Maximizing the use of available natural energy from a reservoir is crucial to any production installation. The natural energy in many wells or fields is often unable to produce sufficient reservoir pressure to cause the well to flow under its own power, or to deliver the required volume of oil to the surface at optimum rates. In these situations, some form of artificial lift or secondary recovery process must be used to supplement the reservoir's natural energy.

Gas Lift is an artificial lift process that most closely resembles the natural flow process and basically operates as an enhancement or extension of that process. This secondary recovery method is suitable for almost every well. The only major requirement is an economical supply of pressurized injection gas. As produced fluids in natural flow wells travel up the production string, the natural gas comes out of solution and expands as it continues to rise to the surface. As the gas expands, it displaces fluid in the production tubing, lightens the produced fluid column, and lowers the hydrostatic pressure against the formation. As the hydrostatic pressure of the produced fluid column decreases, the well continues to flow on its own. If the reservoir pressure falls below the hydrostatic pressure of the producing column of fluids, then flow from the reservoir would cease, and the well would no longer be capable of flowing under its own energy. By supplementing the formation gas with injected gas, the required pressure differential between the reservoir and wellbore can be reestablished.
Continuous Flow Gas Lift

With casing (annular) flow, the gas is injected down the tubing string and fluids are produced out of the tubing/casing annulus. Higher gas lift injection rates must be available to prove efficient in this application and surface facilities must be set up to handle higher fluid volumes.

Continuous Flow Gas Lift

The majority of gas lift wells are continuous flow gas lift. This type of gas lift is the most common because it resembles the natural flow of a well. Using a continuous injection of compressed gas into the well reduces bottomhole pressure and increases production.

In the continuous flow gas lift process, relatively high-pressure gas is injected downhole into the produced fluid column. This injected gas joins the formation gas to lift the fluid to the surface by one or more of the following processes:

- **Reduction** of the fluid density, and thus the fluid column hydrostatic pressure, making the reservoir pressure greater than the produced fluid column hydrostatic pressure so that the reservoir fluids are capable of flowing to the surface.

- **Expansion** of the injection gas so that it pushes liquid ahead of it which further reduces the produced fluid column weight, thereby increasing the differential between the reservoir and the wellbore.

Intermittent Gas Lift

When low reservoir pressure and low production rates are present in a wellbore, intermittent gas lift can be a better option. In this process, high-pressure gas is injected in intermittent cycles to displace liquid slugs to the surface. This type of gas lift is only used for tubing flow. Due to high injection rates from the compressor in intermittent gas lift, the energy in the formation gas does little to assist in lifting most wells.

Types of Gas Lift Systems

Continuous flow and intermittent flow are the two type of gas lift systems used in the oil and gas industry. Because of its cyclic nature, intermittent lift is best suited to wells that produce at relatively low rates. Continuous lift will usually be more efficient and less expensive for wells that produce at higher rates where it can be maintained without excess use of injection gas.

Advantages, Applications & Requirements

**Advantages:**

+ Low initial installation cost
+ High lifting efficiencies
+ Operator control of production rates at the surface
+ Minimal moving parts
+ Flexibility of lifting from near the surface or deep within the wellbore

**Gas Lift Applications:**

+ Almost any well requiring artificial lift to produce hydrocarbons is a candidate for gas lift
+ Produce wells to depletion regardless of how low the rate of production
+ Kick off wells that will flow naturally once the heavier completion fluids are vacated from the production string
+ Unload water from gas wells that would otherwise prevent gas production

**Gas Lift System Requirements:**

+ Installation of the appropriate gas lift equipment both on the surface and in the wellbore
+ An available and economic supply of pressurized injection gas
TP Valve Series

Applications
Used for intermittent or continuous flow applications with tubing-retrievable gas lift mandrels. Smaller size valves are available for use with the IM and CT-IM special application mandrels for packoff, special clearance and smaller diameter installations.

Features
+ Large dome volume improves operating efficiency of valve
+ Optional reverse-flow check valve (TP-1 and TP-1.5 models)
+ Mechanical travel stop increases the cycle life of the bellows
+ Three-ply Monel® bellows
+ Silicon fluid bellows protection
+ Replaceable floating Monel® seat (tungsten seat available)
+ Silver-brazed bellows connections
+ Stainless steel or Monel® materials available
+ Pressure rating up to 1800 psi PTRO maximum
+ Temperature rating of 250°F (standard service)
+ Port sizes from 1/8" to 1/2"

TC Valve Series

Applications
These valves are used with tubing-retrievable gas lift valves that do not have an integral check valve, such as the TP-1 and TP-1.5 gas lift valves. A primary application for these valves is preventing back flow from the injection valve which damages casing. Other applications include preventing production commingling in dual gas lift installations and improving pressure integrity during acidizing and circulation operations.

Features
+ Stainless steel or Monel® materials available
+ Inconel® spring
+ Eliminates need to re-unload annulus liquid since valve prevents annulus fill up during shut down periods
+ Elastomeric and metal-to-metal seat for bubble tight seal
+ Seal system options available
+ Valves can be stacked for additional protection

TP Series Specification Guide

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TC Series Specification Guide

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THE FLOWCO PRODUCTION SOLUTIONS CP SERIES PACKOFFS ARE WIRELINE-RETRIEVABLE, ISOLATION TOOLS WHICH UTILIZE AN ELASTOMER-TYPE ELEMENT DESIGNED TO SEAL IN THE I.D. OF THE PRODUCTION TUBING. CP PACKOFFS ARE NORMALLY RUN AS A COMPONENT OF A PACKOFF ASSEMBLY ON SLICKLINE OR COILED TUBING. IN MORE COMMON APPLICATIONS, CP PACKOFFS ARE USED TO INSTALL GAS LIFT SYSTEMS AND ISOLATE OR CONTROL COMMUNICATION BETWEEN THE CASING AND THE PRODUCTION STRING. STANDARD TUBING STOPS HOLD THE CONTROL DEVICE IN PLACE AND ASSIST IN MAINTAINING SEAL COMPRESSION.

**CP SERIES PACKOFF EQUIPMENT**

- **CP-20 Packoffs** - Upper and lower packoffs used in 2-3/8” tubing.
- **CP-25 Packoffs** - Upper and lower packoffs used in 2-7/8” tubing.

**APPLICATIONS**

- Installed as part of the tubing string to accept tubing-retrievable gas lift equipment for producing wells requiring gas lift. Both mandrels can be used in either a single or dual string completions. JR and SR mandrels may be installed in the casing drift I.D. while maintaining post-completion operations through the bore of the mandrel.

**FEATURES**

- Full tubing I.D.
- Guard plates on side of mandrel protect valve from damage while running in hole
- Tubing-string connection threaded on both upper and lower ends with appropriate terminal threads
- Various ported-lug configurations for specialized applications
- Drift I.D. compatible with tubing connection drift in most tubing thread types, sizes and weights
- Available in various materials for standard, H2S service and hostile well environments
- Special clearance available on request

---

**TUBING-RETRIEVABLE JR and SR Series Gas Lift Mandrels**

**Juniors**

- This mandrel has a lug configured for 1” O.D. tubing-retrievable gas lift equipment.

**Special Application**

Conventional Packoff - CP Series

The Flowco Production Solutions CP Series packoffs are wireline-retrievable, isolation tools which utilize an elastomer-type element designed to seal in the I.D. of the production tubing. CP packoffs are normally run as a component of a packoff assembly on slickline or coiled tubing. In more common applications, CP packoffs are used to install gas lift systems and isolate or control communication between the casing and the production string. Standard tubing stops hold the control device in place and assist in maintaining seal compression.

**CP Series Packoff Equipment**

- **CP-20 Packoffs** - Upper and lower packoffs used in 2-3/8” tubing.
- **CP-25 Packoffs** - Upper and lower packoffs used in 2-7/8” tubing.

**Applications**

This equipment is commonly used to isolate holes in the tubing or to install tubing-retrievable, slimhole concentric gas lift valves in wells where a gas lift system was not originally installed. Packoff equipment can be set and retrieved with standard slickline tools. Accessory equipment include stingers and receptacles for longer isolation intervals, and running the upper and lower assembly separately.

**Features**

- Expandable, elastomer-type seals for positive isolation
- Ratchet mechanism maintains compression on packing elements
- Optional stinger and receptacles for longer isolation intervals
- Can be used with IM mandrels for gas lift installations
- Simple field re-dressing
- Large I.D. for minimum pressure drop
- Pressure differential rated up to 2,500 psi
- Temperature rating of 250° F (standard service)

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**Tubing Retrievable Gas Lift Mandrels Series Specification Guide**

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**Note:** Mandrel DR I.D. may vary according to the type of thread connection

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**CP Series Specification Guide**

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<th>Packoff Series Model</th>
<th>Tubing Size Nominal (in.)</th>
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**Note:** O.D. and Length dimensions include coupling
The Flowco Production Solutions WP Series gas lift valves are retrievable, injection-pressure-operated valves with a nitrogen-charged dome and bellows configuration. Since the charge pressure is affected by temperature, it is important to use accurate operating depth temperature information when calculating the set pressure. The nitrogen dome pressure is preset at a reference temperature and corrected to an operating depth temperature for the desired application. The valve is held on seat by the downward force of the nitrogen charge inside the bellows.

**WP Valve Series**
- The WP-1 model is a 1" O.D. valve.
- The WP-1.5 model is 1-1/2" O.D. valve.

**Applications**
For intermittent or continuous gas lift, and tubing or casing flow applications depending on pocket porting configurations.

**Features**
- Maximum travel stop increases the cycle life of the bellows
- Integral reverse-flow check valve to prevent tubing-to-casing communication
- Three-ply Monel® bellows
- Compatible with all common top latches
- Silicon dampering fluid minimizes throttling effects
- Replaceable floating Monel® or tungsten carbide seat
- Silver-brazed bellows connections
- Guidance system designed to prevent corkscrew of the bellows
- Stainless steel or Viton® materials available
- Pressure rating up to 1,800 psi Pressure Tested Open Rack (PTRO) maximum
- Temperature rating of 250° F (standard service)
- Post sizes from 1/8" to 1/2"
- Standard Viton® packing element system with other packing materials available

**WP Series Specification Guide**

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*Port diameter based on port size plus .006" for lapped seat

**WP-C Valve Series**
- The WP-1C model is a 1" O.D. valve.

**Applications**
For intermittent or continuous gas lift, and tubing or casing flow applications depending on pocket porting configurations.

**Features**
- Large dome area improves operating efficiency of the valve
- Integral collet bottom latch
- Maximum travel stop increases the cycle life of the bellows
- Integral reverse-flow check valve to prevent tubing-to-casing communication
- Silicon dampering fluid minimizes throttling effects
- Replaceable floating Monel® or tungsten carbide seat
- Silver-brazed bellows connections
- Guidance system designed to prevent corkscrew of the bellows
- Stainless steel or Monel® materials available
- Pressure rating up to 1,800 PTR maximum
- Temperature rating of 250° F (standard service)
- Port sizes from 1/8" to 1/4"
- Standard Viton® packing element system with other packing materials available

**WP-C Series Specification Guide**

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*Port diameter based on port size plus .006" for lapped seat

**WP-1C Latch Specification Guide**

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*Compatible running and pulling tool information available upon request
Gas Lift Dummy Valves

WD and WD-C SERIES DUMMY VALVE

WD-1C Dummy Valves

The Flowco Production Solutions WD and WD-C Series dummy valves are retrievable, isolation tools installed in a side pocket mandrel to block the mandrel’s injection ports. The valve with appropriate latch may be installed or retrieved prior to or after completion for various procedures.

WD Series Dummy Valve

+ The WD-1 model is a 1” O.D. valve.
+ The WD-1.5 model is a 1-1/2” O.D. valve.

WD-1C Series Dummy Valves

This series includes an integral bottom collet latch and is typically used when a retrievable latch will not engage in the latch-pocket profile of a side pocket mandrel.

The WD-1C model is a 1” O.D. valve with integral bottom collet latch.

Applications

Used to seal off the pocket of a side pocket mandrel, preventing communication between the casing and tubing. These valves are also used to blank off the tubing for production until gas lift valves are required. Other applications include pressurizing the tubing in various procedures, isolating tubing and casing flow during single-alternative production, and isolating tubing and casing flow for test purposes during multi-point water or gas injection floods.

Features

+ Stainless steel or Monel® materials available
+ Orifices sizes from 1/8” to 1/2” diameter ports (WO Series)
+ Flow capacity governed by orifice size
+ Replacable floating orifice
+ Spring-loaded, reverse-flow check valve (WO Series)

WO Series Specification Guide

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*Compatible running and pulling tool information available upon request.

WD and WD-C Series Specification Guide

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*Compatible running and pulling tool information available upon request.

Note: A core extension is required for the WD-1C model to keep the skirt from shouldering on the pocket, allowing for a shear release feature.
**Dummy Valves**

**WED Series Equalizing Dummy Valves**

The Flowco Production Solutions WED Series equalizing valves with integral latches are virtual dummy valves designed to provide controlled equalization or circulation between the casing and tubing.

The downward shifting of the latch opens the communication port, allowing circulation or equalization. Once shifted, the valve can be pulled in the same trip as the integral top latch and redressed, if needed.

**WED Valve Series**
- The WED-1 model is a 1” O.D. valve.
- The WED-1.5 model is a 1-1/2” O.D. valve.

**Applications**
Primarily used to equalize casing and tubing pressure, the most common application is multiple water flood zones isolated by packers. After equalization, the valve must be pulled and redressed, if needed, to prevent communication between the casing and tubing. The valve may also be used to blank off casing for production prior to equalization or circulation.

**Features**
- Stainless steel or Monel® materials available
- Two sets of packing to straddle and pack off casing ports
- Integral top latch to equalize tubing and casing pressure
- Fluid circulation after equalization
- Equalizing feature for controlled flow during equalization prior to removing
- One trip equalizing and pulling operation can be performed in one trip
- Standard Viton® packing element system with other packing materials available

**WDK-R and WDK-S Series Kill Valves**

These valves use an adjustable draw bar to hold the isolation mechanism in the closed position. An integral, double check valve prevents tubing to casing annulus flow once the valve is shifted to the locked-open position.

**Applications**
Valves are installed in side pocket mandrels when a virtual dummy valve is needed to pack off the communication ports in the mandrel, yet retain the option of being able to circulate between the casing and tubing without well intervention. After applying pressure to convert the valve to the circulating valve operation mode, the valve must be retrieved, redressed, and rerun back into the side pocket mandrel for it to function as a virtual dummy valve again.

**Features**
- Stainless steel or Monel® materials available
- Standard Viton® packing element system with other packing materials available
- Ability of valves to convert from virtual dummy valve operation to circulating valve operation eliminates expense associated with re-entering well to install a circulating valve
- Tubing-over-casing pressure differential will not open the valves
- Adjustable opening pressure according to application requirements
- Integral double-check valves prevent tubing to casing annulus flow (WDK-R Series)

### WCS-1 Series Specification Guide

<table>
<thead>
<tr>
<th>Valve Series</th>
<th>Valve Series Model</th>
<th>Valve O.D. (in.)</th>
<th>Latch* Type</th>
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*Compatible running and pulling tool information available upon request.

### WDK-R and WDK-S Series Specification Guide

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*Compatible running and pulling tool information available upon request.
WIRELINE RETRIEVABLE

Circulating Valves
WCS-1 SERIES CIRCULATING VALVES

The Flowco Production Solutions WCS-1 Series circulating valves protect the seal bores of side pocket mandrels from erosion and abrasion when circulating fluids or gases through the mandrel’s ports. The double check valves in this series permit flow only from the annulus to the tubing. Higher circulating rates are achieved when installing these valves with a ported latch.

WCS-1 Valve Series

- The WCS-1 model is a 1” O.D. valve.
- The WCS-1.5 model is a 1-1/2” O.D. valve.

Applications

Installed in 1” and 1-1/2” side pocket mandrels to prevent circulated gases or fluids from damaging the side pocket seal bores. These valves are designed for high gas or fluid rate passage requirements during circulation.

Features

+ Stainless steel or Monel® materials available
+ Standard Viton® packing element system with other packing materials available
+ Abrasion-resistance overlays available
+ Increased flow area since flow permitted from both nose and latch ends
+ Integral double-check valve design to prevent tubing-to-casing annulus flow
+ Installed with a ported latch for increased circulation rates

WCS-1 Series Specification Guide

<table>
<thead>
<tr>
<th>Valve</th>
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<th>Valve O.D. (in.)</th>
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*Compatible running and pulling tool information available upon request.

Pilot Operated Gas Lift Valve
PV-S1 Valve

The Flowco Production Systems PV-S1 is a 1 inch O.D. wireline retrievable injection pressure pilot operated gas lift valve that is primarily controlled by injection gas pressure. The PV-S1 controls injected gas flow and pressure to inject large volumes of gas into the production tubing during intermittent gas lift operations. The large instantaneous gas volume helps to more efficiently displace the liquid slug to the surface.

The valve houses a power spring, bellows, stem, and seat. The power spring provides the closing force of the valve. When injection gas pressure exceeds the closing force then the power spring compresses, lifting the pilot valve stem off its seat allowing gas to depress the power piston assembly permitting a large volume of gas to be injected rapidly through the valve into the production string. Multiple pilot stems and seats sizes are available allowing a spread between the opening and closing casing pressure to compensate for production conditions.

The PV-S1 is constructed of premium materials for corrosion resistance in wells with high concentrations of H2S and/or CO2. Different packing and elastomeric materials used in the valve are available for standard and special service.

Features

+ Stainless steel and Monel type materials are standard plus other premium materials available.
+ Monel bellows (Silver brazed bellows connections)
+ Mechanical stop prevents bellows over-stroke
+ Stem assembly utilizes a tungsten carbide ball in pilot section
+ Replaceable Monel seat (tungsten carbide inserted available)
+ Bellows has no internal Nitrogen gas charge-eliminates temperature effect
+ Robust integral reverse flow check valve and high rate exit paths in housing body
+ BKM-2 type top latch
+ Compatible with other manufacturer’s side pocket mandrels
+ Controlled spread using multiple port sizes
+ Power stem has shock absorber for longer cycle life
+ Maximum injection port (for large gas volumes)

Applications

+ Intermittent gas-lift applications, conventional, and chamber lift

PV-S1 Specifications

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<th>PV-S1 VALVE</th>
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<tr>
<td>Mandrels</td>
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<tr>
<td>Metallurgy / Seal Material</td>
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* PV-S1 can be manufactured from various materials to perform in all service conditions.
Flowco Production Solutions offers a comprehensive line of side pocket mandrels for a variety of well completions applications. We offer top-quality side pocket mandrels with enhanced features and specifications to meet the most demanding requirements.

The family of side pocket mandrels available from Flowco Production Solutions includes both oval and round body designs. The oval-body mandrels, with both machined and forged pocket designs, are typically used in single and dual string completions. The round-body mandrels are full-opening mandrels commonly used in high-pressure environments and special-clearance applications.

Each mandrel features a standard side pocket profile to receive gas lift valves, chemical injection valves, circulating valves, dummy valves, dump kill valves, and related equipment. Several different pocket porting configurations are available for applications such as water flood injection, chamber lift, chemical injection and annular flow.

### Latches

Flowco Production Solutions offers a wide range of latches for installing wireline-retrievable gas lift, chemical injection, and waterflood valves in side pocket mandrels. Latches are designed to lock in place when located in either a 180° or a 360° latch pocket profile. To retrieve a latch and attached valve, upward jar ring of the tool string shears the release pin, permitting the locking mechanism to disengage from the pocket latch profile.

**180° G-Type Latch Pocket Profile**

Latches for 180° latch pocket profile have a spring-loaded, ring style locking mechanism. A ported I.D. is included in some designs for applications requiring a communication path between the latch and attached valve.

- **+ BK-2 Latch Series**
  - This series includes a BK-2 and a BK-2-P model used to secure a 1" valve or dummy valve in a side pocket mandrel with a 1.00 I.D. pocket. The BK-2-P model has a ported I.D.

- **+ RK Latch Series**
  - Used to secure a 1.5" valve or dummy valve in a side pocket mandrel with a 1.5" I.D. pocket, this series includes a RK and a RK-P model. The RK-P model has a ported I.D.

**360° A-Type Latch Pocket Profile**

Latches for a 360° latch pocket profile have either a collet-type locking mechanism or a spring-loaded rotating cam lock with debris barrier. A ported I.D. is included in some designs for application requiring a communication path between the latch and attached valve.

- **+ T-2 Latch Series**
  - The latches in this series have a collet-type locking mechanism and are used to secure a 1.5" O.D. valve or dummy valve in a side pocket mandrel with a 1.5" I.D. pocket. Models available are the T-2 and the T-2-P with ported I.D.

- **+ RA Latch**
  - Used to secure a 1.5" valve or dummy valve in a side pocket mandrel with a 1.5" I.D. pocket, this latch has a rotating cam lock and an o-ring style debris barrier.

### Valve Specification Guide

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</table>
Flowco Production Solutions M and F series Side Pocket Mandrels feature an oval-body design and are installed as a component of the tubing string whereby the pocket acts as a landing nipple for retrievable gas lift equipment. The mandrel’s pocket is offset from the bore of the tubing, allowing post-completion tools to pass through the mandrel without restriction.

Several mandrel configurations include an integral orienting sleeve to position the kick over tool to the mandrel’s side pocket for precise alignment and installation of devices. Mandrels with an orienting sleeve can be installed in both straight and deviated wellbores whereas mandrels without an orienting sleeve can only be installed in straight wellbores.

M Series Side Pocket Mandrels
The mandrels in this series feature machined pockets and guards. Several mandrel configurations with 1” and 1-1/2” I.D. pockets are available.
- 1D and 1.5D models with 1” and 1-1/2” I.D. pockets and no orienting sleeves. The 1.5D model has a 360° A-type latch pocket profile.
- 1D-SO and 1.5D-SO models with 1” and 1-1/2” I.D. pockets and integral orienting sleeves. The 1.5D-SO model has a 360° A-type latch pocket profile.
- 1.5 DG and 1.5 DG-SO models with 1-1/2” ID pockets and 180° G-type pocket profiles. The 1.5 DG-SO model includes an integral orienting sleeve.

F Series Side Pocket Mandrels
This series features a one-piece forged pocket/deflector, 1” pocket I.D., and a 180° latch pocket profile.
- 1F model with a 1” I.D. pocket and no orienting sleeve
- 1F-SO model with a 1” I.D. pocket and an integral orienting sleeve

Applications
Used as an internal receiver for the installation and retrieval of gas lift valves and related equipment without having to pull or rerun the tubing string. Can be installed in deviated or straight wellbores depending upon the mandrel model type. The external shape of these oval-body mandrels make them ideal for dual completion applications.

Features
- Oval-body design
- Machined pocket and guards (M Series)
- One-piece forged pocket/deflector (F series)
- Models with and without a slotted orienting sleeve to accommodate setting and retrieving in straight and deviated wells.
- Tubing-string connection threaded on both swaged sections with appropriate terminal threads.
- Accepts standard gas lift equipment for pocket configuration.
- Variety of pocket configurations for specialized applications.
- Drift I.D. compatible with tubing connection drift in most tubing thread types, sizes and weights.
- Available in standard or H2S service.
- 4130 material is standard and with other materials are available upon request.

H Series Side Pocket Mandrels
These high-pressure mandrels have a 1” pocket I.D. and feature an enhanced “burst-and-collapse” pressure rating design for compatibility with most heavy-weight tubulars. This series is primarily used for deep and/or high pressure applications.
- 1H high-pressure model with a 1” I.D. pocket and no orienting sleeve
- 1H-SO high-pressure model with a 1” I.D. pocket and an integral orienting sleeve

Applications
- Receptacle for the installation and retrieval of gas lift valves and related equipment without having to pull or rerun the tubing string.
- Deviated or straight wellbores based on inclusion of an orienting sleeve.
- Side pocket mandrels are primarily used in single completions.
- Special applications
- High burst-and-collapse pressure ratings
- Deep or high pressure applications
- Special clearance requirements.

R Series Side Pocket Mandrels
These round-body mandrels with 1” and 1-1/2” I.D. pockets are available in several configurations.
- 1R and 1.5R models which have 1” and 1-1/2” I.D. pockets and no orienting sleeves. The 1.5R model has a 360° A-type latch pocket profile.
- 1R-SO and 1.5R-SO models which have 1” and 1-1/2” ID pockets and integral orienting sleeves. The 1.5R-SO model has a 360° A-type latch pocket profile.
- 1SR and 1.5SR-SO models which have 1-1/2” I.D. pockets and 180° G-type pocket profiles.

G-type Pocket Profiles
The 1.5SR-SO mandrel includes an orienting sleeve while the 1.5SR mandrel does not.

H Series Side Pocket Mandrels
These high-pressure mandrels have a 1” pocket I.D. and feature an enhanced “burst-and-collapse” pressure rating design for compatibility with most heavy-weight tubulars. This series is primarily used for deep and/or high pressure applications.
- 1H high-pressure model with a 1” I.D. pocket and no orienting sleeve
- 1H-SO high-pressure model with a 1” I.D. pocket and an integral orienting sleeve

Applications
- Receptacle for the installation and retrieval of gas lift valves and related equipment without having to pull or rerun the tubing string.
- Deviated or straight wellbores based on inclusion of an orienting sleeve.
- Side pocket mandrels are primarily used in single completions.
- Special applications
- High burst-and-collapse pressure ratings
- Deep or high pressure applications
- Special clearance requirements.
Features and Special Applications

+ Round-body design ideal for special applications
+ Machined pocket and guards
+ Models available with and without a slotted orienting sleeve to accommodate setting and retrieving in straight and deviated wellbores
+ Deep and/or high pressure applications (H Series)
+ Special clearance O.D. for installation in small casing sizes where standard O.D. mandrels may not be practical (U Series)
+ Tubing-string connection threaded on both swaged sections with appropriate terminal threads. Special clearance applications may require special thread connections
+ Variety of pocket configurations for specialized applications
+ Drift I.D. compatible with tubing-connection drift in most tubing thread types, sizes and weights
+ 4130 material for standard and H2S service, with other materials available upon request

PRODUCT IDENTIFICATION

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<th>Tubing Size</th>
<th>Valve Size</th>
<th>Body Pipe Shape</th>
<th>Config. Options</th>
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### WIRELINE RETRIEVABLE Side Pocket Mandrel SPECIFICATION GUIDE

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<th>Mandrel Body Design</th>
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### Rated Test Pressures

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<th>External Test</th>
<th>Latch Type</th>
<th>Kickover Tool</th>
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<tbody>
<tr>
<td>7,500 psi</td>
<td>7,000 psi</td>
<td>11,500 psi</td>
<td>11,500 psi</td>
<td>BK-2 BEK-2</td>
<td>INTEGRAL</td>
</tr>
<tr>
<td>6,000 psi</td>
<td>5,500 psi</td>
<td>10,000 psi</td>
<td>10,000 psi</td>
<td>OK-1 MERLA</td>
<td></td>
</tr>
<tr>
<td>4,000 psi</td>
<td>3,500 psi</td>
<td>8,000 psi</td>
<td>8,000 psi</td>
<td>RK RKP</td>
<td></td>
</tr>
</tbody>
</table>

*For mandrel designations not shown above, please contact your local Flowco Representative*
Flowco Corporate Headquarters
18511 Imperial Valley Dr.
Houston, Texas 77073 USA
O: 281.528.6298  F: 281.528.6319
www.flowcosolutions.com
Sales@flowcosolutions.com

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