & downward jarring.

LOCKOUT TOOL			
* Size (in)	Nominal ID	Nipple Profile	Top Conn.
3.1/2	2.31	X, R, F	1-1/16" - 10
	2.56		
	2.75		
	2.81		
4.1/2	3.668	X, R, F	1-1/16" - 10
	3.750		
	3.813		
5	4.125	X, R, F	1-1/16" - 10
	4.313		
5.1/2	4.562	X, R, F	1-1/16" - 10
	4.750		

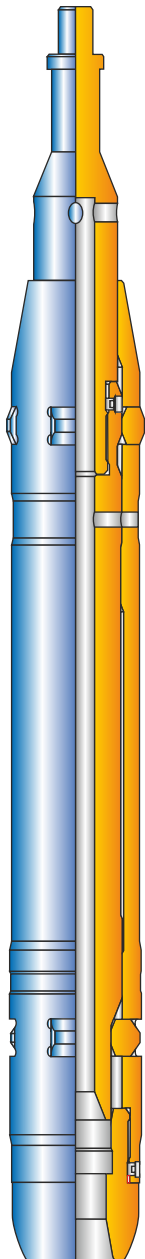
* Other tubing sizes available on request.

DEFORMATION LOCKOUT TOOL

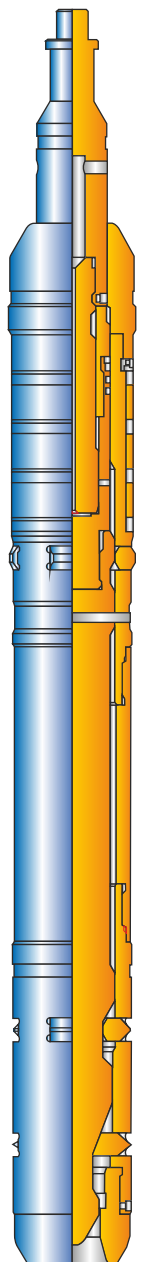
Deformation Lockout Tool is made to permanently lock the TRSSV in open position. This tool is a combination mechanical & hydraulic tool. Applied tubing pressure will move the flow tube of TRSSSV downwards keeping the flapper fully open. When tubing pressure is increased further, the deforming dogs will penetrate into the TRSSSV flow tube, making it permanently deformed. This deformation of the flow tube will prevent it from traveling back into the closed position thus keeping the flapper locked in open position.

DEFORMATION LOCKOUT TOOL			
* Size (in)	Nominal ID	Nipple Profile	Top Conn.
3.1/2	2.31	X, R, F	1-1/16" - 10
	2.56		
	2.75		
	2.81		
4.1/2	3.668	X, R, F	1-1/16" - 10
	3.750		
	3.813		
5	4.125	X, R, F	1-1/16" - 10
	4.313		
5.1/2	4.562	X, R, F	1-1/16" - 10
	4.750		

* Other tubing sizes available on request.

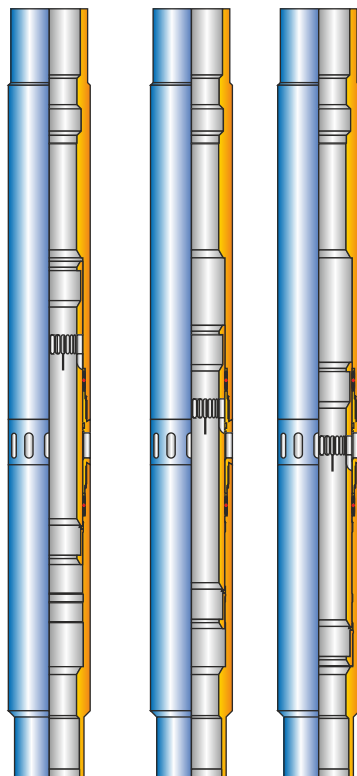


Lockout Tool



Deformation Lockout Tool

MODEL 'PCMD' AND 'PCMU' SLIDING SLEEVE

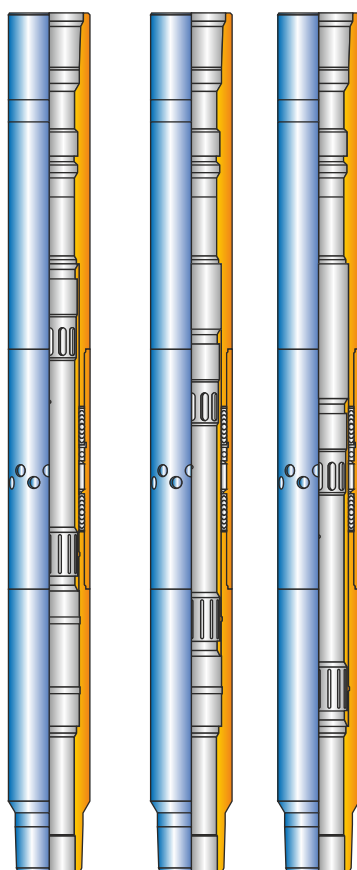


ACT'S Model 'PCMD' and 'PCMU' Sliding Sleeve provides a means of communication between the tubing and the annulus. It has internal honed sealed bores located at the top and bottom housing for placement of flow control devices. The internal sleeve is shifted open or closed by using a 'B' type wireline shifting tool. For ACT model 'PCMD', it is down shift to open and for 'PCMU' it is up shift to open sliding sleeve.

PCMD AND PCMU SLIDING SLEEVES										
	2.3/8"		2.7/8"	3.1/2"			4"	4.1/2"		5.1/2"
SEAL BORE	1.81	1.87	2.31	2.56	2.75	2.81	3.31	3.75	3.81	4.43
MAX. OD	3.080	3.080	3.750	4.280	4.280	4.280	5.520	5500		6.500
TOTAL LENGTH	48.99	48.99	48.63	51.67	52.37	50.00	55.25	54.89	54.30	60.64

Closed Equalized Open

MODEL 'PXD' AND 'PXU' SLIDING SLEEVE

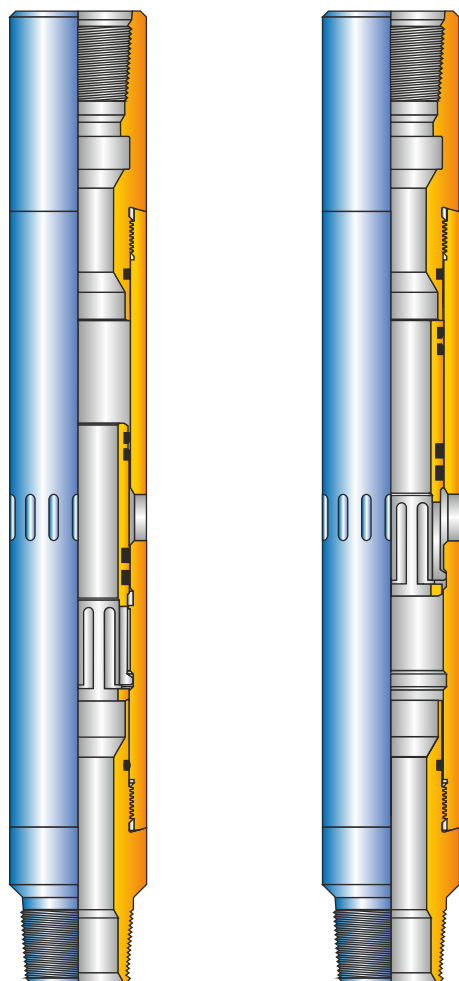


ACT'S Model 'PXD' and 'PXU' Sliding Sleeve provides a means of communication between the tubing and the annulus. It has internal honed sealed bores located at the top and bottom housing for placement of flow control devices. The internal sleeve is shifted open or closed by using a 'B' type wireline shifting tool. For ACT model 'PXD', it is down shift to open and for 'PXU' it is up shift to open sliding sleeve.

PXD AND PXU SLIDING SLEEVES					
	2.3/8"	2.7/8"	3.1/2"		5.1/2"
SEAL BORE	1.875"	2.313"	2.75"	2.813"	4.562"
MAX. OD	3.083"	3.75"	4.50"	4.50"	6.71
TOTAL LENGTH	36.28"	39.50"	51.38"	51.38"	65.28

Closed Equalized Open

MODEL 'L' SLIDING SLEEVE



Closed

Open

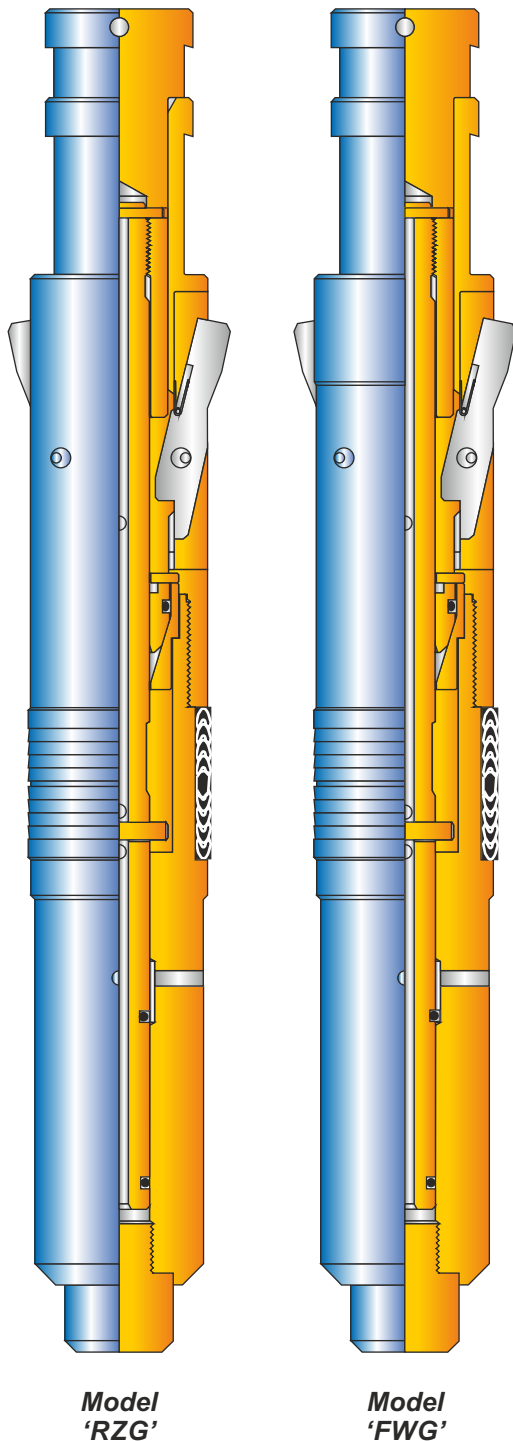
ACT'S Model 'L' Sliding Sleeve is a downhole tool used to establish communication, when desired, between the tubing and annulus. Selective and/or top No-Go locking devices are available for use with the sleeve. It has seal bores above and below the ports, and a top No-Go shoulder and locking groove.

The 'L' Sliding Sleeve locates, seals and retains flow control accessories that have either to No-Go or selective locks.

ACT'S Model 'L' Sliding Sleeve is manufactured for standard H₂S and H₂S-CO₂ services.

'L' SLIDING SLEEVE SPECIFICATIONS			
Tubing	Sliding Sleeve		
ID-in.	Seal Bore in.	Size-in.	OD-in.
1.900	1.437	1.43	2.375
	1.500	1.50	
2.1/16	1.562	1.56	2.500
	1.625	1.62	
2.3/8	1.781	1.78	2.910
	1.812	1.81	
	1.875	1.87	
2.7/8	2.250	2.25	3.410
	2.312	2.31	
3.1/2	2.750	2.75	4.500
	2.812	2.81	
4.1/2	3.688	3.68	5.500
	3.812	3.81	
5.1/2	4.313	4.31	Coupling OD
	4.562	4.56	

MODEL 'G' BOTTOM BYPASS BLANKING PLUGS



ACT'S Model 'G' Bottom Bypass Blanking Plugs are available in the following sizes:

'FSG'

Run in all model 'F' Nipples

'FWG'

Run in Top No-Go Model 'F' Nipples

'RZG'

Run in Bottom No-Go 'R' Nipples

These type of plugs are run in the by pass position to allow the passage of well fluid through the assembly, while landing the equipment in a Nipple Profile. A 'C-1' Running Tool is used to run the plug.

Once set in the Nipple Profile this group of plugs can hold pressure from above and below.

The pressure is equalized prior to retrieval by pulling the equalizing mandrel.

A standard Pulling Tool and proper Probe for the style of lock is used to pull the plug assembly.

The ACT'S 'G' Bottom Bypass Plugs are manufactured for standard, H₂S-CO₂ service.

Applications:

- Selected zones can be produced or shut in
- To pressure test tubing
- To isolate tubing for wellhead repair or removal
- To set hydraulic actuated packers
- To snub tubing in, or out of the well

Ordering information:

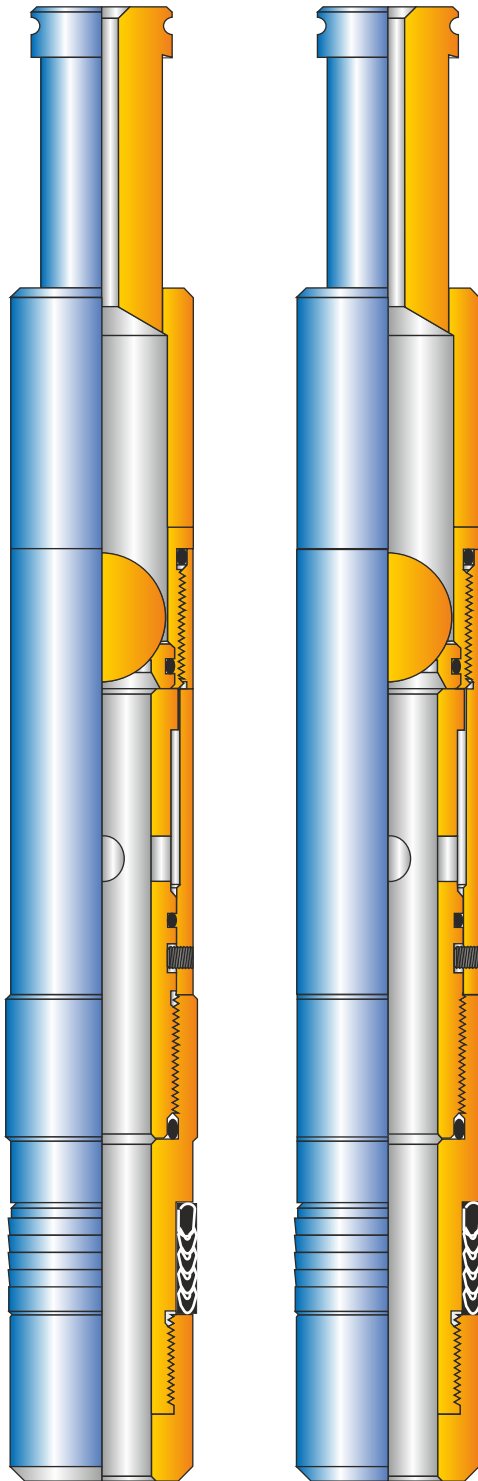
Please specify nipple model, seal bore size, plug model, working pressure and temperature, percentage of H₂S and CO₂.

MODEL 'G' BOTTOM BYPASS BLANKING PLUGS

‘FWG’ BYPASS BLANKING PLUG SPECIFICATIONS										
Tubing Nipple Accessory Availability			To Run	To Pull			FWG Dimension Specifications			
			‘C-1’	Equalizing		Plug	Equalizing	Plug Lock Mandrel		Maximum Plug OD
Tubing Size	Nipple Size	Plug Type	Running Tool	Mandrel		Assembly	Mandrel			
ID in.	Seal Bore in.	‘FWG’ Size	Size in.	Pulling Tool Type		B Probe	Fishing Neck		Fishing Neck ID	
				OTIS	CAMCO	Size in.	OD in.	OD in.	ID in.	OD in.
1.900	1.437	1.43	1.900	40RB14	JUC15174	1.900				1.490
	1.500	-					1.188	1.188	0.750	-
2.1/16	1.562	1.56	2.1/16	40SB6	JDC15154	2.1/16				1.615
	1.625	-								-
	1.781	1.78		40RB17	JUC15185					1.865
2.3/8	1.812	1.81	2.3/8			2.3/8	1.375	1.375	0.875	1.865
	1.875	-		40SB1	JDC15169					-
	2.062	2.06		40RB18	JUC15189					2.115
2.7/8	2.250	2.25	2.7/8			2.7/8	1.750	1.750	1.188	2.302
	2.312	-		40SB2	JDC15171					-
	2.562	2.56		40RB19	JUC15191					2.625
3.1/2	2.750	2.75	3.1/2			3.1/2	2.313	2.313	1.438	2.802
	2.812	-		40SB9	JDC15181					-
	3.688	3.68		40RB20	JUC15193					3.740
4.1/2	3.750	3.75	4.1/2			4.1/2	3.125	3.125	2.062	3.802
	3.812	-		40SB10	JDC15183					-

'RZG' BYPASS BLANKING PLUG SPECIFICATIONS										
Tubing Nipple Accessory Availability			To Run	To Pull			RZG Dimension Specifications			
			'C-1'	Equalizing		Plug	Equalizing	Plug Lock Mandrel		Maximum Plug OD
Tubing Size	Nipple Size	Plug Type	Running Tool	Mandrel		Assembly	Mandrel			
ID in.	Seal Bore in.	'RZG' Size	Size in.	Pulling Tool Type		B Probe	Fishing Neck		Fishing Neck ID	
				OTIS	CAMCO	Size in.	OD in.	OD in.	ID in.	OD in.
1.900	1.437	1.43	1.900	40RB14	JUC15174	1.900				1.472
	1.500	1.50					1.188	1.188	0.750	1.490
2.1/16	1.562	1.56	2.1/16	40SB6	JDC15154	2.1/16				1.552
	1.625	1.62								1.615
	1.781	1.78		40RB17	JUC15185					1.771
2.3/8	1.812	1.81	2.3/8			2.3/8	1.375	1.375	0.875	1.802
	1.875	1.87		40SB1	JDC15169					1.865
	2.062	2.06		40RB18	JUC15189					2.052
2.7/8	2.250	2.25	2.7/8			2.7/8	1.750	1.750	1.188	2.240
	2.312	2.31		40SB2	JDC15171					2.302
	2.562	2.56		40RB19	JUC15191					2.552
3.1/2	2.750	2.75	3.1/2			3.1/2	2.313	2.313	1.438	2.740
	2.812	2.81		40SB9	JDC15181					2.802
	3.688	3.68		40RB20	JUC15193					3.678
4.1/2	3.750	3.75	4.1/2			4.1/2	3.125	3.125	2.062	3.740
	3.812	3.81		40SB10	JDC15183					3.802

MODEL 'FB-2' AND 'RB-2' EQUALIZING CHECK VALVES



**Model
'FB-2'**

**Model
'RB-2'**

ACT'S Model 'FB-2' and 'RB-2' Equalizing Check Valves are completion equipment, without any locking device. These are utilized in the following tubing mounted equipment:

'FB-2'

Run in all model 'F' Nipples and all model 'L' Sliding Sleeves

'RB-2'

Run in Bottom No-Go 'R' Nipples

Both models are run into a nipple profile and hold pressure from above only. The 'FB-2' model lands on the top of an 'F' Nipple Profile Seal Bore. The 'RB-2' model seats on the Bottom No-Go Shoulder of an 'R' Nipple.

A 'C-1' Running Tool is used to run both valve assemblies.

Both models can be equalized prior to retrieval, by shifting open the equalizing mandrel ports. Standard Pulling Tool is utilized for retrieval of these valves.

The ACT'S 'FB-2' and 'RB-2' Equalizing Check Valves are manufactured for standard, H₂S and H₂S-CO₂ service.

Applications:

- Can be used as a plug to pressure test tubing
- To set hydraulically actuated packer with the check valve positioned below the packer
- For gas lift operations
- To be used as a standing valve in wells which have downhole electric pumps

Ordering information:

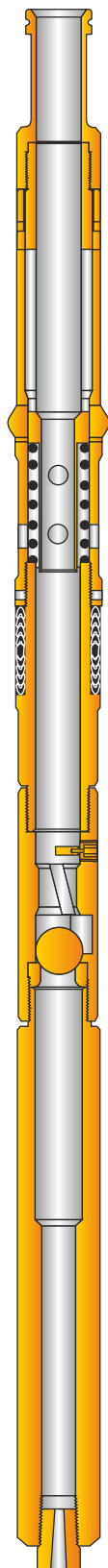
Please specify nipple model, seal bore size, check valve model, working pressure and temperature, percentage of H₂S and CO₂.

MODEL 'FB-2' AND 'RB-2' EQUALIZING CHECK VALVES

'FB-2' EQUALIZING CHECK VALVE SPECIFICATIONS								
Tubing Nipple Accessory Availability			To Run			To Pull		Maximum Check Valve OD
			'C-1'	Jar Down		Pulling Tool type		
Tubing Size	Nipple Size	Check Valve	Running Tool	Pulling Tool				
ID-in.	Seal Bore in.	'FB-2' Size	Size in.	OTIS	CAMCO	OTIS	CAMCO	OD in.
1.900	1.437	1.43	1.900			40RB14	JUC15174	1.490
	1.500	1.50		40SB6	JDC15154			1.552
2.1/16	1.562	1.56	2.1/16			40SB6	JDC15154	1.615
	1.625	1.62						1.672
	1.781	1.78						1.865
2.3/8	1.812	1.81	2.3/8	40SB1	JDC15169	40RB17	JUC15185	1.865
	1.875	1.87				40SB1	JDC15169	1.905
2.7/8	2.250	2.25	2.7/8	40SB2	JDC15171	40RB18	JUC15189	2.302
	2.312	2.31				40SB2	JDC15179	2.364
3.1/2	2.750	2.75	3.1/2	40SB9	JDC15181	40RB19	JUC15191	2.802
	2.812	2.81				40SB9	JDC15181	2.865
	3.688	3.68						3.740
4.1/2	3.750	3.75	4.1/2	40SB10	JDC15183	40RB20	JUC15193	3.802
	3.812	3.81				40SB10	JDC15183	3.875

'RB-2' EQUALIZING CHECK VALVE SPECIFICATIONS								
Tubing Nipple Accessory Availability			To Run			To Pull		Maximum Check Valve OD
			'C-1'	Jar Down		Pulling Tool type		
Tubing Size	Nipple Size	Check Valve	Running Tool	Pulling Tool				
ID-in.	Seal Bore in.	'RB-2' Size	Size in.	OTIS	CAMCO	OTIS	CAMCO	OD in.
1.900	1.437	1.43	1.900			40RB14	JUC15174	1.427
	1.500	1.50		40SB6	JDC15154			1.490
2.1/16	1.562	1.56	2.1/16			40SB6	JDC15154	1.552
	1.625	1.62						1.615
	1.781	1.78						1.771
2.3/8	1.812	1.81	2.3/8	40SB1	JDC15169	40RB17	JUC15185	1.802
	1.875	1.87				40SB1	JDC15169	1.865
2.7/8	2.250	2.25	2.7/8	40SB2	JDC15171	40RB18	JUC15189	2.240
	2.312	2.31				40SB2	JDC15179	2.302
3.1/2	2.750	2.75	3.1/2	40SB9	JDC15181	40RB19	JUC15191	2.740
	2.812	2.81				40SB9	JDC15181	2.802
	3.688	3.68				40RB20	JUC15193	3.678
4.1/2	3.812	3.81	4.1/2	40SB10	JDC15183	40SB10	JDC15183	3.802

MODEL 'FGK' EQUALIZING CHECK VALVE CHOKE WITH CERAMIC BEAN



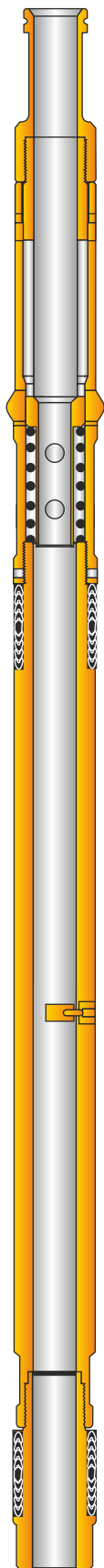
The model 'FGK' equalizing check valve choke is a top No-Go wireline retrievable tool which controls upward flow and prevents downward flow. It is landed and set in the type 'F' landing Nipple. An integral, erosion resistant, ceramic orifice is sized to control the upward flow as desired, while downward flow is checked with a ball and seat device.

Pressure can be equalized across the valve by breaking the equalizing plug.

'FGK' EQUALIZING CHECK VALVE CHOKE SPECIFICATIONS									
Size in.	Seal Bore Size	Size	Max O.D. in.	To Run		To Equalize		To Pull	
				"C-1" Running Tool	"N-1" Shank	'A' Guide	'A' Prong	Pulling Tool	"N-1" Probe
2.3/8	1.78	1.78	1.865	2.3/8		2.3/8	1/2	40RB17	2.3/8
	1.812	1.81						40SB1	
	1.875	1.87	1.928					JUC-TD15185 JDC-TD15169	
2.7/8	2.25	2.25	2.302	2.7/8		2.7/8	1/2	40RB18	2.7/8
	2.31	2.31	2.365					40SB2 JUC-TD15189 JDC-TD15171	
3.1/2	2.75	2.75	2.802	3.1/2		3.1/2	5/8	40RB19	3.1/2
	2.812	2.81	2.865					40SB9 JDC15181 JUC15191	
4.1/2	3.688	3.68	3.740	4.1/2		4.1/2	5/8	40RB20	4.1/2
	3.812	3.81	3.875					40SB10 JDC15183 JUC15193	

**Model
'FGK'**

MODEL 'LGE' SEPARATION SLEEVE

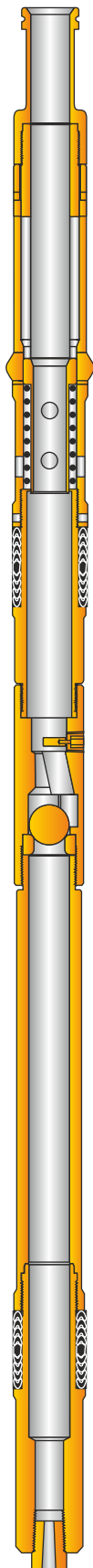


The model 'LGE' Separation Sleeve is a Top No-Go device which is run on wireline and designed to be landed and set in the type 'L' sliding sleeve. These are equipped with two packing assemblies, that seal off the upper and lower seal bore of sliding sleeve, Therefore isolating the sleeve ports. Production can be maintained by producing the well through the inside diameter of the tool. The separation Sleeve is also designed with an internal equalizing plug to equalize pressure before retrieving.

'LGE' SEPARATION SLEEVE SPECIFICATIONS									
Size in.	Seal Bore Size	Size	Max O.D. in.	To Run		To Equalize		To Pull	
				"C-1" Running Tool	"N-1" Shank	'A' Guide	'A' Prong	Pulling Tool	"N-1" Probe
2.3/8	1.78	1.78	1.865	2.3/8		2.3/8	1/2	40RB17	2.3/8
	1.812	1.81						40SB1	
	1.875	1.87	1.928					JUC-TD15185 JDC-TD15169	
2.7/8	2.25	2.25	2.302	2.7/8		2.7/8	1/2	40RB18	2.7/8
	2.31	2.31	2.365					40SB2 JUC-TD15189 JDC-TD15171	
3.1/2	2.75	2.75	2.802	3.1/2		3.1/2	5/8	40RB19	3.1/2
	2.812	2.81	2.865					40SB9 JDC15181 JUC15191	
4.1/2	3.688	3.68	3.740	4.1/2		4.1/2	5/8	40RB20	4.1/2
	3.812	3.81	3.875					40SB10 JDC15183 JUC15193	

Model
'LGE'

MODEL 'LGK' EQUALIZING CHECK VALVE CHOKE WITH CERAMIC BEAN



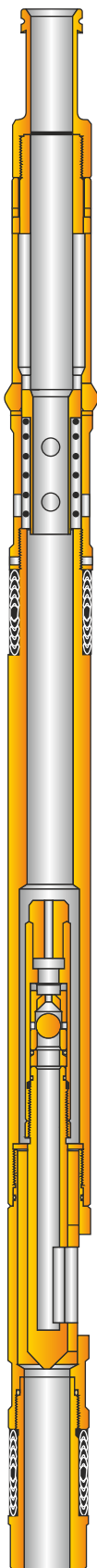
The model 'LGK' equalizing check valve choke is a Top No-Go wireline retrievable tool which controls upward flow and prevents downward flow. It is landed and set in the type 'L' sliding sleeve. An integral, erosion resistant, ceramic orifice is sized to control the upward flow as desired, while downward flow is checked with a ball and seat device.

Pressure can be equalized across the valve by breaking the equalizing plug.

'LGK' EQUALIZING CHECK VALVE CHOKE SPECIFICATIONS									
Size in.	Seal Bore Size	Size	Max O.D. in.	To Run		To Equalize		To Pull	
				"C-1" Running Tool	"N-1" Shank	'A' Guide	'A' Prong	Pulling Tool	"N-1" Probe
2.3/8	1.78	1.78	1.865	2.3/8		2.3/8	1/2	40RB17	2.3/8
	1.812	1.81						40SB1	
	1.875	1.87	1.928					JUC-TD15185 JDC-TD15169	
2.7/8	2.25	2.25	2.302	2.7/8		2.7/8	1/2	40RB18	2.7/8
	2.31	2.31	2.365					40SB2 JUC-TD15189 JDC-TD15171	
3.1/2	2.75	2.75	2.802	3.1/2		3.1/2	5/8	40RB19	3.1/2
	2.812	2.81	2.865					40SB9 JDC15181 JUC15191	
4.1/2	3.688	3.68	3.740	4.1/2		4.1/2	5/8	40RB20	4.1/2
	3.812	3.81	3.875					40SB10 JDC15183 JUC15193	

MODEL 'LGU' BYPASS CHOKE

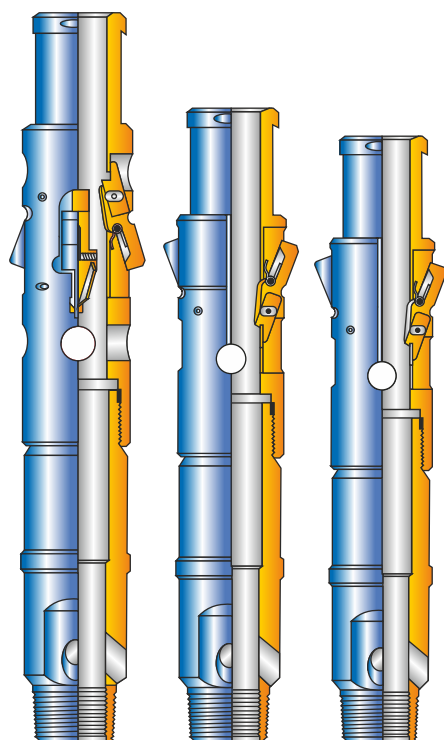
The TYPE "LGU" BY-PASS CHOKE is a Top No-Go device which is run on wireline and designed to be landed and set in the Type "L" Sliding Sleeve ideally suited for commingled production. The BY -PASS CHOKE is equipped with a ceramic flow choke which controls the flow of the zone being produced through the Sliding Sleeve. Production from the other zone flows through the bypass, but is prevented from back flowing through the choke and the Sliding Sleeve by an API ball and seat back check valve.



**Model
'LGU'**

‘LGU’ BYPASS CHOKE SPECIFICATIONS							
Size in.	Seal Bore Size	Size	Max O.D. in.	To Run		To Pull	
				“C-1” Running Tool	“N-1” Shank	Pulling Tool	“N-1” Probe
2.3/8	1.78	1.78	1.865	2.3/8		40RB17	2.3/8
	1.812	1.81				40SB1	
	1.875	1.87	1.928			JUC-TD15185 JDC-TD15169	
2.7/8	2.25	2.25	2.302	2.7/8		40RB18	2.7/8
	2.31	2.31	2.365			40SB2 JUC-TD15189 JUC-TD15171	
3.1/2	2.75	2.75	2.802	3.1/2		40RB19	3.1/2
	2.812	2.81	2.865			40SB9 JDC15181 JUC15191	
4.1/2	3.688	3.68	3.740	4.1/2		40RB20	4.1/2
	3.812	3.81	3.875			40SB10 JDC15183 JUC15193	

ACT MODEL 'B' DOWNHOLE INSTRUMENT HANGERS



**Model
'FSB'**

**Model
'FWB'**

**Model
'RZB'**

ACT'S Model 'B' Downhole Instrument Hangers are available in the following models:

'FSB'

Run in all models

'F' Nipples

'FWB'

Run in Top No-Go models

'F' Nipples

'RZB'

Run in Bottom No-Go

'R' Nipples

These type of hangers are used to hang instruments such as pressure and temperature gauges in a nipple profile. Recorders are held securely in place when recording data during high production rates. Pressure data is easily correlated between runs, as recorders are always landed at the same depth. The hangers permit simultaneous surveys to be done on several zones at the same time.

Standard wireline equipment is used to set and retrieve all three models.

ACT'S model 'B' Downhole Instrument Hangers are manufactured for standard H₂S and H₂S-CO₂ service.

Ordering information:

Please specify nipple model, seal bore size, hanger model.

Percentage of H₂S and CO₂.

'FSB' INSTRUMENT HANGER SPECIFICATIONS

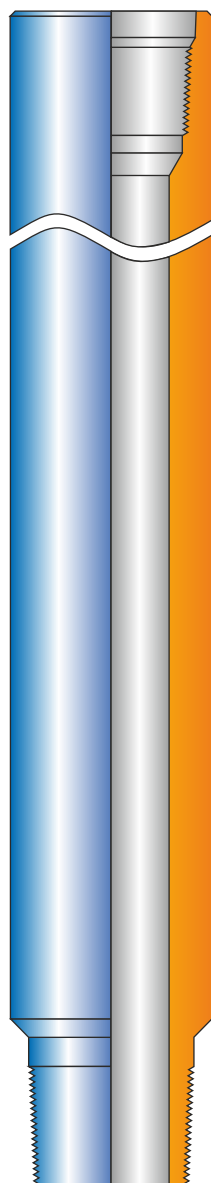
'FSB' INSTRUMENT HANGER SPECIFICATIONS									
Tubing Nipple Accessory Availability			To Run		To Pull				Maximum Tool OD
			'C-1'Running Tool		Running Tool Attachment	Pulling Tool Type		'A' Probe	
Tubing Size	Nipple Size	Instrument Hanger	Running Selective	Locating With NoGo-ring	'A' Shank				
OD in.	Seal Bore in.	'FSB' Size	Size-in.	Size-in.	Size-in.	OTIS	CAMCO	Size-in.	OD in.
1.900	1.437	1.43	1.900	1.468	1.900	40RB14	JUC15174	1.900	1.427
	1.500	1.50		1.520					1.427
2.1/16	1.562	1.56	2.1/16	1.593	2.1/16x4-3/4	40SB6	JDC15154	2.1/16	1.552
	1.625	1.62		1.656		40RB17	JUC15185		1.552
2.3/8	1.781	1.78	2.3/8	1.807	2-3/8x5	40SB1	JDC15169	2.3/8	1.771
	1.812	1.81		1.843					1.802
	1.875	1.87		1.906					1.802
2.7/8	2.062	2.06	2.7/8	2.093	2-7/8x5-5/16	40SB18	JUC15189	2.7/8	2.052
	2.250	2.25		2.281		40SB2	JDC15181		2.240
	2.312	2.31		2.343					2.240
3.1/2	2.562	2.56	3.1/2	2.593	3.1/2x5-5/16	40RB19	JUC15191	3.1/2	2.552
	2.750	2.75		2.781		40SB9	JDC15181		2.740
	2.812	2.81		2.843					2.740
4.1/2	3.688	3.68	4.1/2	3.718	4-1/2x7	40RB20	JUC15193	4.1/2	3.678
	3.750	3.75		3.781		40SB10	JDC15183		3.740
	3.812	3.81		3.835					3.802

ACT MODEL 'B' DOWNHOLE INSTRUMENT HANGERS

‘FWB’ INSTRUMENT HANGER SPECIFICATIONS								
Tubing Nipple Accessory Availability			To Run		To Pull			Maximum Tool OD
			‘C-1’ Running Tool	Running Tool Attachments	Pulling Tool Type		‘B’ Probe	
Tubing Size	Nipple Size	Instrument Hanger		‘A’ Shank Dogs Retracted				
OD in.	Seal Bore in.	‘FWB’ Size	Size in.	Size in.	OTIS	CAMCO	Size-in.	OD in.
1.900	1.437 1.500	1.43 -	1.900	1.900	40RB14	JUC15174	1.900	1.490 -
2.1/16	1.562 1.625	1.56 -	2.1/16	2.1/16x5-7/8	40SB6	JDC15154	2.1/16	1.615 -
2.3/8	1.781 1.812 1.875	1.78 1.81 -	2.3/8	2.3/8x6-1/8	40RB17 40SB1	JUC15185 JDC15169	2.3/8	1.865 1.865 -
2.7/8	2.062 2.250 2.312	2.06 2.25 -	2.7/8	2.7/8x6-3/32	40RB18 40SB2	JUC15189 JDC15171	2.7/8	2.115 2.302 -
3.1/2	2.562 2.750 2.812	2.56 2.75 -	3-1/2	3-1/2x6-11/16	40RB19 40SB9	JUC15191 JDC15181	3.1/2	2.625 2.802 -
4.1/2	3.688 3.750 3.812	3.68 3.75 -	4.1/2	4.1/2x6-1/2	40RB20 40SB10	JUC15193 JDC15183	4.1/2	3.740 3.802 -

‘RZB’ INSTRUMENT HANGER SPECIFICATIONS								
Tubing Nipple Accessory Availability			To Run		To Pull			Maximum Tool OD
			‘C-1’ Running Tool	Running Tool Attachments	Pulling Tool Type		‘B’ Probe	
Tubing Size	Nipple Size	Instrument Hanger		‘A’ Shank Dogs Retracted				
OD in.	Seal Bore in.	‘RZB’ Size	Size in.	Size in.	OTIS	CAMCO	Size-in.	OD in.
1.900	1.437	1.43	1.900	1.900	40RB14	JUC15174	1.900	1.427
	1.500	1.50						1.490
2.1/16	1.562	1.56	2.1/16	2.1/16x5-7/8	40SB6	JDC15154	2.1/16	1.552
	1.625	1.62						1.615
2.3/8	1.781	1.78	2.3/8	2.3/8x6-1/8	40RB17	JUC15185	2.3/8	1.771
	1.812	1.81			40SB1	JDC15169		1.802
	1.875	1.87						1.865
2.7/8	2.062	2.06	2.7/8	2.7/8x6-3/32	40RB18	JUC15189	2.7/8	2.052
	2.250	2.25			40SB2	JDC15171		2.240
	2.312	2.31						2.302
3.1/2	2.562	2.56	3-1/2	3-1/2x6-11/16	40RB19	JUC15191	3.1/2	2.552
	2.750	2.75			40SB9	JDC15181		2.740
	2.812	2.81						2.802
4.1/2	3.688	3.68	4.1/2	4.1/2x6-1/2	40RB20	JUC15193	4.1/2	3.678
	3.750	3.75			40SB10	JDC15183		3.740
	3.812	3.81						3.802

FLOW COUPLINGS



**Flow
Coupling**

Flow couplings are used in a tubing string of a flowing well, which are normally installed above and below a nipple or sliding sleeve to protect the flow area. The flow coupling is a thick walled section of tubing which minimizes the effect of internal erosion that can occur in flowing well. The flow coupling is generally installed in turbulence inducing locations which can cause changes in diametrical cross section due to erosive effect of abrasive particles in flow stream, and may also cause erosion by cavitation effect.

The flow couplings are generally connection O.D and are available in 3, 4, 6 and 8ft.

Features:

- Connection OD, tubing ID
- Available in various lengths
- Available in various materials

Benefits:

- Provides a thicker wall to resist erosive wear from fluid turbulence.
- Provides a thicker wall across from perforations to resist erosive fluid blast.

Applications:

- Placement adjacent to changes in the tubing ID.
- Placement across from perforations.

FLOW COUPLINGS		
TUBING ^a SIZE (INCH)	O.D. (INCH)	I.D. (INCH)
2.3/8"	3.063"	1.995"
2.7/8"	3.668"	2.441"
3.1/2"	4.500"	2.992"
4.1/2"	5.563"	3.958"
5.1/2"	6.100"	4.670"

- a - Top Box x Bottom Pin EUE 8RD connection / customer to specify tubing / premium casing conn.
- b - Other sizes are available on request.

SLIP LOCK ASSEMBLY

Application

- ACT Slip Lock Assembly is run to lock downhole flow control equipment in tubing string without landing nipple. The Slip Lock can be set at any location in the tubing

Advantages

- Run in tubing string without landing nipple
- Operator can set the lock at any desired depth in the tubing

SLIP LOCK ASSEMBLY							
Tubing O.D	O.D Slips Expand	O.D Slips Retract	Min. I.D.	Fishing Neck	Running Tool	Pulling Tool	Thread Connection
2.375	2.062	1.859	0.687	1.375	41 WO 13	40 RB 17	1 3/16 x 14
2.875	2.530	2.296	0.875	1.750	41 WO 14	40 RB 18	1 9/16 x 12
3.500	3.080	2.843	1.375	2.312	41 WO 22	40 RB 19	2 x 12
4.500	3.500	3.281	1.750	2.750	41 WO 30	40 RB 30	2 1/4 x 12

SURGE TOOL ASSEMBLY

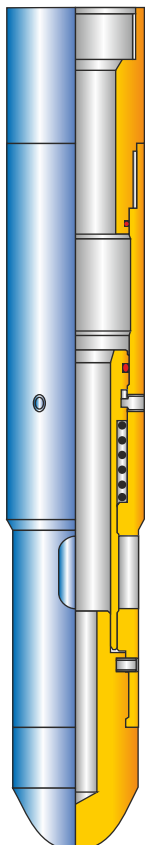
Application

- ACT formation Surge Tool is to be assembled with relevant lock / equalizing assembly. The assembly is to be run in the well bore in a normal manner and device located in relevant nipple. The running tool is to be retrieved prior to utilizing formation surge tool

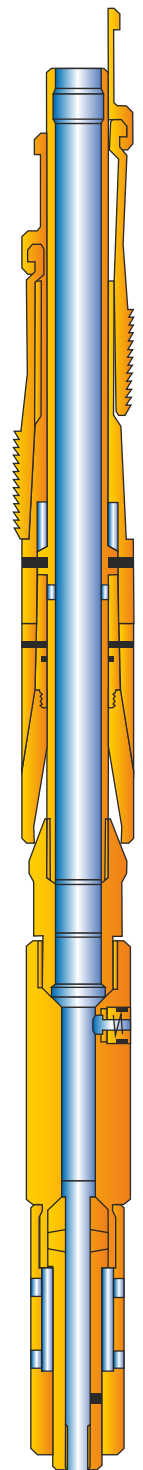
Advantages

- Designed to allow draw-down to be created across the perforations in order to remove debris
- Can be retrieved by conventional wireline operations, after well pressure is stabilized

SURGE TOOL ASSEMBLY				
Tubing Size	Weight lbs	Surge Tool O.D.	Surge Tool O.D.	Length
2.3/8	10.40	1.750	0.885	14.25
2.7/8	14.30	2.150	1.096	15.50
3.1/2	20.50	2.604	1.315	16.00



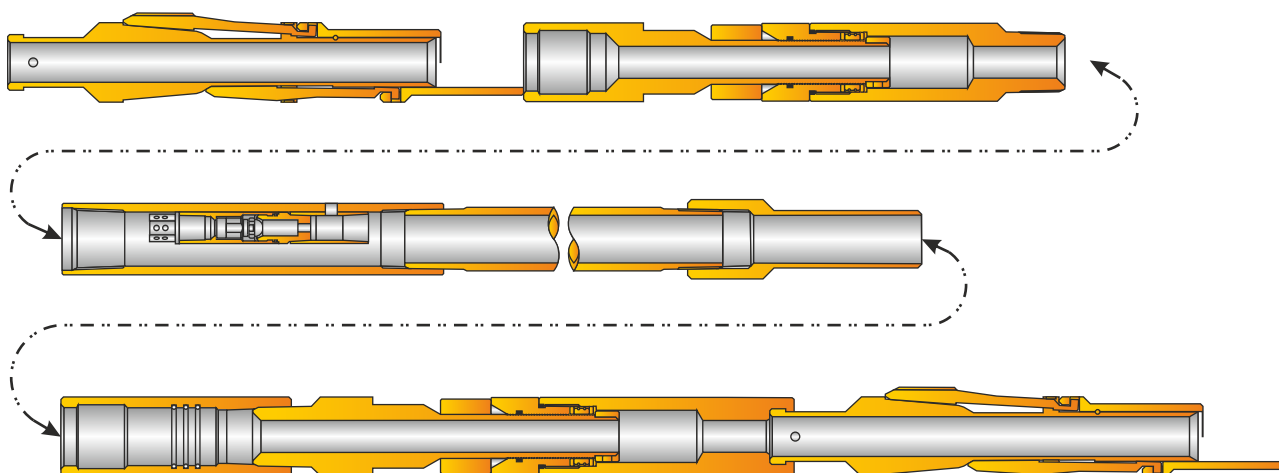
**Surge
Tool
Assembly**



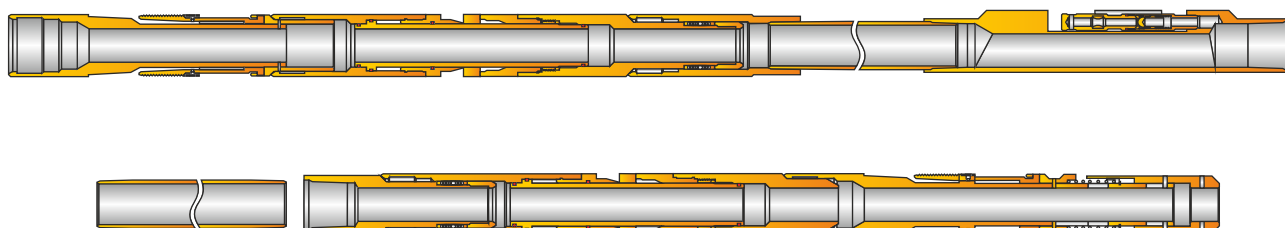
**Slip Lock
Assembly**

ACT TUBING PACK-OFF ANCHOR ASSEMBLY

These anchors are designed to be set anywhere in the tubing string to straddle and pack-off holes or other communication in the tubing string, so that well production can be continued without pulling tubing. Tubing pack-off anchors are run and set by wireline methods.



ACT Tubing Pack-Off Anchor Assembly - 5,000 psi



ACT Tubing Pack-Off Anchor Assembly - 10,000 psi

CONTROL LINE & ACCESSORIES

CONTINUOUS CONTROL LINE: A small-diameter hydraulic line used to operate downhole completion equipment such as the Surface Controlled Subsurface Safety Valve (SCSSV). Available in various sizes and materials including Monel for highly corrosive environment. Quick specifications guide is furnished underneath for quick reference. Consult factory for detailed specifications.



CONTROL LINE SPECIFICATION GUIDE					
OD in.	WALL in.	WEIGHT (LBS/FT)	MATERIAL	W.P (psi)	CONTINUOUS LENGTH
1/4	.035	.0804	300 SERIES	5,000 10,000 15,000	AS ORDERED
	.040	.1052	S.S		
	.039	.0804	MONNEL 400		
	.040	.1052			
	.039	.0804	INCOLOY		
	.040	.1052			



STRAPS: Straps are used to tie control line on the outer diameter of tubing while running in. Consult factory for detailed specifications.



BUCKLES: Buckles are used to crimp straps together after control line is tied up with tubing. Consult factory for detailed specifications.



CONNECTOR: Connectors are used for connecting control line to the downhole completion equipment. Consult factory for detailed specifications.



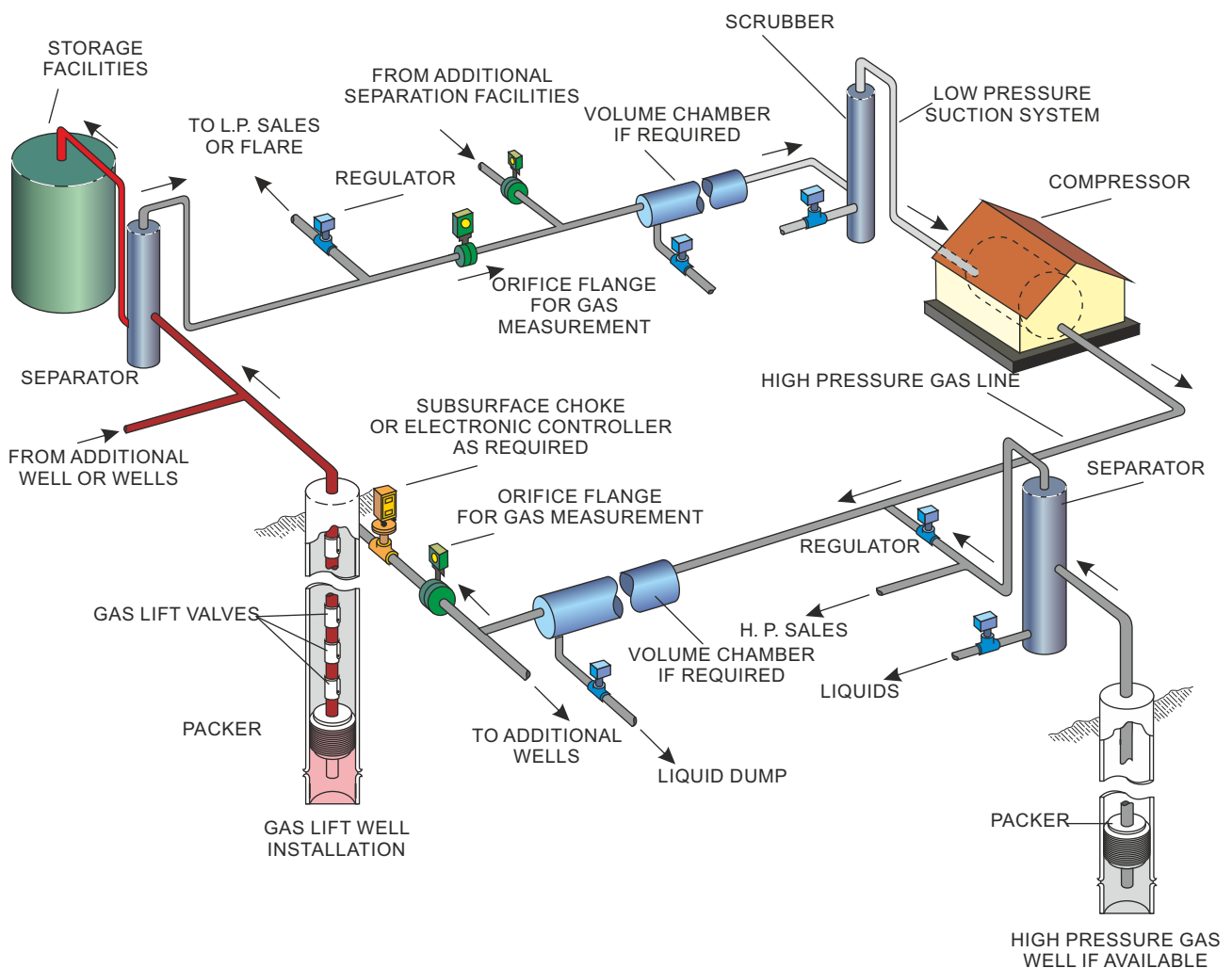
CONTROL LINE PROTECTORS: Control Line Protectors are designed to provide excellent protection of control line and/or cables during running in. The protectors prevent the cables/control lines from twisting, crushing and also from erosion against the tubing coupling and the casing. Consult factory for detailed specifications.

GAS LIFT COMPLETION SYSTEMS

In order to boost production from wells, which do not flow at all or do not flow at optimum level, artificial systems using a variety of methods are used. These methods use Gas Lift, Plunger Lift, Chamber Lift, Rod Pumps, Submersible Pumps and so on. ACT provides a complete line of Equipment and Services for such applications, e.g. Gaslift, Plunger Lift and Chamber Lift.

Which artificial method will be most effective for a particular well can be determined by evaluating several factors such as well's production potential, Gas/Oil ratios, well bore deviation and size as well as corrosion / erosion potential of produced fluids. Other factors include availability of power source such as compressed gas, electricity, surface facility, service availability, space limitation and personnel capabilities.

The diagram below provides the basic components of a Gas Lift System. In many fields, a high pressure well provides a readily available energy source. If sufficient gas pressure or volume is not available, a compressor can be utilized to operate a closed system. The Gas is recirculated through a compressor facility. Only minor amount of make up gas is needed to replenish gas lost in separation processing or as fuel for compressor facilities.

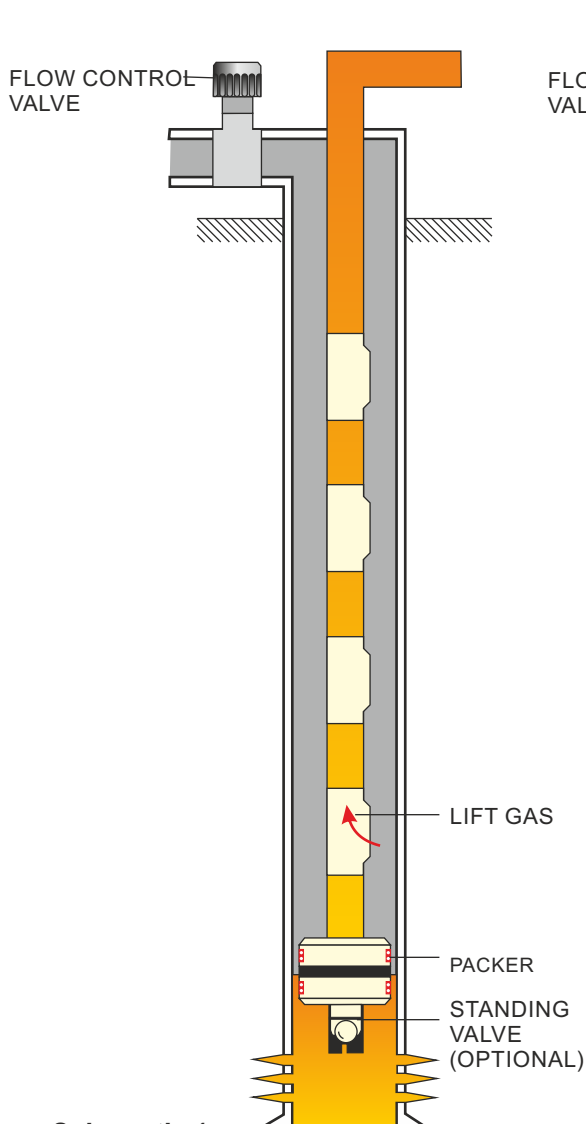


Basic Components For A Gas Lift System

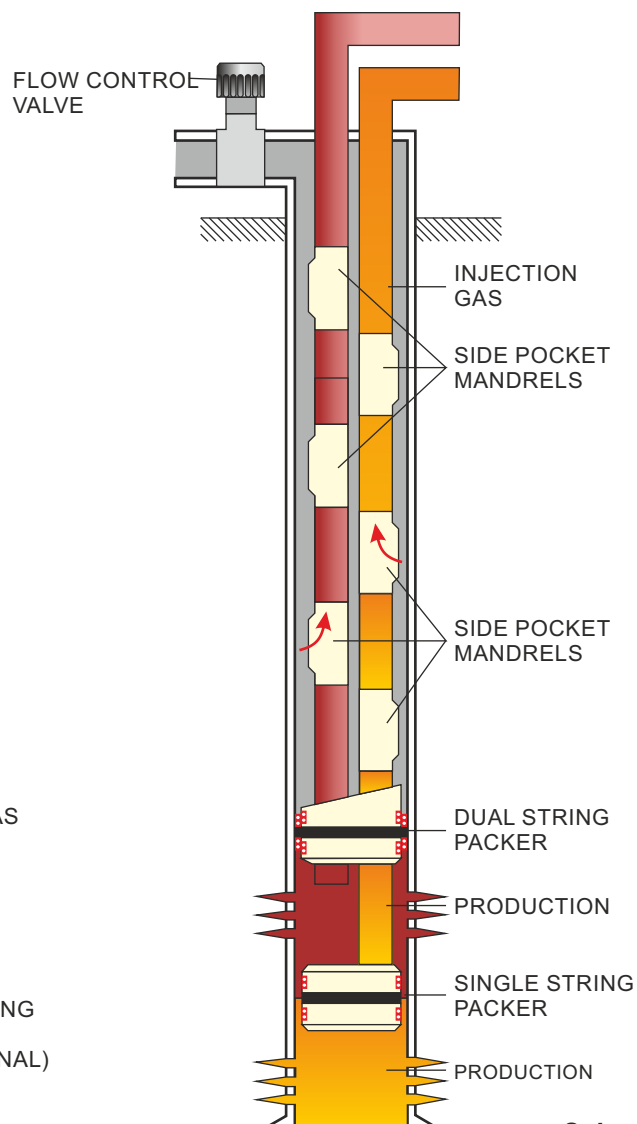
GAS LIFT COMPLETION SYSTEMS

Schematic 1- The single string Gas Lift completion for intermittent lift applications utilizes a standing valve near the bottom of the tubing to prevent Gas pressure surges against the reservoir during cyclic operations. A single zone continuous lift installation would not require a standing valve but otherwise it will be identical. In either application Conventional or Side Pocket Mandrel can be used. Side Pocket Mandrels are designed to provide the facility of removing and replacing Gas Lift Valves without removing the tubing. These service operations are performed either by using wireline, through - flow line (TFL) or coiled tubing methods depending on the completion configuration. Wire line installations are more economical for servicing wells with vertical access, especially remote, offshore or other hard - to - reach locations, since wireline units are light and portable. TFL and coil tubing service methods can provide production maintenance for wells that require tubing loops, such as ocean floor completions, highly deviated wells, extremely deep wells and any well where there is no straight or vertical access for wireline service.

Schematic 2 - This illustrates dual-string installations where Gas Lift Valves lift fluids from two zones using gas from a common annulus. An installation can be designed, with proper well information, to produce and carry both zones to depletion. The conditions affecting dual string design are casing size, distance between zones, well bore deviation, continuous or intermittent lift and operator's preference. Gas lift valves should be of proportional response or production pressure operated if the operation has to be trouble free.

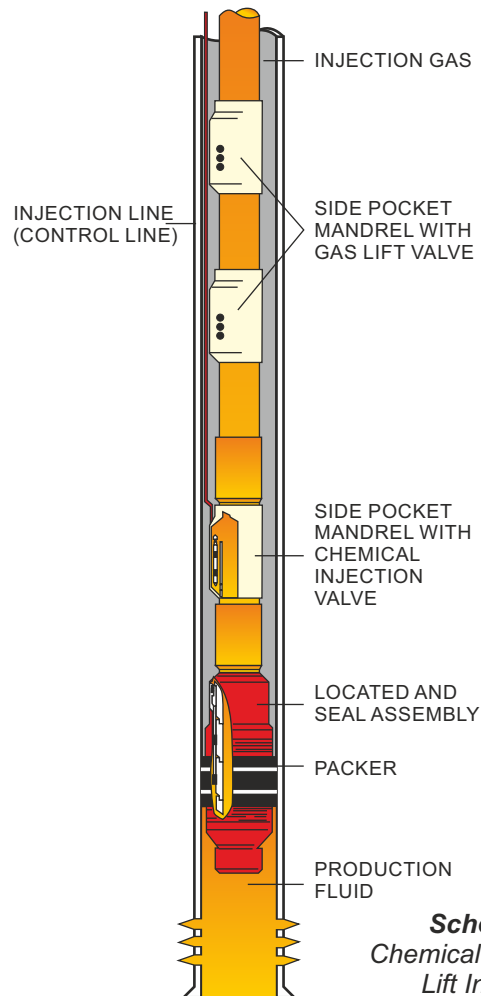
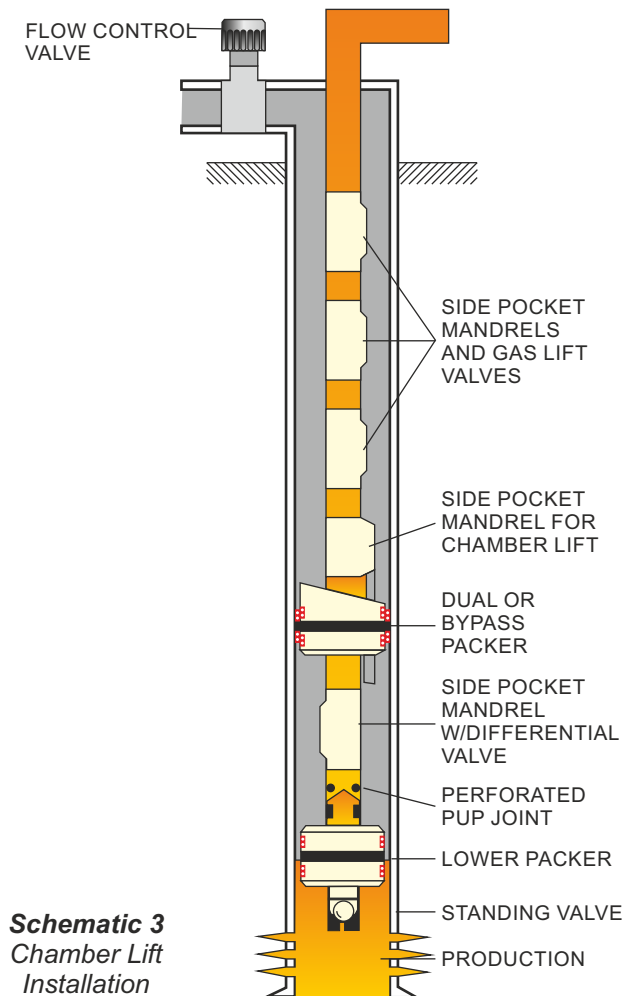


Schematic 1
Single Zone Gas Lift
Installation



Schematic 2
Dual String Gas Lift
Installation

GAS LIFT COMPLETION SYSTEMS



Schematic 3 - In the chamber lift system, one normally utilizes two packers, a standing valve, a perforated pup above the bottom packer, and a differential vent valve just below the top packer, in addition to the Gas Lift Valve necessary to unload and produce the well.

While the bottom injection pressure operated valve is closed, the standing valve is open. Fluid fills both the tubing and annular space (chamber) between the two packers. The differential valve is open, and allows gas in the top of the annular part of the chamber to bleed into the tubing as the chamber fills. When the chamber has filled to the point that the liquid level is near the differential valve, the operating gas lift valve opens. A calculated gas volume enters the top of the chamber, closing the bleed valve and standing valve, forcing accumulated liquids to U-tube from the chamber to the tubing. Liquids are produced as a slug to the surface. As the tubing is cleared, the operating gas lift valve closes, the standing valve and bleed valve open, and liquids again refill the chamber. The cycle then repeats.

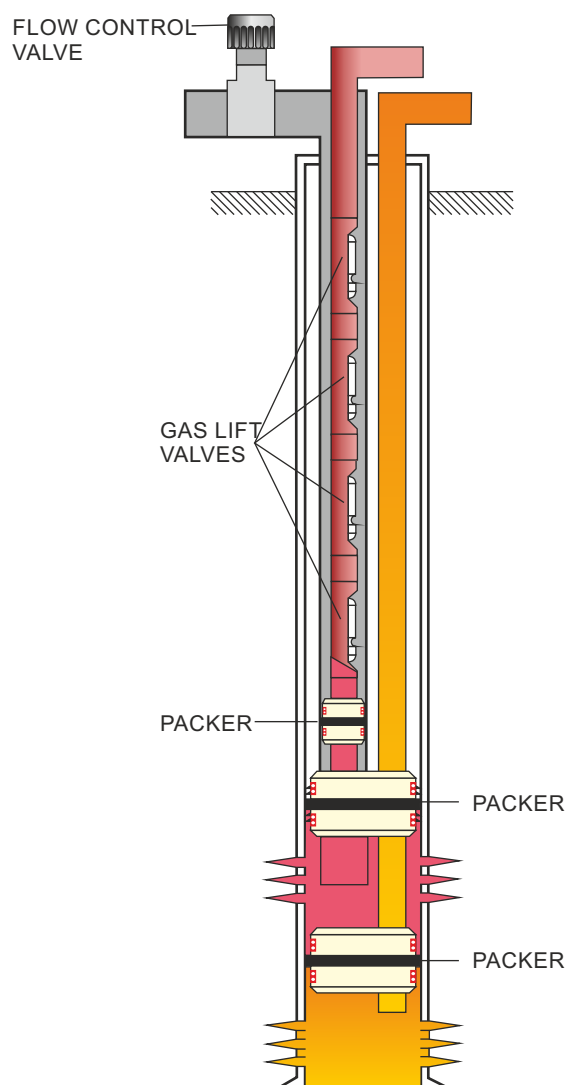
If properly planned, a chamber lift system permits a larger volume of fluid to be produced by intermittent lifts from wells with a high productivity index and low-to medium bottom hole pressure.

Schematic 4 - In certain cases, Chemical injection is desirable to be coupled with Gas Lift. Side Pocket Mandrels may be run at pre-determined depths for Gas lift valves to be installed. An additional mandrel with a chemical injection valve and injection line may also be run to desired depth on the same tubing string. Tubing / Casing annulus can be used for gas injection and the injection line for chemical injection.

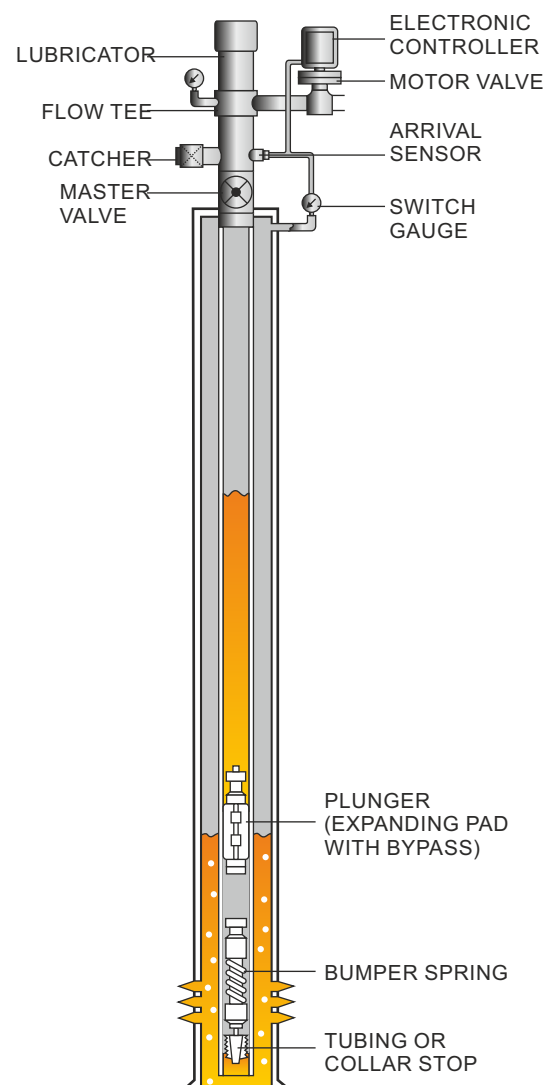
GAS LIFT COMPLETION SYSTEMS

Schematic 5 - Macaroni tubing installation works well in either intermittent or continuous Gas Lift System. Essentially the installation is the same as a single zone installation, except the size of the macaroni string is the limiting factor due to ultra-slim hole conditions. It is an ideal method of artificial lift for slim hole completions.

Schematic 6 - This fig. shows a simple installation without packer application for unloading fluids in a gas well. Plunger lift systems can effectively produce high GOR wells, water producing gas wells, or very low bottom hole pressure oil wells (used with gas lift). Depending upon individual well requirements surface/subsurface equipment varies. Installation may or may not require a packer and/or additional gas.

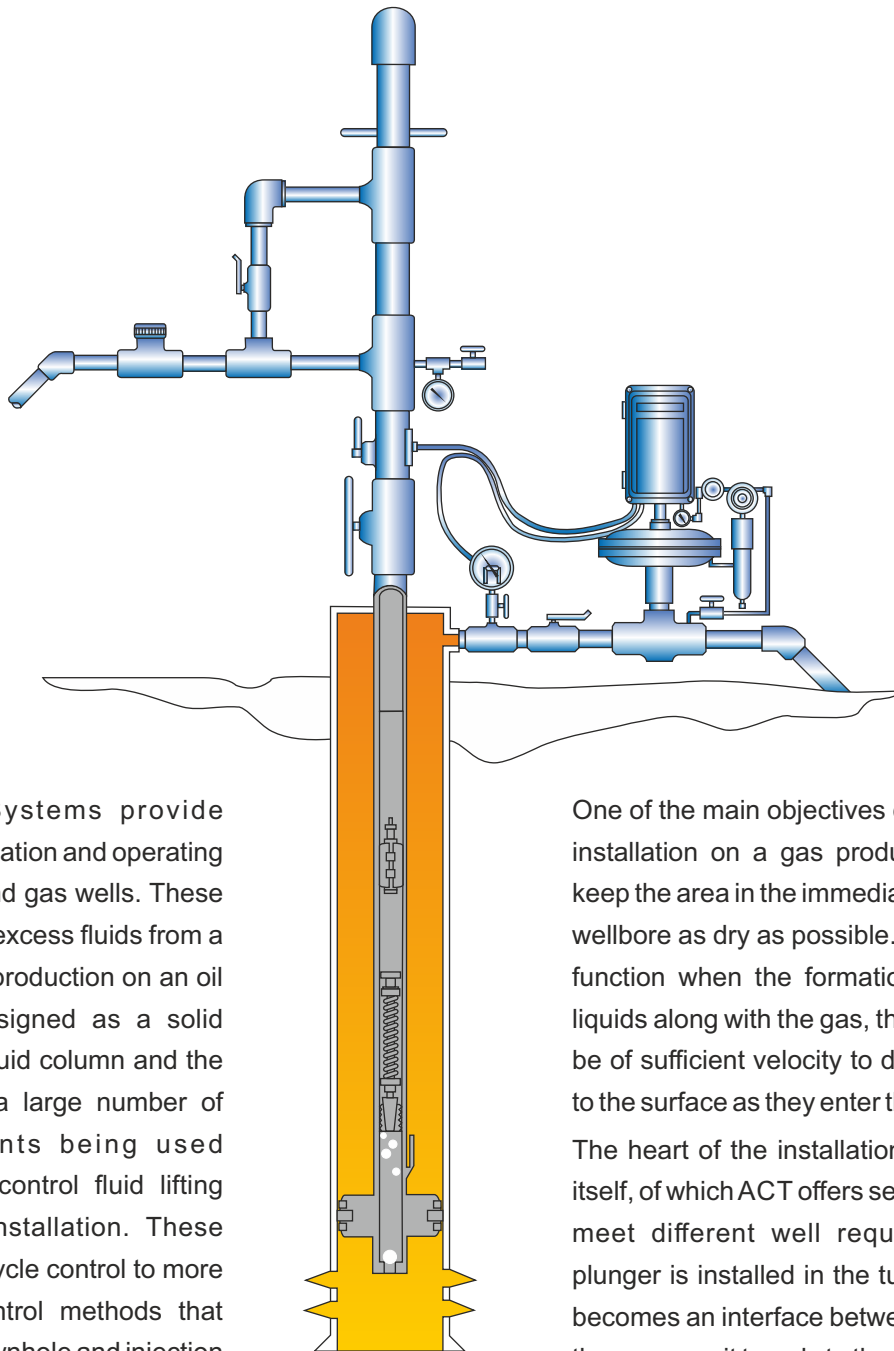


Schematic 5
Macaroni Installation



Schematic 6
Single Zone Plunger
Lift Installation

PLUNGER LIFT SYSTEMS



ACT Plunger Lift Systems provide operators with low installation and operating cost for producing oil and gas wells. These are designed to unload excess fluids from a gas well or to increase production on an oil well. Plungers are designed as a solid interface between the fluid column and the lifting gas. There are a large number of surface arrangements being used successfully today to control fluid lifting performance of the installation. These range from basic time cycle control to more complex electronic control methods that respond to changing downhole and injection gas supply conditions, reducing the need for frequent inspection to maintain optimum installation operation.

Plunger Lift is ideal for: (1) improving the efficiency of intermittent gas lift (2) removing liquid from gas wells (3) producing high GOR wells/solution gas drive reservoirs and (4) preventing paraffin and/or scale buildup.

One of the main objectives of a Plunger Lift installation on a gas producing well is to keep the area in the immediate vicinity of the wellbore as dry as possible. To perform this function when the formation is producing liquids along with the gas, the gas flow must be of sufficient velocity to deliver all liquids to the surface as they enter the wellbore.

The heart of the installation is the plunger itself, of which ACT offers several designs to meet different well requirements. The plunger is installed in the tubing string and becomes an interface between the fluid and the gases as it travels to the surface to expel accumulated fluid. The plunger movement is the result of a cyclic operation that creates a differential across the plunger. This is normally accomplished by opening and closing a motor valve with a time cycle controller such as the auto controller.

PILOT - OPERATED GAS LIFT VALVES

DESCRIPTION

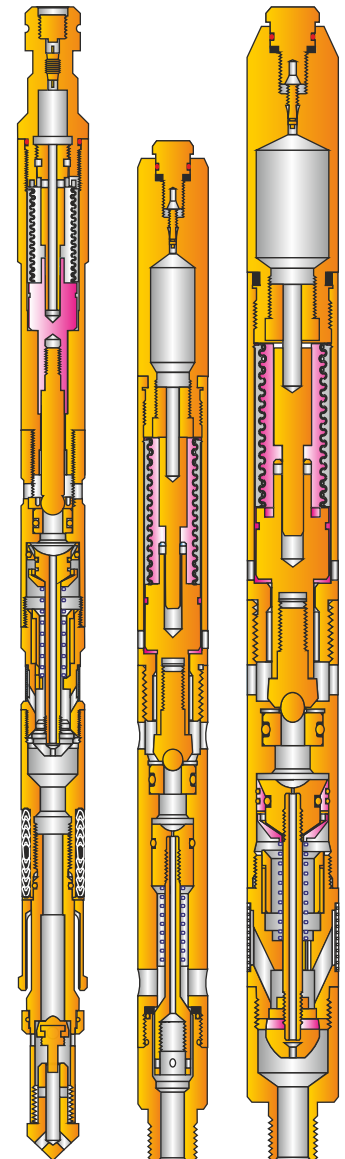
ACT'S Conventional Pilot Valve (1" & 1-1/2" OD) and Retrivable Pilot Valve (1" OD) consist of a pilot section and a power section. This valve utilizes a pilot section to activate a power section. A sealed chamber, including a multiply monel bellow, contain a nitrogen pressure charge over a dampening fluid which provides the closing force necessary to maintain the pilot section in a normally closed position and an inconel spring provides the force necessary to maintain the power section normally in a closed position.

OPERATION

Injection gas first enters the pilot section of the valve and acts on the effective bellows area. When injection gas pressure exceeds the closing force (due to pre-charged nitrogen gas pressure in the bellows), the bellow compresses, lifting the pilot valve stem off the seat to open the pilot section and thus allows gas to be injected on top of the power piston. The differential between injection gas pressure and production fluid pressure, working on the annulus area between the power piston and port areas overcomes the spring closing force of the power section piston. This differential pressure opens the power section, allows injection gas to flow through the valve, past the reverse flow check valve into the production fluid through the production conduit. When pilot section closes due to injection gas pressure drop, the injection gas pressure on top of the power piston bleeds down to production fluid pressure and the spring closes the power section.

APPLICATION

Pilot operated valves are used primarily for intermittent gas lift where large, instantaneous injection gas volumes between opening and closing injection gas pressure are desired. The pilot valve can also be used where intermittent lift is required but injection gas must be controlled by a choke to prevent surface gas system pressure fluctuations.



PPK-1

PBP

PCP

ENGINEERING DATA FOR RETRIEVABLE PILOT OPERATED GAS LIFT VALVE.

Type	Assly Number.	Nominal O.D. (Inch)	Latch	Running Tool		Pulling Tool		Mandrel Series.
				Type	Assly No.	Type	Assly No.	
PPK-1	140-20 -XX-XXX -01	1	Integral Bottom	GA-2	—	MP	11361	TMP, KBM, KBMG, KBG.

ENGINEERING DATA FOR CONVENTIONAL PILOT OPERATED GAS LIFT VALVE.

Type	Assly Number.	Nominal O.D. (Inch)	Connecting Thread
PBP	140-20 XX-XXX -00	1	1/2"- 14 NPT
PCP	140-10 XX-XXX -00	1-1/2	1/2"- 14 NPT

INJECTION PRESSURE OPERATED GAS LIFT VALVE

DESCRIPTION

ACT N Series Valves utilize a nitrogen charged dome and bellow configuration designed for either continuous or intermittent flow applications. These 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 both wireline-retrievable and conventional installations.

BENEFITS

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, makes this valve series appropriate for a wide range of operating conditions.

Reversible seat is also available in several different materials.

OPERATING PRINCIPLE

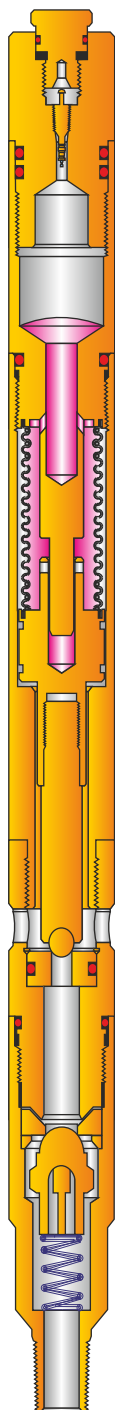
The dome nitrogen charge applied to the external area of the bellows provides the downward force, holding the valve on its seat. This dome pressure is preset at the reference temperature and corrected to operating temperature. The opening forces on the valve are the casing pressure acting on the internal area of the bellows (less the area of the seat) and the tubing pressure acting on the seat area. When the combined casing and tubing pressures are sufficient, the valve opens. Once the valve is open, it remains open until the casing pressure is reduced to the predetermined closing pressure. The spread (the difference between opening and closing casing pressure) is controlled by the tubing sensitivity of the valve. The larger the seat port area, the more tubing sensitive the valve is.

ACT HIGH PRESSURE GAS LIFT VALVE (1-1/2" OD Type N90H & N90RH)

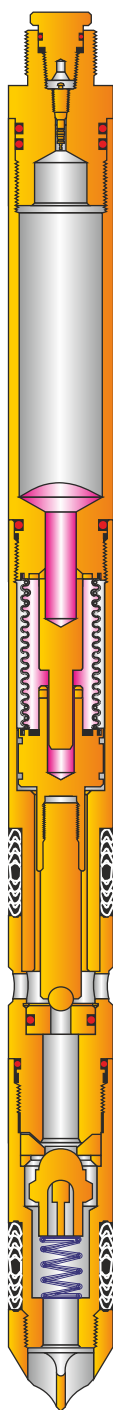
ACT High Pressure Gas Lift Valve incorporates the concept of piston cylinder in the true sense, which was not present in old Gas Lift Valves available in the market. Bellow is protected in this new design against deformation and remains not only straight but its coil is also not over stressed against high pressure. Due to this the bellow's life gets increased and valve functions in a predetermined manner.

ENGINEERING DATA FOR INJECTION PRESSURE OPERATED VALVES										
TYPE	ASSY. NO.	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				
N-90	122-10XX-XXX-XO	1-1/2	—	—	1/8	1/2	1/2" NPT	—	—	SERIES 15
N-90H	122-11XX-340-00	1-1/2	—	—	1/8	1/2	1/2" NPT	—	—	SERIES 15
N-90R	122-10XX-XXX-X1	1-1/2	1-9/16	1-1/2	1/8	1/2	TG, RK, RM, T-2	RTG, TER	PTG, TRP	TP, MM, MMA, MMG
N-90R(H)	122-11XX-320-01	1-1/2	1-9/16	1-1/2	1/8	1/2	TG, RK, RM, T-2	RTG, TER	PTG, TRP	TP, MM, MMA, MMG
NM-90	122-20XX-XXX-XO	1	—	—	1/8	3/8	1/2" NPT	—	—	SERIES 12
NM-90R	122-20XX-XXX-X1	1	1-1/32	1-1/32	1/8	3/8	BK-2, M	MR	MP	TMP, KBM, KBMG, KGB
PBK-1	122-90XX-XXX-X1	1	1-1/32	1-1/32	1/8	3/8	Integral Bottom	GA-2	MP	TMP, KBM, KBMG, KGB

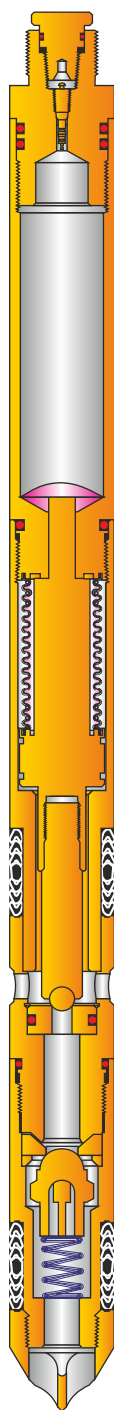
INJECTION PRESSURE OPERATED GAS LIFT VALVE



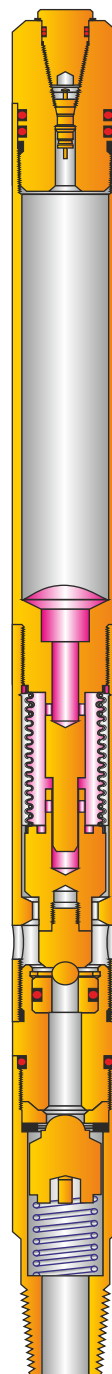
N-90



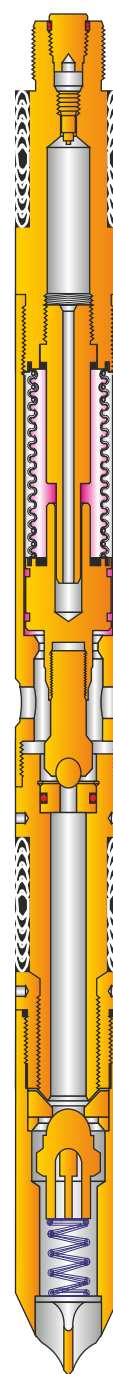
N-90R



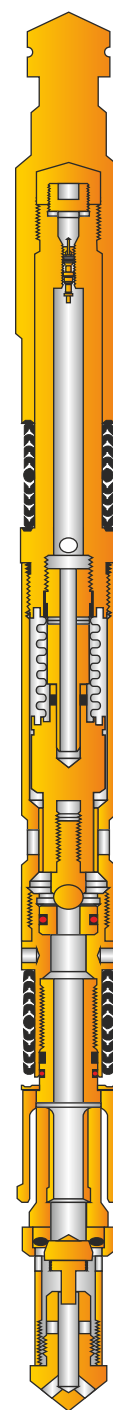
N-90R(H)



NM-90



NM-90R



PBK-1

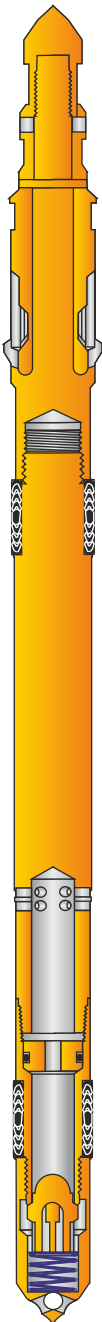
ORIFICE VALVES

ACT'S "O" Series valves are designed for circulating operations and provide means for communication between the tubing and the tubing / casing annulus.

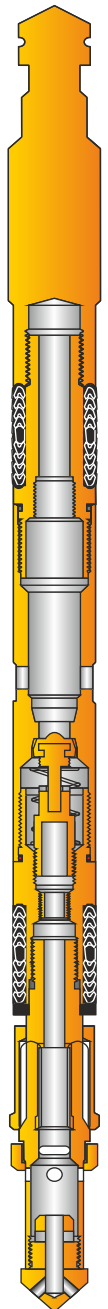
The ACT (Model PKO) retrievable single point injection gas lift orifice valves are used for continuous tubing flow gas lift installations. It is used to control the flow of gas between the casing annulus and the tubing at valve depth. The valve has a check dart controlled by a spring which does not allow the back flow of gas or well fluids. If the injection gas pressure in casing & tubing annulus at valve depth falls below the fluid tubing pressure, the fluid from tubing will try to flow back through the valve. Reverse flow through the valve is prevented by a check dart in the valve body. The check dart is closed by pressure from the tubing and will not allow passage of fluid until casing pressure is greater or equal than tubing pressure. This valve is available from 1/8" to 3/8" port sizes in 1/16" increments.

BENEFITS OF DESIGN PRINCIPLE

- CV valves for each orifice size are determined with ISA procedures to provide accurate sizing for proper injection rates
- Efficiency of back 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



**"O" Series
Orifice Valve**



**"PKO" Series
Orifice Valve**

ENGINEERING DATA FOR ORIFICE VALVES

Type	Assy. No.	Nominal OD in.	Packing OD in.		Port Size in.		Latch Or End Conn.	Running Tool Type	Pulling Tool Type	Mandrel Type
			Upper	Lower	Min.	Max.				
OM 14R	150-40	1	1.1/32	1.1/32	1/8	7/16	BK-2, M	MR	MP	TMP
OM 20R	150-27	1	1.1/32	1.1/32	1/8	7/16	BK-2, M	MR	MP	TMP
O20R	150-12	1.1/2	1.9/16	1.1/2	1/8	5.1/64	TG, RK, RM T-2	RTG, TER	PTG, TRP	TP
OSM-14R	150-05	1	1.1/32	1.1/32	1/8	7/16	BKP	MR	MP	TMP
OS 14R	150-08	1.1/2	1.9/16	1.1/2	1/8	5.1/64	TFA, PKP	RTG, TER	PTG, TRP	TP
PKO	130-30 XX-XXX- 01	1	1.1/32	1.1/32	1/8	7/16	Integral Bottom	MR-01	MP	TMP, KBM, KBMG, KBG.

WIRELINE RETRIEVABLE SUPER FLOW ORIFICE VALVE

ACT'S 1" & 1-1/2" OD wireline retrievable injection gas lift super flow orifice valves are used for continuous flow application. These are designed for circulating operations and provide a means of flow from casing to annulus through orifice and then into the tubing.

OPERATION

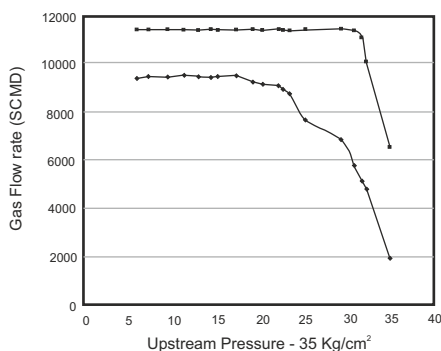
Super flow orifice valve utilizes an orifice venturi as well as a back check valve for continuous flow operations. Injection fluid enters through the entry ports and then flows through orifice venturi. Injection pressure moves the back check valve off the seat & thus allowing fluids to enter into the tubing. Reverse flow pushes the check valve on the seat to prevent flow into the casing.

FLOW CHARACTERISTICS OF SUPER FLOW ORIFICE VALVE

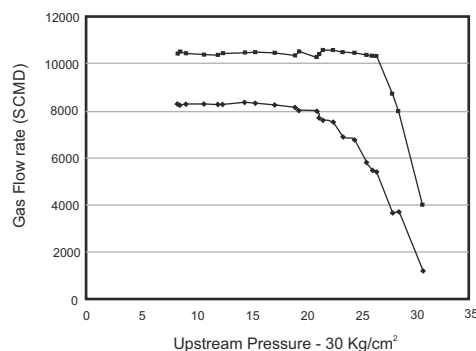
ACT has successfully developed after conducting extensive in-house research the Super Flow Orifice Valve which is one step ahead of Conventional Orifice Valves available in the market. Its performance is dynamically tested by Institute of Oil & Gas Production Technology, ONGC, Panvel, Mumbai, India.

Flow Performance Curve of NOM - 14R Orifice Valve (Port - 12/64) against different Upstream Pressures i.e. 30 kg/cm² and 35 kg/cm² are depicted below and comparison with Conventional Square Edge Orifice Valve are also shown below.

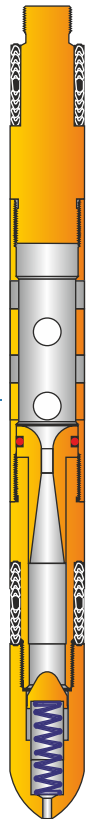
Flow Performance (NOM14-R, Port12/64")



Flow Performance (NOM14-R, Port12/64")



**Retrievable
Super Flow
Orifice Valve**



ANALYSIS OF RESULTS

1) The Critical Flow rate was achieved at approx 0.878-0.879 pressure ratio of Down Stream Pressure to Upstream Pressure i.e. at a pressure differential of 12% compared to almost 50% in case of a Standard Orifice in a Conventional Orifice Valve.

2) The Actual Critical Flow rates obtained through the testing were approximately 20% higher than the calculated theoretical flow rates.

ENGINEERING DATA FOR RETRIEVABLE SUPER FLOW ORIFICE VALVE										
Type	Assy. Number	Nominal O.D. in.	Packing O.D. in.		Port Size in.		Latch or End Conn.	Running Tool Type	Pulling Tool Type	Mandrel Type
			Upper	Lower	Min.	Max.				
NOM 14R	N150-04	1	1.1/32	1.1/32	1/8	5/16	BK-2,M	MR	MP	TMP
NO 20R	N150-12	1.1/2	1.9/16	1.1/2	1/8	5.1/64	TG,RK,RM	RTG, TER	PTG, TRP	TP

PDK-1 WIRELINE RETRIEVABLE DUMMY VALVE

ACT'S Wireline Retrieable Dummy Valves (PDK-1) have 2 sets of packing which fit in the seal bore of side pocket mandrel and isolate the casing ports between tubing and casing annulus. In other words, the valves are used to prevent communication between the tubing and the casing.



PDK-1
Retrievable
Dummy Valve

ENGINEERING DATA FOR WIRELINE RETRIEVABLE (PDK-1) DUMMY VALVES								
Type	Assy. Number	Nominal O.D. in.	Packing O.D. in.		Latch or End Conn.	Running Tool Type	Pulling Tool Type	Mandrel Type
			Upper	Lower				
PDK - 1	170-09	1	1-1/32	1-1/32	Integral Bottom	GA - 2	MP	TMP

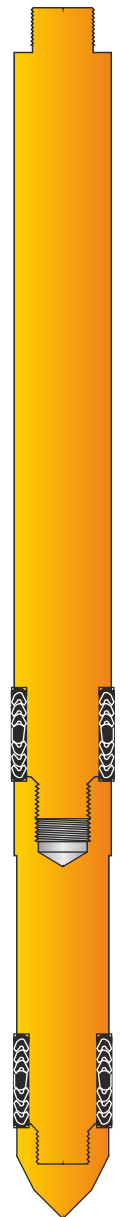
DUMMY AND EQUALIZING VALVES

D Series Valves are installed in side pocket mandrels by wireline to block the mandrel's injection gas ports. Dummies can be run prior to or after completion for testing tubing, packers and other equipment. In new installations, dummies can be retained in the mandrels until gas lift valves are required to maintain production. Then, dummies are pulled and gas lift valves installed by wireline. Also during the life of the well, gas lift valves installed above the fluid level can be replaced with dummies to block off injection gas. These are available in 1 and 1 ½ inch sizes.

STANDARD SERIES MODELS

D-14R: 1 ½ inch wireline-retrievable dummy valve for TG or T Mandrels with TG, RK, RM and T2 Latches.

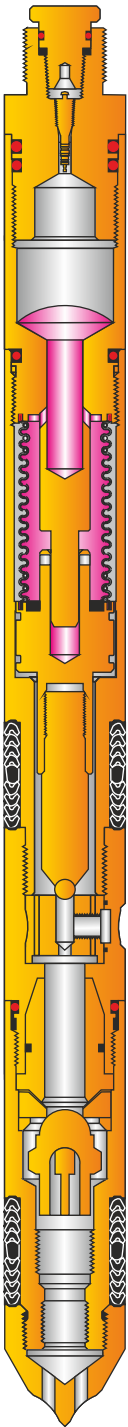
DM-14R: 1 inch wireline-retrievable dummy valve for TM Mandrels with BK-2 and M Latches.



D-14R
1 ½ Inch
Dummy
Valve

ENGINEERING DATA FOR D & ED SERIES DUMMY VALVES								
Type	Assy. No.	Nominal OD in.	Packing OD in.		Latch Or End Conn.	Running Tool Type	Pulling Tool Type	Mandrel Type
			Upper	Lower				
D-14R	170-03	1.1/2	1.9/16	1.1/2	TG, RK, RM T2	RTG, TER	PTG, TRP	TP
DM-14R	170-01	1	1.1/32	1.1/32	BK-2, M	MR	MP	TMP

RETRIEVABLE PRODUCTION - PRESSURE OPERATED GAS LIFT VALVES

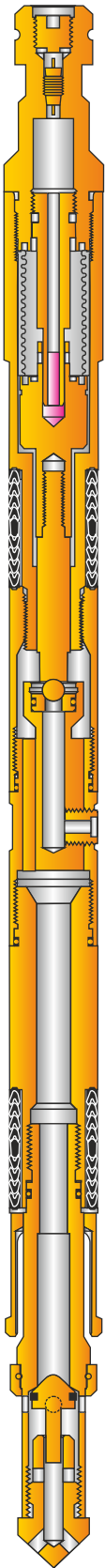


PR-5
Gas Lift
Valve

ACT wireline retrievable production pressure operated GLV' s are used for continuous flow gas lift production. A nitrogen charged multiply monel bellows provides the force necessary to maintain valve in a normally closed position. This valve contains the integral reverse flow check valve.

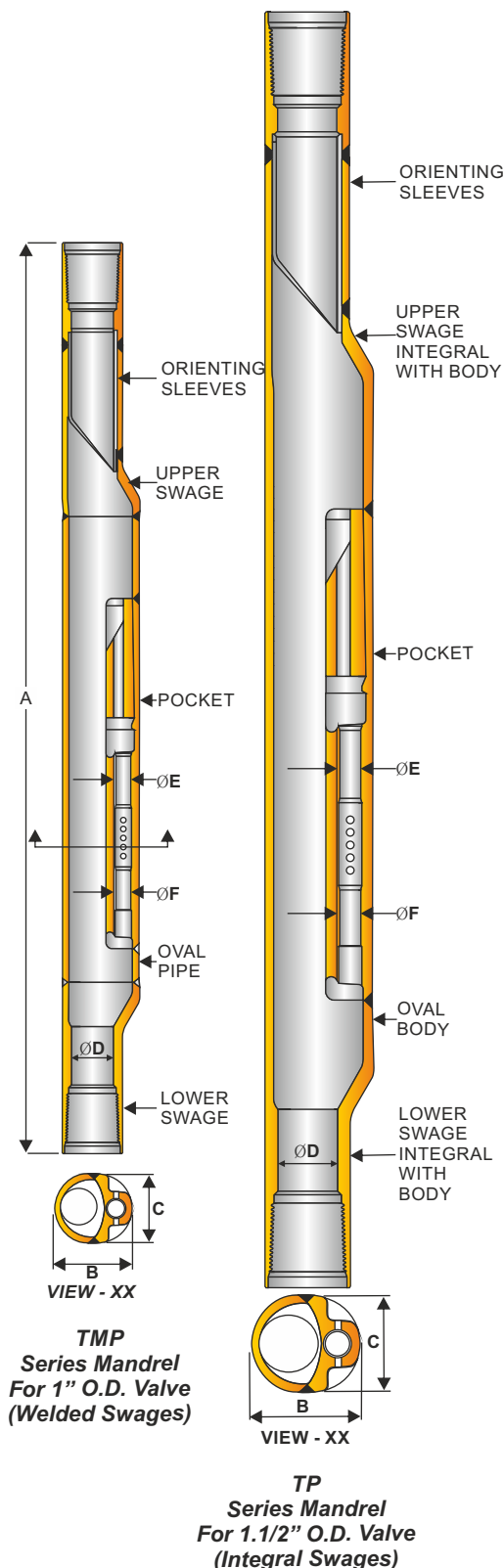
Port sizes available are 3/16", 1/4" & 5/16"

ENGINEERING DATA FOR RETRIEVABLE PRODUCTION-PRESSURE VALVE								
Type	Assly Number.	Nominal O.D. in.	Latch	Running Tool		Pulling Tool		Mandrel Series.
				Type	Assly No.	Type	Assly No.	
PR-5	160-40 XX-XXX -01	1.1/2	R, RA, RK.	RTG, TER	16927 11730	PTG, TRP	17048 11390	MM, MMA, MMG.
PBK-2	160-40 XX-XXX -01	1	Integral Bottom	MR-01	10336-01	MP	11361	TMP, KBM, KBMG, KBG.



PBK-2
Gas Lift
Valve

SIDE POCKET MANDREL



TMP and TP Series Side Pocket Mandrel:

ACT'S TMP and TP Series Side Pocket Mandrels consist of forged pocket with integral tool discriminator, oval pipe, swages and orienting sleeves. Its orienting sleeve allows precise and proper alignment during the insertion of positioning devices / tools into the side pocket. Forged tool discriminator guides the proper diameter side pocket devices / tools into the mandrel pocket and deflects larger tools into the tubing bore to prevent damage to the positioning devices / tools.

In Gas Lift applications, high pressure gas injected into the casing annulus flows through the ports of the pocket in the gas lift valve and into the tubing. The standard pocket is ported between the seal bores to communicate with the casing annulus and the gas is circulated down the annulus through the gas lift valve into the tubing. These mandrels are used for tubing flow applications.

Both TMP and TP series feature multiple porting variations for specific applications i.e. annulus flow, chamber lift, fluid injection water flood installations.

TMP and TPC Series Side Pocket Mandrel:

These mandrels are used in annulus flow applications in which a snorkel functions as an exhaust port. Snorkel located at the bottom of the side pocket, extends downward into casing annulus. The holes in the mandrel side pocket directly communicate with the tubing. High pressure gas injected into the tubing flows through the port between the packing bores into the pocket of the mandrel, then through the ports into the gas lift valve, downward through the snorkel and then finally into the casing.

TMPE and TPE Series Side Pocket Mandrel:

These mandrels are mainly used in chamber lift applications. They have no ports in the side pocket for communication with the tubing. Instead of that, an exhaust port is located at the bottom of the side pocket. This port is extended downward into the casing annulus through a 1/2" pipe connected to the top packer of a chamber lift installation. In gas lift application, high pressure gas injected into the casing annulus flows through the ports in the side of the mandrel, the through the port in the gas lift valve and finally downward to the exhaust port.

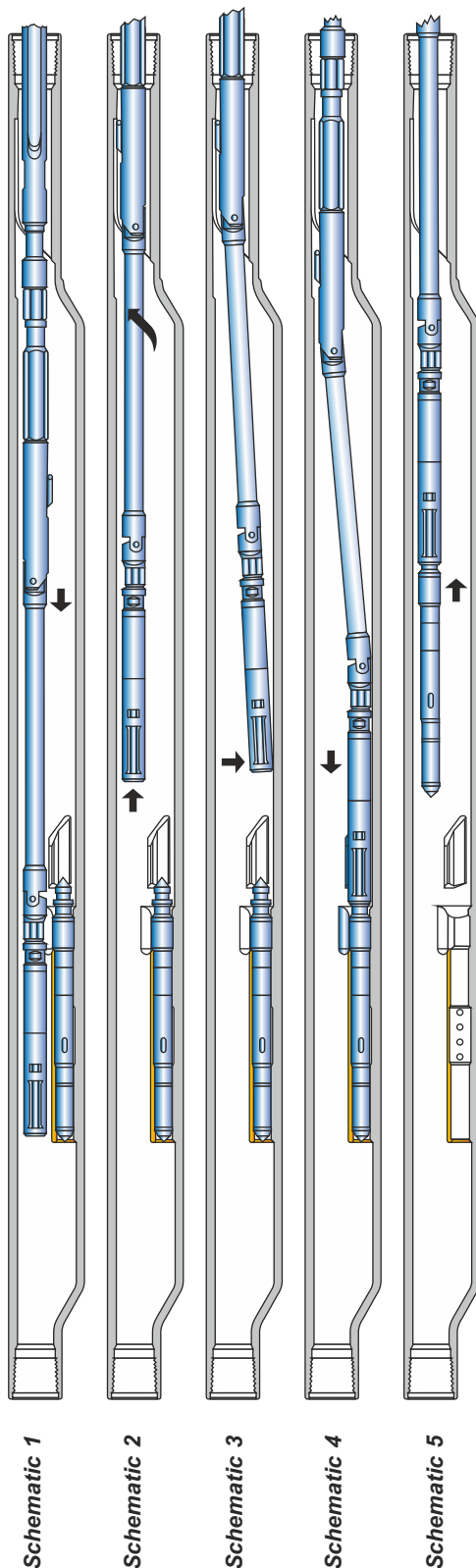
TMPS and TPS Series Side Pocket Mandrel:

These mandrels are used in single string, multi zone fluid injection water flood installations. The casing exhaust port located at the bottom of the side pocket is used to protect the casing from high velocity turbulence related with water flooding. In water flood operations, water injected into the tubing flows into the mandrel side pocket, through the water flood flow regulator valve and downward through the exhaust port. A non retrievable check valve can be attached directly to the exhaust port. A non retrievable check valve can be attached directly to the exhaust port to prevent back flow from the annulus when the water flood regulator valve is removed.

SIDE POCKET MANDREL

ENGINEERING DATA FOR SIDE POCKET MANDRELS											
Tubing Size in.	Valve OD in.	Mandrel		Dimensions (Inch)							Assembly Part No. a.) With Welded Swages b.) With Integral Swages
		Type	Shape	Length* A	Major OD B	Minor OD C	I.D ØD	Drift Dia	ØE E	ØF F	
2.3/8	1.0	TMP	OVAL	83	4.25	2.92	2.00	1.901	1.027	1.027	a.) 238X1-D1901-SXXXX-XXW-X b.) 238X2-D1901-SXXXX-XXI-X
2.3/8	1.5	TP	OVAL	102	4.75	4.00	2.00	1.901	1.6	1.5	a.) 238X2-D1901-SXXXX-XXW-X b.) 238X1-D1901-SXXXX-XXI-X
2.7/8	1.0	TMP	OVAL	85	4.75	4.00	2.441	2.347	1.027	1.027	a.) 288X1-D2347-SXXXX-XXW-X b.) 288X1-D2347-SXXXX-XXI-X
2.7/8	1.5	TP	OVAL	103	5.50	4.59	2.441	2.347	1.6	1.5	a.) 288X2-D2347-SXXXX-XXW-X b.) 288X2-D2347-SXXXX-XXI-X
3.1/2	1.0	TMP	OVAL	85	5.31	4.12	2.992	2.867	1.027	1.027	a.) 350X1-D2867-SXXXX-XXW-X b.) 350X1-D2867-SXXXX-XXI-X
3.1/2	1.5	TP	OVAL	104	6.06	5.00	2.992	2.867	1.6	1.5	a.) 350X2-D2867-SXXXX-XXW-X b.) 350X2-D2867-SXXXX-XXI-X
4.0	1.0	TMP	OVAL	86	5.85	5.00	3.476	3.351	1.027	1.027	a.) 400X1-D3351-SXXXX-XXW-X b.) 400X1-D3351-SXXXX-XXI-X
4.0	1.5	TP	OVAL	107	6.63	5.55	3.476	3.351	1.6	1.5	a.) 400X2-D3351-SXXXX-XXW-X b.) 400X2-D3351-SXXXX-XXI-X
4.1/2	1.0	TMP	OVAL	86	6.45	5.50	3.958	3.833	1.027	1.027	a.) 450X1-D3833-SXXXX-XXW-X b.) 450X1-D3833-SXXXX-XXI-X
4.1/2	1.5	TP	OVAL	107	7.03	5.625	3.958	3.833	1.6	1.5	a.) 450X2-D3833-SXXXX-XXW-X b.) 450X2-D3833-SXXXX-XXI-X
5.0	1.5	TP	OVAL	116	7.94	6.80	4.408	4.283	1.6	1.5	a.) 500X2-D4283-SXXXX-XXW-X b.) 500X2-D4283-SXXXX-XXI-X
5.1/2	1.0	TMP	OVAL	87	7.94	6.80	4.778	4.653	1.6	1.5	a.) 550X1-D4653-SXXXX-XXW-X b.) 550X1-D4653-SXXXX-XXI-X
5.1/2	1.5	TP	OVAL	108	7.44	6.05	4.00	3.833	1.6	1.5	a.) 550X2-D3833-SXXXX-XXW-X b.) 550X2-D3833-SXXXX-XXI-X
5.1/2	1.5	TP	OVAL	108	7.94	6.80	4.778	4.653	1.6	1.5	a.) 550X2-D4653-SXXXX-XXW-X b.) 550X2-D4653-SXXXX-XXI-X
7.0	1.0	TMP	ROUND	90	8.25	8.25	6.184 **	6.059	1.027	1.027	a.) 700X1-D6059-SXXXX-XXW-X b.) 700X1-D6059-SXXXX-XXI-X
7.0	1.5	TP	OVAL	117	9.38	8.38	6.184 **	6.059	1.6	1.5	a.) 700X2-D6059-SXXXX-XXW-X b.) 700X2-D6059-SXXXX-XXI-X

HD TP POSITIONING TOOLS



Wireline Positioning Tools are designed to provide selective location of the mandrel when there are two or more mandrels installed in a well. The tool orients in the proper position, and offsets the valve (or pulling tool) into position over the pocket for setting or retrieving.

BENEFITS OF DESIGN PRINCIPLE

- Spring-loaded trigger key is guided to a stop in the mandrel's positioning sleeve, which provides positive weight increase to the operator.
- There is only one brass shear pin in the assembly which is replaced easily after each wire line run. The pin can be replaced with the tool projecting from the lubricator.
- Large bypass flow area, both internal and external, reduces swabbing effect during setting or pulling operations.
- The tool is locked in the in-line position, which prevents it from accidentally kicking over and dragging on the tubing walls during insertion and withdrawal. The tool is locked in the offset position for positive pocket locating when inserting or retrieving the valve.

OPERATING PRINCIPLE

Schematic 1 - The tool is run below the mandrel. Since the tool is locked in a rigid position, it is designed not to kick over accidentally.

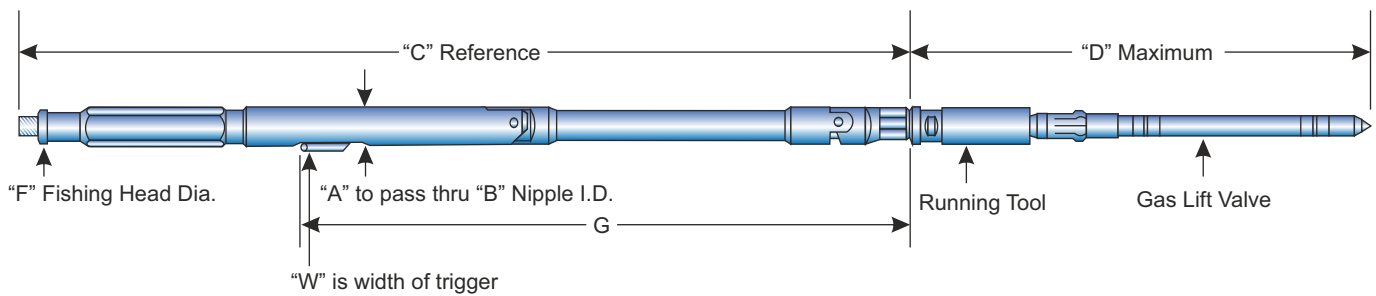
Schematic 2 - The tool is raised until its key engages the sleeve in the mandrel. Continued upward movement rotates the tool until its key enters a slot. When the key reaches the top of the slot, the operator is notified by a weight increase displayed on the weight indicator. The tool is now properly oriented.

Schematic 3 - The pivot arm is designed to swing out and lock in position due to additional pull. This action locates the valve or pulling tool above the pocket or latch on the gas lift valve.

Schematic 4 - The mandrel is designed to guide the valve or pulling tool to accurately land the valve or engage the latch on the valve.

Schematic 5 - A straight, upward pull shears a pin when the key reaches the top of the slot. This action allows the trigger to guide freely out of the slot and through the tubing. When the pivot arm reaches the small upper section of the mandrel, it is designed to snap back and lock into its vertical running position, reducing drag on the tool and valve as it is removed.

HD-TP/HD-TMP POSITIONING TOOLS



The HD Tools have identical running & pulling procedure as standard tools.

ENGINEERING DATA FOR HD-TP/HD-TMP POSITIONING TOOLS								
TOOLS	A	B	G	W	C	F	D	PART NUMBER
2.3/8 HD TMP	1.855	1.875	25.73	.55	38.00	1.375	20.50	375-0100-110-00
2.7/8 HD TMP	2.280	2.313	25.88	.55	38.00	1.375	20.50	375-1000-110-00
3.1/2 HD TMP	2.730	2.750	25.57	.55	39.25	1.375	20.50	375-2000-110-00
4.0 HD TMP	3.292	3.313	25.79	.55	40.44	1.750	20.50	375-3000-110-00
4.1/2 HD TMP	3.725	3.750	26.82	.55	40.44	1.750	20.50	375-4000-110-00
2.3/8 HD TP	1.855	1.875	24.22	.55	48.10	1.375	33.00	375-0100-210-00
2.7/8 HD TP	2.280	2.313	24.47	.55	48.57	1.375	33.00	375-1000-210-00
3.1/2 HD TP	2.730	2.750	24.27	.55	46.00	1.375	33.00	375-2000-210-00
4.0 HD TP	3.290	3.310	24.22	.55	38.96	1.750	33.00	375-3000-210-00
4.1/2 HD TP	3.725	3.750	25.80	.55	41.44	2.312	33.00	375-4000-210-00
5.0 HD TP	4.250	4.280	25.80	.55	47.00	2.312	33.00	375-5000-210-00
5.1/2 HD TP	4.480	4.500	27.70	.55	49.00	2.312	33.00	375-6000-210-00

MODEL OM & OK SERIES TYPE KICKOVER TOOLS

ACT manufactures Model OM & OK Series Type Kickover Tools. The OM series type kickover tool is used to install a 1-1/2" OD valve into the side pocket mandrel and retrieve it from side pocket mandrel. The OK series type kickover tool is used to install 1" OD valve into the side pocket mandrel and retrieve it from side pocket mandrel.

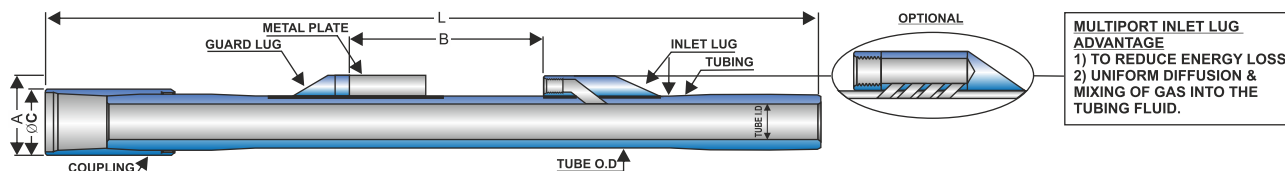
A running or pulling tool must be installed to these kickover tools in order to perform the operations.

These are available in all sizes.

CONVENTIONAL MANDRELS

CONVENTIONAL MANDREL - SERIES 12 (Model : PCM-12)

Series 12 Mandrels are designed to receive any valve with a ½" NPT inlet lug connection, a maximum OD of 1-1/16", and a maximum length of 17.1/8". Many tubing sizes, thread types and grades are available. Only the more popular grades and sizes are listed below.

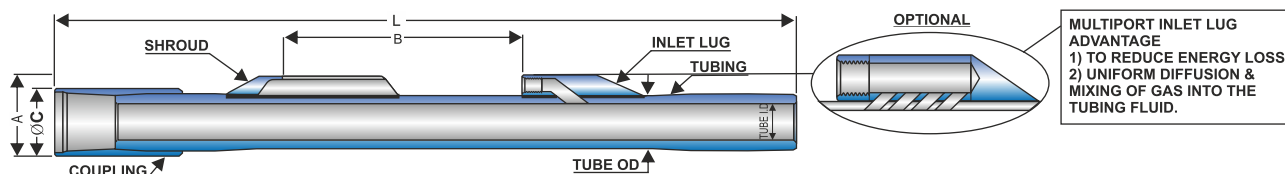


SPECIFICATION OF STANDARD CONVENTIONAL MANDREL SERIES 12 (Model : PCM-12)

Nominal Tube Size in.	Type Thread	OD of Tube in.	Weight (PPF)	ID of Tube in.	A Max. in.	B in.	L (ft.)	Approx Weight (Lbs-f)	Coupling OD ϕ C in.	Assembly Part no. Material Grade API-N-80
2.3/8	EUE, 8RD	2.3/8	4.7	1.995	3.920	17-1/8	4	24.5	3.063	4C0-0601-100-00
2.3/8	EUE, 8RD	2.3/8	4.43	1.995	3.825	17-1/8	4	23.5	2.91	4C0-0601-100-01
2.3/8	NUE, 10RD	2.3/8	4.6	1.995	3.840	17-1/8	4	23.8	2.875	4C0-0602-100-00
2.7/8	EUE, 8RD	2.7/8	6.5	2.441	4.490	17-1/8	4	34.0	3.668	4C0-0701-100-00
2.7/8	EUE, 8RD	2.7/8	6.0	2.441	4.330	17-1/8	4	32.0	3.460	4C0-0701-100-01
2.7/8	NUE, 10RD	2.7/8	6.4	2.441	4.400	17-1/8	4	33.9	3.5	4C0-0702-100-00
3.1/2	EUE, 8RD	3.1/2	9.3	2.992	5.125	17-1/8	4	42.0	4.5	4C0-0801-100-00

CONVENTIONAL MANDREL - SERIES 12 (MODEL : PCM-12S)

Series 12 Mandrels are designed to receive any valve with a ½" NPT inlet lug connection, a maximum OD of 1-1/16", and a maximum length of 17.1/8". Many tubing sizes, thread types and grades are available. Only the more popular grades and sizes are listed below. These Mandrels use shroud instead of Guard Lug & Metal Plate.



SPECIFICATION OF STANDARD CONVENTIONAL MANDREL SERIES 12 (MODEL : PCM-12S)

Nominal Tube Size in.	Type Thread	OD of Tube in.	Weight (PPF)	ID of Tube in.	A Max. in.	B in.	L (ft.)	Approx Weight (Lbs-f)	Coupling OD ϕ C in.	Assembly Part no. Material Grade API-N-80
2.3/8	EUE, 8RD	2.3/8	5.45	1.995	3.920	17-1/8	4	27.5	3.063	4C0-1601-100-00
2.3/8	EUE, 8RD	2.3/8	5.18	1.995	3.825	17-1/8	4	26.5	2.91	4C0-1601-100-01
2.3/8	NUE, 10RD	2.3/8	5.35	1.995	3.840	17-1/8	4	26.8	2.875	4C0-1602-100-00
2.7/8	EUE, 8RD	2.7/8	7.25	2.441	4.490	17-1/8	4	37.0	3.668	4C0-1701-100-00
2.7/8	EUE, 8RD	2.7/8	6.75	2.441	4.330	17-1/8	4	35.0	3.460	4C0-1701-100-01
2.7/8	NUE, 10RD	2.7/8	7.15	2.441	4.400	17-1/8	4	36.9	3.5	4C0-1702-100-00
3.1/2	EUE, 8RD	3.1/2	10.05	2.992	5.125	17-1/8	4	45.0	4.5	4C0-1801-100-00

CONVENTIONAL MANDRELS

CONVENTIONAL MANDRELS - SERIES 15 (MODEL: PCM-15)

Series 15 Conventional Mandrels are designed to receive any valve with a 1/2" NPT inlet lug connection, a maximum OD of 1-1/2" and a maximum length of 29". Many tubing sizes, thread types and grades are available. Only the more popular grades and sizes are listed below.

SPECIFICATIONS OF STANDARD CONVENTIONAL MANDREL SERIES 15 (MODEL : PCM-15)										
Nominal Tube Size (inch)	Type Thread	OD of Tube (inch)	Weight (PPF)	ID of Tube (inch)	A Max. (inch)	B (inch)	L (ft.)	Approx Weight (Lbs.-f)	Coupling OD ϕ C (inch)	Assembly Part no. Material Grade API-N-80
2.3/8	EUE, 8RD	2.3/8	4.7	1.995	4.577	29	4	27	3.063	4C2-3601-100-00
2.3/8	EUE, 8RD	2.3/8	4.43	1.995	4.375	29	4	26	2.91	4C2-3601-100-01
2.3/8	NUE, 10RD	2.3/8	4.60	1.995	4.484	29	4	26.4	2.875	4C2-3602-100-00
2.7/8	EUE, 8RD	2.7/8	6.50	2.441	5.130	29	4	36.5	3.668	4C2-3701-100-00
2.7/8	NUE, 10RD	2.7/8	6.40	2.441	5.046	29	4	36.3	3.50	4C2-3702-100-00
3.1/2	EUE, 8RD	3.1/2	9.30	2.992	5.859	29	4	44.5	4.50	4C2-3801-100-00
3.1/2	NUE, 10RD	3.1/2	8.98	2.992	5.734	29	4	43.6	4.25	4C2-3802-100-00

NOTE:

Using 2-3/8" EUE,8RD tubing inside 4-1/2" casing. The mandrel contains a shroud to provide valve protection.

HIGH STRENGTH CONVENTIONAL MANDRELS

ACT has been manufacturing high strength conventional mandrels. Their round exterior design makes them easy to rotate in difficult situations and perform easier washover operations. These mandrels exceed N-80 tubing strength.

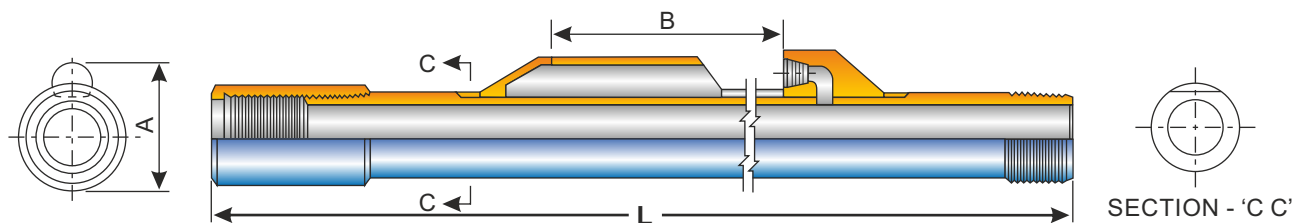
ACT'S high strength mandrels have the benefit of:

1. Withstanding pull load of over 60 metric tones.
2. Testing hydraulically to 8000 psi.

Series 502: These are designed to receive any valve with 1/2" NPT & a maximum OD of 1-1/2".

All above series are available in many tubing sizes, thread sizes & grades, only the more popular sizes are listed below.

HIGH STRENGTH CONVENTIONAL MANDREL - SERIES 502 (MODEL: PHSCM-502)

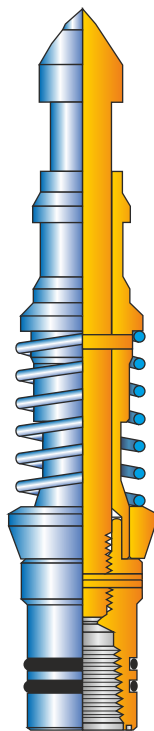


Nominal Tube Size in.	Type Thread	OD of Tube in.	ID of Tube in.	A Max. in.	B in.	L (ft.)	Approx Weight (Lbs.-f)	Coupling OD in.	Assembly Part no Material Grade API - N80
2.3/8	EUE, 8RD	2.594	1.995	4.577	29	4	35.5	3.063	502-3601-100-00
2.3/8	EUE, 8RD	2.594	1.995	4.375	29	4	34.5	2.91	502-3601-100-03
2.7/8	EUE, 8RD	3.094	2.441	5.130	29	4	43.0	3.668	502-3701-100-00

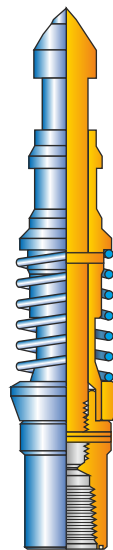
LATCHES

1 ½ inch RK and 1 inch BK-2 Latches are designed for installation in G-type pocket profile side pocket mandrels. They utilize a locking ring which is held in position by spring force. 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.

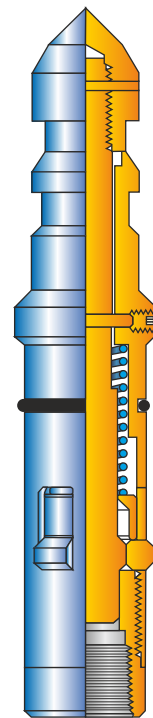
1 ½ inch RM Latches are designed for installation in A-type pocket profile mandrel. They have a set of spring-loaded locking dogs designed to move up into a recessed area on the latch core when run into the latch profile of the mandrel. The valve is lowered into the pocket until the No-Go shoulder is reached. The spring force moves the locking ring downward, forcing the dogs to move over and onto the large O.D. of the inner mandrel, thus locking the valve in place. To release the latch, a pin is sheared by upward force which allows the inner mandrel to move up and out of the way. The locking dogs are then free to return to the recess area as the latch and valve are retrieved.



**1-1/2 Inch
RK Latch**



**1 Inch
BK - 2 Latch**



**1-1/2 Inch
RM Latch**

ENGINEERING DATA FOR LATCHES							
Type	Part No.	Pulling Neck OD in.	Running Neck OD in.	Max OD in.	Side Pocket Accessory OD in.	Running Tool	Pulling Type
TG	230-1600-000-01	1.183	0.939	1.795	1.500	RK-1 / RTG	1-5/8 JDS / PTG
RK	230-1200-000-01	1.185	0.936	1.787	1.500	RK-1 / RTG	1-5/8 JDS / PTG
T2	230-0700-000-01	1.375	1.000	1.75	1.500	TER	2" JDC / SM / TRP
RM	230-3000-000-01	1.375	1.000	1.75	1.500	TER	2" JDC / SM / TRP
M	230-0200-000-01	0.875	0.750	1.335	1	MR	1-1/4 JDC / MP
BK-2	230-2400-000-01	0.875	0.750	1.358	1	MR / JK	1-1/4 JDC / MP
WFM	230-0400-000-01	0.875	0.750	1.335	1	MR/JK	1-1/4 JDC / MP

STANDING VALVES AND SEATING NIPPLES

ACT Standing valves and companion seating nipples are normally used in intermitting or chamber lift wells at the bottom of the tubing or chamber. The seating nipple is an integral part of the tubing string. The standing valve seats on the No-Go of the seating nipple and seals in the honed bore of the nipple to prevent the fluid from flowing back into well bore when high pressure gas is injected under a slug of fluid. ACT manufactures E-3 type of standing valve, in all popular sizes. A complete line of seating nipples are available to accept the standing valves.

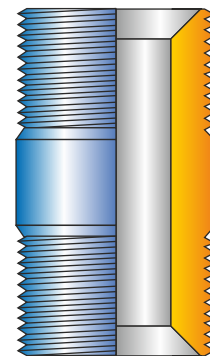
DESCRIPTION & SPECIAL FEATURES OF STANDING VALVE

The E-3 Equalizing Standing Valve has a standard fishing neck and may be equalized and retrieved by wireline. The equalizing feature allows the operator to open ports below the valve and seat without lifting the hydrostatic head. This feature in many cases eliminates the need for an operator to pull a wet string of tubing. This valve may also be used as test plug for testing tubing to check pressure leaks above the valve. Carbide balls are available for severe service in sandy wells.

SEATING NIPPLES

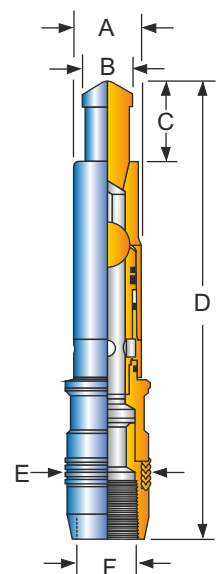
The E Seating Nipples are precision nipples that contain a honed bore to accept and seal the standing valve. They are offered in a wide range of sizes compatible with the tubing string and a large selection of bores for different size standing valves.

ENGINEERING DATA FOR TYPE E SEATING NIPPLES						
Size in.	Size in.	Threads	Length (W/O Coupling)	Wt/Lbs.	Bore in.	Part no.
2.3/8	2	10 RD NUE	7.1/2	5.1/2	1.781	6972
2.3/8	2	8 RD EUE	7.1/2	5.1/2	1.781	6823
2.3/8	2	10 RD NUE	7.1/2	5.1/4	1.813	4901
2.3/8	2	8 RD EUE	7.1/2	5.1/4	1.813	4902
2.3/8	2	10 RD NUE	7.1/2	7.1/2	1.375	4941
2.3/8	2	8 RD EUE	7.1/2	7.1/2	1.375	4942
2.3/8	2	10 RD NUE	7.1/2	10.1/2	1.188	5174
2.3/8	2	8 RD EUE	7.1/2	10.1/2	1.188	5175
2.7/8	2.1/2	10 RD NUE	7.1/2	7	2.250	4903
2.7/8	2.1/2	8 RD EUE	7.1/2	7	2.250	4904
2.7/8	2.1/2	8 RD EUE	7.1/2	9.1/2	1.813	4906
2.7/8	2.1/2	10 RD NUE	7.1/2	9.1/2	1.813	4907
2.7/8	2.1/2	8 RD EUE	7.1/2	10.1/2	1.188	7858
2.7/8	2.1/2	8RD EUE	7.1/2	10	1.375	8773
2.7/8	2.1/2	8 RD EUE	7.1/2	9.1/2	1.438	8774
3.1/2	3	8 RD EUE	7.1/2	17.1/2	1.781	8824
3.1/2	3	8 RD EUE	7.1/2	14.1/2	2.250	8825
3.1/2	3	8 RD EUE	7.1/2	10.1/2	2.750	8826
3.1/2	3	8 RD EUE	7.1/2	19.1/2	1.375	8769



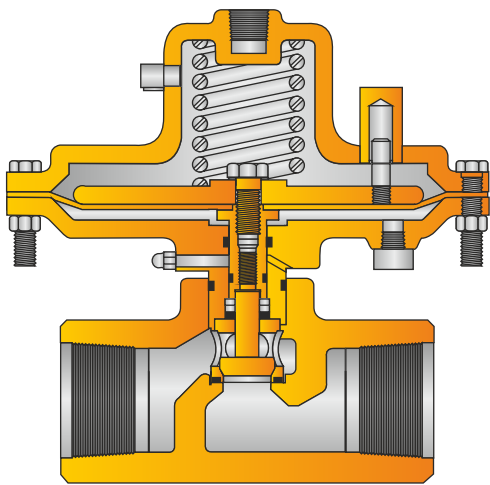
Seating Nipples
Type E

ENGINEERING DATA FOR TYPE E-3 STANDING VALVES										
Size (Nom.) in.	WT/ Lbs.	Dimensions (inches)						Bottom Thread in.	Part no.	Remark
		Max. O.D.	Fishing Head Dia.	Fishing Neck Length	Overall Length	Packing Size in.	Min. Port Size			
		A	B	C	D	E	F			
2	5.3/4	1.860	1.3/8	3.3/16	14.3/4	1.25/32	1.00	1 NPT	300-3240-000-01	SS BALL
2	5.3/4	1.860	1.3/8	3.3/16	14.3/4	1.13/16	1.00	1 NPT	300-3250-000-01	SS BALL
2.1/2	7.1/4	2.298	1.3/8	3.3/16	14.3/4	2.1/4	1.00	1 NPT	300-4260-000-01	SS BALL
2.1/2	7.1/4	2.298	1.3/8	3.3/16	14.3/4	2.1/4	1.00	1 NPT	300-4261-000-01	TC BALL

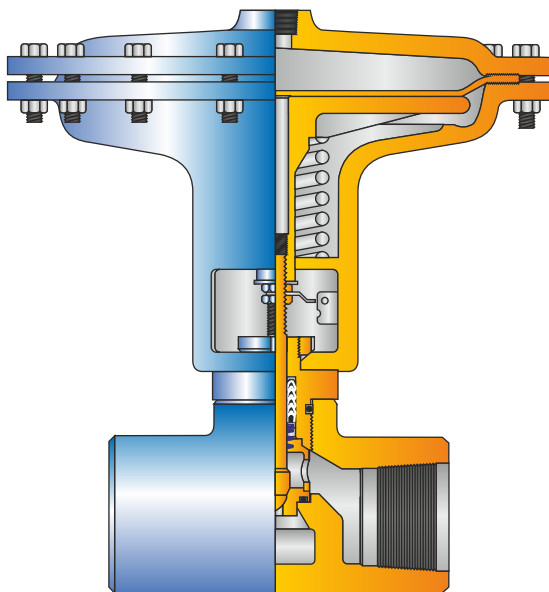


Type E-3
Standing Valve

SURFACE FLOW CONTROLS MOTOR VALVES



Motor Valve - MV 40



Motor Valve - MV 60

ACT offers two basic motor valve designs, the MV-40 and the MV-60. Both models are pneumatically operated valves for oil and gas separators, pressure vessels, storage tanks, various wellhead and process control applications.

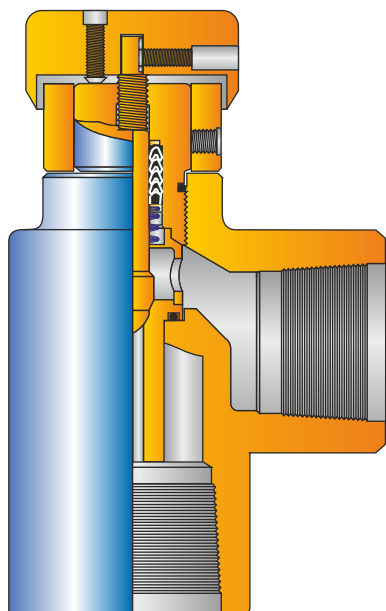
The MV-40 is an economical motor valve designed for applications where the maximum working pressure does not exceed 3,000 pounds per square inch. The MV-60 is specified for service up to 4,000 pounds per square inch working pressure. Both models are available in 1 in. or 2 in. body size, angle or through configuration with welded, flanged or threaded ends.

The standard trim material is stainless steel but optional hard chrome or tungsten carbide may be ordered for more severe service. Four size of trim are available - 1/4 in., 1/2 in., 3/4 in., or 1 in. Both MV-40 and MV-60 may be operated as either pressure open or pressure close. The valve, seat and packing may be replaced without removing the body from the line or without disassembling the diaphragm section.

ENGINEERING DATA FOR MV SERIES MOTOR VALVES

Type	Assembly Number	Maximum Working Pressure	Connecting Thread (in - TPI)		Trim Size in.	Area (Sq. in.)	Diaphragm Maximum Working Pressure (psi)
			Inlet	Outlet			
MV-60	610	4,000	2-11.1/2 LP	2-11.1/2 LP	1/4-1	72	60
MV-40	650	3,000	2-11.1/2 LP	2-11.1/2 LP	1/4-1	54	60

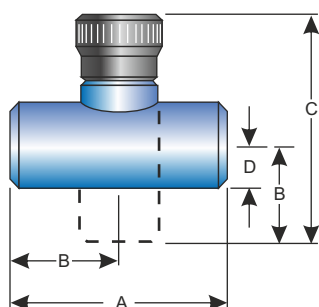
SURFACE FLOW CONTROLS WFC SERIES WATERFLOOD CONTROL VALVES



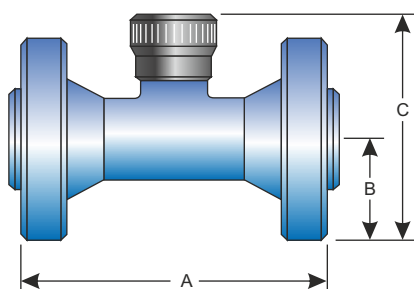
ACT WFC Waterflood Control Valves are designed specifically for waterflood applications. These are available in either 1 or 2 inch angle body configurations with threaded, butt weld or flanged connections. This design contains a long throat seat to control the turbulence and erosion associated with liquid service. Standard features of this valve include the adjustable hand wheel calibrated in sixty-fourths of an inch and Teflon packing for positive seal and minimum maintenance. An optional feature is the availability of a secondary positive choke bean for high-pressure differentials. This feature is designed for a 60% and 40% pressure drop across the primary and secondary controls respectively.

Stainless steel, hard chrome or tungsten carbide trims are available in 1/8, 1/4, 1/2 and 3/4 inch sizes. The long throat seat, stainless steel handle and indicator ring are standard.

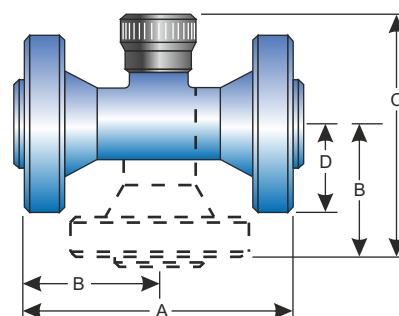
WFC Waterflood Valve



FCV - WFC



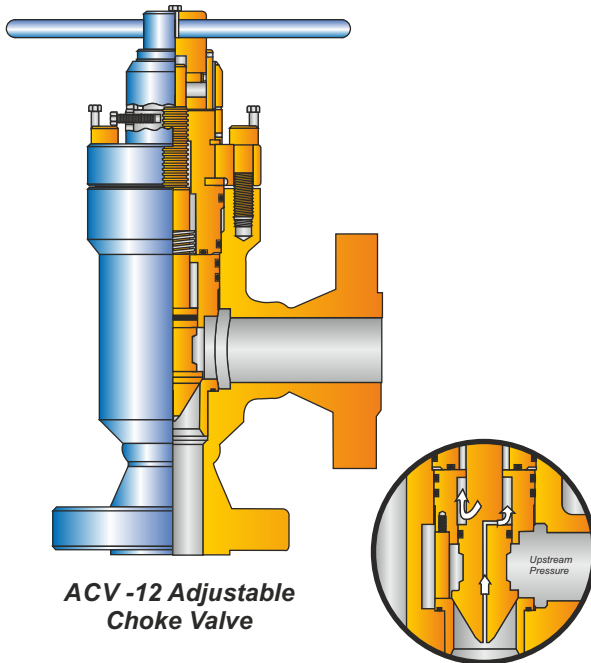
FCV - Flanged



FCV - 2X

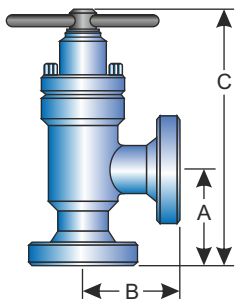
DIMENSIONAL DATA FOR FCV, WFC AND FCV-2X															
End Connection	Dimensions (Inches)												Approximate Weight in Lbs.		
	A			B			C			D					
Type / Size	1	2	2X	1	2	2X	1	2	2X	1	2	2X	1	2	2X
Screwed	6.30	7.80		2.95	3.90		7.90	8.81		1.06	1.72		10	20	
Butt Weld	5.00	6.75		2.50	3.37		7.45	8.65		1.06	1.72		10	20	
Socket Weld	5.12	6.75		2.56	3.37		7.51	8.65		1.06	1.72		10	20	
Series 150 RF		9.00			4.50			9.78			3.00			32	
Series 300 RF		10.00		5.00				10.28			3.25			32	
Series 600 RF	8.50	11.50	11.50	4.25	5.75	5.75	9.20	11.03	9.65	2.44	3.25	3.25	18	40	34
Series 600 RJ	8.50	11.62	11.62	4.25	5.81	5.81	9.20	11.09	9.71	2.44	3.25	3.25	18	40	34
Series 1500 RF	10.00	14.50		5.00	7.25		9.95	12.53		2.94	4.25		30	70	
Series 1500 RJ	10.00	14.62		5.00	7.31		9.95	12.59		2.94	4.25		30	70	
Series 900 RF	10.00	14.50	14.50	5.00	7.25	7.25	9.95	12.53	11.25	2.94	4.25	4.25	30	70	
Series 900 RJ	10.00	14.62	14.62	5.00	7.31	7.31	9.95	12.59	11.21	2.94	4.25	4.25	30	70	90
API 3000		14.62			7.31			12.59			4.25			70	
API 5000		14.62			7.31			12.59			4.25			70	

SURFACE FLOW CONTROLS ACV SERIES ADJUSTABLE CHOKE VALVES



ACV-12 Adjustable Choke Valve

Semi-Balanced Stem Feature



ACV-12 Dimensional Data
Available with 1 1/2, 2 or 3-inch trim.

ACT ACV Adjustable Choke Valves have wide applications in oil, gas and water service. Three body sizes are available to allow proper matching of the choke to the expected flow rate. Maximum working pressure of up to 5000 psi are standard on ACV-8 and ACV-12 Valves, with higher pressures available on ACV-5 Valves. Easily read indicator ring calibrated in sixty-fourths of an inch is designed to provide accurate flow control. Bubble tight seal of stem is provided by a spring-loaded Teflon packing design.

Valve and seat replacement without removal of the valve body from the line is accomplished by simply removing the bonnet, which requires no special tools. The seat can then be removed by hand.

All valves in this series may be equipped with either an electric or pneumatic actuator to meet installation requirements.

ACV-12 Series Valves feature a 3-inch maximum port and a semi balanced stem design to reduce the torque required to open the valve when high pressure differentials exist.

ACV-8 Series Valves features a 2-inch maximum port and offer an optional positive choke seat for high differential pressures.

ACV-5 Series Valves features an 1 1/4-inch maximum port size.

All valves in this series are available with API or ANSI flanges or with socket weld, butt weld or threaded connections.

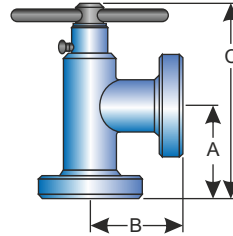
Body Style	Maximum Working Pressure (psi)	4-Inch			6-Inch		
		in. A&B	in. C	Approx. Wt. in Lbs.	Inches A&B	Inches C	Approx. Wt. in Lbs.
Series 600 RF	1480	8.50	26.69	299	11.00	29.19	371
Series 600 RJ	1480	8.56	26.75	299	11.06	29.25	371
Series 900 RF	2220	9.00	27.19	327	12.00	30.19	445
Series 900 RJ	2220	9.06	27.25	327	12.06	30.25	445
Series 1500 RF	3701	10.75	28.94	363	13.87	32.06	553
Series 1500 RJ	3705	10.81	29.00	363	14.00	32.19	553
Series 2500 RF	5000	13.25	31.44	517	18.00	36.19	981
Series 2500 RJ	5000	13.44	31.63	517	16.25	34.44	981
API 2000	2000	8.56	26.75	299	11.06	29.25	371
API 3000	3000	9.06	27.25	327	11.25	29.44	445
API 5000	5000	10.81	29.00	363	12.63	30.82	553

C _v Values Flow Coefficient at Maximum Settings	
Model & Trim Size	C _v Maximum
ACV-5	
3/4 - inch	19.3
1 - inch	28.0
1 1/4 - inch	35.0
ACV-8	
1 - inch	30.8
1 1/2 - inch	61.5
2 - inch	85.8
ACV-12	
2 - inch	124
3 - inch	285

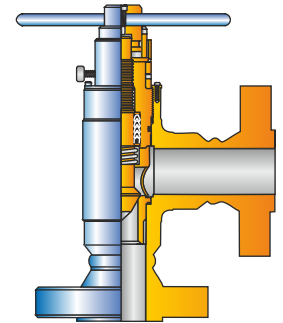
SURFACE FLOW CONTROLS ACV SERIES ADJUSTABLE CHOKE VALVES

ACV-8 DIMENSIONAL DATA

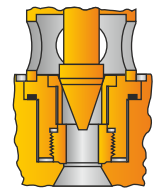
Available with 1, 1 1/2 or 2 - inch trim



Body Style	Maximum Working Pressure (psi)	2 1/2-Inch			3-Inch			4-Inch		
		in. A&B	in. C	Approx. Wt. in Lbs.	in. A&B	in. C	Approx. Wt. in Lbs.	in. A&B	in. C	Approx. Wt. in Lbs.
Threaded	3000	5.00	15.19	60	5.00	15.19	70	5.44	15.63	80
Socket Weld	3600	5.00	15.19	60	5.00	15.19	70	5.44	15.63	80
Butt Weld 160	5000	5.00	15.19	60	5.00	15.19	70	5.44	15.63	80
Series 600 RF	1480	6.5	16.69	88	7.00	17.19	106	8.50	18.69	154
Series 600 RJ	1480	6.56	16.75	88	7.07	17.26	106	8.56	18.75	154
Series 900 RF	2220	8.25	18.44	132	7.50	17.69	128	9.00	19.19	182
Series 900 RJ	2220	8.31	18.50	132	7.57	17.76	128	9.06	19.25	182
Series 1500 RF	3705	8.25	18.44	132	9.25	19.44	166	10.36	20.55	218
Series 1500 RJ	3705	8.31	18.50	132	9.32	19.51	166	10.46	21.65	218
Series 2500 RF	5000	10.00	20.19	164	11.37	21.56	258	13.25	23.44	372
Series 2500 RJ	5000	10.13	20.32	164	11.50	21.69	258	13.40	23.59	372
API 2000	2000	6.56	16.75	88	7.06	17.25	106	8.56	18.75	154
API 3000	3000	8.31	18.50	132	7.57	17.76	128	9.06	19.25	182
API 5000	5000	8.31	18.50	132	9.31	19.50	166	10.81	21.00	218



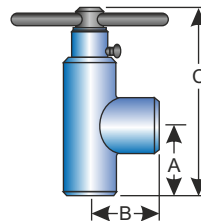
ACV-8 Adjustable Choke Valve



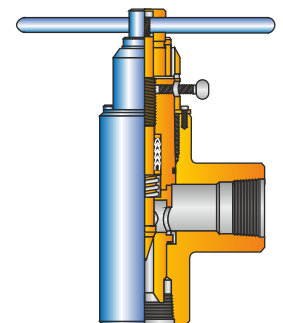
Choke Seat With Optional Positive Bean

ACV-5 DIMENSIONAL DATA

Available with 3/4, 1 or 1 1/4 - inch trim



Body Style	Maximum Working Pressure (psi)			2 -Inch			2-1/2 Inch			3-Inch		
	in.			in.	in.	Approx.	in.	in.	Approx.	in.	in.	Approx.
	2	2 1/2	6	A&B	C	Wt. in Lbs.	A&B	C	Wt. in Lbs.	A&B	C	Wt in Lbs
Threaded	5000		3000	5.00	13.44	35	5.00	13.44	40	5.00	13.44	45
Socket Weld		3600		5.00	13.44	35	5.00	13.44	40	5.00	13.44	45
Butt Weld 160		6000		4.50	12.94	35	5.00	13.44	40	5.00	13.44	45
Butt Weld XXH		10000		4.50	12.94	35	5.00	13.44	40	5.00	13.44	45
Series 600 RF		1480		6.38	14.82	55	6.50	14.94	60	7.00	15.44	65
Series 600 RJ		1480		6.44	14.88	55	6.56	15.00	60	7.07	15.51	65
Series 900 RF		2220		7.25	15.68	83	8.25	16.69	88	7.50	15.74	93
Series 900 RJ		2220		7.31	15.75	83	8.31	16.75	88	7.57	16.01	93
Series 1500 RF		3705		7.25	15.69	83	8.25	16.69	88	9.25	17.69	93
Series 1500 RJ		3705		7.31	15.75	83	8.31	16.75	88	9.32	17.76	93
Series 2500 RF		5000		8.75	17.19	119	10.00	18.44	144	11.31	19.75	233
Series 2500 RJ		5000		8.94	17.38	119	10.13	18.57	144	11.50	19.94	233
API 2000		2000		6.44	14.88	55	6.56	15.00	60	7.06	15.50	65
API 3000		3000		7.31	15.75	83	8.31	16.75	88	7.57	16.01	93
API 5000		5000		7.31	15.75	83	8.31	16.75	88	9.31	17.75	93
API 10000		10000		6.92	15.36	119	7.83	16.27	144	8.86	17.30	233



ACV-5 Adjustable Choke Valve

CALIBRATION & TESTING OF GAS LIFT VALVES

ACT GLV test bench is manufactured from heavy duty stainless steel sheet metal, pressure gauges with all stainless steel fittings and valves. The test bench is designed to meet most of the test / calibration requirements of API spec. 11 V1 for GLV's. This is a combination of typical sleeve tester, typical encapsulated stem-seat leakage tester and also built-in pressure chamber (ager). Our GLV test bench provides testing facility for following parameters:

1. **Charging bellows to specific nitrogen pressure**
2. **Valve opening pressure**
3. **Valve closing pressure**
4. **Valve leakage test**
5. **Hydrostatic valve test**

DESIGN PARAMETERS

ACT Test Bench is designed in accordance with following design parameters as per API spec. 11 V1.

Design parameters:

1. **Valve Size:** 1" and 1 1/2" conventional & retrievable nitrogen charged gas lift valves.
2. **System Accuracy:** ± 100 psi for aging chamber ± 5 psi for calibration and charging of gas lift valves.
3. **Maximum Bellow Charge:** 2000 psi
4. **Maximum Chamber Hydro test:** 5000 psi
5. **Valve/Bellow Stabilizing /Storing Capacity:** 10 nos (max.)

CONSTRUCTIONAL FEATURES OF GLV TEST BENCH

There are four sections of test bench as follows:

1. **Gauge Section**
2. **Chamber Section**
3. **Control Valves Section and**
4. **Inlet Section**

There are three testing devices provided in our GLV test bench as follows:

1. **Hydraulic Pressure Chamber (Ager)**
2. **Encapsulated Stem-seat Leakage Tester**
3. **Sleeve Tester**



APPARATUS

Pressure Chamber (Ager)

This device is a water filled chamber for maximum 5000 psi pressure. The Gas Lift Valves are inserted into the chamber and subjected to a predetermined external pressure for some length of time and number of cycles.

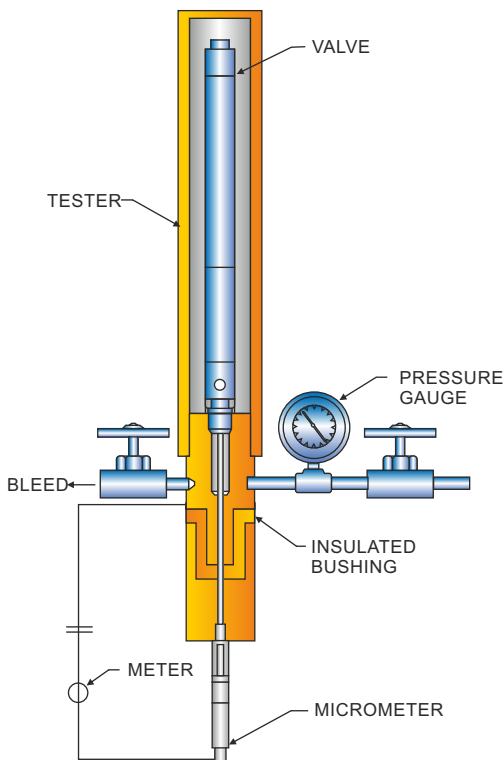
Test Rack

This equipment is used to set the opening or closing pressure of nitrogen charged valves. There are two types in use: Typical sleeve tester (M-010) and typical encapsulated stem and seat leakage tester (M-011), those are arranged in our test bench very conveniently.

Water Bath

This is a water filled container where several gas lift valves are immersed in the water to bring them to a predetermined controlled temperature. Since most gas lift installations design the GLV set pressure at 16°C, the temperature of the water bath is usually controlled at 16°C.

PROBE TESTER



The purpose of the gas lift valve probe tester is to determine the relative "stiffness" of a gas lift valve and to determine the maximum available travel of the stem top. When gas pressure is admitted to the tester, it acts on the full area of the valve bellows to lift the stem off the seat. When this pressure increased, the stem tip lifts further off the seat. By using the valve probe tester, an accurate measure of the stem tip travel, per pressure increase, can be determined and the results tabulated and plotted.

When the pressure is plotted as the ordinate and the stem tip travel as the abscissa, a relatively straight line will be generated for the majority of the stem tip travel. The slope of this line is an indication of the "stiffness" of the valve. The numerical value of the slope is called the bellows assembly load rate (blr) and is measured in psig/inch [kpa/mm]. In this context, the "bellows assembly" includes the bellows and the system which applies a load to hold the valve stem on the seat. The higher the load rate, the "stiffer" the valve and inversely, the lower the load rate, the "softer" the valve.

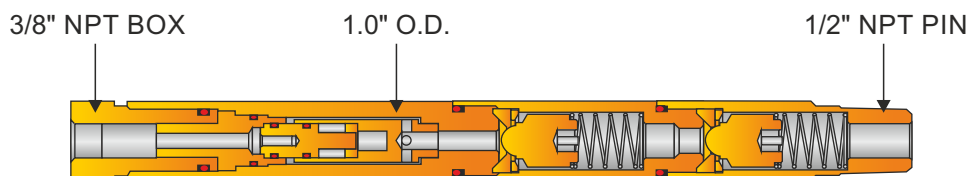
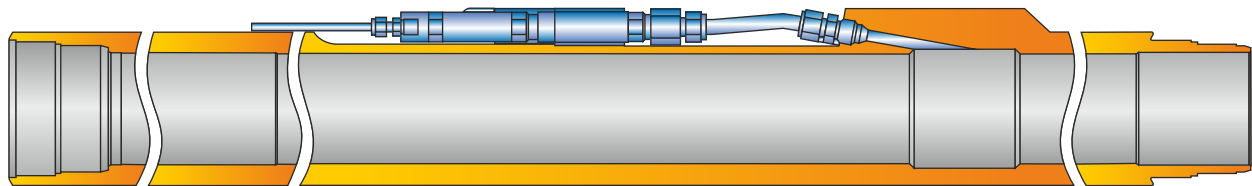
If the above is done with the same valve, except that opening pressure (dome charge or spring setting) is varied, then the effect of dome charge pressure or spring setting on the bellows assembly load rate can be compared for the same type of valve when set for different opening pressures. The bellows assembly load rate is a practical value that can be used to compare different types of valves or when evaluating the same valve under different load conditions and when designing the gas lift installation.

CHEMICAL INJECTION NIPPLE C/W DUAL CHECK & RUPTURE CARTRIDGE (SINGLE / DUAL INJECTION PORT)

ACT Chemical Injection Nipple represents a complete solution to any application requiring downhole chemical injection. At the heart of the chemical injection nipple is the dual check valve and rupture cartridge assembly. This allows the chemical injection nipple to be run in hole in a 'blanked condition' and selectively opened for injection, with the application of the required shear pressure. The optional control line by-pass facility allows encapsulated control lines to pass interrupted through the chemical injection nipple. The chemical injection nipple can be supplied with a variety of profiles to allow for the installation of many standard flow control devices, such as blanking plugs, checks and chokes. These optional profiles also allow installation of the specifically designed separation sleeve, which provides a secondary method of isolating the chemical injection flow path from the tubing.

Features and Benefits:

- Burst, collapse, tensile and torque ratings as good as end connection
- Compact, modular design
- Metal to metal sealing connections throughout
- Optional nipple profiles provide all the flexibility and benefits of flow control equipment
- Removable rupture cartridge allows full pressure and flow testing prior to running
- Rupture cartridge can be supplied with a variety of shear pressures to suit customer requirements
- Optional by-pass facility permits installation and protection of encapsulated control lines



Dual Check Valve C/W Rupture Cartridge Assy.



Rupture Cartridge

$$\text{TEMPERATURE CORRECTION FACTOR } T_f = \sqrt{\frac{520}{T_v + 460}}$$

TEMP. °F	T _f	TEMP. °F	T _f	TEMP. °F	T _f
60	1.000	130	.939	195	.891
65	.995	135	.935	200	.888
70	.990	140	.931	205	.885
75	.986	145	.927	210	.881
80	.981	150	.923	215	.878
85	.977	155	.920	220	.875
90	.972	160	.916	225	.872
100	.964	165	.912	230	.868
105	.959	170	.909	235	.865
110	.955	175	.905	240	.862
115	.951	180	.902	245	.859
120	.947	185	.898	250	.857
125	.943	190	.894		

USEFUL GAS LIFT VALVE EQUATIONS USING API SYMBOLS

$$\frac{A_p}{A_b} = \frac{P_{iod} - P_{vc}}{P_{iod} - P_{pd}}$$

$$P_{iod} = \frac{P_{vc} - (A_p / A_b) P_{bd}}{1 - (A_p / A_b)}$$

$$P_{pef} = \frac{A_p}{A_b - A_p} = \frac{A_p / A_b}{1 - (A_p / A_b)}$$

$$P_{pd} = \frac{P_{vc} - P_{iod} (1 - (A_p / A_b))}{A_p / A_b}$$

$$P_{vo} = \frac{P_{vc}}{1 - (A_p / A_b)}$$

$$P_{vc} = P_{iod} - (A_p / A_b) (P_{iod} - P_{pd})$$

Where: A_b = bellows area, in²

A_p = area of seat or port – ball seat contact, in²

P_{iod} = operating gas injection pressure at valve, psig

P_{pd} = operating production pressure at valve, psig

P_{pef} = production pressure effect factor (formerly Spm or TEF)

P_{vc} = valve closing pressure, psig

P_{vo} = test rack set opening pressure, psig (formerly P_{tro})

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Note: These Terms & Conditions of Sales control the rights and responsibilities of the parties in connection with goods and/or services sold to any customer or purchaser of goods or service hereunder (hereinafter, "Buyer") by American Completion Tools Inc. and its affiliates (individually and/or collectively "Seller"). Please read this document carefully because of its significant legal consequences.

1. ACCEPTANCE: Acceptance by Seller of Buyer's order or proposal is expressly made conditional on assent to these Terms & Conditions of Sales, either by written acknowledgment or by conduct by Buyer that recognizes the existence and controlling nature of these Terms & Conditions of Sales.

2. FORM OF CONTRACT AND NO WAIVER: Seller will not be deemed to have accepted any proposal or sales order through course of dealing, performance, implied consent, or waiver specifically, but without limitation, Seller's (i) supplying products or performing services in response to Buyer's purchase order or proposal, and/or (ii) failing to complain of Buyer's noncompliance with these Terms & Conditions of Sales or the presence of any conflicting terms and condition in any other purchase order or similar document and/or (iii) accepting payment for products or services, shall not be construed as acceptance of any terms and conditions proposed by Buyer. No attempted modification by Buyers of these Terms & Conditions of Sales will be effective against Seller unless expressly in a writing signed by Seller's competent authority with the express authority of Seller to make such agreements.

3. CONFLICTING PROVISION VOID: Seller hereby objects to and rejects any terms & conditions included in Buyer's purchase order or other writing or modification that conflict with these Terms & Conditions of Sales. Any inconsistent terms and conditions contained in Buyer's purchase order, terms & conditions, or any other writing that represents Buyer's offer are not a part of the agreement between Seller and Buyer and shall have no effect.

4. PAYMENT: Payment terms are net cash thirty (30) days from the date of Seller's invoice. Seller at its sole discretion reserves the right to require progress payments or payment in advance. If payment is not made when due the unpaid balance will be subject to a finance charge of 1½% of the unpaid balance per month or at the highest interest rate allowed by law, whichever is less. The amount of finance charges will be added to the balance owed to Seller. If Buyer fails to pay any invoice when due, or if the financial condition or credit of Buyer becomes unsatisfactory to Seller, Seller, at its sole discretion and without affecting any other lawful remedy, may change the terms of payment or suspend work and further deliveries, or both, until Buyer provides security or other assurance of performance as demanded by Seller. In the event Seller institutes legal or collection action against Buyer for non-payment, Buyer shall be liable to Seller for all reasonable costs and attorney's fees incurred by Seller in connection therewith. In the event of a dispute between Seller and Buyer regarding any separate sale(s), purchase(s), project(s), or service(s), Buyer shall not be entitled to withhold payments due to Seller as a setoff for claims based on separate sale(s), purchase(s), project(s), or service(s).

5. LIMITED WARRANTY: Subject to limitations contained below, Seller warrants that services performed by Seller will be free from defects in workmanship under normal care and use until the expiration of the applicable warranty periods hereafter set forth said services are warranted for a period of ninety (90) days from the date of services. If Buyer discovers any warranty defects and notifies Seller thereof in writing and during the applicable warranty period, Seller shall at its sole discretion, promptly correct any errors that are found by the Seller in the services or refund the purchase price of the defective services. All replacements or repairs necessitated by inadequate maintenance, normal wear and usage, unsuitable environmental conditions, accident, misuse, or by improper installation, modification, repair, storage, or handling or any other cause not the fault of Seller, are not covered by this limited warranty, and shall be at Buyer's expense. Seller shall not be obligated to pay any costs or charges incurred by Buyer or any other party except as may be agreed upon in writing and in advance by an authorized representative of Seller. All cost of transportation and time and expenses of Seller's personnel for site travel and diagnosis under this warranty clause will be borne by Buyer. Warranty services rendered during the warranty period shall be warranted for the remainder of the original warranty period. This limited warranty is the sole warranty made by Seller and can be amended only in writing signed by an authorized representative of Seller.

OTHER THAN AS EXPRESSED ABOVE, THERE ARE NO REPRESENTATIONS OR WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED, AT LAW, BY CONTRACT, OR OTHERWISE, AS TO THE MERCHANTABILITY, FITNESS FOR PARTICULAR PURPOSE, OR ANY OTHER MATTER WITH RESPECT TO ANY OF THE GOODS OR SERVICE.

6. LIMITATION OF REMEDY AND LIABILITY: In no event, regardless of the form of the claim or cause of action (including but not limited to claims based in contract, patent or trademark infringement, negligence, strict liability, other tort, or otherwise), shall Seller's liability to Buyer and/or its affiliates exceed the contract price. The parties agree that in no event shall either party's liability to the other and/or their affiliates extend to include incidental, consequential, punitive or exemplary damages. The term "consequential damages" shall include, but not be limited to, lost or deferred production, loss of anticipated profits, loss of use, loss of revenue, and cost of capital.

7. DELIVERY: Seller's obligation is to deliver the goods F.O.B. Seller's warehouse, place of manufacture, or other place from which the goods are actually shipped within the U.S.A., at which point risk of loss shall pass to Buyer. Freight will be prepaid and added to invoice unless otherwise agreed to by Seller in writing. Delivery dates give to Buyer in any manner are approximate. Seller will not be liable for failure to make delivery or delay in making delivery that directly or indirectly results from or is contributed to by any cause beyond Seller's reasonable control, including but not limited to fire, flood or other acts of God, strikes or other labor disagreements, accidents, acts or requirements of government or civil authorities, riot, war, embargo, shortages of labor, material or energy, delay in transportation, failure or delay by subcontractors or suppliers, or necessary changes in production or shipment schedules. In the event of such delay, Seller, at its sole discretion, will have the right to apportion supplies among its customers, including Buyer, in any manner that Seller determines, and any delivery date will be postponed for a period of time equal to the delay. If shipments are held at Seller's premises at request of Buyer, invoices will be rendered for all completed goods as though actually shipped, and Buyer will also pay Seller for all extra expenses incurred.

8. CANCELLATION BY BUYER: Buyer may cancel its order, or any part of it, by sending written notice of cancellation to Seller and by paying Seller a reasonable cancellation fee. The reasonable cancellation fee will be determined by Seller and will reflect, among other factors: the expenses already incurred, other commitments made by Seller, sales and administrative overheads, and profits. Goods may not be returned without Seller's prior written consent. Restocking charges may be assessed at the sole discretion of Seller.

9. PRICES: Unless otherwise specified by Seller, Seller's prices for the goods or services shall remain in effect for thirty (30) days from the date of Seller's quotation or acceptance of the order for the goods, whichever occurs first, provided an unconditional, complete authorization for the immediate procurement and shipment of the goods pursuant to Seller's standard invoicing procedures is received and accepted by the Seller from the Buyer within such time period. After such thirty (30) days period, Seller shall have the right to revise the price of the goods or services up to Seller's price in effect for the goods at the time the order is released by Buyer and Seller prior to shipment. The price for any Resale Goods or Services shall be Seller's price in effect at the time of shipment to Buyer.

10. INSTALLATION: All goods shall be installed by and at the expense of the Buyer.

11. TAXES: Buyer is responsible for any taxes, charges or other fees presently or subsequently imposed by any law, order, regulation or ordinance of the Federal, State or municipal governments for production sale, use, transportation, delivery or servicing of the products sold hereby. The foregoing shall not apply to taxes based upon Seller's net income.

12. ASSIGNMENT: Buyer shall not (by operation of law or otherwise) assign its rights or delegate its performance hereunder without the prior written consent of Seller, and any attempted assignment or delegation without such consent shall be void.

13. GOVERNING LAW: All sales shall be governed by and construed for all purpose, including without limitation, Seller's obligations or liabilities respecting its products, according to the laws of the State of Texas.

14. ENTIRE AGREEMENT: These Terms & Conditions of Sale (and any of Seller's purchase or work orders in connection therewith) constitute a complete and exclusive statement of the agreement between Seller and Buyer. There are no understandings, agreements or representations, express or implied, not specified in the Agreement. These Terms & Conditions of Sale control over any conflicting provision in any purchase or work order issued by Buyer. There are no other promises, conditions, understandings, representations or warranties. All provisions are severable, and if any of these Terms & Conditions of Sales are found by a court of competent jurisdiction to be unenforceable, then the Terms & Conditions of Sale shall be deemed modified only to the extent necessary to make them enforceable.

15. CREDIT BALANCES: Buyer agrees that any credit balances issued will be applied within one (1) year of its issuance. IF NOT APPLIED OR REQUESTED WITHIN ONE (1) YEAR, ANY BALANCE REMAINING WILL BE SUBJECT TO CANCELLATION, AND SELLER SHALL HAVE NO FURTHER LIABILITY.

16. GENERAL PROVISION: (a) No action, regardless of form, arising out of transactions under the Agreement, may be brought by either party more than two (2) years after the cause of action has accrued. (b) UNLESS OTHERWISE SPECIFICALLY PROVIDED IN SELLER'S QUOTATION, GOODS AND SERVICES HEREUNDER ARE NOT INTENDED FOR USE IN ANY NUCLEAR OR NUCLEAR RELATED APPLICATIONS. Buyer (i) accepts Goods and Services in accordance with the restriction set forth in the immediately preceding sentence, (ii) agrees to communicate such restriction in writing to any and all subsequent purchasers or users and (iii) agrees to defend, indemnify and hold harmless Seller from any and all claims, losses, liabilities, suits, judgments and damages, including incidental and consequential damages, arising from use of Goods and Services in any nuclear or nuclear related applications, whether the cause of action be based in tort, contract or otherwise, including allegations that the Seller's liability is based on negligence or strict liability. (c) The 1980 United Nation Convention on Contracts for the International Sale of Goods does not apply to this Agreement. (d) Seller specifically objects to the application of any Federal Acquisition Regulation ("FAR") provision or clause to the Agreement.



American Completion Tools

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Upcoming Plant at Houston by, March 2015:

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