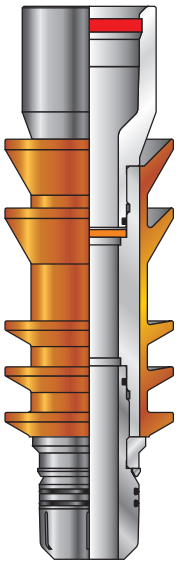
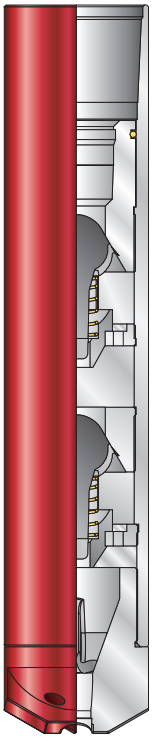
# Multiple Latch-In Plugs

## Rupture Plug System for Sizes 2-7/8 to 5-1/2 in.





Weatherford's innovative high-pressure rupture plug can be used as a single or multiple plug system to eliminate thousands of dollars of cost in horizontal wells being prepared for fracturing operations. This system, run in over 1,000 wells, provides significant value by reducing cost, eliminating nonproductive time (NPT), and placing the well on production more quickly than alternative conventional procedures.

The rupture plug in this system is the bottom plug from the Multiple Latch-In high-pressure plug system that has been used extensively to cement completion strings around the world. Released from Weatherford's rotating cement head in a preplanned sequence, the plugs use adjustable rupture discs to allow cement to be over-displaced to provide communication with the formation below the shoe after the primary cement job. The plugs isolate cement from other potentially contaminating fluids such as mud and preflushes during displacement.

The latch-in antirotation design allows casing to be tested prior to over-displacement, and the superior wiping capability of the polyurethane fins eliminates the need for a cleanout trip. The rig can be released prior to running perforating guns, which can now be pumped down rather than run on threaded pipe.

## Applications

- High-angle, horizontal wells completed in tight, low-permeability formations that require fracturing
- Cementing casing strings where pumpdown wireline perforating guns are advantageous
- Situations where casing-pressure test is required on plug bump
- Compatible and recommended for use with Weatherford's Model 3EHDL float shoes, Model 4E2HL float collars, or Model 5E4HL landing collars

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## Features, Advantages and Benefits

- The plug system enables the use of pumpdown wireline perforating devices, eliminating the need for a rig and tubing-conveyed equipment, reducing operations cost and NPT.
- The system incorporates a modular design composed of one or more high-pressure plugs with high-, medium-, and low-pressure rupture disks, providing plug flexibility for various well conditions.
- Polyurethane fins provide enhanced wiping capabilities and abrasion resistance, resulting in a clean casing ID, thus avoiding the need and cost of a clean-up run.
- The unique, field-changeable rupture disks provide accurate rupture pressure and burst without damaging the float valves, enabling fluid displacement past the shoe.
- The PDC-drillable plug system's antirotational design prevents plug rotation during drill-out, saving rig time.

## Options

- Polyurethane plug fins are available in all sizes from 2-7/8 in. to 5-1/2 in.
- HNBR plug fins are available for high-temperature applications of 392°F (200°C) in 4 1/2-in., 5-in., and 5 1/2-in. sizes, including combinations of these sizes.
- Combinations of sizes from 2-7/8 to 5-1/2 in. are possible.
- Large-diameter high-pressure rupture disks are available from 750 to 6,000 psi (5.17 to 41.37 MPa).*
- Single, dual, or triple configurations are available based on application and well conditions.

* Note: Rupture discs rated above 1,000 psi are metallic and are not PDC-drillable.

# *Multiple Latch-In Plugs*

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## *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* | | |