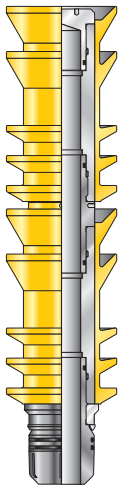
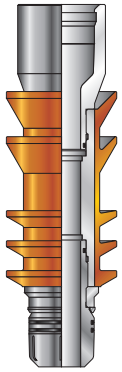
Multiple Latch-In Plug System

High-Pressure Plugs for Tubing or Casing Sizes 2-7/8 in. to 5-1/2 in.



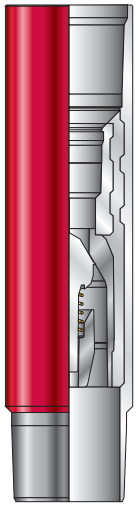
Weatherford's multiple latch-in plug system is a reliable, cost-effective method for using single or multiple high-pressure plugs to cement production tubing or completion strings. These plugs provide superior wiping ability, fluid separation, high-pressure plug bump, and backpressure capabilities for tubing or small-diameter casing in deep wells. Polyurethane plugs are used in wells with normal temperature gradients. For hot wells, the plugs are available in high-temperature versions using hydrogenated nitrile butadiene rubber (HNBR) material.



The wiping efficiency of the plug fins saves rig time by eliminating the need for cleanout trips or scraper runs before installing completion tools. Both top and bottom plugs latch and lock into a float or landing collar to provide backup to the float valves. When multiple plugs are used, the top plug latches and locks into the bottom plug. When latched in, the locking profile also stabilizes the plugs during drill out with PDC bits.

Multiple-plug systems enhance the quality of the primary cement job by isolating the slurry and eliminating contamination. The bottom plug isolates preflushes and mud below from cement above. When the plug lands, increased pressure ruptures a disk, allowing displacement of the cement above. The top plug isolates displacement fluid above from the cement below and lands in the bottom plug when displacement is completed.

Applications



- Cemented completion strings using single or multiple plugs in wells with deep, small-diameter casing or tubing
- High-pressure cemented completions in which a backup to float equipment is beneficial
- Compatible and recommended for use with Weatherford's high-pressure Model 4E2EL or 4E2HL float collars or Model 5E4HL landing collars
- Cementing tubingless completions or conventional production casing with accessory tools that have restricted IDs such as a toe sleeve or x-type nipple

Multiple Latch-In Plug System

High-Pressure Plugs for Tubing or Casing Sizes 2-7/8 in. to 5-1/2 in.

Features, Advantages and Benefits

- Plug fins provide superior abrasion resistance and wiping action, resulting in cleaner tubing that eliminates the need and time for a cleanout or scraper trip.
- Top and bottom plugs maintain fluid separation while pumping cement through tubing and casing, preventing cement contamination and ensuring a high-quality cement job.
- Bottom plugs have a large bypass-flow area, minimizing pressure drop and risk of plugging as cement circulates through the landing collar or shoe.
- The float or landing collars have a high backpressure rating and locking profile for pressure-holding redundancy and are quickly drilled out with PDC bits.
- Multiple plugs are stackable and stabilized with a latch-in design, enabling faster drillout times.

Options

- Polyurethane plug fins are available for standard temperature applications in all sizes from 2-7/8 in. to 5-1/2 in.
- Combinations of sizes from 2-7/8 to 5-1/2 in. are possible.
- HNBR plug fins are available for high-temperature applications up to 392°F (200°C) in 4 1/2-in., 5-in., and 5 1/2-in. sizes, including combinations of these sizes.
- Single, dual, and triple top and bottom plugs are available for optimum wiping efficiency.
- Large-diameter high-pressure rupture disks are available from 750 to 6,000 psi (5.17 to 41.37 MPa).*

* Note: Rupture discs rated above 1000 psi are metallic and are not PDC-drillable.

Multiple Latch-In Plug System

High-Pressure Plugs for Tubing or Casing Sizes 2-7/8 in. to 5-1/2 in.

Specifications

Performance

Size (in./*mm*)	**2-7/8 *73.0***	**3-1/2 *88.9***	**4 *101.6***	**4-1/2 *114.3***	**5 *127.0***	**5-1/2 *139.7***
Maximum circulating temperature rating of polyurethane plug fins (°F/°*C*)	293 *145*					
Maximum temperature rating of polyurethane plugs for bump pressure rating (°F/°*C*)	392 *200*					
Maximum circulating temperature rating of HNBR plug fins (°F/°C)	N/A			350 *176*		
Maximum temperature rating of HNBR plugs for bump pressure rating (°F/°C)				392 *200*		
Bottom-plug rupture-disk shear pressure (psi/*MPa*)	750 to 6,000 *5.17 to 41.37*					
Minimum plug ID (in./*mm*)	0.85 *21.6*			1.50 *38.1*		
Minimum flow area (in.^{2}/*mm*^{2})	0.56 *361*			1.76 *1135*		
Maximum casing ID (in./mm)	2.441 *62.00*	2.992 *75.80*	3.548 *90.12*	4.090 *103.89*	4.560 *115.82*	5.080 *129.03*
Minimum pump-through drift diameter (in./*mm*)	2.151 *54.64*	2.548 *64.72*	3.015 *76.59*	3.615 *91.82*	4.001 *101.63*	4.375 *111.13*
Maximum bump pressure (psi/*MPa*)	10,000 *68.95*					
Maximum latch-in plug backpressure rating (psi/MPa)	5,000 *34.47*					

Recommended Flow Rate

Size (in./*mm*)	**2-7/8 *73.0***	**3-1/2 *88.9***	**4 *101.6***	**4-1/2 *114.3***	**5 *127.0***	**5-1/2 *139.7***
Top-plug minimum latch-in or bump flow rate (bbl/min, *m*^{3}*/min*)	2 *0.3*					
Top-plug maximum flow rate (bbl/min, *m*^{3}*/min*)	4 *0.6*			6 *1.0*		
Bottom-plug minimum latch-in or bump flow rate (bbl/min, *m*^{3}*/min*)	2 *0.3*					
Bottom-plug maximum flow rate (bbl/min, *m*^{3}*/min*)	4 *0.6*			6 *1.0*		