R Series Injection Pressure Operated Gas Lift Valve (1-in. OD)

Provides a smooth transition from early high-pressure gas lift implementation to lower pressure into mid-life unconventional wells

Applications

- Onshore continuous or intermittent gas lift operations
- Onshore wells that require retrievable gas lift equipment
- Tubing or casing flow applications (based on the side pocket porting configuration)
- Kick-off gas wells that are loaded up with producing fluids.
- Wells requiring smooth transition between higher pressure GL valves (IPO), wireline retrievable to lower pressure GL valves (IPO), wireline retrievable applications

Features and Benefits

- Wireline-retrievable design eliminates the need to pull the tubing to repair or replace the valve, reducing maintenance and repair costs
- Bellows mechanical stop prevents the bellows from stacking, increasing its life cycle
- Silicon-dampening fluid in the bellows also minimizes chattering, preventing valve seat damage and vibration that can lead to valve failure
- Internal bellows guidance system prevents corkscrewing, increasing valve open-and-close life cycle
- Integral reverse-flow check valve with elastomer primary seal and metal-to-metal secondary seal prevents tubing-to-casing communication, avoiding costly workover operations
- Replaceable floating Monel® or tungsten-carbide seats allow for easy service and reduce maintenance costs
- Universal design provides compatibility with all common-top latches allowing deployment in a wide variety of applications, enhancing operational flexibility

Tool Description

The Weatherford McMurry-Macco® R series injection pressure operated gas lift valve with 1-in. nominal outside diameter (OD) is the most frequently used valve in gas lift systems today because of their durability, performance, and wireline retrievability. These versatile valves are used for continuous or intermittent gas lift operations. The unique positive bellows protection (PBP) feature of every R series 1-1/2 in. valve traps silicon fluid within the bellows as the valve reaches its full open position The trapped silicon fluid forms a hydraulic barrier that protects the bellow from high hydrostatic pressure in the well.

R Series Injection Pressure Operated Gas Lift Valves provide a smooth transition from early high-pressure gas lift implementation to lower pressure into mid-life unconventional wells.

Weatherford®

R Series Injection Pressure Operated Gas Lift Valve (1-in. OD)

Tool Description (continued)

Depending on the side pocket mandrel design, these valves are ideal for tubing or annular flow applications (except for R-1R).

Weatherford R series IPO gas lift valves have a nitrogen charged dome-bellow configuration. The nitrogen charge located inside the dome acts on the three-ply Monel® bellows to hold the valve in the closed position.

The high-pressure operation is enhanced by a unique feature of this valve which is the positive bellow-protection. It protects the bellow damage in the case of high casing pressure by trapping dampening fluid inside the bellow.

Specifications

Valve OD	Ab Effective Bellows Area	Valve Series Model	Port Size in. (mm)	Ap* Area of Port in. (mm)	Ap/Ab Ratio	1-(Ap/Ab)	PPEF** Ap/Ab 1-(Ap/Ab)
1.0 in. (25.4 mm)	0.31 in. (200.0 mm)	R-1 R-1D	1/8 (3.18)	0.013 (8.4)	0.042	0.958	0.044
			5/32 (3.97)	0.021 (13.55)	0.067	0.933	0.072
			3/16 (4.76)	0.029 (18.71)	0.095	0.905	0.105
			1/4 (6.35)	0.052 (33.55)	0.166	0.834	0.199
			5/16 (7.94)	0.08 (51.61)	0.257	0.743	0.346
		R-1HV	3/8 (9.53)	0.114 (73.55)	0.368	0.632	0.582
1.5 in. (38.1 mm)	0.77 in. (496.8 mm)	R-2 R-2B	3/16 (4.76)	0.029 (18.71)	0.038	0.962	0.04
			1/4 (6.35)	0.052 (33.55)	0.067	0.933	0.072
			5/16 (7.94)	0.08 (51.61)	0.104	0.896	0.115
			3/8 (9.53)	0.114 (73.55)	0.148	0.8	0.174
			7/16 (11.11)	0.154 (99.35)	0.2	0.739	0.25

RO Series Wireline Retrievable, Single-Point Injection Orifice Valve (1-in. OD)

Controls gas volume into the production conduit and provides a seal for low differential pressures to ensure reliability

Applications

- Establish communication between the tubing and annulus during circulating operations
- Single-point, continuous flow completions
- Control stable injection at operating valve depth

Features and Benefits

- RO series valves allow unobstructed flow of injection gas into the production tubing to enable maximum gas passage and maximize production rates
- Reduces the chance of failure and prevents nonproductive time because valves do not need a pressure-regulating mechanism
- Integral reverse-flow check provides a barrier for tubing-to-casing communication to ensure well containment
- Standard dimensional design is compatible with all manufacturers' gas lift mandrels that meet American Petroleum Institute (API) 19G1 standards to provide operational flexibility for all applications
- Valves can be manufactured from various materials to fit well conditions and reduce nonproductive time
- Dual check valves prevent fluid from entering the casing annulus and possibly preventing well fracking hit flow back

Tool Description

The Weatherford McMurry-Macco® RO series valves are wireline retrievable, single-point injection orifice valves. A replaceable orifice or port controls the volume of gas through the open valve into the production conduit. The spring-loaded, dual-seating, reverse-flow check valve is an integral part of the valve. This design has an elastomeric seal (acting as the primary seal) for low differential pressures and a metal-to-metal seal is established to ensure reliability and act as the secondary seal.

RO Series Wireline Retrievable, Single Point Injection Orifice Valve controls gas volume into the production conduit and provides a seal for low differential pressures to ensure reliability.

Weatherford®

RO Series Wireline Retrievable, Single-Point Injection Orifice Valve (1-in. OD)

Options

Different combinations are available.

- This valve can be manufactured as a RO-1HPDC using a double check valve with a back-pressure rating of 10,000 psi

Specifications

Valve Series	Valve OD
RO-1	1.00 in. (25.4 mm)
RO-1B	
RO-2	1.50 in. (38.1 mm)
RO-2B	

RO-HV Series with Premium Back Check

Provides a smooth transition from early high-pressure gas lift applications including premium check valve for unconventional wells

Applications

- Onshore continuous or intermittent gas lift operations
- Installed during initial production and withstands initial high pressure of early production on unconventional wells
- Used to establish communication between the tubing and annulus during circulating operations
- Single-point, continuous-flow completions
- Used to control stable injection at operating valve depth
- Premium internal check valve for single barrier applications
- Tubing or casing flow applications (based on the side pocket porting configuration)

Features and Benefits

- Flow capacity governed by orifice size
- Replaceable floating orifice
- Higher gas injection rates attainable with RO-HV series
- RO series valves feature a wireline retrievable design that eliminates the need to pull the tubing to repair or replace the valve and reduces maintenance and repair costs
- Wells requiring smooth transition between higher pressure GL valves (IPO), wireline retrievable to traditional pressure GL valves (IPO), and wireline retrievable applications

Tool Description

Weatherford Artificial Lift Systems has developed a gas lift portfolio that spans the lifecycle of onshore wells with a robust approach for high-pressure applications. Weatherford has been able to enhance the seamless transition from early high-pressure production to well depletion in unconventional areas by leveraging deepwater gas lift equipment reliability improvements and integrating these offerings into continuous improvement of the traditional equipment.

High-pressure equipment has been designed to the same standards and requirements as the deep-water applications including premium single barrier check valves. The intent is to ensure that gas lift valves, wellbore integrity, and operational safety are not compromised when earlier gas lift operations are implemented in high-pressure wells.

RO-1HV Series with Premium Back Check provides a smooth transition from early high-pressure gas lift applications including premium check valve for unconventional wells

Weatherford®

RO-HV Series with Premium Back Check

Tool Description (continued)

The Weatherford RO-HV series injection-pressure operated gas lift valve with premium check valve are available with 1-in. and 1-1/2-in. nominal outside diameter (OD). These versatile valves are used for continuous or intermittent gas lift operations and are wireline retrievable. Depending on the side pocket mandrel design, these valves can be used for tubing or annular flow applications.

For high injection rates, the RO-HV series orifice valves feature inlet ports and reverse-flow checks that are engineered for maximum flow efficiency.

Options

Available in a large variety of materials and elastomer combinations

- This valve can be manufactured as a RO-1HVDC using a double check valve with a back-pressure rating of 10,000 psi
- Large, streamlined flow-area reduced pressure drop and erosion
- Dual-sealing design; elastomeric and metal to metal
- Dual-check valves prevent fluid from entering the casing annulus and possibly preventing well fracking hit flow back

Specifications

Valve Series	Valve OD
RO-1	1.00 in. (25.4 mm)
RO-1B	
RO-2	1.50 in. (38.1 mm)
RO-2B	

RH Series Wireline Retrievable, Injection-Pressure Operated Valve (1-in. OD)

Provides early lift implementation for high-pressure gas lift operation envelope designed for fracked or re-fracked onshore unconventional wells

Applications

- Onshore wells requiring wireline retrievable equipment
- Onshore wells that require high injection pressure
- Wells with high injection, high pressure that require gas lift valves to have dome charge of up to 2,500 psi (172 bar) and differential submergence pressures up to 6,000 psi (413 bar)
- Early life unconventional wells with high production rates

Features and Benefits

- RH-1 series wireline retrievable IPO valves use a sealed chamber-dome that includes bellow assembly containing a nitrogen charge
- A major advantage of this valve is that extremely high casing pressure can be applied to the bellow internal surface without damage to the bellow since the dampening fluid is non-compressible
- High-volume integral reverse flow check valves have been tested to API 19G2 V-1 standards and provide a barrier for tubing-to-casing communication and ensure well containment
- Aerodynamic check ensures maximum gas passage and erosion resistance to increase the overall production rate
- Check valve can include a combination modified PTFE non-elastomeric seal to maintain sealing integrity in low- and high-pressure situations
- Optimized stem travel and tightly controlled manufacturing tolerances maximize gas passage and provide a longer lifecycle to prevent failures and nonproductive time
- Manufacturing specifications include submergence pressure testing and specific bellows type to maximize the tool lifecycle, prevent failures, and reduce nonproductive time
- When specified, packing seals can meet API 19G2 requirements to ensure a proper seal that isolates tubing and casing and prevents well containment issues
- Valve is compatible with gas lift mandrels from all manufacturers that meet API 19G1 standards and provides operational flexibility
- Valve can be manufactured from a wide range of materials and customized for use in corrosive well conditions
- Larger dome reduces load rate and improves flow characteristics to enable optimal production

RH Series Wireline Retrievable, Injection-Pressure Operated Gas Lift Valve provides early lift implementation for high-pressure gas lift operation envelope designed for fracked or re-fracked onshore unconventional wells.

Weatherford®

RH Series Wireline Retrievable, Injection-Pressure Operated Valve (1-in. OD)

Tool Description

The Weatherford RH-1 gas lift valve is a 1-in. nominal outside diameter (OD), wireline retrievable, injection-pressure operated (IPO) gas lift valve that is primarily controlled by the injection gas pressure and specially designed for fracked or re-fracked onshore unconventional wells or other high-pressure well applications. These valves are used for continuous flow-tubing flow or annular flow when installed in combination with an EC configuration side pocket mandrel.

The high-pressure operation is enhanced by a unique feature of this valve which is the positive bellow-protection. This positive bellow-protection protects the bellow damage in the case of high casing pressure by trapping dampening fluid inside the bellow.

Options

Different combinations are available.

- The valve can be manufactured as a RH-1QS using check qualified per Equinor TR2385 requirements which includes PEEK/AFLAS/MGFT packing and INC 925 material

Specifications

Valve OD	Ab Effective Bellows Area	Valve Series Model	Port Size in. (mm)	Ap* Area of Port in. (mm)	Ap/Ab Ratio	1-(Ap/Ab)	PPEF** Ap/Ab 1-(Ap/Ab)
1.0 in. (25.4 mm)	0.31 in. (200.0 mm)	RH-1	1/8 (3.18)	0.013 (8.4)	0.054	0.946	0.057
			5/32 (3.97)	0.021 (13.55)	0.069	0.931	0.074
			3/16 (4.76)	0.029 (18.71)	0.099	0.901	0.110
			1/4 (6.35)	0.052 (33.55)	0.162	0.838	0.193
			5/16 (7.94)	0.08 (51.61)	0.252	0.748	0.337

*Ap/Ab values are obtained from open/close test data and are not calculated using the actual geometric values.

RV-1 Series Wireline Retrievable, Venturi Orifice Valve (1-in. OD)

Provides enhanced gas lift flow performance and dependability by maximizing production and reducing nonproductive time

Applications

- Onshore wells requiring wireline retrievable equipment
- High-productivity wells that require high injection rates to maximize production rates
- Dual gas lift
- Wells prone to slugging or instability
- High-profile wells with high intervention cost

Features and Benefits

- Provides maximum gas passage with minimum differential between injection pressure and production pressure which enables a lower injection point and higher production rates
- Increases the injection volume capability through 1-in. gas lift valves in wells with larger tubing without requiring installation of multiple standard wireline retrievable gas lift valves at injection point
- Reduces needed gas-injection pressure by requiring lower differential pressure between the casing and tubing to maximize flow performance
- Aids in achieving critical flow in unstable wells and contributes to well stability
- Contributes to optimization and stabilization of dual gas lift wells by means of more exact orifice sizing that enables both production strings to produce simultaneously
- Aerodynamic check ensures maximum gas passage and erosion resistance to increase overall production rate
- Check valve can include a combination of modified PTFE non-elastomeric seals to maintain integrity in low- and high-pressure situations

Tool Description

The Weatherford RV-1 wireline retrievable gas lift orifice features a special Venturi flow area that significantly reduces gas flow friction. Designed specifically for high profile applications, these valves can achieve critical flow with only 10% pressure drop across the valve. Standard orifice valves require about 40-50% pressure drop to achieve critical flow. This enhanced performance enables RV-1 orifice valves to deliver higher injection points with a more stable flow regime and at a lower operating cost.

The Weatherford RV-1 Series Wireline Retrievable Venturi Orifice Valve (1-in. OD) provides enhanced gas lift flow performance and dependability by maximizing production and reducing nonproductive time.

Weatherford®

RV-1 Series Wireline Retrievable, Venturi Orifice Valve (1-in. OD)

Tool Description (continued)

The Weatherford RV-1 series wireline-retrievable venturi orific valve is a 1-in. nominal outside diameter (OD), wireline retrievable, injection-pressure operated (IPO) gas lift valve. This new operator valve model has an orifice designed according to the geometry.

Weatherford RV-1 valves can be equipped with the Weatherford premium reverse-flow check valve that has a combination modified-PTFE and metal-to-metal seal. These check valves were designed by applying computational flow-dynamics analysis and physical testing to maximize gas-passage capability and erosion resistance.

Options

- This valve can be manufactured using single premium check qualified per Equinor TR2385 requirements

Specifications

Valve Series Model	Assembly Number	Valve OD in. (mm)	Port Size in. (mm)	Upper Connector	Maximum Working Temperature °F (°C)	Check Pressure Rating psi (bar)	Latch	Material
RV-1HV	0139-5NN	1.00 (25.4)	1/8 (3.175) 6/16 (9.375)	11/16-in. – 16 UN-2A	300 (150)	10,000 (690)	BK-2	Monel