



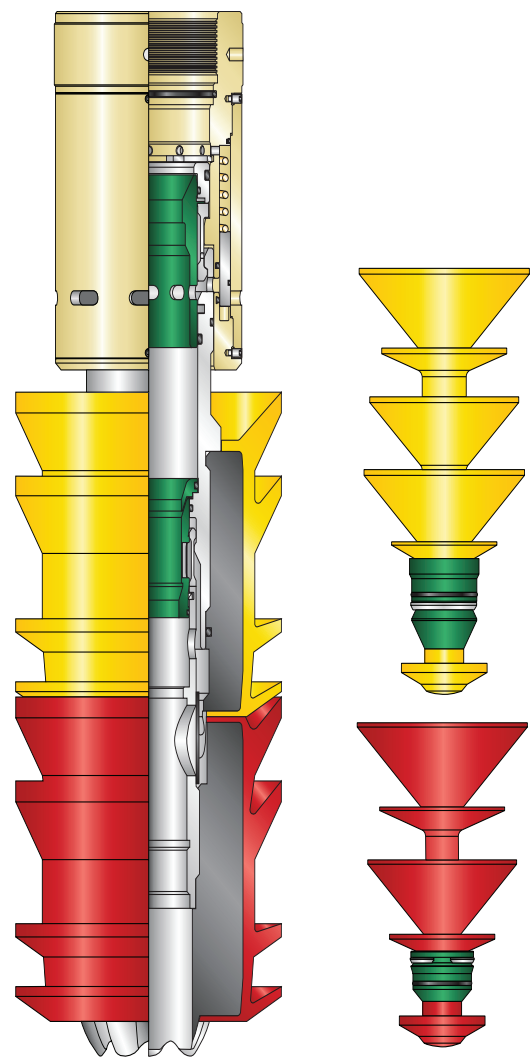
Sub-Surface Release™ Mid-Bore Plug System For Casing and Liner Sizes 9-5/8 in. to 24 in.

Weatherford's industry-standard *Sub-Surface Release* mid-bore plug system is run in conjunction with 9 5/8- to 24-in. subsea casing hanger or liner hanger systems where the minimum drift of the running string is 2.54 in. The plug system is specifically designed with a 2.11-in. mid-bore inside the plugs to enable the passage of 2-in. trip balls, improve fluid-flow capacity, and reduce surge pressures on weak formations when combined with Weatherford's autofill float equipment. The patented, integral pressure-equalizer prevents pressure buildup above the plugs to prevent premature release.

The mid-bore bottom dart is pumped from the surface in front of cement slurry and latches into the bottom plug. The bottom plug releases and features a rupture disk that enables circulation to be re-established after the wiper plug lands on the float equipment. The mid-bore top dart is pumped behind the cement slurry and lands in the top plug. After the top plug is released, it wipes the casing before bumping on the top of the bottom plug, providing a positive indication of cement displacement.

In the unlikely event that the top and bottom plugs are released simultaneously, the integral emergency-bypass feature enables fluid to bypass the plug set and flow into the shoe track, ensuring continuation of cement displacement.

Dramatically reducing drillout and running-in-the-hole time, the *Sub-Surface Release* mid-bore plugs feature a Wiperlok® nonrotating profile that corresponds to equivalent nonrotating landing profiles of compatible Weatherford float equipment. The plugs are primarily constructed from polyurethane and are available in either standard or combination fin designs.





Sub-Surface Release™ Mid-Bore Plug System

For Casing and Liner Sizes 9-5/8 in. to 24 in.

Applications

- Any liner requiring a dual-plug-system configuration to provide fluid separation during cementing operations
- Tight-tolerance liners that require a large bore through the running string
- Compatible and recommended for use with Weatherford's Sure-Seal™ 3 and 402/P/NP autofill equipment
- Liners run in pressure-sensitive formations

Features, Advantages and Benefits

- The mid-bore plug system reduces surge pressures while running casing or liner with autofill equipment in close-tolerance annuli, protecting sensitive formations from surge pressures that can cause mud losses and ultimately saving time and rig costs.
- The patented, integrated pressure-equalizer prevents pressure buildup above the plugs to prevent premature release and enables rotation of the running string without rotation of the plugs, preventing damage of the fins on the plugs.
- The 2.11-in. bore enables 2-in. trip balls to pass through, activating float equipment below the plug. For float equipment requiring larger (2-1/4 in.) trip ball activation, see Weatherford's *Sub-Surface Release* large-bore plug system.
- Two large 1.97-in. (50-mm) rupture disks in the bottom plug minimize risk of plugging with solids or debris, ensuring system reliability.
- In the event the dual plugs are released simultaneously by the bottom dart, the integral emergency bypass feature enables fluid to bypass the plug set and flow into the shoe track, ensuring continued cement displacement.
- Plugs are released by darts that maintain fluid separation through the drillpipe, preventing cement contamination.
- The system is polycrystalline-diamond-composite (PDC) drillable with a Wiperlok® nonrotating profile that prevents rotation of the plugs during drillout of the float equipment, simplifying drillout and saving rig time.
- Polyurethane plug fins offer superior abrasion resistance and excellent wiping action, resulting in a clean casing ID after passage.



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Specifications

Plug sizes (in./mm)		9-5/8 244.5	10-3/4 to 11-3/4 273.1 to 298.57	13-3/8 to 14 339.7 to 355.6	16 to 24 406.4 to 609.6
Maximum plug-bump pressure (psi/MPa)		6,500 44.82	6,000 41.37	5,500 37.92	3,000 20.68
Bottom plug launch pressure (psi/MPa)		800 to 1,200 5.52 to 8.27			
Top plug-launch pressure (psi/MPa)	High pressure	2,000 to 2,500 13.79 to 17.24			
	Low pressure	800 to 1,200 5.52 to 8.27			
Minimum plug ID (in./mm)		2.11 53.59			
Minimum flow area (in ² ./mm ²)		3.48 2,245			
Maximum rigid-dart diameter (in./mm)		2.492 63.30			
Minimum pump-through drift diameter for dart (in./mm)		2.54 64.5			
Flow endurance (bbl/min)		24 for 4 hr / 18 for 16 hr			
Maximum circulating temperature rating (°F/°C)		257 125			
Maximum temperature for bump pressure rating (°F/°C)		257 125			
Pressure required to open equalizer (psi/MPa)		30 to 60 0.21 to 0.41			

Options

- Plug sets are available in standard or combination plug fin designs.
- Top plug available for high- or low-pressure applications.
- Optional ball catcher enables a 1 1/2- to 2-in. setting ball to be caught and retained in the bottom plug.