C Series Tubing Retrievable, Injection Pressure Operated Gas Lift Valve (1-in. OD)

Simplifies conventional gas lift operations, reduces maintenance, and extends production life

Applications

- Onshore continuous or intermittent gas lift operations
- Onshore wells that require tubing retrievable gas lift mandrels
- The C-1R valve is capable of reverse flow for annular flow applications

Features and Benefits

- Large dome volume for improved operating efficiency and reduced operating costs
- Replaceable floating Monel® or tungsten-carbide seats allow for easy service and reduced maintenance costs
- Associated reverse flow check valve (CV series) prevents reverse flow and avoids costly workover operations
- Double check can be assembled for added protection to ensure gas lift system integrity
- Maximized bellows travel stop prevents stacking and increases lifecycle
- High-performance model is available for high-pressure applications

Tool Description

The Weatherford McMurry-Macco® C series tubing retrievable, injection pressure operated gas lift valve with a 1-in. nominal outside diameter (OD) is installed in gas lift systems for continuous or intermittent gas lift applications.

C series IPO gas lift valves have a nitrogen-charged, dome-and-bellows configuration. The nitrogen charge, located inside the dome, acts on the three-ply Monel bellows to hold the valve in the closed position. The valve opens when the combined forces of the injection pressure (acting on the effective area of the bellows) and the tubing pressure (acting on the area of the ports) exceeds the dome pressure charge of the valve. Upon opening, gas is injected into the production conduit and aerates the fluid column.

C series valves are available in several configurations to meet various application requirements. The C1R valve is similar to the C1 model with the added capability of reverse flow operations.

The Weatherford C Series Tubing Retrievable, Injection Pressure Operated Gas Lift Valve is installed in gas lift systems for continuous or intermittent gas lift applications for reduced maintenance and extended production life.

Weatherford®

C Series Tubing Retrievable, Injection Pressure Operated Gas Lift Valve (1-in. OD)

Options

- CV-1IH check valves have a 3/8-in. (9.53 mm) female hex connection size for mounting valve in PM-1 mandrel in concentric applications
- CV-1HP model is used with high-pressure, gas lift valves
- All C series valves are available in stainless steel or Monel® materials that meet NACE MR0175 requirements
- Special erosion-resistant coatings and a wide variety of standard, chemical-resistant, and high-temperature elastomers are available

Specifications

Valve OD	Ab Effective Bellows Area	Valve Series	Port Size in. (mm)	Ap* Area of Port in. (mm)	Ap/Ab Ratio	1-(Ap/Ab)	PPEF** Ap/Ab 1-(Ap/Ab)
5/8 in. (15.9 mm)	0.12 in. (77.4 mm)	C-3	1/8 (3.18)	0.013 (8.400)	0.111	0.889	0.124
			5/32 (3.97)	0.021 (13.55)	0.170	0.830	0.205
			3/16 (4.76)	0.029 (18.71)	0.243	0.757	0.320
1 in. (25.4 mm)	0.31 in. (200.0 mm)	C-1	1/8 (6.35)	0.013 (8.400)	0.042	0.958	0.044
			5/32 (7.94)	0.021 (13.55)	0.067	0.933	0.072
			3/16 (9.53)	0.029 (18.71)	0.095	0.905	0.105
			1/4 (4.76)	0.052 (33.55)	0.166	0.834	0.199
			5/16 (7.94)	0.080 (51.61)	0.257	0.743	0.346
1-1/2 in. (38.1 mm)	0.77 in. (496.8 mm)	C-2	3/16 (9.53)	0.029 (18.71)	0.038	0.962	0.040
			1/4 (4.76)	0.052 (33.55)	0.067	0.933	0.072
			5/16 (7.94)	0.080 (51.61)	0.104	0.896	0.115
			3/8 (9.53)	0.114 (73.55)	0.148	0.800	0.174
			7/16 (11.11)	0.154 (99.35)	0.200	0.739	0.250

CV Series Tubing Retrievable, Reverse-Flow Check Valve

Provides a simplistic operation for conventional gas lift systems and replaceable floating seat allows reduced maintenance cost and extends life

Applications

- Used to prevent back flow from production fluids from entering gas injection conduit
- CV-1, CV-2 and CV-3 valves are used with gas lift valves and orifice valves
- CV-1R valve (tubing-to-casing model) is used to prevent annuli from filling with liquids during shutdown periods and avoids annulus unloading which shortens the service life of gas lift valves

Features and Benefits

- Dual-seal design provides added protection against backflow and protects the casing from damage to avoid costly workover operations
- Check valves can be screwed together to create a double- or triple-check barrier for additional protection against backflow
- Inconel® spring withstands corrosive and high-temperature conditions to deliver reliable performance and extend the life of the valve
- Standard elastomer seal system enhances pressure-sealing performance
- Monel® and Inconel are registered trademarks of the Special Metals Corporation group of companies
- Prevents fluids from entering casing tubing annulus in tubing flow applications and prevents fluids from entering tubing in annular flow applications
- Prevents the need to repeatedly unload fluids from injection conduit
- Allows the application of pressure to the production conduit for circulation of fluids or acid treatments to formation

Tool Description

The Weatherford McMurry-Macco® CV series reverse-flow check valve is attached to the bottom of gas lift valves or other flow-control devices that do not have an integral check valve to prevent fluid backflow through the valves. Backflow of fluids into the annulus can damage casing, reduce the life of gas lift valves, and possibly create unsafe wellbore conditions.

CV Series Tubing Retrievable, Reverse-Flow Check Valve provides a simplistic operation for conventional gas lift systems and protects against backflow.

CV Series Tubing Retrievable, Reverse-Flow Check Valve

Tool Description (continued)

When the gas lift valve is open, the upstream pressure (typically casing) on the check valve is higher than the downstream pressure (typically tubing). The higher upstream pressure depresses the spring-loaded dart to allow the injection gas to flow through the check valve and into the production tubing. If the downstream pressure is greater than the upstream pressure, flow across the check dart causes the dart to seat and prevents backflow.

CV series check valves utilize a dual-seating seal system for added protection against backflow. A soft-seal ring contacts first, then as differential pressure increases, a metal-to-metal seal is established. When the tubing pressure meets the bottom of the check, the elastomer seal is established. As the differential pressure increases, a metal-to-metal seal is formed for additional protection. This prevents annulus fill up during shutdown periods so re-unloading of annulus liquid is not necessary and allows the application of pressure to the tubing for acidizing or circulation.

Options

- CV-1IH and CV-1IHR models have connection size 3/8-in. (9.53-mm) female hex for mounting valve in PM-1 mandrel in concentric applications
- CV-1IHR model is suitable for concentric annular flow applications
- CV-1HP model is used with high pressure gas lift valves like the CH model
- Standard material is 316 stainless steel, but optional Monel and Inconel materials are available for highly corrosive environments

CV Series Tubing Retrievable, Reverse-Flow Check Valve

Specifications

Assembly Number	4301-xxx	*4302-xxx	4303-xxx	4304-xxx	*4305-xxx	*4305-1xx
Check Valve Model	CV-1	CV-1-IH	CV-2	CV-3	CV-1-IHR	CV-1-IHRFT
Valve OD	1-in. (25.40 mm)	1-in. (25.40 mm)	1-1/2-in. (38.10 mm)	5/8-in. (15.88 mm)	1-in. (25.40 mm)	1-in. (25.40 mm)
Equivalent Port Diameter	20/64-in. (7.94 mm)	20/64-in. (7.94 mm)	1/2-in. (12.70 mm)	1/4-in. (6.35 mm)	13/32-in. (10.32 mm)	13/32-in. (10.32 mm)
Connection to Mandrel	1/2-in. (12.70 mm) M-NPT	1/2-in. (12.70 mm) M-NPT	1/2-in. (12.70 mm) M-NPT	1/4-in. (6.35 mm) M-NPT	1/2-in. (12.70 mm) M-NPT	1/2-in. (12.70 mm) M-NPT
Connection to Valve	1/2-in. (12.70 mm) F-NPT	1/2-in. (12.70 mm) F-NPT	1/2-in. (12.70 mm) F-NPT	1/4-in. (6.35 mm) F-NPT	7/8-in. (22.23 mm) M-14 TPI	1/2-in. (12.70 mm) F-NPT
Injection Flow	Annulus to Tubing	Tubing to Annulus	Annulus to Tubing	Annulus to Tubing	Annulus to Tubing	Annulus to Tubing

*Connection has a 3/8-in. (9.53 mm) female hex for mounting in PM-1 mandrel

CV-SO Series Tubing Retrievable, Orifice Choke Valve

Provides communication between the tubing and annulus to control the volume and a more accurate flow rate

Applications

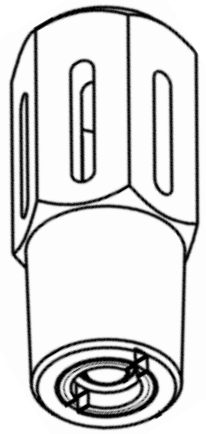
- Suitable for single-point injection for both concentric and/or tubing fixed applications

Features and Benefits

- Orifice valves are the first valved placed into the well
- Large variety of choke inserts allow for more precise gas injection rates from 2/16-in. to 5/16-in. on increments of 1/16-in.
- Standard material is 316 stainless steel
- Added protection against backflow by utilizing check valves to provide a dual-seating seal system
- Check valves can be easily assembled for added protection to ensure gas lift system integrity
- CV-1, CV-2 and CV-3 valves are used with orifice valves

Tool Description

The tubing retrievable CV-SO choke insert allows communication between the tubing and the tubing/casing annulus and controls the volume and flow rate of gas through the valve more precisely. Choke valves have a threaded connection with a slotted body to build a slotted orifice assembly.



CV-SO Series Tubing Retrievable, Orifice Choke Valves provide communication between the tubing and the tubing/casing annulus and controls the volume and flow rate of gas through the valve more precisely.

CV-SO Series Tubing Retrievable, Orifice Choke Valve

Options

- Optional Monel® material is available for highly corrosive environments
- CV-SO choke valve optional concentric annular flow applications come with an internal hex already machined of 3/8-in. diameter
- Wider slots are only required for 316SS choked with 0.313-in. ports or larger and 1/4-in. NPT connection

Specifications

Assembly Number	Check Valve Model	Valve OD in. (mm)	Equivalent Port Diameter in. (mm)	Connection
4307-xxx	CV-SO	1.00 (25.40)	1/8 (3.18)	1/2-in. M-NPT
			5/32 (3.96)	
			3/16 (4.78)	
			7/32 (5.56)	