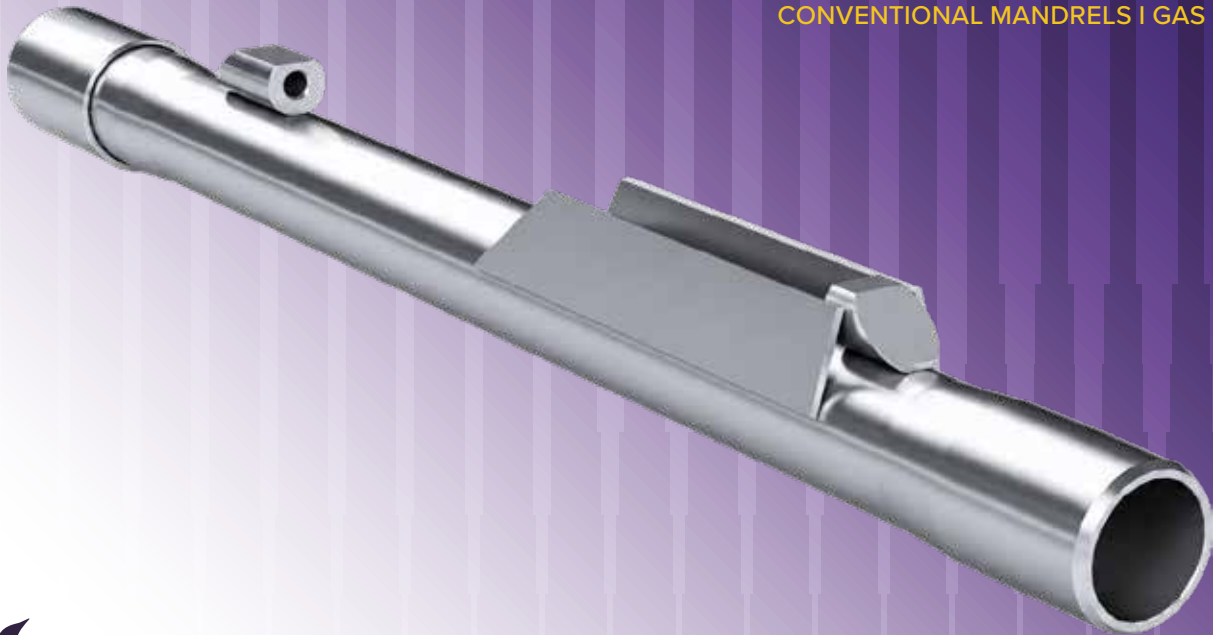


GAS LIFT SYSTEMS

SIDE POCKET MANDRELS | WATERFLOOD MANDRELS
CONVENTIONAL MANDRELS | GAS LIFT VALVES





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ABOUT US

Penguin Petroleum Services (P) Limited (PPSL) delivers end-to-end E&P solutions, from engineering through product realisation, with reliable delivery and real value for customers.

Its 90,000 sqft facility, off the Mumbai–Pune Expressway, India, houses design & development, manufacturing, and validation/functional testing under one roof.

YEARS OF EXPERIENCE

15+

COUNTRIES SERVED

35+

Equipment includes:

- Mechanical and metrology labs
- NDE equipment
- Sucker Rod Pump tooling
- CNC turning centres, VMCs, Turn-Mills
- Make-up/break-out machine (100,000 ft/lbs torque)
- Honing and deep-hole drilling machines

Testing capability:

- Downhole tools up to 1,200,000 lbf bi-directional load
- Liquid (ISO V3) and nitrogen gas (ISO V0) pressure testing, up to 20,000 psi
- Four separate/simultaneous test channels
- Ambient temperature range up to 500°F

Backed by this equipment and a skilled workforce, PPSL's India-based delivery centre offers bespoke engineering, precision machining, manufacturing, testing and assembly at a world-class standard.



GAS LIFT MANDREL

PPSL designs and manufactures Gas lift Mandrels to be installed on production tubing during well completion for gas lift, water flood, chemical injection, and other special applications. Mandrels are available for tubing sizes ranging from 2 3/8" to 5 1/2", suitable for both 1" and 1 1/2" flow control devices, in a variety of thread configurations.

They are manufactured out of fully traceable material, heat treated in conformity with NACE specifications MR0175. Effective for both sour and standard services, these mandrels are designed for straight as well as deviated wellbores and are suitable for dual completions.

Certifications

- ◆ Product grades: V1, F1, Q1
- ◆ Environmental service classes: E1–E4
- ◆ QMS compliant with API Q1 and ISO 9001

Testing and Inspection

- ◆ Magnetic particle inspection
- ◆ Hydrostatic pressure test (internal & external)
- ◆ Radiographic test — welded parts
- ◆ I.D./O.D. drift test
- ◆ Hardness value test
- ◆ Flow control device running/pulling inspection (slickline).





SIDE POCKET MANDREL

Provides full tubing drift while enabling controlled communication.

Oval cross-section mandrels that house a 1" or 1 ½" OD flow control device in an offset bore parallel to the tubing bore — providing full tubing drift while enabling controlled communication between casing annulus and tubing.

How it Works

- ◆ Orienting sleeve (upper swage) guides the kickover tool into the correct orientation while running or retrieving valves on wireline.
- ◆ Tool deflector-cum-anchor admits only the correct running / pulling tools to the pocket, deflecting all others into the tubing bore.

Key Features

- ◆ Full-opening tubing drift via oval cross-section.
- ◆ Offset bore for 1" / 1 ½" OD flow control devices.
- ◆ Machined pocket with sealing surfaces and latching profile.
- ◆ Eccentric swages at both ends of the tube.
- ◆ Orienting sleeve (upper swage) — guides kickover tool for correct valve orientation on wireline.
- ◆ Tool deflector-cum-anchor — admits only correct running / pulling tools; deflects others into tubing bore.



SIDE POCKET MANDREL

(SPECIFICATION GUIDE)

TUBING SIZE		MANDREL POCKET I.D		MANDREL BODY DESIGN	MANDREL TYPE	MAJOR O.D		MINOR O.D		DRIFT		INTERNAL TEST		EXTERNAL TEST		INTERNAL TEST		EXTERNAL TEST		LATCH TYPE	KICKOVER TOOL					
IN.	MM.	IN.	MM.			IN.	MM.	IN.	MM.	IN.	MM.	PSI	BARS	PSI	BARS	PSI	BARS	PSI	BARS							
2.375	60.3	1.000	25.4	OVAL	SPMOI-01-1X-XX-XX	2.375	60.3	1.500	38.1	1.901	48.3	7500	517.1	6000	413.7	6000	413.7	5000	344.7	BK-2 BEK-2 INTEGRAL	OK-1 MERLA KOT-1					
					SPMOI-01-1X-XX-XX													5000	344.7							
				ROUND	SPMR01-1X-XX-XX	2.375	60.3	1.500	38.1			5000	344.7													
					SPMO-02-1X-XX							7500	517.1	6000	413.7	6000	413.7	5000	344.7							
		2.375	60.3	1.500	38.1	OVAL	SPMO-02-1X-XX	2.375	60.3			1.500	38.1	7500	517.1	6000	413.7	6000	413.7	5000	344.7	RK RKP	OM-1 KOT-2			
2.875	73.0	1.000	25.4	OVAL	SPMOI-01-2X-XX-XX	2.375	60.3	2.375	60.3	2.347	59.6	7500	517.1	6000	413.7	6000	413.7	5000	344.7	BK-2 BEK-2 INTEGRAL	OK-1 MERLA KOT-1					
					SPMOI-01-2X-XX-XX													5000	344.7							
					SPMOI-01-2X-XX-XX			5000	344.7																	
					SPMOI-01-2X-XX-XX			5000	344.7																	
					SPMOI-01-2X-XX-XX			5000	344.7																	
				ROUND	SPMR-01-2X-XX-XX	2.375	60.3	N/A	N/A			7500	517.1	6000	413.7	6000	413.7	5000	344.7							
					SPMO-02-2X-XX							7500	517.1	6000	413.7	6000	413.7	5000	344.7							
					SPMO-02-2X-XX																					
		SPMO-02-2X-XX																								
		SPMO-02-2X-XX																								
		1.500	38.1	OVAL	SPMO-02-2X-XX	5.500	139.7	4.593	116.7			7500	517.1	6000	413.7	6000	413.7	5000	344.7							
					SPMO-02-2X-XX																					
					SPMO-02-2X-XX																					
					SPMO-02-2X-XX																					
				ROUND	SPMR-02-2X-XX-XX	5.500	139.7	N/A	N/A			7500	517.1	6000	413.7	6000	413.7	5000	344.7							
3.500	88.9				1.000					25.4	OVAL	SPMOI-01-3X-XX-XX	5.313	135.0	4.125	104.8	7500	517.1	6000	413.7	6000	413.7	5000	344.7	BK-2 BEK-2 INTEGRAL	OK-1 MERLA KOT-1
												SPMOI-01-3X-XX-XX											5000	344.7		
		SPMOI-01-3X-XX-XX	5000	344.7																						
		SPMOI-01-3X-XX-XX	5000	344.7																						
		SPMOI-01-3X-XX-XX	5000	344.7																						
		ROUND	SPMR-01-3X-XX-XX	5.750	146.1	N/A	N/A	7500	517.1	6000	413.7	6000	413.7	5000	344.7											
			SPMO-02-3X-XX-XX					7500	517.1	6000	413.7	6000	413.7	5000	344.7											
			SPMO-02-3X-XX-XX																							
			SPMO-02-3X-XX-XX																							
		SPMO-02-3X-XX-XX																								
		1.500	38.1	OVAL	SPMO-02-3X-XX-XX	5.968	151.6										5.000	127	7500	517.1	6000	413.7	6000	413.7	5000	344.7
					SPMO-02-3X-XX-XX																					
					SPMO-02-3X-XX-XX																					
					SPMO-02-3X-XX-XX																					
				ROUND	SPMR-02-3X-XX-XX	5.468	164.3	N/A	N/A	7500	517.1	6000	413.7	6000	413.7	5000	344.7									
4.500	114.3	1.000	25.4	OVAL	SPMOI-01-4X-XX-XX					6.437	163.5	5.500	139.7	3.833	97.4	7500	517.1	6000	413.7	6000	413.7	5000	344.7	BK-2 BEK-2 INTEGRAL	OK-1 MERLA KOT-1	
					ROUND											SPMR-01-4X-XX-XX	6.625	168.3	N/A			N/A	7500			517.1
			OVAL	SPMO-02-4X-XX-XX	7.031					178.6	6.080	154.4	7500			517.1	6000	413.7	6000	413.7	5000	344.7	RK RKP			OM-1 KOT-2
				SPMO-02-4X-XX-XX		7500	517.1	6000	413.7				6000			413.7	5000	344.7								
		ROUND	SPMR-02-4X-XX-XX	7.531	191.3	N/A	N/A	7500	517.1	6000	413.7	6000	413.7			5000	344.7									
			SPMR-02-4X-XX-XX					7500	517.1	6000	413.7	6000	413.7	5000	344.7											
		5.500	139.7	1.500	38.1	OVAL	SPMO-02-5X-XX-XX	7.938	201.6	6.812	173	4.653	118.2	7500	517.1	6000	413.7	6000	413.7	5000	344.7	RK RKP	OM-1 KOT-2			
							SPMO-02-5X-XX-XX							7500	517.1	6000	413.7			6000	413.7			5000	344.7	
						ROUND	SPMR-02-5X-XX-XX	8.375	212.3	N/A	N/A			7500	517.1	6000	413.7	6000	413.7	5000	344.7					
							SPMR-02-5X-XX-XX							7500	517.1	6000	413.7	6000	413.7	5000	344.7					



SPMO SERIES

(SIDE POCKET MANDRELS — OVAL-BODY)

Available with forged or machined pockets depending on application.

An oval-body mandrel with threaded connections for tubing string installation, available with forged or machined pockets depending on application.

The offset side pocket sits clear of the tubing bore, preserving full tubing drift while housing profiles and seal bores for gas-lift and flow-control device installation via kickover tool on standard wireline.

How it Works

- ◆ Integral orienting sleeve aligns kickover tool and flow-control device with the pocket — accurate installation in both straight and deviated wells.
- ◆ One-piece forged / machined pocket-deflector guides the flow-control device into the pocket, deflecting oversized tools back into the tubing bore.

Key Features

- ◆ Oval-body design with threaded connections.
- ◆ Machined or forged pocket options (application-dependent).
- ◆ 1" and 1 ½" ID pockets.
- ◆ Integral orienting sleeve.
- ◆ Tool guard / deflector.
- ◆ Recessed, opposing ports in forged pocket.
- ◆ Fully heat-treated material.

Applications

- ◆ Straight and deviated wellbores.
- ◆ Dual-completion applications.

Advantages & Benefits

- ◆ No need to pull / rerun tubing string for gas-lift valve installation or replacement.
- ◆ Maximised flow area with full tubing drift for unrestricted servicing.
- ◆ Reduced running clearances (dual-completion use).
- ◆ Prevents damage to gas-lift equipment (tool guard deflects oversized tools).
- ◆ Prevents flow erosion and port blockage even if pocket sits against casing wall.
- ◆ Optimal strength and corrosion resistance (heat-treated material).



SPMO SERIES

(SIDE POCKET MANDRELS — ROUND-BODY)

Robust design suitable for special dimensional requirements.

SPMR series side-pocket mandrels are characterised by their round cross-sectional profile with machined swages, pockets, and tool guards. Their robust design makes them suitable for special dimensional requirements, premium alloy, and increased pressure and tensile-strength capabilities.

How it Works

- ◆ Side pocket is located away from the tubing bore for unrestricted full tubing drift. Contains profiles and sealed bores for installation of appropriate flow-control devices, with a kickover tool.
- ◆ SPMR series mandrels lack orienting sleeves and should only be installed in straight wellbores. They come with tool guards at the top of the pocket that deflect tools larger than the pulling / running tool back into the tubing bore.

Key Features

- ◆ Round-body design, threaded connections.
- ◆ Machined swages, pockets, tool guards.
- ◆ 1" and 1 ½" ID pockets.
- ◆ Slotted orienting sleeve (where fitted).
- ◆ Special-clearance OD options.
- ◆ Fully heat-treated material.

Applications

- ◆ Single completions.
- ◆ Standard, high-pressure, and corrosive service.
- ◆ Deep, high-pressure / high-tensile environments.
- ◆ Smaller-diameter casing (special-clearance OD variants).

Advantages & Benefits

- ◆ Eliminates need to pull / rerun tubing for gas-lift install / replacement — lowers operating cost.
- ◆ Maximised flow area, full unrestricted tubing drift.
- ◆ Tool guards prevent valve latch damage from oversized tools.
- ◆ Slotted orienting sleeve gives positive kickover-tool alignment in deviated wells.
- ◆ Heat-treated material — strength + corrosion resistance.
- ◆ Special-clearance OD — flexibility in tight casing.



WATER FLOOD

(INJECTION SYSTEM)

Delivers reliable and efficient injection rates for management.

A system combining regulator valves and side-pocket mandrels to deliver reliable, efficient injection rates for waterflood management, achieving an even and efficient sweep across single- and multi-zone applications.

How it Works

- ◆ The system pairs regulator valves with side-pocket mandrels to manage injection rate and sweep efficiency across a well.
- ◆ For high-injection-rate applications, dual systems maximize rates while minimizing casing wear.
- ◆ For lower-rate applications, standardized components interchange with other products for added convenience and dependability.
- ◆ Annular/casing-flow side-pocket mandrels enable casing-through-tubing gas injection.
- ◆ Waterflood mandrels paired with Rotate-to-Release packers form a complete injection well completion.

Under Development

- ◆ Dual and Standard Regulators, Specialized Waterflood Valve, Casing (annular) flow regulation.

Key Features

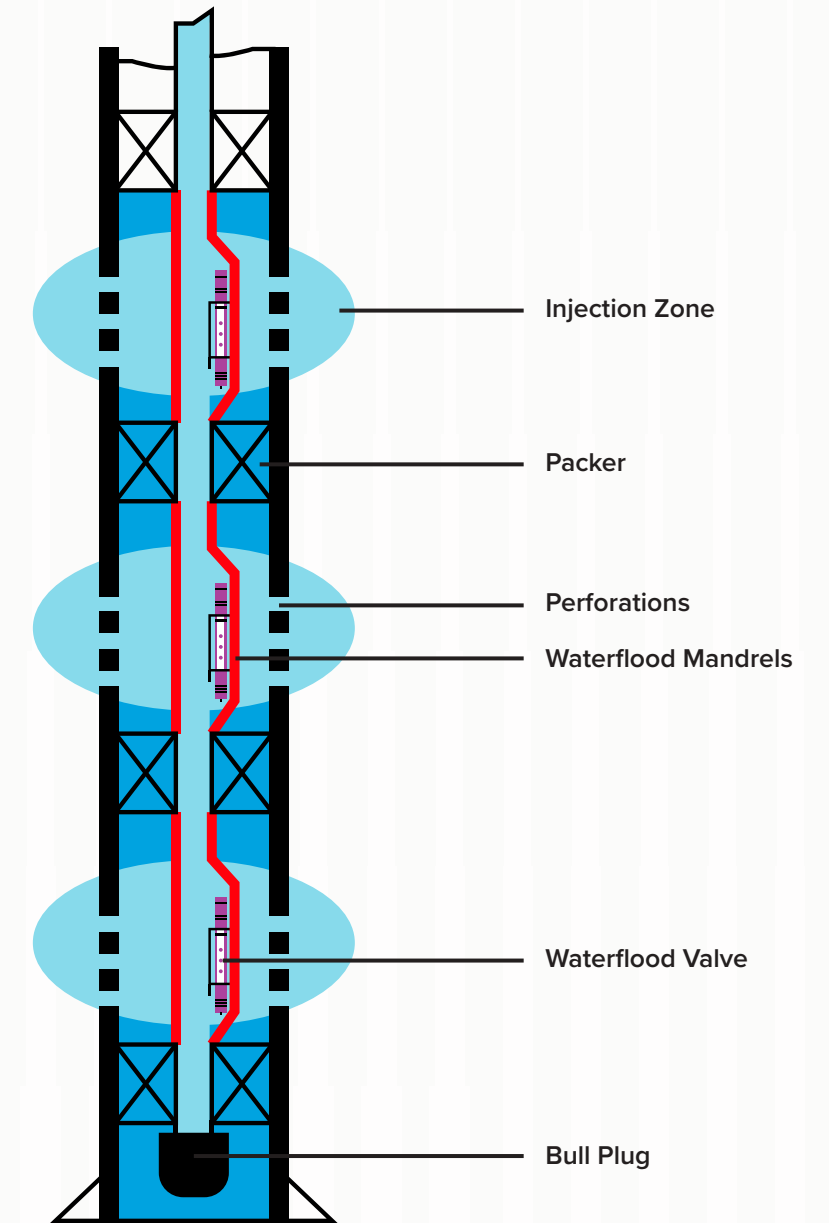
- ◆ Tubing sizes: 2 3/8" to 4 1/2".
- ◆ Single-zone and multi-zone capability.
- ◆ Injection rate range: 60–5,550 bwpd (standard system range).
- ◆ Single-well injection rates: up to 10,000 bwpd (field-proven).

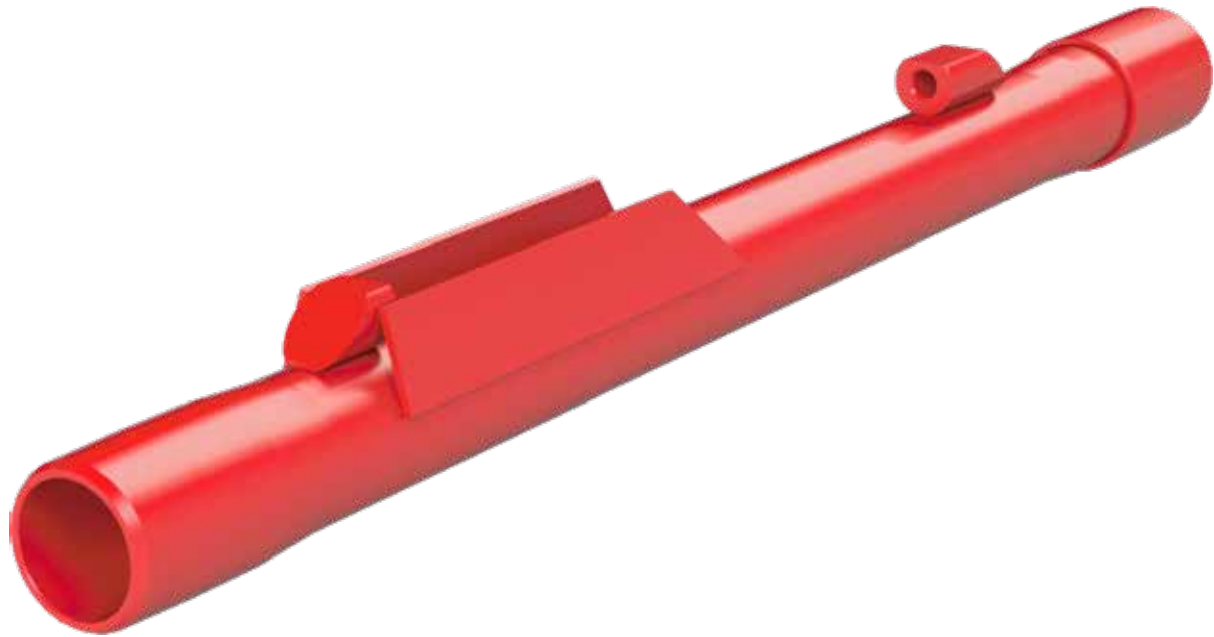
Applications

- ◆ Single-zone and multiple-zone waterflood completions.
- ◆ High-injection-rate applications.
- ◆ Lower-rate applications requiring interchangeable components.
- ◆ Injection well completions (with Rotate-to-Release packers).

Advantages & Benefits

- ◆ Reduces number of injector wells and tubing strings needed
- ◆ Reduces wellbore diameter requirements
- ◆ Minimises surface and completion equipment
- ◆ Stabilises surface injection pressure
- ◆ Ensures consistent flow rate at injection zone
- ◆ Field-proven at scale — hundreds of multi-zone completions installed worldwide.





CONVENTIONAL GAS LIFT MANDRELS

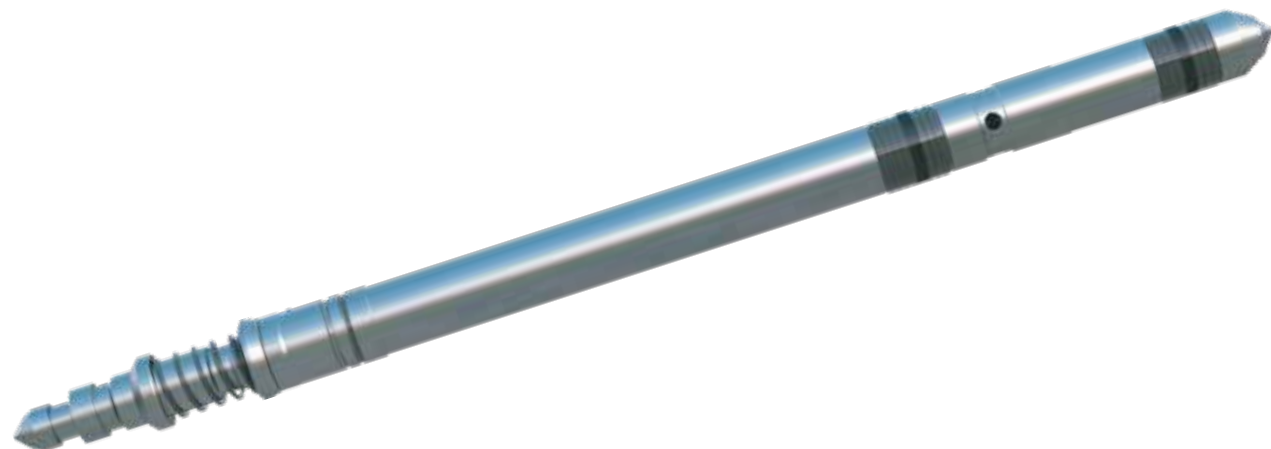
A tubing-retrievable gas lift mandrel.

A tubing-retrievable gas lift mandrel installed as an integral component of the tubing string.

How it Works

- ◆ External ported lug carries tubing-retrievable gas lift and orifice valves.

TUBING SIZE	MANDREL LUG ID	MANDREL OD	DRIFT ID	MANDREL LENGTH
2.375"	1.00	3.782	1.901	51
2.375"	1.50	4.282	1.901	51
2.875"	1.00	4.335	2.347	51
2.875"	1.50	4.835	2.347	51
3.500"	1.50	5.570	2.867	51



How it Works

- ◆ Available sizes: 1" and 1 ½"
- ◆ Retrieval types: Wireline-retrievable, Tubing-retrievable
- ◆ Valve categories offered (5 total):
 - ◆ Injection Pressure Operated (IPO) Valves
 - ◆ Production Pressure Operated (PPO) Valves
 - ◆ Orifice Gas Lift Valves
 - ◆ Dummy Valves
 - ◆ Conventional Valves
- ◆ All valves tested and validated per API 19G2 standards.

GAS LIFT VALVES

Wireline-retrievable and tubing-retrievable gas lift valves.

Wireline-retrievable and tubing-retrievable gas lift valves, manufactured in 1" and 1 ½" sizes for a range of well applications.





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