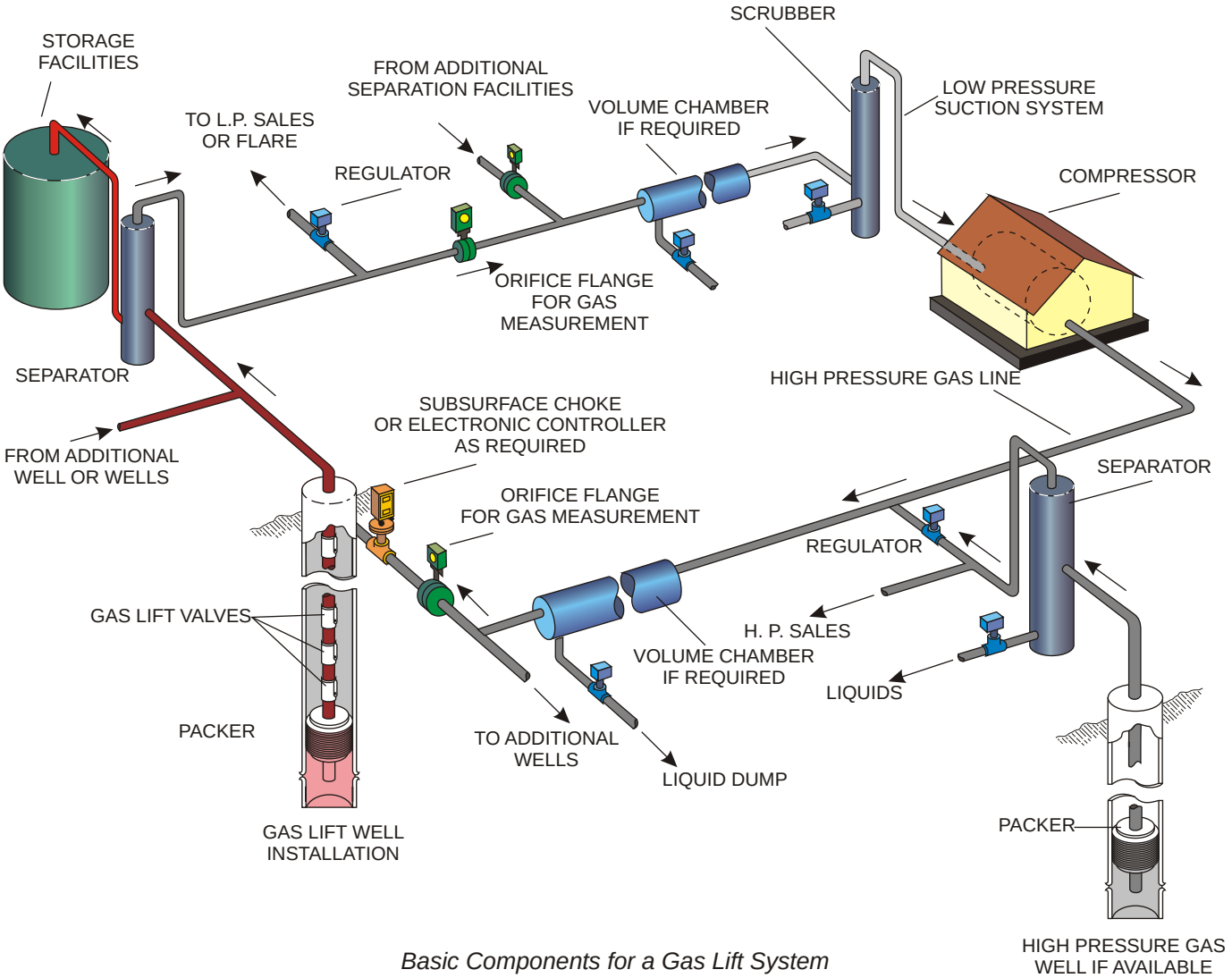
COMPLETION SYSTEMS

In order to boost production from wells, which do not flow at all or do not flow at optimum level, artificial system using a variety of methods are used. These methods use Gas Lift, Plunger Lift, Chamber Lift, Rod Pumps, Submersible Pumps and so on. PARVEEN 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.

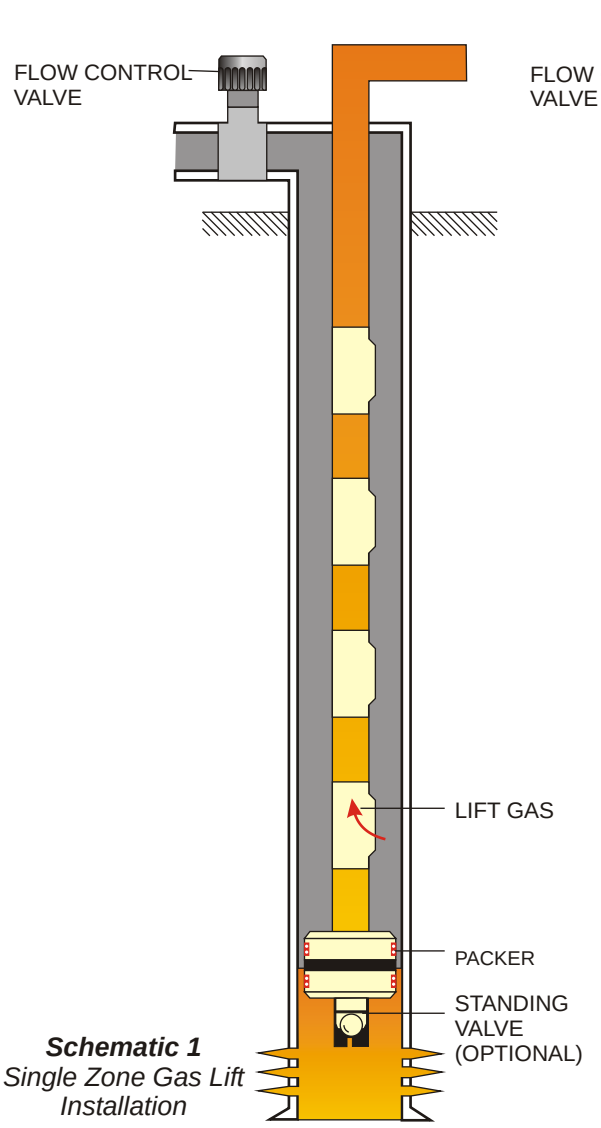


Basic Components for a Gas Lift System

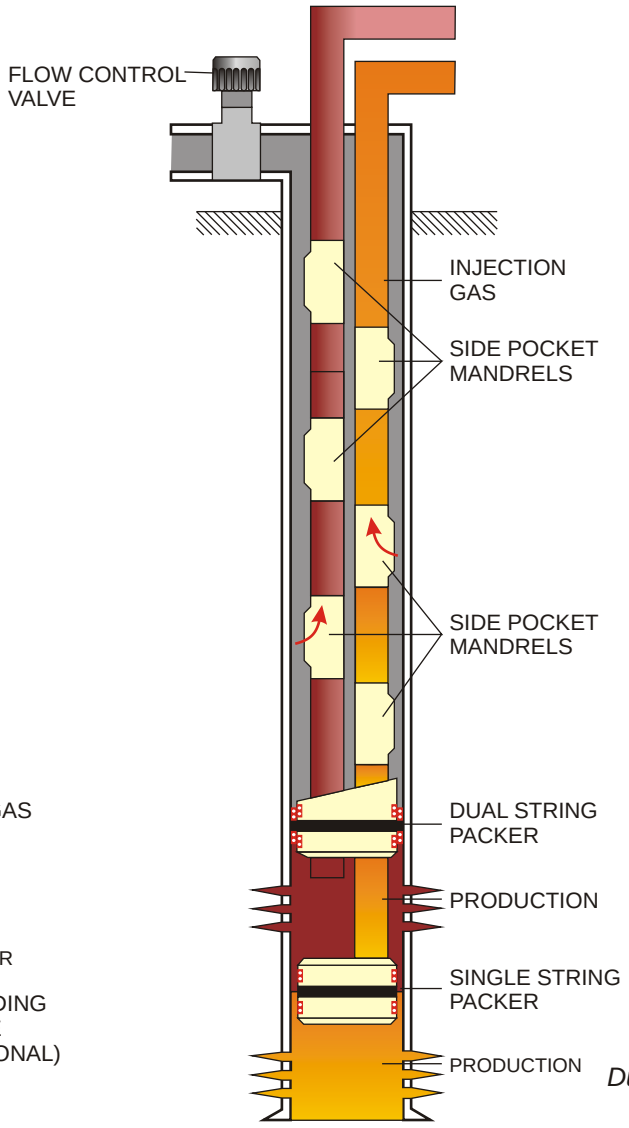
COMPLETION SYSTEMS

Schematic 1- The single string Gas lift completion for intermittent lift applications utilizes a standing valve near 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.

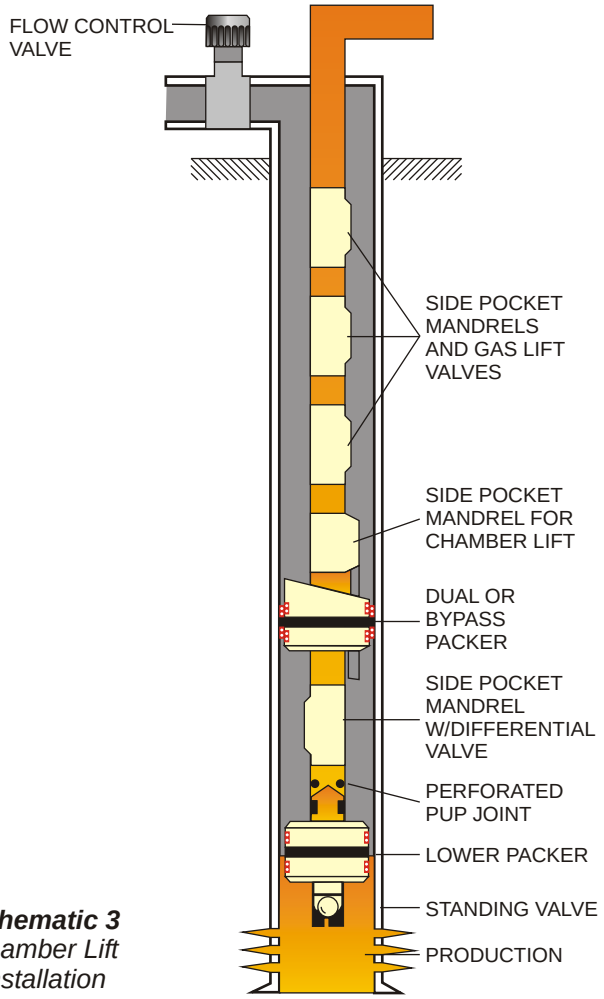


Schematic 1
Single Zone Gas Lift Installation

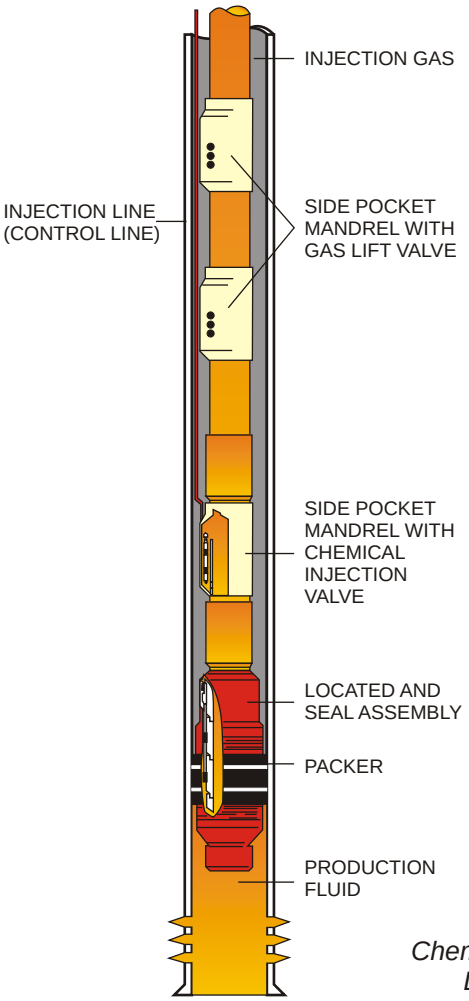


Schematic 1
Dual String Gas Lift Installation

COMPLETION SYSTEMS



Schematic 3
Chamber Lift Installation



Schematic 4
Chemical Injection/Gas Lift Installation

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 allow 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.

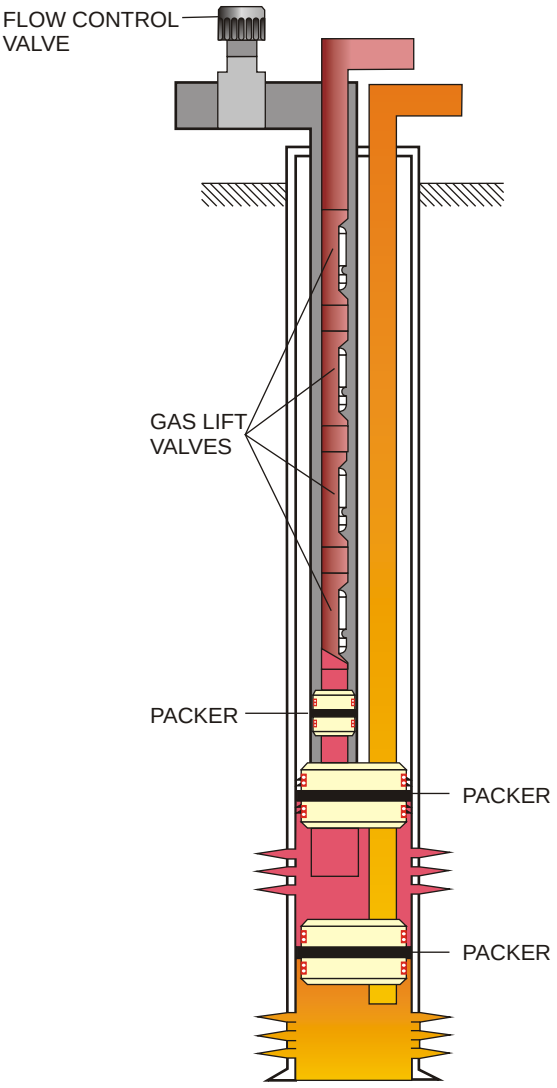
If properly planned, a chamber lift system permits a larger volume of fluid to be produced by intermittent lift from wells with a high productivity index and low-to medium bottom hole pressure.

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.

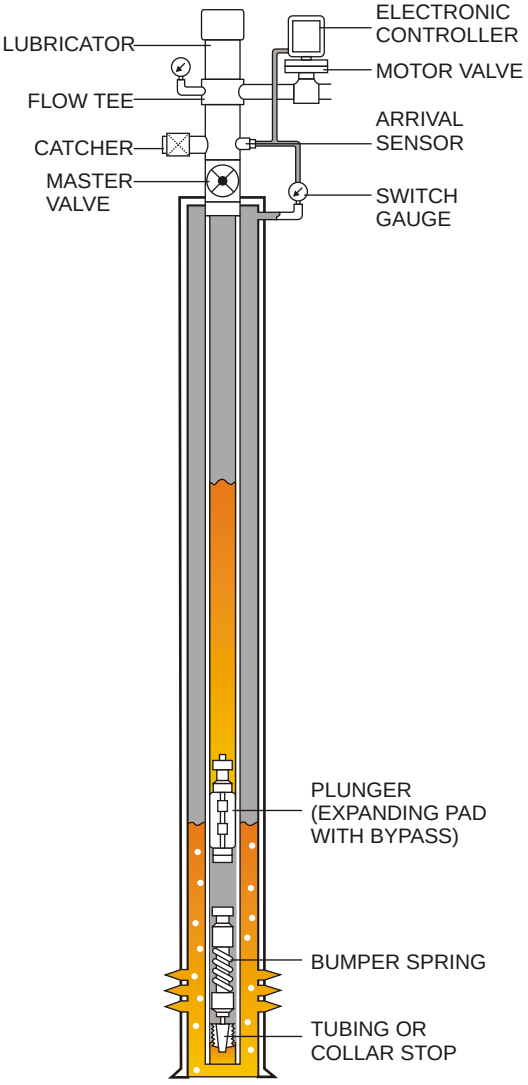
COMPLETION SYSTEMS

Schematic 5 - Macaroni tubing installation work well in either intermittent or continuous Gas Lift System. Essentially the installation is 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

INJECTION PRESSURE OPERATED GAS LIFT VALVE

DESCRIPTION

Parveen N Series Valves utilize a nitrogen charged dome and bellow configuration designed for either continuous or intermittent flow applications. They are especially suitable for use as unloading and operating valves in areas where high gas lift pressures are available. Since the charge pressure above the bellows is affected by temperature, it is important that the operating temperatures at the valve be known. These valve 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, make this valve series appropriate for a wide range of operating conditions.

Reversible seat available in several different materials.

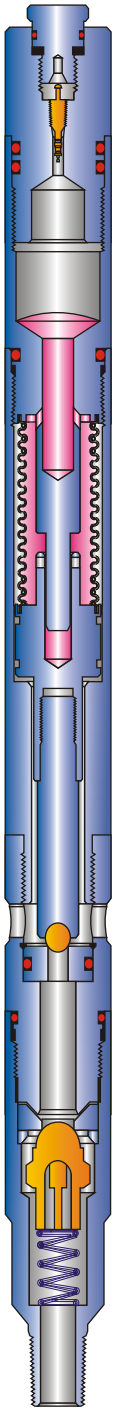
OPERATING PRINCIPLE

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.

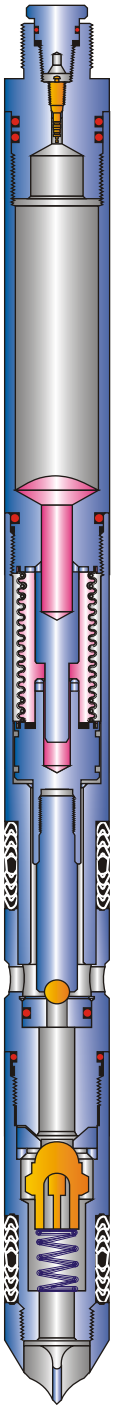
ENGINEERING DATA FOR INJECTION PRESSURE OPERATED VALVES

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” or 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
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, KBG
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, KBG

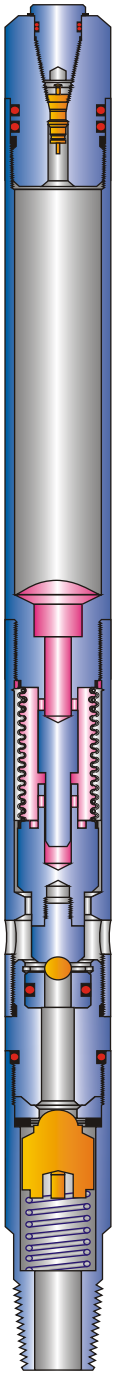
INJECTION PRESSURE OPERATED GAS LIFT VALVE



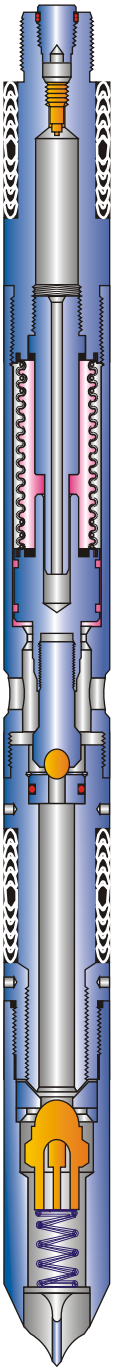
N-90



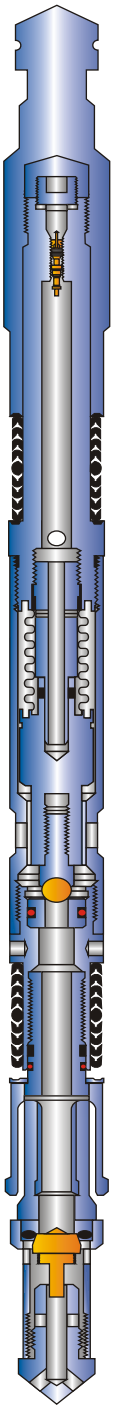
N-90R



NM-90



NM-90R



PBK-1

PROPORTIONAL RESPONSE GAS LIFT VALVES

L SERIES VALVES

PARVEEN L Series Valves are temperature independent, wireline-retrievable, spring-loaded throttling type valves designed for continuous flow gas lift applications. These valves are designed to help adjust the required gas injection rate in response to changes in the tubing pressure at the valve, injecting more gas for a heavy gradient fluid than for a light gradient fluid. This proportional response allows the injection of the optimum volume of gas to maintain the desired fluid lifting capabilities of the installation.

BENEFITS OF DESIGN PRINCIPLE

- Predictable proportional response operating characteristics of this design, permit the optimum volume of gas to pass from the annulus to the tubing in response to fluctuations in production pressure.
- Hydrostatic and vibration protection for the Monel bellows assembly increases valve service life.
- Tungsten carbide ball and seat are designed to minimize erosion and maintain positive closure of the valve.
- Large diameter back check valve is designed with resilient seals to provide protection from intrusion of production fluids into annulus.
- Utilizes full operating gas pressure to the bottom valve.

STANDARD SERIES MODELS

LM-16R : 1-inch diameter wireline-retrievable valve for installation in a TMP Mandrel with BK-2 or M Latch.

L-12R : 1 ½ - inch diameter wireline-retrievable valve for installation in a TP Mandrel with a TG, RK, RM or T2 Latch.

LN SERIES VALVES

PARVEEN LN Series Valves are wireline-retrievable throttling type valves designed for high gas volume and high pressure continuous flow installations. A specialized bellows design allows for very high valve set pressures and improved throttling characteristics. The proportional response capabilities, determined by dynamic flow tests of these valves, enable design engineers to calculate accurately the gas injection volumes to be achieved throughout the anticipated range of operating conditions of the well.

BENEFITS OF DESIGN PRINCIPLE

- Predictable proportional response operating characteristics of this design, permit the optimum volume of gas to pass from the annulus to the tubing in response to fluctuations in production pressure.
- Hydrostatic and vibration protection for the Monel bellows assembly increases valve service life.
- Valve closing pressures can be set to 2500 psi.
- LN- 21R valve can inject maximum gas volumes of over 10 mmcf/d.
- Tungsten carbide ball and seat are designed to minimize erosion and maintain positive closure of the valve.
- Large diameter back check valve is designed with resilient seals to provide protection from intrusion of production fluids into annulus.

STANDARD SERIES MODELS

LN-21R: 1 ½ inch wireline-retrievable, proportional response valve for a TP Mandrel with a TG, RK, RM or T2 Latch.

LNM-31R: 1 inch wireline-retrievable, proportional response valve for a TMP Mandrel with a BK-2 or M Latch.

PILOT - OPERATED GAS LIFT VALVES

DESCRIPTION

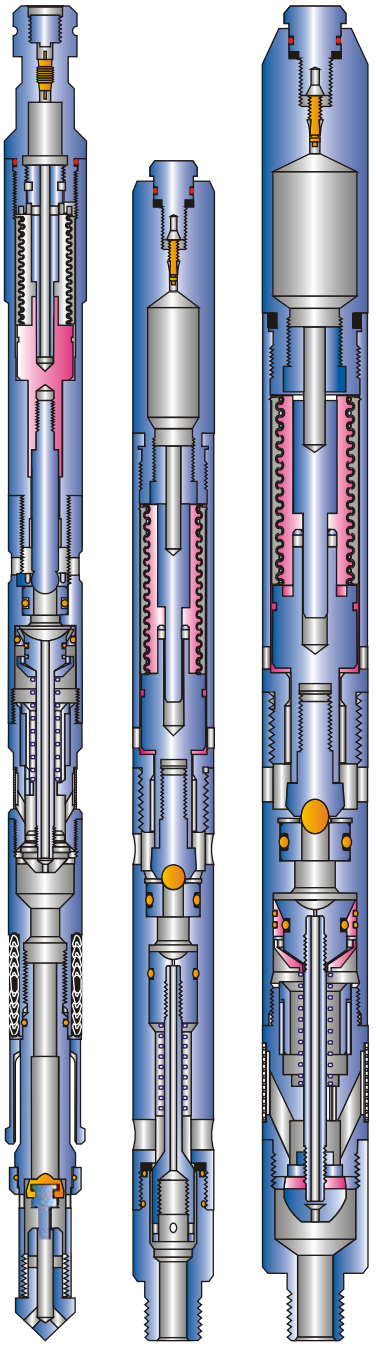
The PARVEEN Conventional Pilot Valve (1"&1.1/2"O.D) and Retrievable Pilot Valve(1"O.D.) consists of a pilot section and a power section.This valve utilizes a pilot section to activate a power section. A sealed chamber, including a multiply monel bellow, contain a nitrogen pressure charge over a dampening fluid which provides the closing forcenecessary 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 precharged 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 andproductionfluidpressure,working on the annulus area between the power piston and port areas overcomes the spring closing force ofthe 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 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 requiredbut injection gas must be controlled by a choke to prevent surface gas system pressure fluctuations.



PPK-1 *PBP* *PCP*

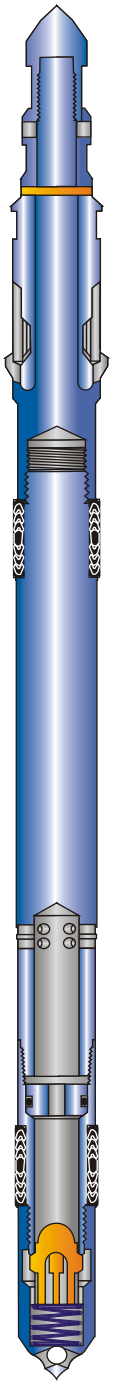
ENGINEERING DATA FOR RETRIEVABLE PILOT OPERATED GAS LIFT VALVE.

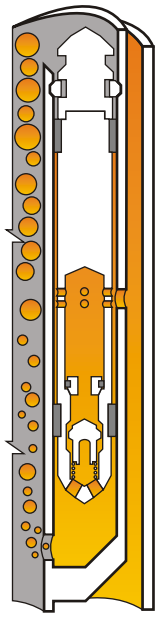
Type	Assly Number.	Nominal O.D. (Inch)	Latch	Running Tool		Pulling Tool		Mandrel Series.
				Type	Assly No.	Type	Assly No.	
PPK-1	140-20 -XX-XXX -01	1	Integral Bottom	GA-2	—	MP	11361	TMP, KBM, KBMG, KBG.

ENGINEERING DATA FOR CONVENTIONAL PILOT OPERATED GAS LIFT VALVE.

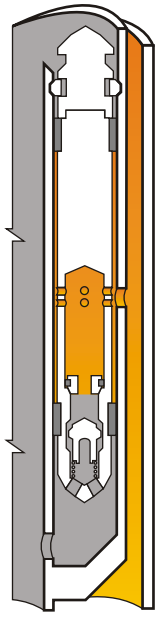
Type	Assly Number.	Nominal O.D. (Inch)	Connecting Thread
PBP	140-20 XX-XXX -00	1	1/2”- 14 NPT
PCP	140-10 XX-XXX -00	1-1/2	1/2”- 14 NPT

O SERIES ORIFICE VALVES





VALVE OPEN



VALVE CLOSED

PARVEEN O Series valves are designed for circulating operations and provide means for communication between the tubing and the tubing/casing annulus.

BENEFITS OF DESIGN PRINCIPLE

- Cv values 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.

OPERATING PRINCIPLE

This valve series design utilizes an orifice (choke) as well as a back check valve for continuous flow operations. Injection fluid or gas enters through the entry ports and through an orifice. Injection pressure moves the back check valve off seat allowing gas or fluids to enter into the tubing. Reverse flow pushes the check valve on seat to prevent flow into the casing.

For injection of fluids or gas from the tubing to the tubing/casing annulus, the design can be modified by replacing the upper packing elements with a spacer. This allows the flow to enter from the top, passing through the valve via the back check and out the bottom of the valve and into the tubing/casing annulus. With this configuration, the valve is installed in a mandrel with a type S pocket which has no ports between the seal bore and vents to the casing/tubing annulus.

Orifice sizes available for this valve design range from 1/8 through 7/16 inch in the 1 inch. size and from 1/8 through 51/64 inch in the 1 ½ inch size, thus making them suitable for a wide range of operating conditions.

ENGINEERING DATA FOR ORIFICE VALVES

Type	Assy. No.	Norminal OD (inch)	Packing OD (inch)		Port Size (inch)		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	51/64	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	51/64	TFA, PKP	RTG, TER	PTG, TRP	TP

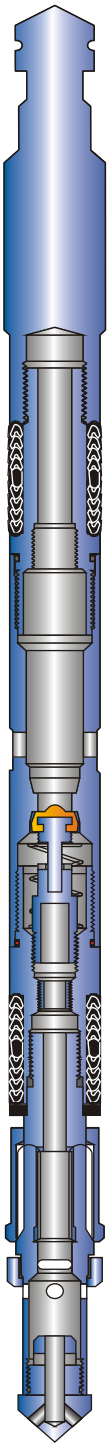
PKO GAS LIFT ORIFICE VALVE

DESCRIPTION

The PARVEEN (Model PKO) retrievable single point injection gas lift orifice valve s are used for continuous tubing flow gaslift 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.

The valve can be installed in Parveen TM series Side Pocket Mandrel&have an integral bottom latch which locks the valve in the side pocket mandrel. After locatingthe valve in the side pocket mandrel, downward jarring is required which causes the collet dogs of the latch to engage the lock in the recess provided at the bottom of the Side Pocket. Upward jarring is required to pull the valve.Upward jarring shears the brass shear pin securing the shear ring to the latch body. During upward pulling of the valve in the side pocket the shoulder on the latch body moves out from behind the collet dogs.The collet fingers are deflected inward and disengage from the locking recess of the mandrel pocket. Then the valve is removed from the well.

Injection gas enters thru the external ports of the orifice valve from annulus between casing & tubing. 2 sets of packing located at the top & bottom of external ports on the valve seals across the ports in side pocket mandrel.The injection gas travels through the choke, past the reverse flow check valve and finally into the production conduit.



PKO GAS LIFT ORIFICE VALVE

ENGINEERING DATA FOR PKO GAS LIFT ORIFICE VALVES.

Type	Assly Number.	Nominal O.D. (Inch)	Latch	Running Tool		Pulling Tool		Mandrel Series.
				Type	Assly No.	Type	Assly No.	
PKO	130-30 XX-XXX -01	1	Integral Bottom	MR-01	10336-01	MP	11361	TMP, KBM, KBMG, KBG.

WIRELINE RETRIEVABLE SUPER FLOW ORIFICE VALVE

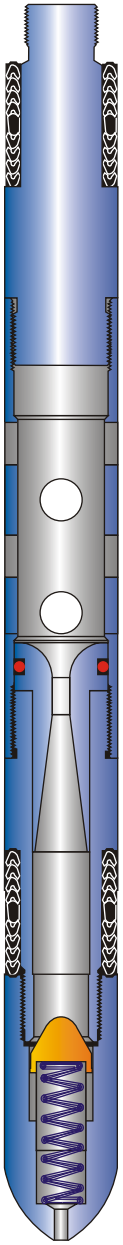
DESCRIPTION

Parveen 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.

Parveen super flow orifice valve achieve maximum flow with less pressure drop w.r.t conventional orifice valves. The injection rate from new orifice valve is almost constant because the valve operates in maximum flow mode. Therefore the injection volume does not depend upon tubing pressure. In comparison with this feature, the injection volume thru conventional orifice valve is unstable be cause of the tubing pressure effect.

OPERATION

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



RETRIEVABLE SUPER FLOW ORIFICE VALVE

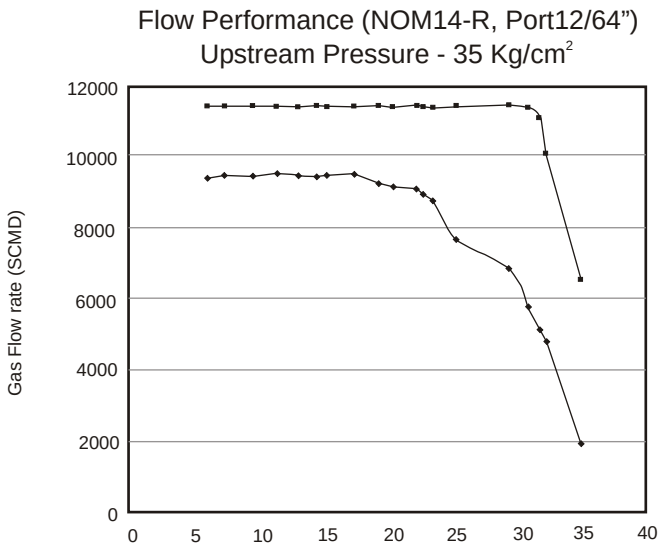
ENGINEERING DATA FOR RETRIEVABLE SUPER FLOW ORIFICE VALVE

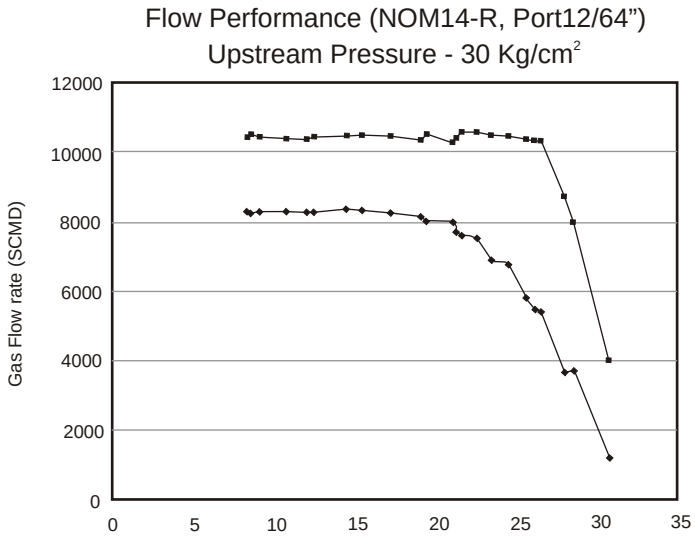
Type	Assy. Number	Nominal O.D. (Inch)	Packing O.D. (Inch)		Port Size (Inch)		Latch or End Conn.	Running Tool Type	Pulling Tool Type	Mandrel Type
			Upper	Lower	Min.	Max.				
NOM 14R	N150-04	1	1-1/32	1-1/32	1/8	5/16	BK-2,M	MR	MP	TMP
NO 20R	N150-12	1-1/2	1-9/16	1-1/2	1/8	51/64	TG,RK,RM	RTG, TER	PTG, TRP	TP

FLOW CHARACTERISTICS OF SUPER FLOW ORIFICE VALVE

Parveen has Successfully developed after conducting extensive in house research Super Flow Orifice Valve which is a one step ahead of Conventional Orifice Valve available in the market. It's performance is dynamically tested by Institute of Oil & Gas Production Technology, ONGCL, Panvel, Mumbai, India.

Flow Performance Curve of NOM - 14R Orifice Valve (Port - 12/64") against different Upstream Pressures i.e. 30 Kg/cm^2 & 35 Kg/cm^2 are depicted below and comparison with Conventional Square Edge Orifice Valve are also shown below.





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 Conventional Orifice Valve.

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

PDO-5 GAS LIFT ORIFICE VALVE

DESCRIPTION

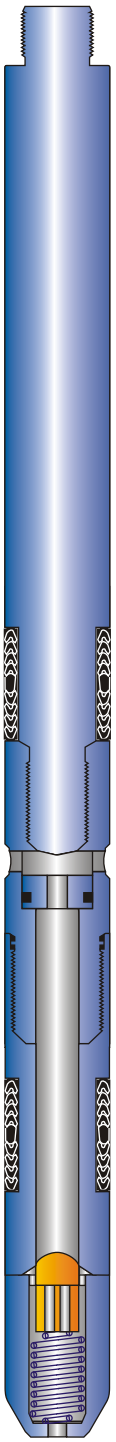
The PARVEEN(Model PDO-5)1.1/2" O.D. retrievable single point injection gas lift orifice valves are used for continuous tubing flow gas lift installations.It is used to control the flow of gas between the casing/tubing annulus and the tubing at valve depth.The valve has a check dart controlled by a spring which does not allow the backflow of gas or well fluids.

An integral floating choke controls the flow of gas through this valve (which is open normally) into the production conduit.This valve is available from 3/16" to 3/4"port sizes in 1/16" increments.

This valve design utilizes an orifice (choke) as well as a back check valve for continuous flow operations. Injection fluid or gas enters through the entry ports and through an orifice. Injection pressure moves the back check valve off seat allowing the gas or fluids to enter into the tubing. Reverse flow pushes the check valve on seat to prevent flow into the casing.

ENGINEERING DATA FOR PDO-5 GAS LIFT ORIFICE VALVE.

Type	Assly Number.	Nominal O.D. (Inch)	Latch	Running Tool		Pulling Tool		Mandrel Series.
				Type	Assly No.	Type	Assly No.	
PDO-05	150-30 XX-XXX -01	1.1/2	R, RA, RK.	RTG TER	16927 11730	PTG TRP	17048 11390	TP, MMA, MMG.



PDO-5 GAS LIFT ORIFICE VALVE

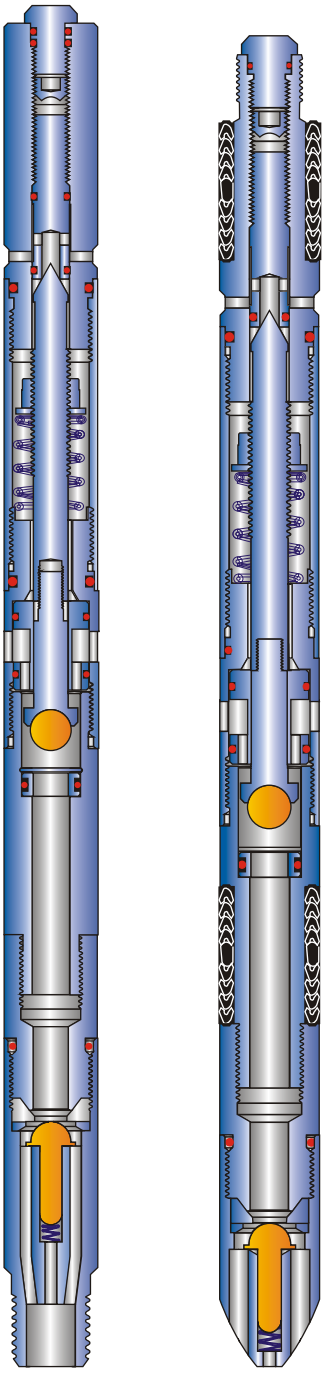
DIFFERENTIAL VALVE

DIFFERENTIAL VALVE

This valve is used as the bleed valve in chamber lift installation for bleeding the tail chamber gas from the chamber, which allows for the formation to refill the chamber. The valve is normally open and closes when differential pressure closes against the calibrated spring.

FUNCTION

When chamber is empty, there is a reduction in chamber pressure. Due to this differential, valve opens which allows the passage of gas from the top of chamber and prevents trapping of gas in top of the chamber. When gas pressure on the top of the liquid in the chamber increases, the spring compresses & valve closes.

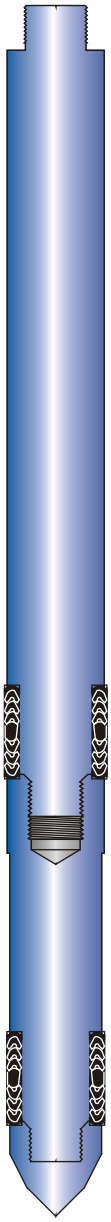


PDV *PDV-R*

ENGINEERING DATA FOR DIFFERENTIAL VALVE

Type	Assy. Number	Nominal O.D. (Inch)	Packing O.D. (Inch)		Latch or End Conn.	Running Tool Type	Pulling Tool Type	Mandrel Type
			Upper	Lower				
PDV	160-1024-320-00	1	1-1/32	1-1/32	-	-	-	Series -12
PDV-R	160-1024-320-01	1	1-1/32	1-1/32	BK-2, M	MR	MP	TMP

DUMMY AND EQUALIZING VALVES



1½ inch Dummy Valve

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. They are available in 1 and 1½ inch sizes.

ED Series Equalizing Valves with integral latches are designed to equalize tubing and casing pressure and or to circulate prior to pulling the valve. They are also available in both 1 and 1½ inch sizes.

To equalize pressure, a pulling tool pushes the inner core downward, shearing a pin and allowing circulation or equalization. When the core moves down, the pulling tool collets latch over the fish neck and the valve is pulled in the usual manner. This tool is designed so that both equalizing and pulling operations can be performed in one wireline run. It is also possible to leave the valve in the side pocket mandrel for continued circulation. This is accomplished by shearing down on the inner core with a special tool. The valve may be pulled out at a later date with a standard pulling tool.

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.

DT-14R: 1½ inch wireline-retrievable, high-temperature dummy valve for TG or TP Mandrels with TG, RK, RM and T2 Latches.

DTM-14R: 1inch wireline-retrievable, high-temperature dummy valve for TMP Mandrels with BK-2 and M Latches.

- **ED-30R:** 1½ inch wireline-retrievable equalizing dummy valve for TG or TP Mandrels with an integral Latch.
- **EDM-30R:** 1 inch wireline-retrievable equalizing dummy valve for TMP Mandrels with an integral BK-2 Latch.
- Both of these valves may be equalized and pulled with one wireline run.

ENGINEERING DATA FOR D & ED SERIES DUMMY VALVES

Type	Assy. No.	Nominal OD (inch)	Packing OD (inch)		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
DT 14R	170	1-1/2	1-9/16	1-1/2	TG, RK, RM T-2	RTG, M, TER	PTG, TRP	TP
DTM 14R	170-02	1	1-1/32	1-1/32	BK-2, M	MR	MP	TMP
ED 30 R	170-XXX	1-1/2	1-9/16	1-1/2	TGP, RKP, TFA	RTG, TER	PTG, TRP	TP
EDM 30 R	170-08	1	1-1/32	1-1/32	BKP	MR	MP	TMP

PDK-1 WIRELINE RETRIEVABLE DUMMY VALVE

FUNCTION

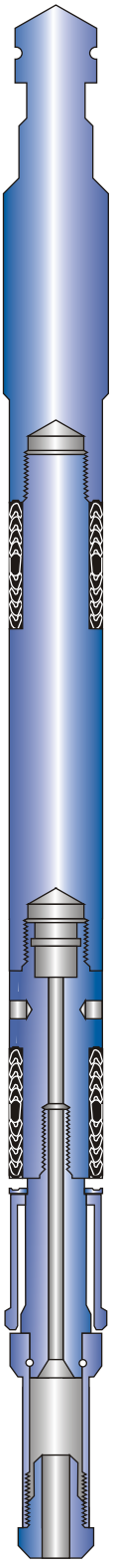
The PARVEEN wireline Retrievable Dummy Valves (PDK -1) have 2 sets of packing which fit in the seal bore of side pocket mandrel and isolate the casing ports between tubing and casing annulus. In other words the valves are used to prevent communication between the tubing and the casing.

APPLICATION

These Valves are used in side pocket mandrel to provide a positive seal between casing - tubing annulus and to protect the mandrel seal bore until they are retrieved by standard wireline methods. When installed, the PDK-1 Dummy Valves eliminates unintentional placement of the other tools or debris in the mandrel pocket.

ENGINEERING DATA FOR WIRELINE RETRIEVABLE (PDK-1) DUMMY VALVES.

Type	Assy. Number	Nominal O.D. (Inch)	Packing O.D. (Inch)		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



PDK-1

RETRIEVABLE PRODUCTION - PRESSURE OPERATED GAS LIFT VALVES

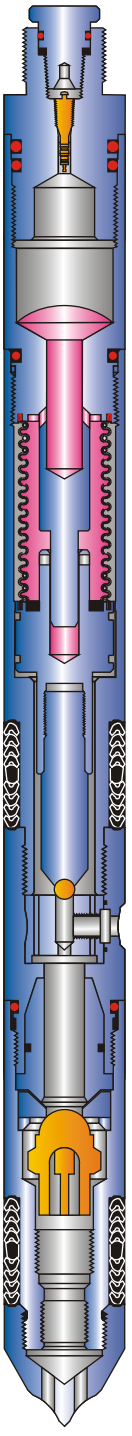
DESCRIPTION

Parveenwireline retrievable production pressure operated GLV's areusedforcontinuous flow gas lift production. A nitrogen charged multiply monel bellow provides the force necessary to maintain valve in a normally closed position.This valve contain integral reverse flow check valve.

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

OPERATION

Production fluid enters the valve and acts on the effective bellow area.The production pressure necessary to compress the bellow is controlled by precharged nitrogen pressure.Whenproductionpressure overcomesthe precharged nitrogenpressure in the bellow, the bellow is compressed and lifts the stem tip off the seat.Injection gas flows through the seat, past the reverse flow check valve and into the production conduit.



PR-5
GAS LIFT VALVE

ENGINEERING DATA FOR RETRIEVABLE PRODUCTION-PRESSURE VALVE .

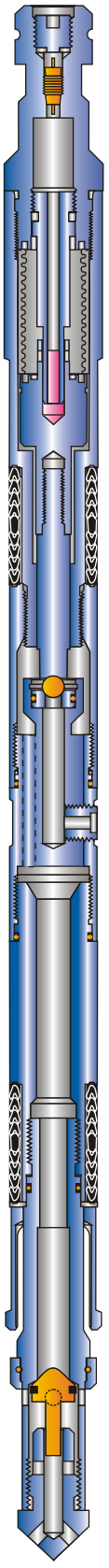
Type	Assly Number.	Nominal O.D. (Inch)	Latch	Running Tool		Pulling Tool		Mandrel Series.
				Type	Assly No.	Type	Assly No.	
PR 5	160-40 XX-XXX -01	1.1/2	R, RA, RK.	RTG, TER	16927 11730	PTG, TRP	17048 11390	MM, MMA, MMG.

RETRIEVABLE PRODUCTION - PRESSURE OPERATED GAS LIFT VALVES

DESCRIPTION

PARVEEN 1" OD PBK-2 is retrievable, production pressure operated Gas Lift Valves which is used in continuous flow gas lift installations. The PBK-2 valve is bellow actuated with nitrogen gas which normally keep the valve in closed position. This valve is having integral reverse flow check valve crossover seat & floating seat. Port sizes available are 1/8", 3/16" and 1/4". Optional choke is also available with this type of valve which can be easily fitted to the external surface of the valve and can be easily removed. The valve can be installed in Parveen TMP series Side Pocket Mandrel & have an integral bottom latch which locks the valve in the side pocket mandrel. After locating the valve in the side pocket, downward jarring is required which causes the collet dogs of the latch to engage the locking recess provided at the bottom of the side pocket. Upward jarring is required to pull the valve. Upward jarring shears the brass shear pin securing the shear ring to the latch body. During upward pulling of the valve in the side pocket, the shoulder on the latch body moves out from behind the collet dogs. The collet fingers are deflected inward and disengage from the locking recess of the mandrel pocket. Then the valve will be free in the pocket of the mandrel and can be removed.

Production pressure enters through the valve nose and passed upward through cross over seat. The production pressure acts on the effective bellow area. As production pressure overcomes the pre-charged nitrogen pressure in the bellows, the bellow compressed and lifts the stem off the seat. The injection gas then flows through the seat, past the reverse flow check valve and into the production conduit. If the injection gas pressure in the casing & tubing annulus at valve depth falls bellow the valve set pressure, the valve is closed. Reverse flow through the valve is prevented by a check dart in the valve body.



PBK-2
GAS LIFT VALVE

ENGINEERING DATA FOR RETRIEVABLE PRODUCTION-PRESSURE OPERATED VALVES.

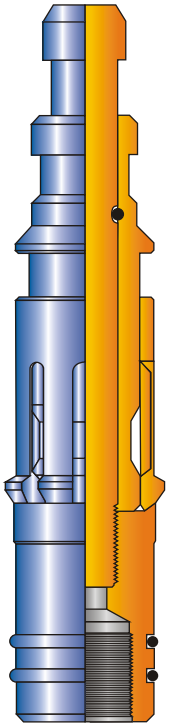
Type	Assly Number.	Nominal O.D. (Inch)	Latch	Running Tool		Pulling Tool		Mandrel Series.
				Type	Assly No.	Type	Assly No.	
PBK-2	160-40 XX-XXX -01	1	Integral Bottom	MR-01	10336-01	MP	11361	TMP, KBM, KBMG, KBG.

LATCHES

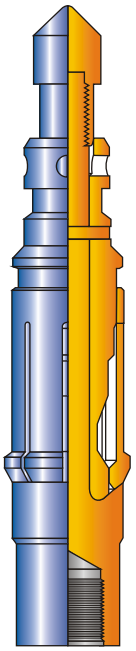
Latches are available in a wide range of designs for use with retrievable gas lift and circulation valves to be installed in side pocket mandrels. These latches are designed to be installed with a minimum of force, a feature very important in deviated wells where forceful downward jarring may be difficult. Side pocket mandrels feature two types of pocket latch profiles: the G-type which has a 180-degree eccentric latch ring profile with the no-go surface located near the lower end of the latch; and the A-type which has a 360 degree latch profile with the no-go surface above the locking mechanism, Latches used in each of these profiles are not interchangeable; however, valves and other flow control devices can be adapted from one profile to the other by selecting the correct latch.

1 ½ inch TG and 1 inch M Latches are designed for installation in G-type pocket mandrels. A set of collet type locking dogs are free to move up and into a recess in the locking mandrel as the latch engages the pocket profile. When an upward pull is exerted on the latch, the full diameter of the locking mandrel moves behind the dogs which locks them in the set position. To retrieve the valve and latch, an upward force is applied, which shears a pin. This action moves the locking the mandrel up, which frees the dogs to retract as the valve and latch are pulled.

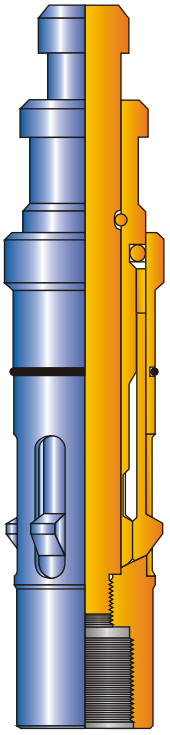
1 ½ inch T2 Latches are designed for installation in A-type pocket mandrels. They utilize a set of collet type locking dogs configured inside a slotted sleeve. As the latch enters the pocket, the dogs move up and into a recess the locking mandrel. After reaching the no-go position, an upward pull causes the dogs to move over the locking mandrel and lock into the pocket recess. To release the locking dogs, an upward force is applied which shears a pin, moving the locking mandrel up. The latch and valve are then free to be retrieved.



1 1/2 - INCH TG LATCH



1 - INCH M LATCH

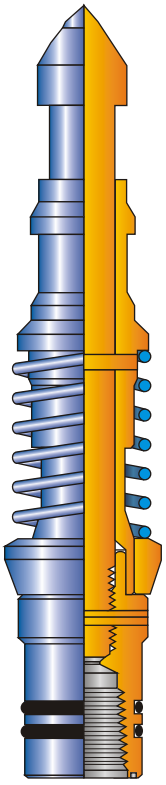


1 1/2 - INCH T2 LATCH

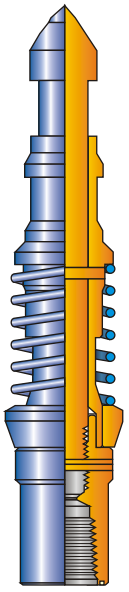
LATCHES

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.

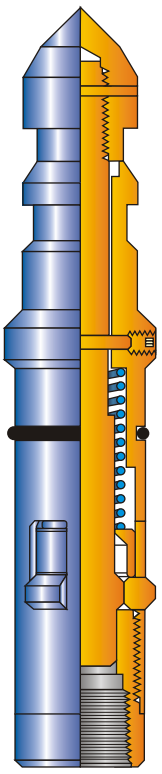
1 ½ inch RM Latches are designed for installation in A-type pocket profile mandrel. They have a set of spring-loaded locking dogs designed to move up into a recessed area on the latch core when run into the latch profile of the mandrel. The valve is lowered into the pocket until the no-go shoulder is 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 1/2 INCH BK - 2 LATCH



1 1/2 INCH RM LATCH

ENGINEERING DATA FOR LATCHES

Type	Part No.	Pulling Neck OD (inch)	Running Neck OD (inch)	Max OD (inch)	Side Pocket Accessory OD (inch)	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

SIDE POCKET MANDREL

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

MATERIALS :

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

FORGINGS :

Pockets & tool discriminators are closed die forged and are integral part of the pocket. Swages are forged from seamless mechanical tubing or it can be machined from solid bar stock. Forgings are made by using a precision closed die process. All forged parts are visually and dimensionally inspected by Quality Control before machining.

MACHINING :

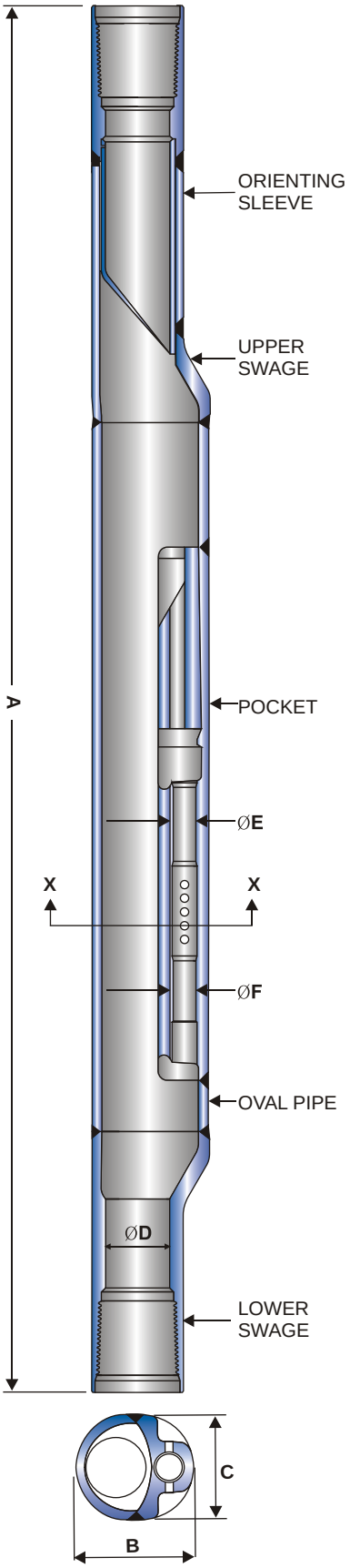
Pockets are machined using deep hole drilling & boring process that provides accurate polished bore diameters, alignment and better surface finish for packing seals. The swages are machined with precision accuracy. Threads are machined asper design specification. All components are dimensionally inspected.

WELDING HEAT TREATMENT :

Welding is done asper ASME Section VIII & IX with the use of proper welding electrodes. Full penetration welds take place when joining the swages and forged pocket are welded to the oval pipe. After welding, all external weld deposits are evenly grounded down to match the outside profile. All mandrels are heat treated, Quenched & Tempered to 18-22 HRC, for corrosive service and 24-38 HRC for standard service application.

ASSEMBLED MANDREL :

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



View- XX
TP Series Mandrel for
1-1/2" OD Valve (Welded Swages)

SIDE POCKET MANDREL

ENGINEERING DATA FOR SIDE POCKET MANDRELS											
Tubing Size (Inch)	Valve OD (Inch)	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

SIDE POCKET MANDREL

TMP and TP Series Side Pocket Mandrel :

PARVEEN TMP and TP Series Side Pocket Mandrels are consisting 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 :

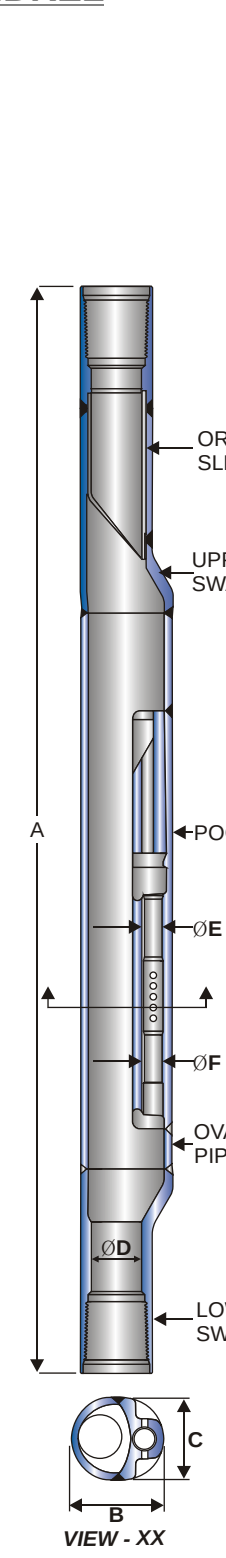
These mandrels are used in annulus flow applications in which a snorkel functions as an exhaust port. Snorkel located at the bottom of the side pocket, extends downward into casing annulus. The holes in the mandrel side pocket directly communicate with the tubing. High pressure gas injected into the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

TMPE and TPE Series Side Pocket Mandrel :

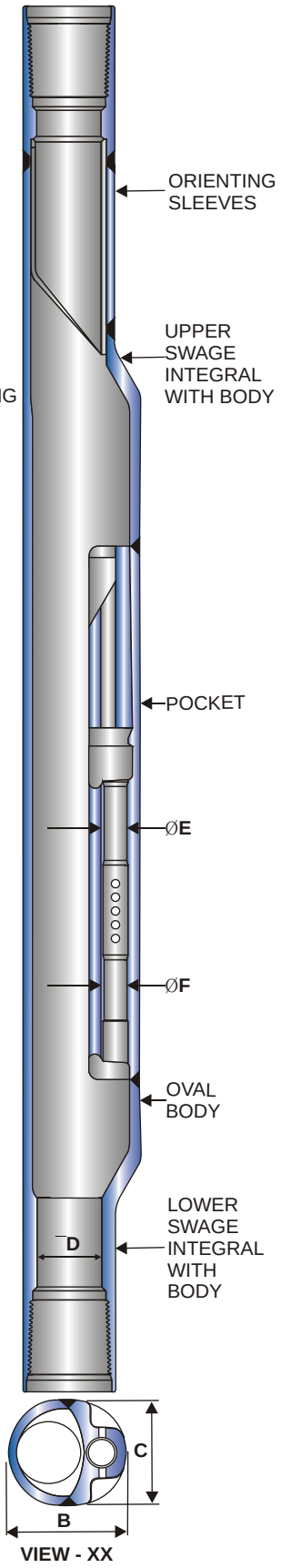
These mandrels mainly used in chamber lift applications. It has no ports in the side pocket for communication with the tubing. Instead of that, an exhaust port is located at the bottom of the side pocket. This port is extended downward into the casing annulus through a ½" pipe connected to the top packer of a chamber lift installation. In gas lift application, high pressure gas is injected into the casing annulus flows through the ports in the side of the mandrel, then through the ports 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, thru the water flood flow regulator valve and downward through he 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.



TMP Series Mandrel for 1" O.D. Valve (Welded Swages)



TP Series Mandrel for 1.1/2" O.D. Valve (Integral Swages)

SIDE POCKET MANDREL

PRESSURE RATING FOR SIDE POCKET MANDRELS								
Tubing Size (Inch)	Valve OD (Inch)	Mandrel Type	Weight Lbs - F* (Kg - F)	Volume (Cubic Ft.)	Test Pressure (PSI)*			
					Standard Services		Corrosive Services	
					Internal	External	Internal	External
2-3/8	1.0	TMP	75.0 (34)	0.47	8000	7000	6000	5500
2-3/8	1.5	TP	130 (59)	0.88	7500	6500	6000	5000
2-7/8	1.0	TMP	121.25 (55)	0.73	8000	7000	6000	5500
2-7/8	1.5	TP	180.77 (82)	1.18	7500	6500	6000	5000
3-1/2	1.0	TMP	150.00 (68)	0.84	8000	6500	6000	5000
3-1/2	1.5	TP	209.4 (95)	1.43	8000	6500	7000	5500
4.0	1.0	TMP	205.0 (92)	1.14	8000	6500	7000	5500
4.0	1.5	TP	236.0 (107)	1.78	8000	6500	7000	5500
4-1/2	1.0	TMP	216.0 (98)	1.38	7500	6000	6000	5000
4-1/2	1.5	TP	242.5 (110)	1.92	7500	6000	6000	5000
5.0	1.5	TP	310.8 (141)	2.84	8500	7000	6500	5500
5-1/2	1.0	TMP	262.3 (119)	2.13	7500	6000	6000	5000
5-1/2	1.5	TP	291.0 (132)	2.20	7500	6000	6000	5000
5-1/2	1.5	TP	297.6 (135)	2.64	8500	7000	6500	5500
7.0	1.0	TMP	405.6 (184)	2.8	7000	5500	5000	4500
7.0	1.5	TP	452.0 (205)	4.17	7000	5500	5000	4500

NOTES:

* Test Pressures given are for mandrels made of AISI-4130 materials heat treated for standard or corrosive environments. Test Pressures may be reduced due to end connection limitations.

** Weight and Length may vary depending upon end connection etc.

*** For 7” TMP & TP Series other drift sizes can also be provided upon request.

CONVENTIONAL MANDRELS

INTRODUCTION

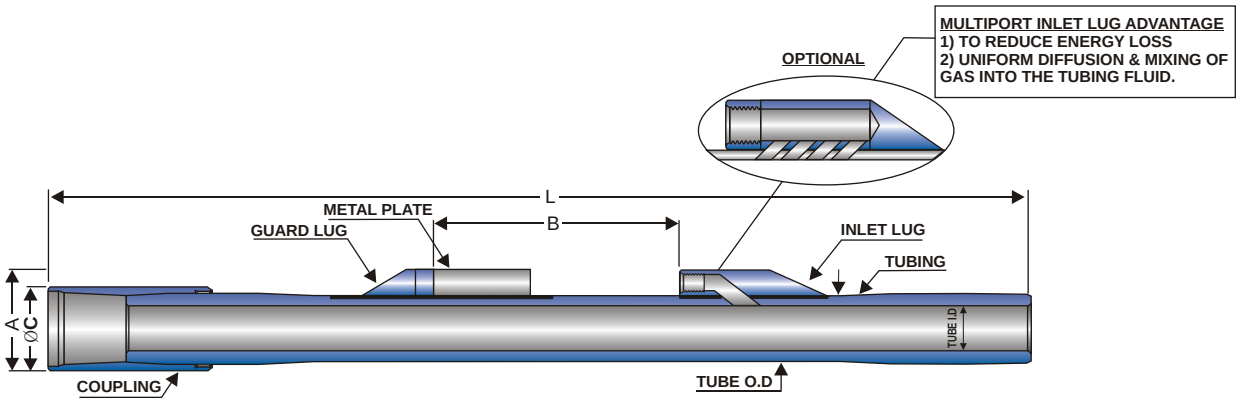
PARVEEN manufactures both standard as well as high strength conventional mandrels. These are designed for single - string installations and generally used in injection pressure operated tubing flow applications.

Mandrels for gas lift valves have two-fold function - first, they provide a convenient fitting on which to install a gas lift valve as an integral part of a tubing string and second, these help pass the gas through the valves in the proper direction. All mandrels are constructed to perform these functions with maximum reliability. After the machining and welding operations are completed, all mandrels are pressure tested and checked for alignment and drift I.D.

Internal, external or complete plastic coating is available for protection from corrosion or paraffin accumulation.

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 (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 ϕC(inch)	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

ORDERING INFORMATION

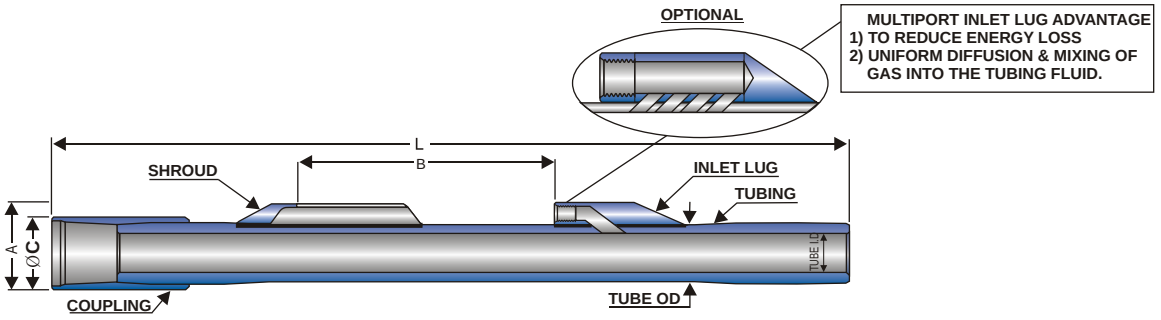
1. Determine the type of mandrel required based on the casing and tubing sizes and the type gas lift valve being used to the application.
2. Specify tubing size, thread and grade required for the application.
3. Valve adapters and/or thread adapters are sometimes required. Please include these when applicable.

CONVENTIONAL MANDRELS

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 Grand Lug & Metal Plate.

SPECIFICATION OF STANDARD CONVENTIONAL MANDREL SERIES 12 (MODEL : PCM-12S)										
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 ϕC(inch)	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 - SERIES 15 (MODEL : PCM-15)

Series 15 Conventional MANDRELS are designed to receive any valve with a ½" NPT inlet lug connection, a maximum OD of 1- ½" 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 ϕC(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

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

PARVEEN'S high strength mandrels have the benefit of:

1. Can with stand pull load of over 60 Metric Tones.
2. Tested hydraulically to 8000 PSI.
3. Tapered lugs to provide easy running.
4. Bore size to match with tubing specifications.

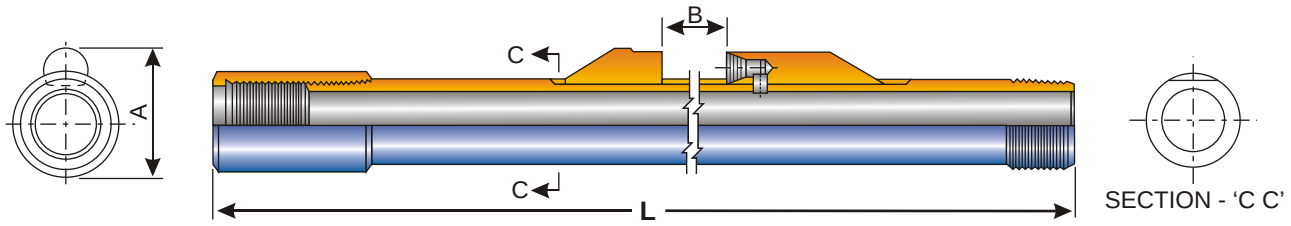
These mandrels come in 2 series.

Series 500: These are designed to receive any valve with ½" NPT inlet lug connection and a maximum OD of 1-1/16".

Series 502: These are designed to receive any valve with ½" NPT & a maximum OD of 1-1/2".

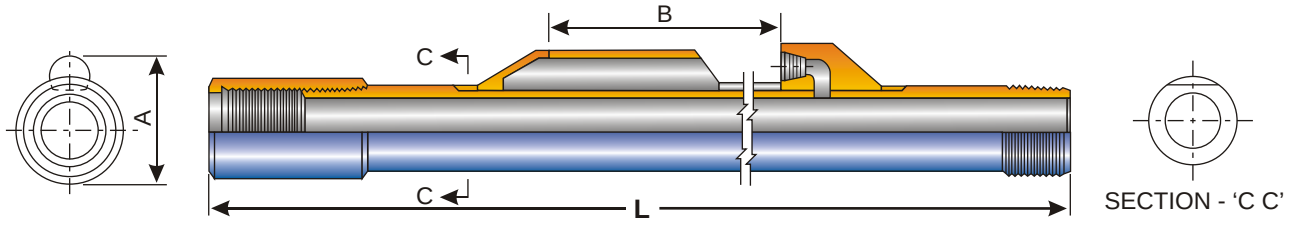
All above series are available in many tubing size, thread size & grades, only the more popular sizes are listed below.

HIGH STRENGTH CONVENTIONAL MANDREL - SERIES 500 (Model: PHSCM-500)



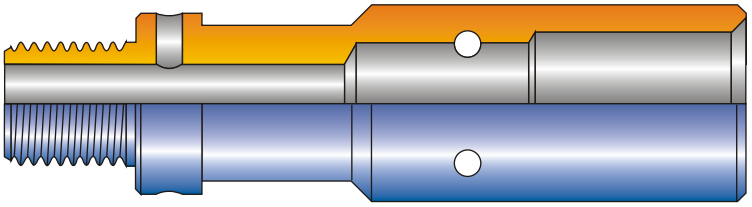
Nominal Tube Size (inch)	Type Thread	OD of Tube (inch)	ID of Tube (inch)	A Max. (inch)	B (inch)	L (ft.)	Approx Weight (lbs.-f)	Coupling OD (inch)	Assembly Part no. Material Grade API N-80
2-3/8	EUE, 8RD	2.594	1.995	3.920	17-1/8	4	33.0	3.063	500-0601-100-00
2-3/8	EUE, 8RD	2.594	1.995	3.825	17-1/8	4	32.0	2.91	500-0601-100-01
2-7/8	EUE, 8RD	3.094	2.441	4.490	17-1/8	4	40.5	3.668	500-0701-100-00
2-7/8	EUE, 8RD	3.094	2.441	4.330	17-1/8	4	38.5	3.460	500-0701-100-01

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



Nominal Tube Size (inch)	Type Thread	OD of Tube (inch)	ID of Tube (inch)	A Max. (inch)	B (inch)	L (ft.)	Approx Weight (Lbs.-f)	Coupling OD (inch)	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

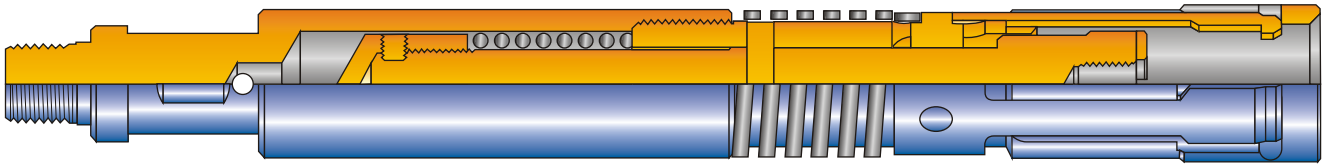
RUNNING, PULLING TOOLS



Running Tools

PARVEEN Manufactures Wireline Running Tools used to install latches and valves, MR, RTG and TER running tools are used to install appropriate latches with valves in side pocket mandrels.

ENGINEERING DATA FOR RUNNING TOOLS					
TYPE	**ASSEMBLY NUMBER**	**MAX OD. (INCH)**	**FISHING NECK O.D. (INCH)**	**PIN THREAD**	**USED TO RUN**
MR	10336	1.370	1.370	15/16-10	BK-2, M, WFM LATCH
RTG	16927	1.430	1.188	15/16-10	RK, TG LATCH
TER	11730	1.750	1.372	15/16-10	T-2, RM LATCH

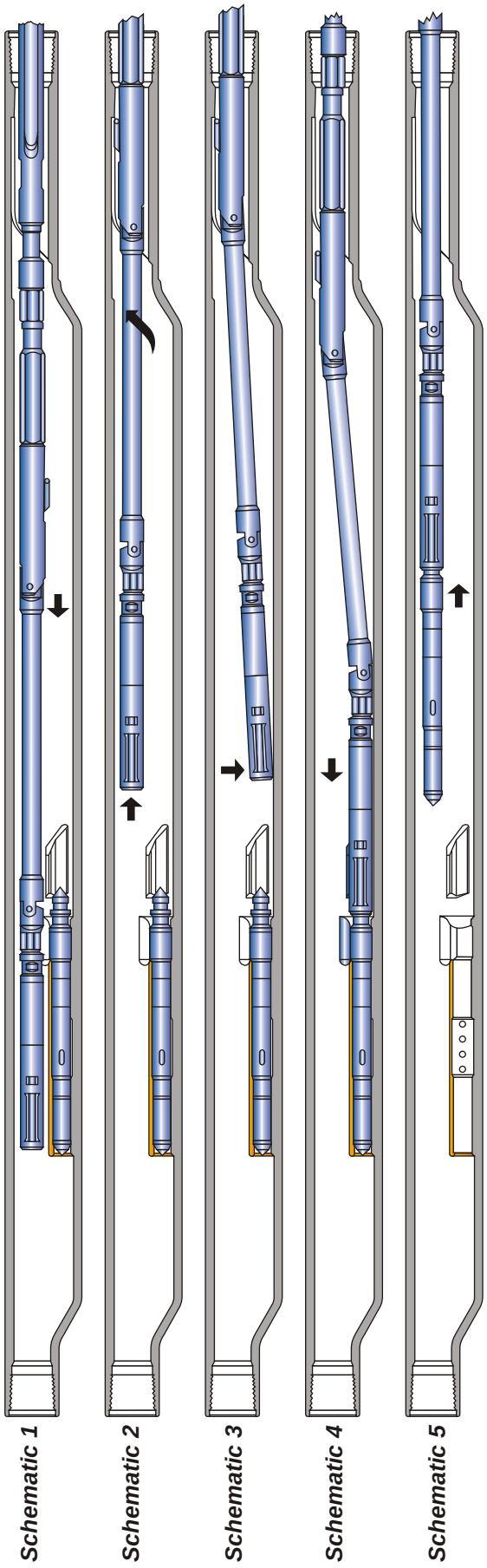


Pulling Tools

MP, PTG, TRP Pulling tools are designed to retrieve 1" and 1-1/2" OD Gas lift valves with latches. It features the collect type dogs with large shear area and it will withstand repeated impacts with long life on the dogs. Jar down will cause the dogs to release from the pulling head of the latch.

ENGINEERING DATA FOR PULLING TOOLS				
TYPE	**ASSEMBLY NUMBER**	**MAX OD. (INCH)**	**FISHING NECK O.D. (INCH)**	**PIN THREAD**
MR	11361	1.291	1.188	15/16-10 TPI
PTG	17048	1.625	1.188	15/16-10 TPI
TRP	11390	1.859	1.375	15/16-10 TPI

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.

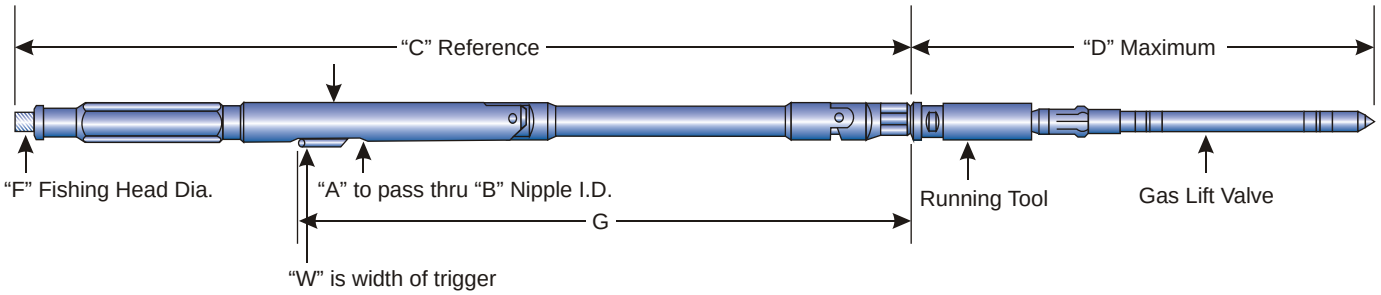
Schematic 2 - The tool is raised until its key engages the sleeve in the mandrel. Continued upward movement rotates the tool until its key enters a slot. When the key reaches the top of the slot, the operator is notified by a weight increase displayed on the weight indicator. The tool is now properly 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 snapback and lock into its vertical running position, reducing drag on the tool and valve as it is removed.

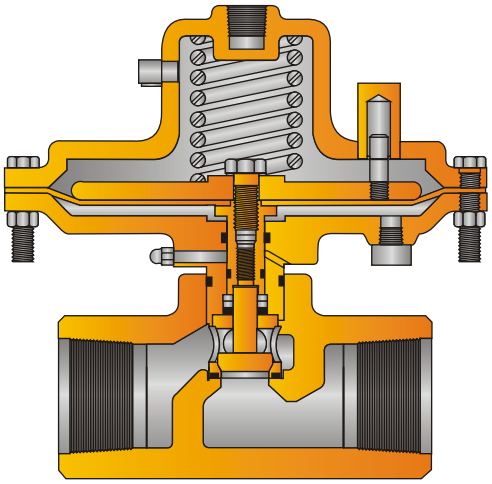
HD-TP/HD-TMP POSITIONING TOOLS



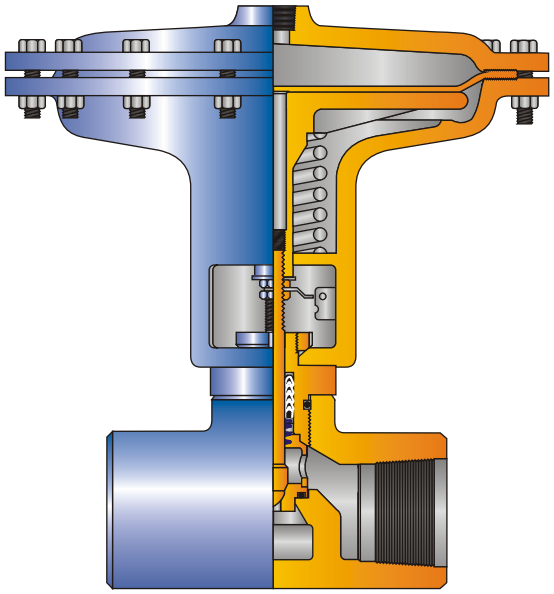
The HD Tools have identical running & pulling procedure as the standard tools.

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	375-1000-110-00
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

SURFACE FLOW CONTROLS MOTOR VALVES



MOTOR VALVE - MV 40



MOTOR VALVE - MV 60

PARVEEN offers two basic motor valve designs, the MV-40 and the MV-60. Both models are pneumatically operated valves for use in time cycle controllers, dump valves for oil and gas separators, pressure vessels, and storage tanks; and various wellhead and process control applications.

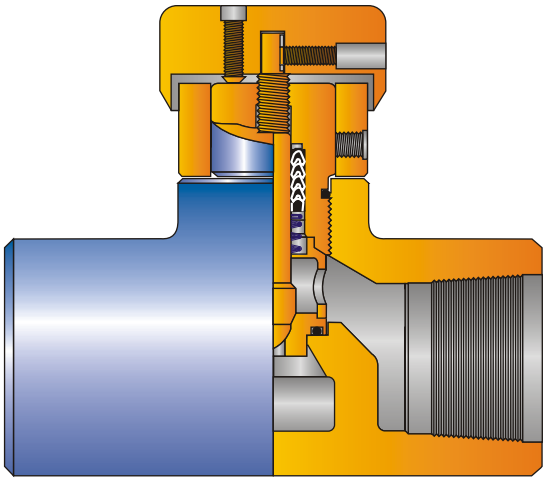
The MV-40 is an economical motor valve designed for applications where the maximum working pressure does not exceed 3,000 pounds per square inch. The MV-60 is specified for service up to 4,000 pounds per square inch working pressure. Both models are available in 1 in. or 2 in. body size, angle or through 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 sizes of trim are available -1/4 in., 1/2 in., 3/4 in, or 1 in. Both MV-60 and the MV-40 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 (inches)	Area (Sq. inch)	Diaphragm Maximum Woking 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

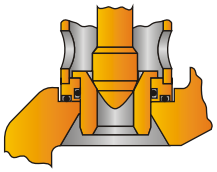
SURFACE FLOW CONTROLS FCV SERIES
FLOW CONTROL VALVES



FCV FLOW CONTROL VALVE

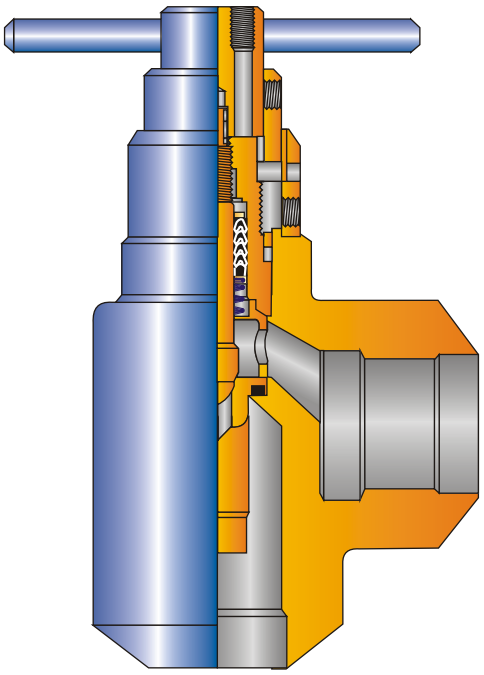
PARVEEN FCV Series Flow Control Valves are manually adjusted valves designed to provide repeatable settings. Available in 1 and 2-inch body sizes and a wide range of bodies and trim configurations, these valves feature an adjustable handwheel calibrated in sixty-fourths of an inch, and Teflon packing for positive seal and minimum maintenance. Threaded connections are rated for 5000 psi, socket weld at 3600 psi and butt weld at 5000 psi. They are designed to operate in any position and to resist the effects of vibration on the selected setting. Their construction allows easy inspection or replacement of internals without removing the valve from the line. Type 316, 410 or duplex - stainless steel bodies, and stainless steel handles and indicator rings are available for corrosive service.

Valve trims and seats are available in 1/8, 1/4, 1/2 or 3/4-inch sizes in stainless steel, hard chrome or tungsten carbide materials.

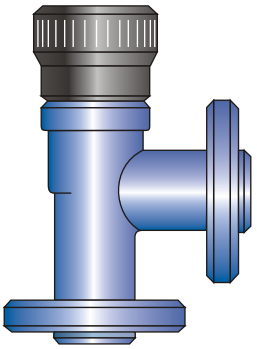


OPTIONAL REVERSE FLOW CHECK SEAT

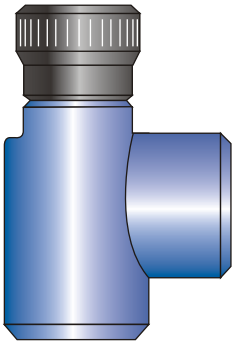
PARVEEN FCVT High Temperature Flow Control Valves are designed for steam injection or other high temperature gas or liquid service. Rated at 3500 psi working pressure at 700^{0}F, these 2 inch angle body valves feature 1/4, 1/2 or 3/4 inch stainless steel, hard chrome or tungsten carbide long throat trim and high temperature packing. The high temperature configuration is also available in an adjustable choke valve model (ACVT -5). This valve series is also available with flanged end connections.



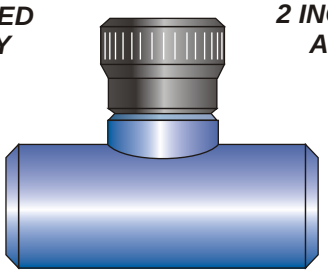
FCVT HIGH TEMPERATURE FLOW CONTROL VALVE



1 INCH FLANGED ANGLE BODY

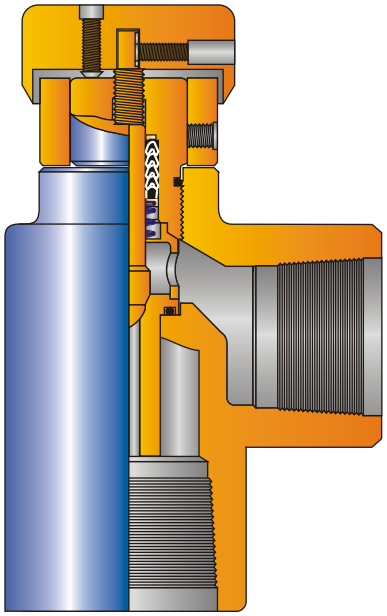


2 INCH THREADED ANGLE BODY



2 INCH THROUGH BODY

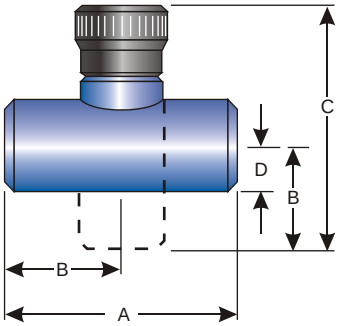
SURFACE FLOW CONTROLS WFC SERIES
WATERFLOOD CONTROL VALVES



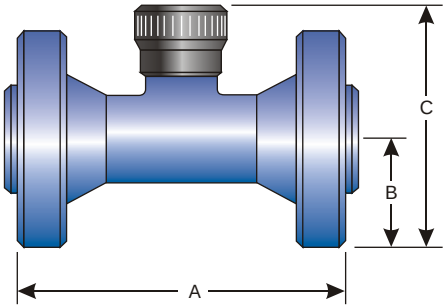
WFC WATERFLOOD VALVE

PARVEEN WFC Waterflood Control Valves are designed specifically for waterflood applications. They 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.

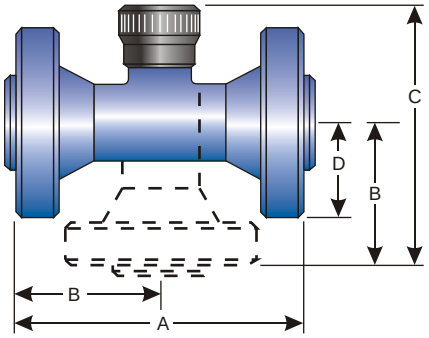
Stainless steel, hard chrome or tungsten carbide trims are available in 1/8, 1/4, 1/2 and 3/4 inch sizes. The long throat seat, stainless steel handle and indicator ring are standard.



FCV - WFC



FCV - FLANGED

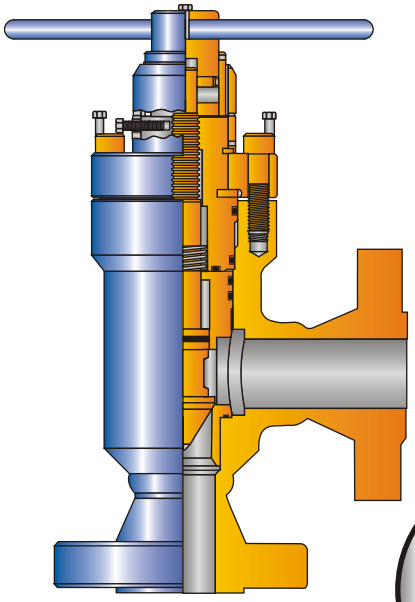


FCV - 2X

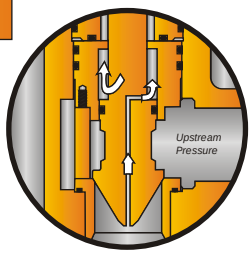
DIMENSIONAL DATA FOR FCV, WFC AND FCV-2X

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

PARVEEN 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 ACV8 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.

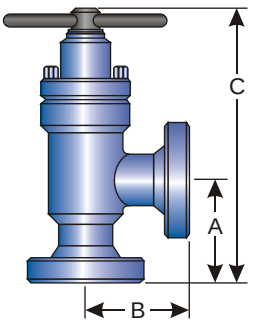
All valves in this series may be equipped with either an electric or pneumatic actuator to meet installation requirements.

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 feature a 2-inch maximum port and offer an optional positive choke seat for high differential pressures.

ACV-5 Series Valves feature an 1 ¼ -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.

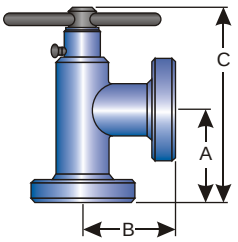


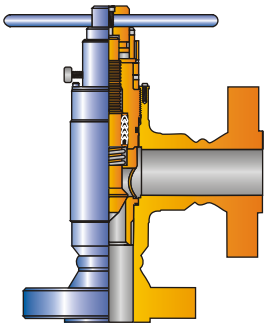
ACV-12 DIMENSIONAL DATA
Available with 1 1/2, 2 or 3-inch trim.

Body Style	Maximum Working Pressure (psi)	4-Inch			6-Inch		
		Inches A&B	Inches 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

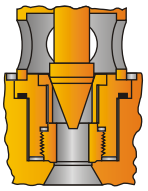




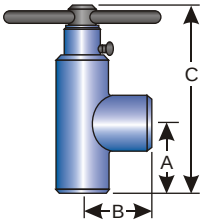
ACV-8 ADJUSTABLE CHOKE VALVE

ACV-8 DIMENSIONAL DATA
Available with 1, 1 1/2 or 2 - inch trim

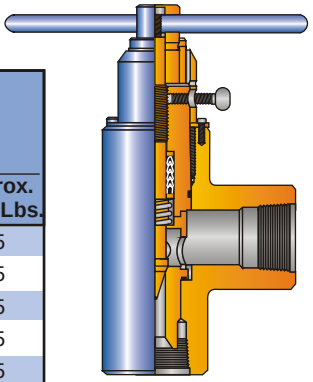
Body Style	Maximum Working Pressure (psi)	2 1/2-Inch			3-Inch			4-Inch		
		Inches A&B	Inches C	Approx. Wt. in Lbs.	Inches A&B	Inches C	Approx. Wt. in Lbs.	Inches A&B	Inches C	Approx. Wt in Lbs.
Threaded	3000	5.00	15.19	60	5.00	15.19	70	5.44	15.63	80
Socket Weld	3600	5.00	15.19	60	5.00	15.19	70	5.44	15.63	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



CHOKE SEAT WITH OPTIONAL POSITIVE BEAN



ACV-5 DIMENSIONAL DATA
Available with 3/4, 1 or 1 1/4 - inch trim



ACV-5 ADJUSTABLE CHOKE VALVE

Body Style	Maximum Working Pressure (psi)	2 -Inch			2-1/2 Inch			3-Inch		
	Inches 2 2 1/2 6	Inches A&B	Inches C	Approx. Wt. in Lbs.	Inches A&B	Inches C	Approx. Wt. in Lbs.	Inches A&B	Inches C	Approx. 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

STANDING VALVES AND SEATING NIPPLES

PARVEEN Standing valves and companion seating nipples are normally used in intermitting or chamber lift wells in 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. PARVEEN 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

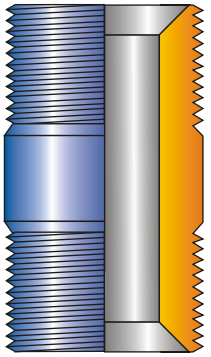
The E-3 Equalizing Standing Valve has a standard fishing neck and may be equalized and retrieved by wireline. The equalizing feature allows the operator to open ports below the valve and seat without lifting the hydrostatic head. This feature in many cases eliminates the need for an operator to pull a wet string of tubing. This valve may also be used as test plug for testing tubing for 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 sizes standing valves.

ENGINEERING DATA FOR TYPE E SEATING NIPPLES

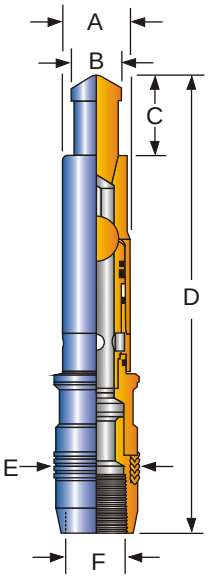
Size (Inch)	Size (inch)	Threads	Length (W/O Coupling)	Wt/Lbs.	Bore (Inch)	Part no.
2.3/8	2	10 RD NUE	7.1/2	5.1/2	1.781	6972
2.3/8	2	8 RD EUE	7.1/2	5.1/2	1.781	6823
2.3/8	2	10 RD NUE	7.1/2	5.1/4	1.813	4901
2.3/8	2	8 RD EUE	7.1/2	5.1/4	1.813	4902
2.3/8	2	10 RD NUE	7.1/2	7.1/2	1.375	4941
2.3/8	2	8 RD EUE	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

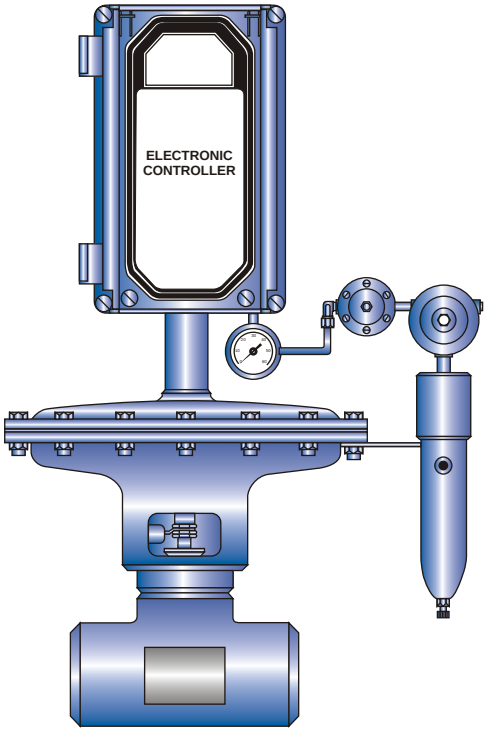
Size (Nom.) (Inch)	WT/ Lbs.	Dimensions (inches)						Bottom Thread (Inch)	Part no.	Remark
		Max. O.D.	Fishing Head Dia.	Fishing Neck Length	Overall Length	Packing Size (inch)	Min. Port Size			
–	–	A	B	C	D	E	F			
2	5.3/4	1.860	1.3/8	3.3/16	14.3/4	1.25/32	1.00	1 NPT	300-3240-000-01	SS BALL
2	5.3/4	1.860	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

TIME CYCLE CONTROLLERS WITH ACCESSORIES

TIME CYCLE ELECTRONIC CONTROLLERS

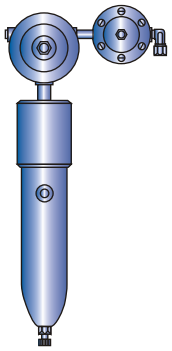


ELECTRONIC CONTROLLER AND MV-60 MOTOR VALVE

Mounted directly to the Motor Valve, the Electronic Times Cycle Controller with the Two Stage Regulator and Filter Drip is a compact assembly designed to provide the operator with a reliable method of obtaining optimum control of a plunger lift installation without frequent visual inspection and adjustment of cycle times. The Electronic Time Cycle controller is, having microprocessor based timer that can be programmed to display name, date or whatever you like. The controller maintain On-Time, OFF-Time & Delay Time.

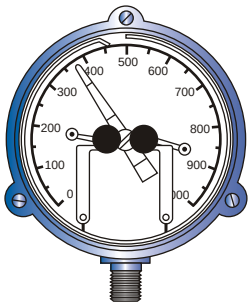
Each timer is easily set by the operator using the dedicated keys & the display on the front panel. Timer timings can be in hours & minutes or as required so as to achieve maximum accuracy for any operating condition.

The electronic controller features a rugged, watertight enclosure with a clear, see-through front cover that allows the operator to monitor the current cycle being timed without exposing the interior to ambient atmospheric conditions. In addition, the internal electronics are conformably coated for protection against moisture laden air or corrosive gases. The coil in the solenoid valve and current limiting components are totally encapsulated to prevent the possibility of electric arcing in the presence of an explosive atmosphere.



2 RBF TWO STAGE REGULATOR AND FILTER DRIP

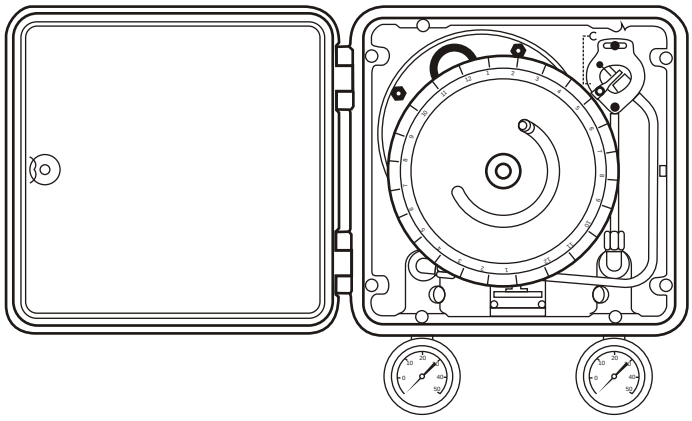
2RBF Two Stage Regulator and Filter Drip is composed of two pressure regulators and a filter-drip pot. The primary high-pressure regulator input up to 6000-psi supply gas and provides a 250-psi inlet supply to the secondary low-pressure regulator. The drip pot contains a stack of felt filters, which in conjunction with the sintered metal filter in the high-pressure regulator, provide a dry, clean (particulates less than 4 microns) operating supply to the pilot. The drip pot body features an extension for attachment to the motor valve, which permits a compact, unified installation.



SWITCH GAUGE

Switch Gauges are conventional pressure gauges with adjustable high and low set points for controlling motor valve operation in response to well pressure. In operation, the indicator moves between the set point contact arms, and when the indicator touches one of the arms, an electric circuit is completed that generates a signal to an electronic timer, which controls the operation of a motor valve. These contact closure signals are used by the timer to override the programmed time cycles and typically represent high and low tubing and casing pressure.

4501 (MECHANICAL) TIME CYCLE CONTROLLERS



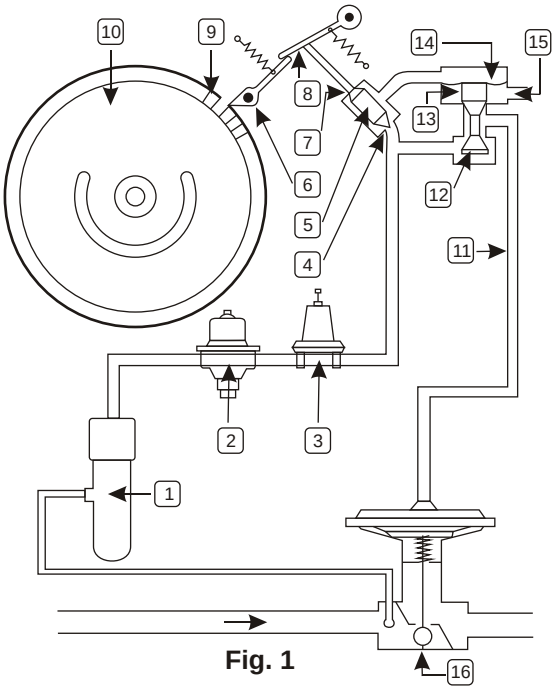


Fig. 1

A time cycle Controller is recommended for any application where it is desired to automatically open and close a valve in accordance with a predetermined time schedule. It is normally used as a time cycle controller on the gas injection line of an intermitting installation or as a controller on the tubing for "stop clocking" service.

The T.C.C. consist of a clock with cast aluminum wheel holding timing clips and two 3 way valves. One of the 3 way valves is operated by a trigger while the other is activated by a composition diaphragm. Operating medium is taken from the up stream gas line or from the well casing and differed through filter (1) The Pressure is then reduced by the high pressure regulator (2) to about 75 PSI and further reduced to 20 PSI by the low pressure regulator (3)

Assume that timing clip (9) is moved out of the path of the trigger, as shown in Figure 1. When the point of the trigger (6) falls into the slot left by the displaced clip, the other end of the trigger exerts a force on the leaf spring (8) This in turn allows the primary 3-way valve (5) to open the supply port (4) and close the exhaust port (7) The supply gas then flows through the primary 3-way valve, loading the diaphragm (14) of the secondary 3-way valve. The force exerted on this diaphragm closes the exhaust valve (13) and opens the supply valve (12) to load the diaphragm of the motor valve (16).

As the timing wheel turns counterclockwise, the timing clips bump the trigger (6) forcing the trigger to reliever it pressure on leaf spring (8). This allows the 3-way valve (5) to close supply port (4) and open exhaust port (7) bleeding pressure off chamber above diaphragm (14) The operating medium then forces supply valve (12) to close, opening exhaust valve (13). Pressure in the main diaphragm will then bleed out exhaust port (15) and valve (16) will close.

ASSEMBLIES

UNIT NO.
5931 E - 4501 Time Cycle Control Pilot with 24-Hour Rotation 7-Day
5937 E - 4501 Time Cycle Control Pilot with Gas Proof 24-Hour Rotation, 7-Day Wind Clock (5932)
5938 E - 4501 Time Cycle Control Pilot with 2-Hour Rotation, 24 Hour wind Clock (5933)
5939 E - 4501 Time Cycle Control Pilot with Gas proof 2-Hour Rotation, 24-Hour Wind Clock (5933)
5940 E - 4501 Time Cycle Control Pilot with 2-Hour Rotation 7-Day's wind Clock (5935)
5942 E - 4501 Time Cycle Control Pilot with 6-Hour Rotation 7-Day's Wind Clock (5936)
8321 E - 4501 Time Cycle Control Pilot with Battery Powered Clock (Specify 12 or 24 Hour Rotation)
8320 E - Battery Powered Clock for Time Cycle Control Pilot (Specify 12 or 24 Hour Rotation)
*** Other rotation & Shaft Style Upon Request**

API TUBING TABLE

Gas Lift Equipment

Tubing Size		Nominal Weight					Threaded Coupling						Joint Yield Strength		Capacity Table	
								Coupling Outside Dia.								
Nom in.	OD in.	T & C Non-Upset Lb/Ft	T & C Upset Lb/Ft	Grade	Wall Thick-ness in.	Inside Dia in.	Drift Dia. in.	Non Upset in.	Upset Reg. in.	Upset Spec. in.	Col-lapse Resis-tance psi	Internal Yield Pres-sure psi	T & C Non-Upset Lb.	T & C Upset Lb.	Barreis Per Lin. Ft.	Lin. Ft. Per Barrel
3/4	1.050	1.14	1.20	H-40	.113	.824	.730	1.313	1.660		7,200	7,530	6,360	13,300	.0007	1516.13
	1.050	1.14	1.20	J-55	.113	.824	.730	1.313	1.660		9,370	10,360	8,740	18,290	.0007	1516.13
	1.050	1.14	1.20	C-75	.113	.824	.730	1.313	1.660		12,250	14,120	11,920	24,940	.0007	1516.13
	1.050	1.14	1.20	N-80	.113	.824	.730	1.313	1.660		12,970	15,070	12,710	26,610	.0007	1516.13
1	1.315	1.70	1.80	H-40	.113	1.049	.955	1.660	1.900		6,820	7,080	10,960	19,760	.0011	935.49
	1.315	1.70	1.80	J-55	.113	1.049	.955	1.660	1.900		8,860	9,730	15,060	27,160	.0011	935.49
	1.315	1.70	1.80	C-75	.113	1.049	.955	1.660	1.900		11,590	13,270	20,540	37,040	.0011	935.49
	1.315	1.70	1.80	N-80	.113	1.049	.955	1.660	1.900		12,270	14,160	21,910	39,510	.0011	935.49
1 1/4	1.660			H-40	.125	1.410					5,220	5,270			.0019	517.79
	1.660	2.30	2.40	H-40	.140	1.380	1.286	2.054	2.200		5,790	5,900	15,530	26,740	.0018	540.55
	1.660			J-55	.125	1.410					6,790	7,250			.0019	517.79
	1.660	2.30	2.40	J-55	.140	1.380	1.286	2.054	2.200		7,530	8,120	21,360	36,770	.0018	540.55
	1.660	2.30	2.40	C-75	.140	1.380	1.286	2.054	2.200		9,840	11,070	29,120	50,140	.0018	540.55
	1.660	2.30	2.40	N-80	.140	1.380	1.286	2.054	2.200		10,420	11,810	31,060	53,480	.0018	540.55
1 1/2	1.900			H-40	.125	1.650					4,450	4,610			.0026	378.11
	1.900	2.75	2.90	H-40	.145	1.610	1.516	2.200	2.500		5,290	5,340	19,090	31,980	.0025	397.14
	1.900			J-55	.125	1.650					5,790	6,330			.0026	378.11
	1.900	2.75	2.90	J-55	.145	1.610	1.516	2.200	2.500		6,870	7,350	26,250	43,970	.0025	397.14
	1.900	2.75	2.90	C-75	.145	1.610	1.516	2.200	2.500		8,990	10,020	35,800	59,960	.0025	397.14
	1.900	2.75	2.90	N-80	.145	1.610	1.516	2.200	2.500		9,520	10,680	38,180	63,960	.0025	397.14
2 1/16	2.063			H-40	.156	1.751					5,240	5,290			.0030	335.75
	2.063			J-55	.156	1.751					6,820	7,280			.0030	335.75
	2.063			C-75	.156	1.751					8,910	9,920			.0030	335.75
	2.063			N-80	.156	1.751					9,440	10,590			.0030	335.75
2 3/8	2.375	4.00		H-40	.167	2.041	1.947	2.875			4,880	4,920	30,130		.0040	247.12
	2.375	4.60	4.70	H-40	.190	1.995	1.901	2.875	3.063	2.910	5,520	5,600	35,960	52,170	.0039	258.65
	2.375	4.00		J-55	.167	2.041	1.947	2.873			6,340	6,770	41,430		.0040	247.12
	2.375	4.60	4.70	J-55	.190	1.995	1.901	2.875	3.063	2.910	7,180	7,700	49,450	71,730	.0039	258.65
	2.375	4.00		C-75	.167	2.041	1.947	2.875			8,150	9,230	56,500		.0040	247.12
	2.375	4.60	4.70	C-75	.190	1.995	1.901	2.875	3.063	2.910	9,380	10,500	67,430	97,820	.0039	258.65
	2.375	5.80	5.95	C-75	.254	1.867	1.773	2.875	3.063	2.910	12,180	14,040	96,560	126,940	.0034	295.33
	2.375	4.00		N-80	.167	2.041	1.947	2.875			8,660	9,840	60,260		.0040	247.12
	2.375	4.60	4.70	N-80	.190	1.995	1.901	2.875	3.063	2.910	9,940	11,200	71,930	104,340	.0039	258.65
	2.375	5.80	5.95	N-80	.254	1.867	1.773	2.875	3.063	2.910	12,890	14,970	102,990	135,400	.0034	295.33
	2.375	4.60	4.70	P-105	.190	1.995	1.901	2.875	3.063	2.910	13,250	14,700	94,410	136,940	.0039	258.65
	2.375	5.80	5.95	P-105	.254	1.867	1.773	2.875	3.063	2.910	17,190	19,650	135,180	177,710	.0034	295.33
2 7/8	2.875	6.40	6.50	H-40	.217	2.441	2.347	3.500	3.668	3.460	5,230	5,280	52,780	72,480	.0058	172.76
	2.875	6.40	6.50	J-55	.217	2.441	2.347	3.500	3.668	3.460	6,800	7,260	72,580	99,660	.0058	172.76
	2.875	6.40	6.50	C-75	.217	2.441	2.347	3.500	3.668	3.460	8.900	9,910	98,970	135,900	.0058	172.76
	2.875	8.60	8.70	C-75	.308	2.259	2.165	3.500	3.668	3.460	12,200	14,060	149,360	185,290	.0050	201.72
	2.875	6.40	6.50	N-80	.217	2.441	2.347	3.500	3.668	3.460	9,420	10,570	105,570	144,960	.0058	172.76
	2.875	8.60	8.70	N-80	.308	2.259	2.165	3.500	3.668	3.460	12,920	15,000	159,310	198,710	.0050	201.72
	2.875	6.40	6.50	P-105	.217	2.441	2.347	3.500	3.668	3.460	12,560	13,870	138,560	190,260	.0058	172.76
	2.875	8.60	8.70	P-105	.308	2.259	2.165	3.500	3.668	3.460	17,220	19,690	209,100	260,810	.0050	201.72
3 1/2	3.500	7.70		H-40	.216	3.068	2.943	4.250			4,070	4,320	65,070		.0091	109.37
	3.500	9.20	9.30	H-40	.254	2.992	2.867	4.250	4.500	4.180	5,050	5,080	79,540	103,610	.0087	114.99
	3.500	10.20		H-40	.289	2.992	2.797	4.250			5,680	5,780	92,550		.0083	120.57
	3.500	7.70		J-55	.216	3.068	2.943	4.250			5,290	5,940	89,470		.0091	109.37
	3.500	9.20	9.30	J-55	.254	2.992	2.867	4.250	4.500	4.180	6,560	6,980	109,370	142,460	.0087	114.99
	3.500	10.20		J-55	.289	2.992	2.797	4.250			7,390	7,950	127,250		.0083	120.57
	3.500	7.70		C-75	.216	3.068	2.943	4.250			6,690	8,100	122,010		.0091	109.37
	3.500	9.20	9.30	C-75	.254	2.992	2.867	4.250	4.500	4.180	8,530	9,520	149,140	194,260	.0087	114.99
	3.500	10.20		C-75	.289	2.992	2.797	4.250			9,660	10,840	173,530		.0083	120.57
	3.500	12.70	12.95	C-75	.375	2.750	2.625	4.250	4.500	4.180	12,200	14,060	230,990	276,120	.0073	136.12
	3.500	7.70		N-80	.216	3.068	2.943	4.250			7,080	8,640	130,140		.0091	109.37
	3.500	9.20	9.30	N-80	.254	2.992	2.867	4.250	4.500	4.180	9,080	10,160	159,090	207,220	.0087	114.99
	3.500	10.20		N-80	.289	2.992	2.797	4.250			10,230	11,560	185,100		.0083	120.57
	3.500	12.70	12.95	N-80	.375	2.750	2.625	4.250	4.500	4.180	12,920	15,000	246,390	294,530	.0073	136.12
	3.500	9.20	9.30	P-105	.254	2.992	2.867	4.250	4.500	4.180	12,110	13,330	208,800	217,970	.0087	114.99
	3.500	12.70	12.95	P-105	.375	2.750	2.625	4.250	4.500	4.180	17,200	19,690	323,390	386,570	.0073	136.12
4	4.000	9.50		H-40	.226	3.548	3.423	4.750			3,580	3,960	72,00		.0122	81.78
	4.000		11.00	H-40	.262	3.476	3.351		5.000		4,420	4,580		123,070	.0117	85.20
	4.000	9.50		J-55	.226	3.548	3.423	4.750			4,650	5,440	99,010		.0122	81.78
	4.000		11.00	J-55	.262	3.476	3.351		5.000		5,750	6,300		169,220	.0117	85.20
	4.000	9.50		C-75	.226	3.548	3.423	4.750			5,800	7,420	135,010		.0122	81.78
	4.000		11.00	C-75	.262	3.476	3.351		5.000		7,330	8,600		230,750	.0117	85.20
	4.000	9.50		N-80	.226	3.548	3.423	4.750			6,120	7,910	144,010		.0122	81.78
	4.000		11.00	N-80	.262	3.476	3.351		5.000		7,780	9,170		246,140	.0117	85.20
4 1/2	4.500	12.60	12.75	H-40	.271	3.958	3.833	5.200	5.563		3,930	4,220	104,360	144,020	.0152	65.71
	4.500	12.60	12.75	J-55	.271	3.958	3.833	5.200	5.563		5,100	5,800	143,500	198,030	.0152	65.71
	4.500	12.60	12.75	C-75	.271	3.958	3.833	5.200	5.563		6,430	7,900	195,680	270,040	.0152	65.71
	4.500	12.60	12.75	N-80	.271	3.958	3.833	5.200	5.563		6,810	8,430	208,730	288,040	.0152	65.71

FLUID WEIGHT CONVERSION TABLE

OIL, WATER AND MUD SPECIFIC GRAVITY - WEIGHT AND PRESSURE TABLE

Degrees A. P. I.	Specific Gravity	Weight (Density) Gallon (Pounds)	Weight (Density) Cubic Foot (Pounds)	Fluid Head Height Per Pound (Feet)	Fluid Head Pressure Per Foot (Lbs./Sq. In.)	Degrees A. P. I.	Specific Gravity	Weight (Density) Gallon (Pounds)	Weight (Density) Cubic Foot (Pounds)	Fluid Head Height Per Pound (Feet)	Fluid Head Pressure Per Foot (Lbs./Sq. In.)
60.	.739	6.16	46.1	3.13	.320		1.20	10.0	74.8	1.93	.519
59.	.743	6.20	46.4	3.11	.322		1.22	10.2	76.3	1.89	.530
58.	.747	6.23	46.6	3.09	.324		1.25	10.4	77.8	1.85	.540
57.	.751	6.26	46.8	3.08	.325		1.27	10.6	79.3	1.81	.551
56.	.755	6.30	47.1	3.06	.327		1.29	10.8	80.8	1.78	.561
55.	.759	6.33	47.4	3.04	.329		1.32	11.0	82.3	1.75	.571
54.	.763	6.36	47.6	3.03	.330		1.34	11.2	83.8	1.72	.582
53.	.767	6.40	47.9	3.01	.332		1.37	11.4	85.3	1.69	.592
52.	.771	6.43	48.1	2.99	.334		1.39	11.6	86.8	1.66	.603
51.	.775	6.46	48.3	2.98	.336		1.41	11.8	88.3	1.63	.631
50.	.780	6.51	48.7	2.96	.338		1.44	12.0	89.8	1.61	.623
49.	.784	6.54	48.9	2.94	.340		1.46	12.2	91.3	1.58	.634
48.	.788	6.57	49.2	2.93	.341		1.49	12.4	92.8	1.55	.644
47.	.793	6.61	49.5	2.92	.343		1.51	12.6	94.3	1.53	.655
46.	.797	6.65	49.8	2.90	.345		1.53	12.8	95.8	1.50	.665
45.	.802	6.69	50.0	2.87	.348		1.56	13.0	97.3	1.48	.675
44.	.806	6.72	50.3	2.87	.349		1.58	13.2	98.7	1.46	.686
43.	.811	6.76	50.6	2.85	.351		1.61	13.4	100.	1.44	.696
42.	.816	6.81	50.9	2.82	.354		1.63	13.6	102.	1.42	.706
41.	.820	6.84	51.2	2.82	.355		1.65	13.8	103.	1.39	.717
40.	.825	6.88	51.5	2.80	.357		1.68	14.0	105.	1.38	.727
39.	.830	6.92	51.8	2.79	.359		1.70	14.2	106.	1.36	.738
38.	.835	6.96	52.1	2.76	.362		1.73	14.4	108.	1.34	.748
37.	.840	7.01	52.4	2.75	.364		1.75	14.6	109.	1.32	.758
36.	.845	7.05	52.7	2.73	.366		1.77	14.8	111.	1.30	.769
35.	.850	7.09	53.0	2.72	.368		1.80	15.0	112.	1.28	.779
34.	.855	7.13	53.3	2.70	.370		1.82	15.2	114.	1.27	.790
33.	.860	7.17	53.6	2.69	.372		1.85	15.4	115.	1.25	.800
32.	.865	7.21	53.9	2.67	.375		1.87	15.6	117.	1.23	.810
31.	.871	7.26	54.3	2.65	.377		1.89	15.8	118.	1.22	.821
30.	.876	7.31	54.7	2.63	.380	Common	1.92	16.0	120.	1.20	.831
29.	.882	7.36	55.1	2.62	.382	Cement	1.94	16.2	121.	1.19	.842
28.	.887	7.40	55.4	2.60	.384	Slurry	1.97	16.4	123.	1.17	.852
27.	.893	7.45	55.7	2.58	.387		1.99	16.6	124.	1.16	.862
26.	.898	7.49	56.0	2.57	.389		2.01	16.8	126.	1.15	.873
25.	.904	7.54	56.4	2.55	.392		2.04	17.0	127.	1.13	.883
24.	.910	7.59	56.8	2.54	.394		2.06	17.2	129.	1.12	.894
23.	.916	7.64	57.2	2.52	.397		2.09	17.4	130.	1.11	.904
22.	.922	7.69	57.5	2.51	.399		2.11	17.6	132.	1.09	.914
21.	.928	7.74	57.9	2.49	.402		2.13	17.8	133.	1.08	.925
20.	.934	7.79	58.3	2.47	.405		2.16	18.0	135.	1.07	.935
19.	.940	7.84	58.7	2.46	.407		2.18	18.2	136.	1.06	.945
18.	.946	7.89	59.0	2.44	.410		2.21	18.4	138.	1.05	.956
17.	.953	7.95	59.5	2.42	.413		2.43	18.6	139.	1.04	.966
16.	.959	8.00	59.8	2.40	.416		2.25	18.8	141.	1.02	.977
15.	.966	8.06	60.3	2.39	.419		2.28	19.0	142.	1.01	.987
14.	.973	8.11	60.7	2.38	.421		2.30	19.2	144.	1.00	.997
13.	.979	8.16	61.0	2.36	.424		2.33	19.4	155.	.992	1.01
12.	.986	8.22	61.5	2.34	.427		2.35	19.6	147.	.982	1.02
11.	.993	8.28	61.9	2.33	.430		2.37	19.8	148.	.972	1.03
10° A. P. I. or	1.00	8.34	62.4	2.31	.433		2.40	20.0	150.	.962	1.04
Pure Water	1.01	8.4	62.8	2.29	.436		2.42	20.2	151.	.953	1.05
	1.03	8.6	64.3	2.24	.447		2.45	20.4	153.	.943	1.06
	1.06	8.8	65.8	2.19	.457		2.47	20.6	154.	.935	1.07
	1.08	9.0	67.3	2.14	.468		2.49	20.8	156.	.925	1.08
	1.10	9.2	68.8	2.09	.478		2.52	21.0	157.	.917	1.09
	1.13	9.4	70.3	2.05	.488		2.54	21.2	159.	.908	1.10
	1.15	9.6	71.8	2.00	.499		2.57	21.4	160.	.899	1.11
Salt Water	1.154	9.625	72.0	2.00	.500		2.59	21.6	162.	.891	1.12
	1.18	9.8	73.3	1.96	.509		2.61	21.8	163.	.883	1.13

GAS TABLE

To find the bottomhole pressure, multiply the surface by the factor corresponding to the Well depth and gravity of the gas

Well Depth	Correction Factors 0.6 Gravity	0.7 Gravity	0.8 Gravity	Well Depth	Correction Factors 0.6 Gravity	0.7 Gravity	0.8 Gravity
4,500	1.099	1.116	1.132	7,500	1.171	1.195	1.227
5,000	1.110	1.130	1.149	8,000	1.181	1.210	1.241
5,500	1.120	1.141	1.163	8,500	1.190	1.230	1.260
6,000	1.132	1.155	1.181	9,000	1.202	1.240	1.273
6,500	1.143	1.175	1.195	9,500	1.215	1.250	1.285
7,000	1.155	1.184	1.211	10,000	1.225	1.265	1.305

CONVERSION FACTORS APPLYING TO OIL COUNTRY CALCULATIONS

Acre	=	43,560.	Square feet	Horse power	=	.7457	Kilo Watt
Acre	=	4,047.	Square meter	Horse power hour	=	2,547.	British Thermal Unit
Acre foot	=	7,758.	Barrels	Inch	=	2.540	Centimeters
Atmosphere	=	33.94	Feet of water	Inch of mercury	=	1.134	Feet of water
Atmosphere	=	29.92	Inches of mercury	Inch of mercury	=	.4912	Pound per square inch
Atmosphere	=	760.0	Millimeters of mercury	Inch of water 60°F	=	.0361	Pound per square inch
Atmosphere	=	14.70	Pounds per square inch	Kilogram	=	2.2046	Pounds
Bar	=	14.504	Pounds per square inch	Kilogram calorie	=	3.968	British Thermal Units
Barrel	=	5.6146	Cubic feet	Kilogram per sq. centimeter	=	14.223	Pounds per square inch
Barrel	=	42.0	Gallons	Kilometer	=	3,281.	Feet
Barrel of water @ 60°f	=	.1588	Metric ton	Kilometer	=	.2614	Miles
Barrel (36O A. P. I.)	=	.1342	Metric ton	Kilo Pascal (KPa)	=	0.145	Pounds per square inch
Barrel per hour	=	.0936	Cubic feet per minute	Kilo weight	=	1.341	Horse power
Barrel per hour	=	.700	Gallon per minute	Liter	=	.2642	Gallon
Barrel per hour	=	2.695	Cubic inches per second	Liter	=	1.0567	Quarters
Barrel per day	=	.02917	Gallon per minute	Mega Pascal (MPa)	=	145.03	Pound per square inch
British Thermal Unit	=	.2520	Kilogram calorie	Meter	=	3.281	Feet
British Thermal Unit	=	.2928	Watt hour	Meter	=	39.37	Inches
B.T.U. per minute	=	.02356	Horse power	Mile	=	5,280.	Feet
Centimeter	=	.3937	Inch	Mile	=	1.609	Kilometers
Centimeter of mercury	=	.1934	Pound per square inch	Mile per hour	=	1.4667	Feet per second
Cubic centimeter	=	.06102	Cubic inch	Ounce (Avoirdupois)	=	28.3495	Grams
Cubic foot	=	.1781	Barrel	Part per Million	=	.05835	Grain per gallon
Cubic foot	=	7.4805	Gallons (U. S.)	Part per Million	=	8.345	Pounds per million gallon
Cubic foot	=	.02832	Cubic meter	Pascal (Pa)	=	0.000145	Pounds per square inch
Cubic foot	=	.9091	Sacks cement (Set)	Pounds	=	7,000.	Grains
Cubic foot per minute	=	10.686	Barrels per hour	Pounds	=	.4536	Kilogram
Cubic foot per minute	=	28.800	Cubic inches per second	Pound per square inch	=	2.309	Feet of water 60°F
Cubic foot per minute	=	7.481	Gallons per minute	Pound per square inch	=	2.0353	Inches of mercury
Cubic inch	=	16.387	Cubic centimeters	Pound per square inch	=	51.697	Millimeters of mercury
Cubic meter	=	6.2897	Barrels	Pound per square inch	=	.0703	Kilograms per sq. cms.
Cubic meter	=	35.341	Cubic feet	Pound per square inch	=	0.0689	Bar
Cubic meter	=	1.308	Cubic yards	Pound per square inch	=	.006895	Mega Pascal (MPa)
Cubic meter	=	264.20	Gallons (U. S.)	Pound per square inch	=	6.895	Kilo Pascal (KPa)
Cubic meter, normal	=	34.77	Cubic feet, standard	Pound per square inch	=	6895.	Pascal (Pa)
Cubic yard	=	4.8089	Barrels	Pound per million gallons	=	.00700	Grain per gallon
Cubic yard	=	46.656	Cubic inches	Pound per million gallons	=	.11982	Parts per million
Cubic yard	=	.7646	Cubic meter	Quarter (Liquid)	=	.946	Liter
Foot	=	30.48	Centimeters	Sack cement (set)	=	1.1	Cubic feet
Foot	=	.3048	Meter	Square centimeter	=	1.550	Square inch
Foot of water @ 60°F	=	.4331	Pound per square inch	Square foot	=	.929	Square meter
Foot per second	=	.68182	Mile per hour	Square inch	=	6.452	Square centimeters
Foot pound	=	.001286	British Thermal Unit	Square kilometer	=	.3861	Square mile
Foot pound per second	=	.001818	Horse power	Square meter	=	10.67	Square feet
Gallon (U. S.)	=	.02381	Barrel	Square mile	=	2.590	Square kilometers
Gallon (U. S.)	=	.1337	Cubic feet	Temperature Centigrade	=		5/9 (Temperature °F -32)
Gallon (U. S.)	=	231.000	Cubic inches	Temperature Fahrenheit	=		9/5 (Temperature °C) +32
Gallon (U. S.)	=	3.785	Liters	Temp. Absolute (Kelvin)	=		Temperature °C +273
Gallon (U. S.)	=	.8327	Gallon (Imperial)	Temp. Absolute (Rankine)	=		Temperature °F +460
Gallon (U. S.)	=	0.003785	Cubic meters	Ton (Long)	=	2,240.	Pounds
Gallon (Imperial)	=	1.2009	Gallon (U. S.)	Ton (Metric)	=	2,205.	Pounds
Gallon (Imperial)	=	277.274	Cubic inches	Ton (Short or Net)	=	2,000.	Pouds
Gallon per minute	=	1.429	Barrels per hour	Ton (Metric)	=	1.102	Tons (Short on Net)
Gallon per minute	=	.1337	Cubic feet per minute	Ton (Metric)	=	1,000.	Kilograms
Gallon per minute	=	34.286	Barrels per day	Ton (Metric)	=	6.297	Barrels of water @ 60°F
Gram	=	.03527	Ounce	Ton (Metric)	=	7,454.	Barrels (36° A. P. I.)
Horse power	=	42.44	T. U.'s per minute	Ton (Short or Net)	=	.907	Ton (Metric)
Horse power	=	33,000.	Foot-pounds per minute	Watt - Hour	=	3,415.	British Thermal Unit
Horse power	=	550.	Foot pounds per seconds	Yard	=	.9144	Meter
Horse power	=	1.014	Horse power (metric)				

Metric P. I. in $\frac{M^3 / D}{Kg / Cm^2}$ x .428 = US P. I. in BPD / PSI

Metric GLR in $\frac{{}_{N}M^3 / D}{M^3}$ x .5.529 = US GLR in scf / bbl

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, in^2
A_p = area of seat or port – ball seat contact, in^2
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 Ptro)

VALVE AND SEAT SPECIFICATIONS

LN Series Valve
VALVE AND SEAT SPECIFICATIONS

Type	Trim Size	Port Dia. (inches)	* Fe
LN-21R	Small Medium Large	0.582 0.670 0.775	0.34 0.46 0.60
LNM-31R	Small Medium Large	0.300 0.360 0.410	0.27 0.38 0.48

* Fe = Dynamic Ap / Ab

N Series Valve
VALVE AND SEAT SPECIFICATIONS

Type Valve	Bellows Area In^2	Port Dia. (inches)	Ap/Ab
N-15 & N-15R	77	8/64	.017
		10/64	.020
		12/64	.038
		16/64	.067
		20/64	.103
		24/64	.148
		28/64	.200
		32/64	.261
NM-16 & NM-16 R	.31	8/64	.043
		12/64	.094
		16/64	.166
		20/64	.256
		24/64	.368

RV Series Valves
PERFORMANCE DATA AND VALVE SPECIFICATIONS

The maximum flow rate can be calculated using the following formula. Use Cv from the chart for the particular valve and choke size used.

$$Q_{max} = 1780\ C_v \sqrt{\frac{(P_{cf} - P_t)\ P_t}{G t_v}}$$

Q = MCF / Day
G = Specific Gravity (Air = 1)
T_v = Valve Temperature (460+^{o}F)
C_v = Coefficient of Flow (Discharge)
P_{cf} = Flowing Casing Pressure of Valve
P_t = Tubing Pressure

No. of 1/8-inch D Orifices	Cv	RVM-16R	
		Area	Equiv. Dia
1	.0102	.0123	.0125
2	.0162	.0245	.0177
3	.0202	.0368	.0217
4	.0222	.0491	.0250

WF Series Valve
VALVE AND SEAT SPECIFICATIONS
WF-14R

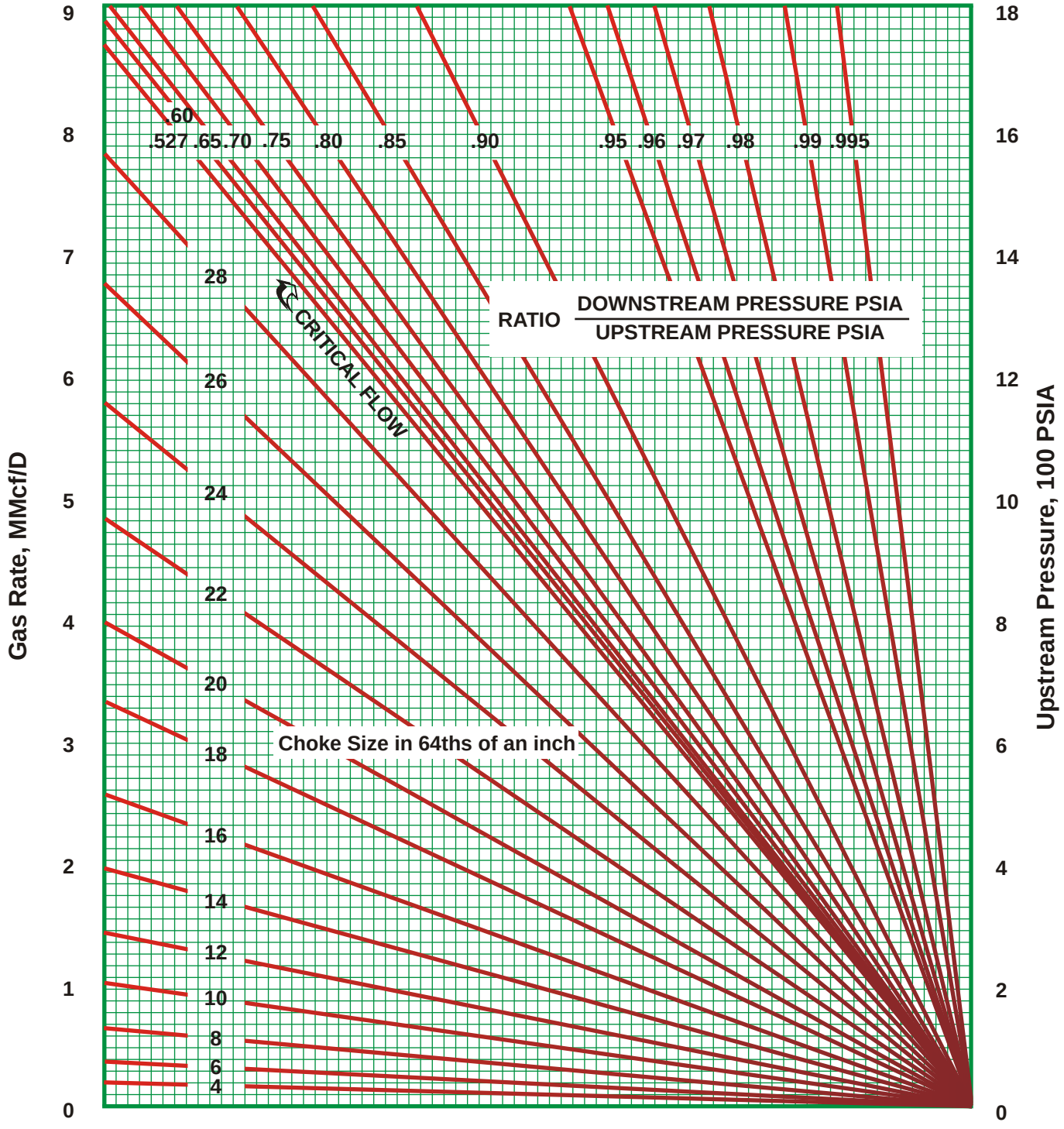
Ball Dia.	Seat Angle	Bellows Area, In^2	Ap/Ab	Bellows Area, In^2	Ap/Ab
16/64	37^o		.058		.078
20/64	37^o	.31	.090	.23	.122
24/64	38^o	Adj. Range	.135	Adj. Range	.183
24/64	45^o	0-800	.177	600-1500	.239
32/64	38^o	psi	.242	psi	.326
32/64	45^o		.316		.426

WFM-14R

Ball Dia.	Seat Angle	Bellows Area, In^2	Ap/Ab
16/64	37^o		.150
18/64	37^o	.12	.183
20/64	37^o	Adj. Range	.233
24/64	37^o	0-1500 psi	.333

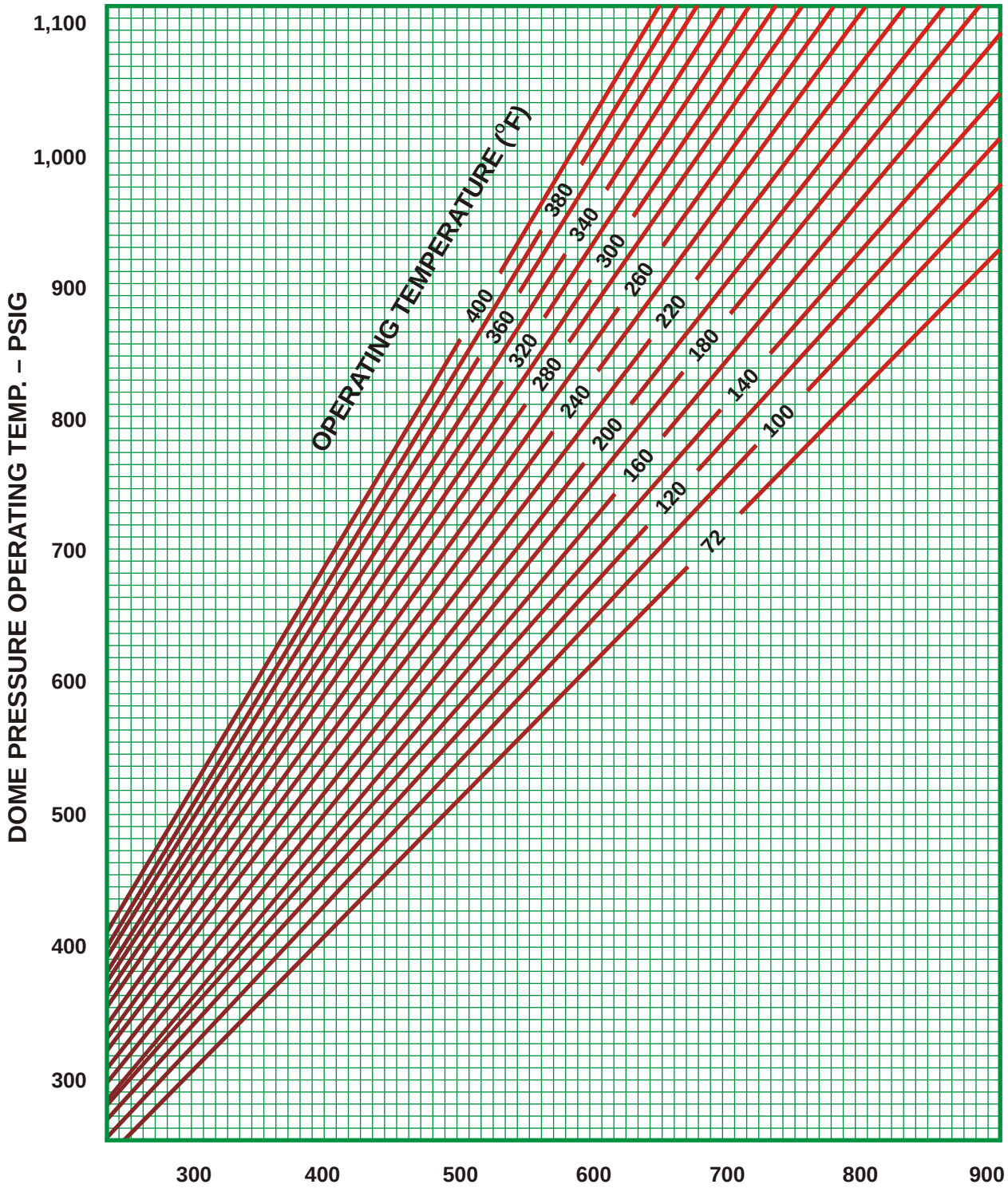
GAS RATE THROUGH CHOKES

AFTER THORNHILL CRAVER
TEMP 60°F SpG. 6 14.7 PSIA



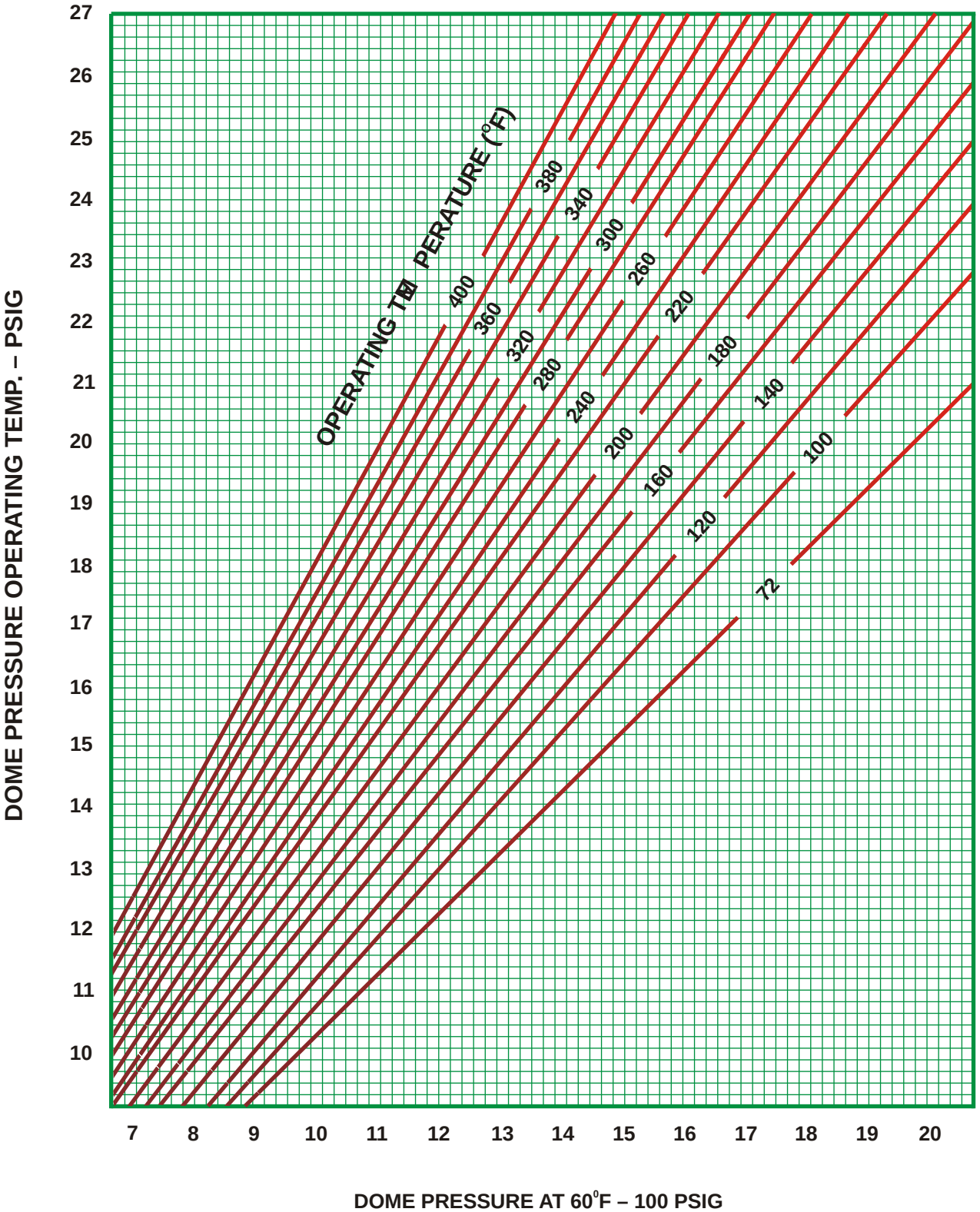
TEMPERATURE CORRECTION CHART

NITROGEN PRESSURE CHARGED
GAS LIFT VALVE
(300 - 900 PSIG)



TEMPERATURE CORRECTION CHART

NITROGEN PRESSURE CHARGED
GAS LIFT VALVE
(700 - 2000 PSIG)



CALIBRATION & TESTING OF GAS LIFT VALVES

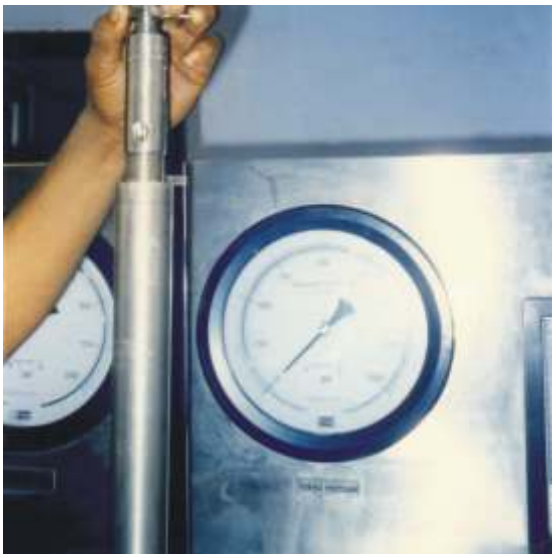
Parveen GLV test bench is manufactured from heavy duty stainless steel sheet metal, pressure gauges with all stainless steel fittings and valves. Test bench is designed to meet most of the test / calibration requirements of API spec. 11 V1 for GLV's. This is combination of typical sleeve tester, typical 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**

TOOLS/ACCESSORIES WITH TEST BENCH

A) Chamber Valve Removing

B) Pressure Releasing & Charging Tool



DESIGN PARAMETERS

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

Design parameters:

1. **Valve Size:** 1" and 11/2" 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:** 2000psi
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**

i) PRESSURE GAUGE SECTION

Used in the test bench as follows:

A) Hydraulic Pressure Gauge:
(Range: 0-10,000 psi)

This pressure gauge shows the pressure in hydraulic pressure chamber (ager).

B) Casing Pressure Gauge:
(Range: 0-2000 psi)

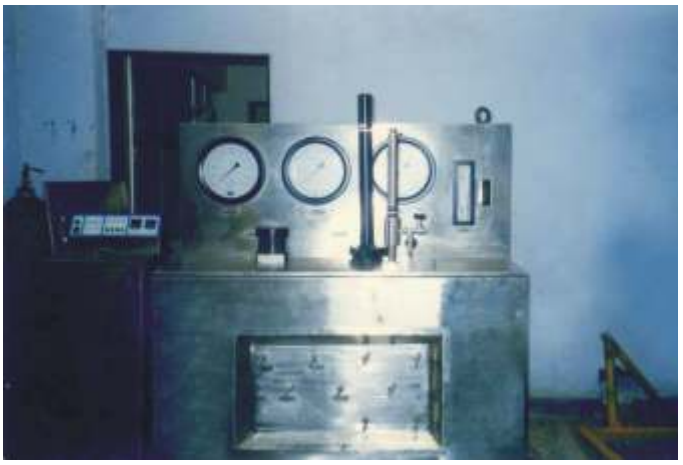
This pressure gauge shows casing pressure in typical sleeve tester and typical encapsulated tester for stemseat leakage test of gas lift valve.

C) Tubing pressure gauge (Range: 0-2000psi)

To indicate tubing pressure in the glv this pressure gauge is used.

ii) CHAMBER SECTION

As shown in above figure there are three testing devices provided in our GLV test bench



A) Hydraulic Pressure Chamber (Ager)

B) Encapsulated Stem-seat Leakage Tester

C) Sleeve Tester

iii) CONTROL VALVE SECTION

There are nine control valves systematically arranged as shown in above figure having specific functions of each one, used to operate test bench for different testings of GLV.

1. **Hydraulic Exhaust/Bleed**
2. **Tubing Pressure Exhaust**
3. **On/Off For Sleeve, Stem-Seat Leakage**
4. **Gas Pressure Tubing**
5. **Leak Test**
6. **Casing Pressure On**
7. **For Sleeve Tester**
8. **Casing Pressure Exhaust**
9. **Hydraulic Pressure On/Off**

iv) INLET SECTION

In this section there are three inlet provided with ½" NPT for external connection and also two outlets/ exhausts provided.

1. **N2 Inlet:**
   From this inlet we can give nitrogen supply upto 2000 psi for GLV leak test and for valve setting & bellow stabilization.

2. **Orifice:**
   Here 1/16" orifice is provided for tubing pressure exhaust.

3. **Hydraulic Exhaust:**
   It is used to exhaust hydraulic pressure in ager.

4) **Air Inlet:**
   Air supply of 100 psi from air hydraulic pump can be applied through this inlet.

5) **water inlet:**
   From this inlet we can supply water for inside pressure pump.

APPARATUS

Pressure Chamber (Ager)

Tills 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.

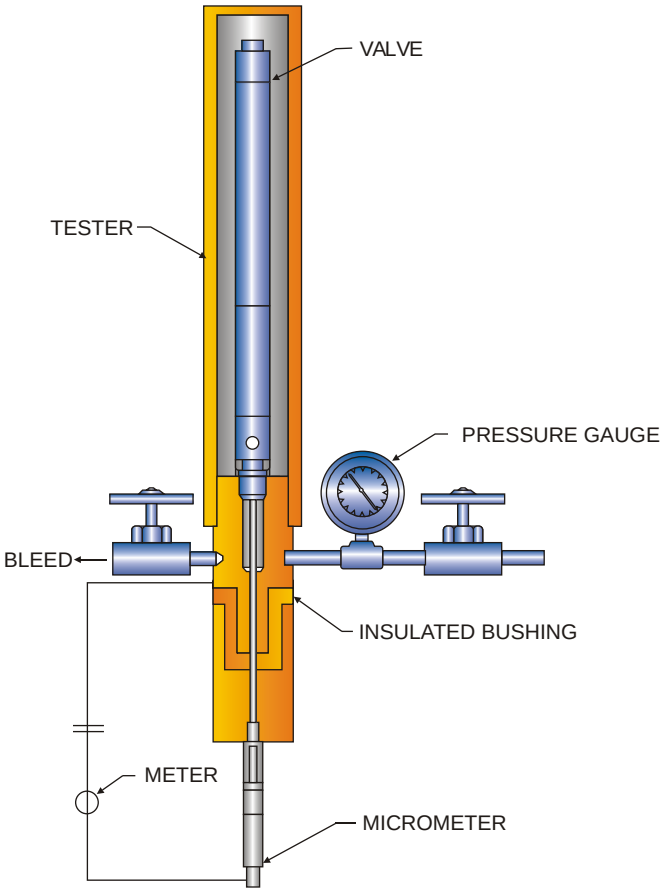
Test Rack

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



Introduction:

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 from 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 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 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.