Mego

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Casing Equipment Solutions

Catalog 2025

Casing equipment solutions
for challenging environments.

Contents

04 Introduction

06 Float Equipment

07 Super Seal II® float shoes and collars

08 Trophy Seal II® float shoes and collars

08 GasVault™ float valve

09 IsoLatch™ multiple plug cementing system

10 Super Seal II® MR float valve (mechanically retained)

10 Inner-string/stab-in float equipment

12 SuperFill™ surge reduction equipment

12 SuperFill surge reduction float equipment

14 SuperFill™ II diverter

15 Guide and specialty shoes

15 Standard guide shoes

15 High-port up-jet and down-jet float shoes

16 RPT reamer shoe

17 Float equipment table

18 Displacement equipment

19 Surface release plugs

19 HWE® high wiping efficiency cementing plugs

19 Omega™ HWE® high wiping efficiency cementing top plugs

20 24-tooth NR (non-rotating) five-wiper cementing plugs

21 SSR-II™ subsurface release cementing plug systems and landing collar

22 VersaFlex® liner hanger plug assembly and landing collar

23 MCXV drillpipe wiper darts

24 Surface release and subsurface release plug specification tables

33 Centralizers

34 MEGO centralizers

35 ICCS-II centralizers

37 Stage tools and packers

37 Standalone stage cementers

38 ES-II™ cementer – Type P and Type H

39 ES-II™ HD cementer

40 Fidelis™ cementer

41 NO-Dull composite seat stage cementer

41 Integrated composite baffle and Super Seal II® float collar

42 Integrated stage cementers

42 MSIPC packer collar

43 ESIPC™ packer collar

44 ESIPC™ HD packer collar

45 Compression-set packers

46 Obex GasLock® packer

47 Obex IsoLock® packer collar

48 Obex EcoLock® packer

49 Stage cementing operating plug sets

50 Contingency free fall closing plugs

51 Displacement type plug sets

53 Type H selective-release (SR) plug set

55 Specialty tools

55 Plug setting aids

55 BHKA™ disconnect tool

56 Advanced cement support tool

57 Casing Floatation

57 AirGlide™ floatation collar

58 Cementing service equipment

58 Indicating ball catcher

58 Indicating dart catcher

59 Foam wiper balls

60 Inflatable Casing Annulus Packer

62 Swellable packers freecap®

Casing equipment solutions

Faster placement

Successful long-term zonal isolation

With more than 40 years of experience, MEGO continues to provide casing equipment solutions for well construction in challenging environments:

- **Mature Fields**
  A key aspect to manage cementing risks in Mature Fields is to design a program that includes casing equipment that meet the well objectives and challenges. You need to consider cement slurries and casing equipment for wellbore conditions, operational constraints, and the regulatory requirements.
- **Unconventionals**
  Cementing unconventional wells can present a number of challenges, especially associated with with number and intensity of hydraulic fracturing stages in extended-reach lateral sections in unconventional horizontal wells. Proper selection of casing equipment helps mitigate the risk of inadequate zonal isolation.
- **Deep Water**
  Deepwater cementing can be challenging due to a number of factors, including narrow pore pressures and fracture gradients, low temperatures, unstable table formations, and salt that can damage wells, causing tight spots, doglegged pipe, or collapsed pipe. Propper casing equipment selection is critical in these.
- **Geothermal/HPHT (High Pressure, High-Temperature)**
  Geothermal cementing faces a number of challenges, including extreme temperature and pressure changes can stress the cement and casing movement. Corrosive gases and naturally occurring brines can cause cement carbonation and steel corrosion. Geothermal casing equipment needs to be corrosion resistant competent in high temperature applications.
- **Carbon Capture and Storage**
  Carbon sequestration wells, also known as Class VI wells, are constructed to store carbon dioxide (CO2) underground and prevent it from leaking. Highly regulated well construction and underground injection control standards demand casing equipment compatible with CO2 and resistant to corrosion for the life of the well. Using casing equipment for this challenging environment is critical.
- **Plug Setting Aids**
  When it is necessary to plug and abandon a well or to set a kick-off plug, using the right tools to increase the success of plug placement enables safer and more const effective operations.
- **Casing While Drilling**
  In CwD, casing equipment is used for drilling and must endure significant torque and weight applied on it to make hole. A reliable tool for this type of operations is critical to the success of the operation, which includes cementing the casing in place.
- **Centralization**
  Proper centralization is a fundamental aspect of a successful cement job. Depending on the type of well construction environment, type of centralizer, quantity and placement are key to a successful primary cement job.

Poppet valves

- Super Seal II® float valve
- Trophy Seal® float valve
- GasVault™ float valve
- Super Seal II® MR float valve

Flappers valves

- SuperFill™ and SuperFill™ II Big Bore surge reduction float equipment

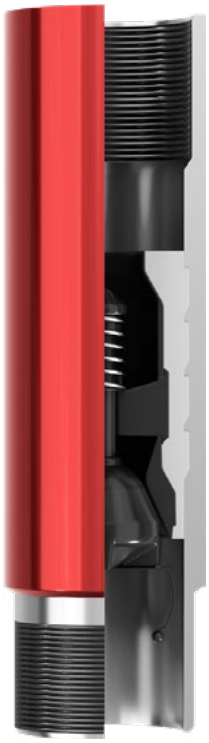
Super Seal II® float shoes and collars

Super Seal II® float equipment is designed to perform reliably under the most severe downhole conditions and can be customized to specific requirements . Super Seal II valves can withstand a wide spectrum of wellbore environments.

Features and benefits

- PDC drillable
- 2 3/4-in. valve in 4 1/2- to 7-in. casing sizes
- 4 1/4-in. valve in 7-in. and larger casing sizes
  - Options:
  - Auto-fill capability
  - Single or double valve options for collars and shoes
  - Sealing sleeve for inner-string cementing operations
  - With or without latchdown plug seat
  - Down-jet and high-port up-jet (HPUJ) float shoes
  - Non-rotating (NR) plug seat in 7- through 20-in. equipment
  - Offset tapered composite or aluminum noses
  - RPT reamer shoes with tapered composite or aluminum noses

Super Seal II® double valve float shoe



Super Seal II® float collar

API specification 10F ratings for Super Seal II® valves

Casing Size (in.)	AF	R	D	T	P
4 1/2 to 5 1/2	12	10	24	400	7.5
7 to 7 3/4	12	20	36	400	7.5
8 5/8 to 9 7/8	12	20	36	350	7.5
10 to 13 5/8	12	20	36	350	5
14 to 22	12	15	24	200	1.5

*7,500 psi is the maximum fluid rating according to API Spec 10F; however, pressure testing to 10,000 psi has been performed on 4 1/2-in float equipment

Flow durability time and rate:

AF Cumulative reverse flow duration (hours) at 3 bbl/min (0 .5 m3/min)

R Forward flow rate (bbl/min) lative forward flow duration (hours)

Static high-temperature/high-pressure:

T Static high-temperature tests (°F)

P High-pressure tests (1,000 psi)

Trophy Seal® float shoes and collars

Built upon the proven quality of the Super Seal II® float equipment line, Trophy Seal® float shoes and collars are engineered to perform within a specific range of low temperatures and pressure, use API threading, and can meet non-critical and shallow well needs.

Features and benefits

- API RP 10F IA rating
- PDC drillable
- Tested to 10 bbl/min with 1,500 psi at 250°F (121°C) and 2,500 psi at 150°F (66°C)
- Float collars and shoes available in 8rd and buttress; also available in slip joint float shoes
- Available in K-55 stock only
- Optional auto-fill kit available on request and sold separately
- PDC drillable

Trophy Seal®
float shoe

Trophy Seal®
float collar

Standard Trophy Seal shoes and collars are equipped with short pins and long box ends to fit any style of API 8rd threads. Long thread box ends accept short or long API threads.

GasVault™ float valve

GasVault™ float valve

This gas tight float equipment is qualified as a true barrier to hydrocarbons, a crucial benefit for unconventional plays economic feasibility. The GasVault™ float valve is an improved float equipment barrier that allows operators with a wet- shoe track to safely rig-down drilling equipment and efficiently move to the next pad as soon as the cement job is complete.

Features and benefits

- 5 1/2-in. casing size with more production sizes available upon request
- Extended flow endurance and higher debris tolerance
- Modular valve design allows tailored configurations
- Gas tight tested to 5,500 psi at 300°F after 48 hours flow
- Fluid tested to 15,000 psi at 300°F
- Standard poppet design with flow protected mechanics
- Available for use with the IsoLatch™ multiple plug cementing system

API specification 10F ratings for MEGO Super Seal II® valves

Casing Size	Duration (hours)	Flow Rate (bbl/min)	Temperature (ºF)	Pressure (ksi)	Auto-Fill (hours)
5 1/2-in.	36	10	300	7.5*	0

*7,500 psi is the maximum fluid rating according to API Spec 10F; however, fluid testing to 15,000 psi and gas testing to 5,500 psi has been performed.

IsoLatch™ multiple plug cementing systemrs

The IsoLatch™ multiple plug cementing system is a latchdown system designed to land and latch the top cement wiper plug after cementing by integrating the latch into the top plug. Once the casing is wiped and fluids are separated ahead of the cement slurry, the bottom plug passes through the landing collar and lands on the float collar. The top plug then follows the cement slurry to wipe the casing internal diameter (ID), and latches in the landing collar, which is integral to the float collar. An optional rupture disc can be placed within the top plug to accommodate various scenarios, including 3,000-psi wet-shoe cementing or high-pressure casing testing.

Features and benefits

- Based on field-proven high-pressure/high-temperature (HP/HT) RapidStart® Initiator (RSI) plug sets
- Rugged wiper fins to withstand long horizontal wells
- Rated up to 15,000 psi bump pressure
- Suitable for use up to 400°F (204°C)
- Single latch-in design for top plug increases reliability by preventing plug from lifting off seat
- Integral landing collar and float collar that enables wet-shoe applications

Wet-shoe applications

Latch-in cement wiper plugs are designed for use in conjunction with SuperSeal II® float valves and are ideal for wet-shoe cementing applications where the operator must continue displacing cement past the casing shoe. Upon completion of the cement application, pressure can be applied to rupture the disc on the top plug. The lack of cement on the casing shoe allows operators to pump down frac plugs for plugging and perforating operations. Optionally, the Super Seal II valve can be replaced with the GasVault™ valve.

IsoLatch™ multiple plug cementing system

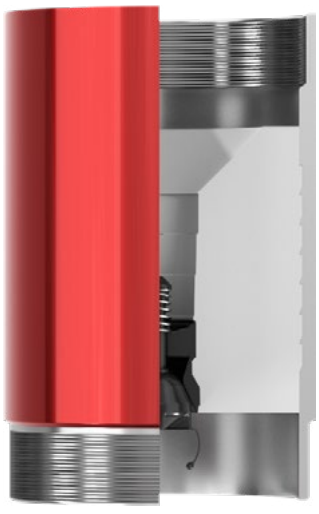
Super Seal II® MR float valve (mechanically retained)

This robust valve design was built upon the field proven technology of Super Seal II® poppet valves and engineered to withstand high pressure and temperature operations at high flow rates. The unique design feature of the high-temperature aluminum Super Seal II MR float valve is a mechanically retained sealing element, custom molded for the target environment . The MR case body includes a sealed valve seat, which increases pressure ratings at higher temperatures.

Features and benefits

- Mechanically retained sealing element
- High-temperature aluminum construction
- Double valve options available
- Rated to 15,000 psi up to 300°F (149°C)
- Rated to 10,000 psi up to 400°F (204°C)
- PDC drillable
- Suitable for use in geothermal applications

Super Seal® II MR float valve



Stab-in float collar

Inner-string/stab-in float equipment

Inner-string float equipment allows large-diameter casing strings to be cemented through drillpipe or tubing with an adapter that is stung into and/or sealed into the float shoe or float collar.

Features and benefits

- Economical alternative to cementing large casing compared to conventional methods
- Helps eliminate the need for large-diameter cementing plugs or heads
- Helps reduce cement contamination
- Helps reduce the amount of cement to be drilled out of large-diameter casing
- Helps decrease cementing displacement time
- Extended-length seal bore and adapter available for deepwater drilling
- PDC drillable
- Available with latchdown dart system
- Double valve available upon request

SUPER FILL™ SURGE REDUCTION EQUIPMENT

Running casing in the well at an operationally efficient speed without resulting surge pressure damaging the formation is a long-standing challenge within the oil and gas industry. Hours of rig time are consumed manually filling the casing from the surface or running in with reduced running speeds.
The SuperFill surge reduction family is designed to help reduce surge pressure and optimize speed during casing running operations in tight annular clearance or in wells with narrow margins between the fracture gradient and pore pressure. The portfolio consists of reliable auto-fill float valves and a landing string flow diverter system.

SuperFill™ surge reduction float equipment

Conventional poppet valve float equipment can allow wellbore fluid to enter the string but this equipment does not provide the benefit of surge reduction. SuperFill equipment is available for use in casing sizes 5-in. and larger, in either shoe or collar configurations.
The deactivation ball for each of the three types varies in size based on the casing outside diameter (OD): 1 3/8-, 2 3/8- or 3 1/2-in.
Deactivation of the auto-fill feature is achieved by selecting one of three design types that provide the flexibility to suit a variety of well conditions.

SuperFill™ type FV (flapper valve) features and benefits

- Deactivation of auto-fill with surface released drop ball
- Allows for extended circulation or washing down to total depth (TD) without risking deactivation
- Double valve equipment available for 7-in. and larger sizes
- Single valve float shoes available for added redundancy to prevent backflow
- PDC drillable

SuperFill™ Type FV

SuperFill™ type FVB (ball retained) features and benefits

- Deactivation of auto-fill with first circulation as ball is retained and carried with the tool to TD
- Enables rapid well control
- Useful to achieve the required flow rate/differential pressure to deactivate auto-fill equipment
- Deactivation balls can be sized to maximize flow area through the valves, resulting in improved surge reduction
- Useful in applications where the liner/casing hanger systems create an ID restriction that would limit the size of an auto-fill deactivation ball
- PDC drillable

SuperFill™ Type FVB

SuperFill™ type FVB+ (multi-circulation ability) features and benefits

- Deactivation of auto-fill with increased circulating flow rate with ability to perform multiple circulations
- Provides the ability to wash past ledges or restrictions while running casing to TD and maintain auto-fill capability afterwards
- Deactivation balls can be sized to maximize flow area through the valves, resulting in improved surge reduction
- PDC drillablePDC drillable

SuperFill™ FVB+

SuperFill™ II Big Bore surge reduction equipment

To maximize surge reduction, all SuperFill float equipment that is 9 5/8-i. and larger is equipped with the new and improved SuperFill II Big Bore design.
SuperFill II Big Bore equipment is converted with a 3 1/2-in. deactivation ball and offers a pre-conversion flow area of 8 .95-sq .in., offering industry leading reduction in surge pressure while running casing in the well.
SuperFill II Big Bore valves can be configured to convert in all three design types: FV, FVB, FVB+.

Features of SuperFill™ and SuperFill™ II Big Bore float equipment

Features	FV	FVB	FVB+
Reduction or elimination of casing fill-up times	•	•	•
PDC (Polycrystalline Diamond Compact) drillable	•	•	•
Reduction of formation surges by allowing for fluid to enter the casing almost freely	•	•	•
Increased compatibility with surface and subsurface tools, with elimination of dropping a conversion ball		•	•
Presents no limitation regarding wellbore deviation		•	•
Auto-fill conversion is achieved with simple fluid circulation		•	•
Pressure converted, allowing circulation while RIH and prior to reaching TD without affecting auto-fill capability			•

SuperFill™ II diverter

For liner and offshore operations pipe run in hole (RIH) speed can generate excessive fluid frictional pressure loss through the length of the landing string. Proper management of pipe speed can help reduce surge pressure. However, this can increase the time necessary to reach the casing final depth.

To enhance auto-fill float equipment benefits and significantly reduce induced surge pressure on the formation, a diverter tool is installed on the landing string above the casing/liner hanger running tool to redirect fluid flow from inside the landing string to the annulus.

As part of its closing mechanism, the SuperFill II diverter features a glass ball seat installed to the closing sleeve. Pressure applied to the seated ball causes retaining pins to shear and the sleeve to close communication from the inside out. Increased pressure causes the seat to disintegrate into fine, sand-like particles that flow down the pipe with the ball after tool closure. The innovative glass seat, however, leaves no debris after deactivation for fullbore access.

The SuperFill II diverter system is available in 6 5/8 FH or 4 1/2 IF (NC50) drillpipe connections.

SuperFill™ II diverter

Features and benefits

- Innovative glass ball seat disintegrates into fine, sand-like particles that impose no restrictions once the tool is closed
- Provides fullbore ID that maximizes compatibility with downhole tools
- Single-body design provides high torque and tensile ratings
- Large diverting port flow area alleviates surge pressure while running casing in tight-clearance applications or at high RIH speeds
- Flow diversion feature is deactivated with a dropped 1 3/4-in . closing ball
- Designed with quick and easy redress kits that requires no tool service breaks, eliminating the need of pressure integrity test to perform subsequent jobs

SuperFill™ II closing confirmation sub

SuperFill II closing confirmation sub

The closing confirmation sub is designed to run in conjunction with, and a couple of stands below, the SuperFill II diverter. This provides confirmation that the ports in the diverter tool are closed before cement operations begin. The tool features the identical glass ball seat technology used on the diverter.

GUIDE AND SPECIALTY SHOES

Standard guide shoes

Attached to the lowermost end of the casing string, standard guide shoes are a low-cost method that enables the casing to pass ledges or obstructions in the wellbore and aid bit re-entry.

Standard guide shoe

Features and benefits

- Protects casing string from impact associated with landing casing on bottom
- Directs casing away from ledges, helping reduce occurrence of sidewall cave-in
- Helps casing pass through narrow, deviated holes and areas with hard shoulders
- Provides a re-entry angle to help ensure bits and other bottomhole assembly (BHA) hardware can enter the casing during tripping operations
- Has large diameter hole through the center of the shoe, allowing maximum cement pumping rates and passage of auto-fill tubes and deactivated balls
- Noses available in cement and plastic designs
- PDC drillable

High-port up-jet float shoe

Down-jet float shoe
with tapered nose

High-port up-jet and down-jet float shoes

When more than the standard guide shoe is necessary in a wellbore, MEGO offers High-port up-jet and Down-jet float shoes. Flow through the ports causes turbulent, jetting action that promotes mud removal and improves cement annular distribution. The tool design is customizable to include multiple material options of tapered and offset tapered noses to help casing pass severe ledges, obstructions, high angles, and previous sidetracks. These noses also help protect float valves from premature damage caused by debris while running in hole.

Features and benefits

- Enables casing to reach total depth in one trip
- Helps improve cement bonding by jetting wellbore clean and aids circulating past tight spots
- Can be manufactured with or without a float system. Super Seal II, SuperFill, SuperFill II Big Bore or GasVault options available
- Available in aluminum (PDC drillable) and composite material (PDC drillable)
- “Enclosed” down-jet option available with molded plastic nose, which passes 60% of flow through the nose and 40% through down-jet ports

RPT reamer shoe

Reamer shoes remove bridges or wellbore obstructions caused by formation swelling, unconsolidated formations, and caving and faulting conditions. Reamer shoes are available in spiral vane (RPT) with or without the Badger RPT™ aggressive reamer nose design.

Features and benefits

- Equipped with Cut-Rite carbide cutting material structure to help eliminate obstructions and prevent having to pull casing for another wiper run by assuring near gauge hole when running casing
- Aluminum and composite nose options available based on wellbore specific challenges
- For use with and without rotation
- Can be manufactured with or without a float system. Super Seal II, SuperFill, SuperFill II Big Bore or GasVault options available
- Specially built to fit any casing and hole size combinations, customizable in any grade material
- PDC drillable
- Built to 1/4-in. under gauge hole size

RPT reamer shoe

FLOAT EQUIPMENT SPECIFICATION TABLE

SuperFill surge reduction float equipment

Specification	FV			FVB			FVB+	
Recommended Applications	Use the Type FV deactivation design to achieve periods of extended circulation or washing of casing to total depth (TD) without risking deactivation of the auto-fill flapper valves. Remember that a ball is dropped from surface, so be aware of the IDs in the string between surface to the float equipment.			The Type FVB deactivation design is ideal for rapidly achieving well control after first circulation, or in wells where pre-job analysis predicts difficulty in achieving the required rate / differential pressure to deactivate the auto-filling floating equipment.			The FVB+ deactivation design provides the ability to circulate through the valve to wash past ledges or restrictions while running casing to total depth and maintains auto-fill capability afterwards. This feature is especially useful in liner applications where ID restrictions in the liner / casing hanger system may require smaller activation balls to land and deactivate the auto-fill float equipment.	
Casing size (in.)	< 7	≥ 7 < 9 5/8	≥ 9 5/8	< 7	≥ 7 < 9 5/8	≥ 9 5/8	≥ 9 5/8	≥ 9 5/8
Conversion Ball OD (in.)	1 3/8	2 3/8	3 1/2	1 3/8	2 3/8	3 1/2	2 3/8	3 1/2
Conversion Ball Specification	Phenolic Plastic 3 .4 sg			Phenolic Plastic 3 .4 sg		Phenolic Plastic 1 .77 sg	Phenolic Plastic 3 .4 sg	Phenolic Plastic 1 .77 sg
Flow Area for Auto-fill (sq .in.)	1 .287	3 .976	8 .946	1 .287	3 .976	8 .946	3 .976	8 .946
Flow Area before Conversion (sq .in.)	1 .287	3 .976	8 .946	N/A			0 .500	0 .354
Flow Area after Conversion (sq.in.)	1 .485	4 .430	9 .621	1 .485	4 .430	9 .621	4 .430	9 .621
Service Temperature, °F (°C)	300 (149)			300 (149)			300 (149)	
Expected Conversion Pressure (psi)	5 to 5 1/2	900 to 1200		5 to 5 1/2	900 to 1200		5 to 5 1/2	N/A
	7 to 7 3/4	500 to 800		7 to 7 3/4	500 to 800		7 to 7 3/4	400 to 600
	9 3/8 to 20	400 to 600		9 3/8 to 20	400 to 600		9 3/8 to 20	400 to 600
Backpressure Rating (psi)	Pressure rating varies on casing size: 5,000 psi for <13 5/8 8-in, 1,600 psi for 14 - and 16 -in, 2,100 psi for >18-in.							
Flow Endurance	25 bpm for 8 hours 10 bpm for 24 hours							

Notes:
- Pressure ratings are based on tests performed at 300°F (149°C) unless otherwise noted.
- Listed pressures might exceed pressure limits of casing or pumping equipment and indiate the operating limits of the equipment only.
- Pressure ratings and are subject to change without notice. Contact a Casing Equipment representative for possible revisions.

THE CEMENTING PLUG PORTFOLIO

Our cementing plugs are manufactured with robust materials designed to withstand wear and support high bump pressure, which improve overall drillability, reduce drillout time, and minimize rig costs. A color-coding system is used to correctly identify each plug; the top plug is black, while the bottom plug is orange or red. As operations transition to deeper water, higher downhole pressure and temperature, and longer laterals, cementing plugs historically have and will continue to provide the following basic functions:

- Wipe mud sheath from casing ID
- Prevent fluid intermixing during cementing operations
- Help prevent over displacement of cement slurry
- Provide a surface indication when the cementing operation is complete by creating a hydraulic seal with a float or landing collar
- Use of multiple bottom plugs when separating well fluid from spacer

Industry leading wiper plug technology.

Surface release plug systems

- HWE® (high wiping efficiency) cementing plugs
- Omega™ HWE® top plugs
- 24-tooth NR (non-rotating) five-wiper cementing plugs
- RapidStart® Initiator plug sets**

Subsurface release plug systems

- SSR® plug system
- VersaFlex® liner hanger plug system and landing collar
- SR Type H plug system*

*SR Type H plug sets are detailed in the Stage Tools and Packers section of this catalog.
**RapidStart Initiator plug sets are covered in the IsoLatch multiple plug system section.

SURFACE RELEASE PLUGS

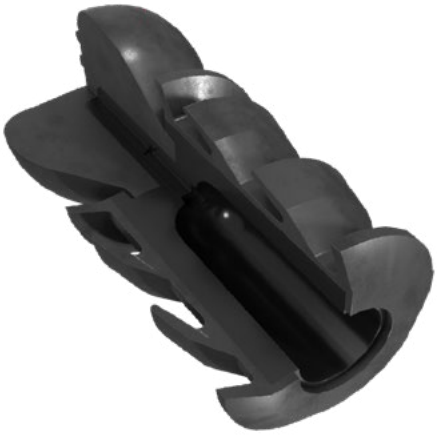
HWE® high wiping efficiency cementing plugs

HWE® top and bottom cementing plugs are designed to help improve wiping efficiency during cementing operations.
Wipers of HWE plugs are of deep-cup design, which provides greater wiping efficiency to remove mud film, rust, and mill scale.

HWE® top and bottom plug

Features and benefits

- Deep-cup wiper design energized from pumping pressure to aid maximum casing wall contact
- Bottom plug supplied with an LCM tolerant, 750-psi shear disk capable of handling large lost circulation materials
- Drillout improved by reduced material, smaller debris, and tighter gripping compared to conventional five wiper plugs
- In 4 1/2- through 5 1/2-in. sizes, optional 1,500/2,000- psi rupture disc pressures provide definitive landing indication of bottom plug; other pressures available u pon request
- Replace top plug with high-pressure rupture disc bottom plug for an intentional wet-shoe application
- Compatible with WBM, OBM, and SBM systems
- Suitable for up to 400°F (204°C)



Omega™ HWE® top plug

Omega™ HWE® high wiping efficiency cementing top plugs

Omega™ HWE® cementing plugs combine the wiping technology of two designs (HWE plug + Omega ball) to help achieve maximum wiping capability and casing wall cleaning, particularly in horizontal production casing string.

Features and benefits

- Deep-cup wiper design energized from pumping pressure to aid maximum casing wall contact
- Omega “ball” provides self-energized surface contact as secondary wiping mechanism
- Prevents the plug from freefalling in vertical and long horizontal wells
- Combats solids settling with low displacement rates before cementing
- Available for WBM, OBM, and SBM systems
- Suitable for use up to 400°F (204°C)

24- tooth NR (non-rotating) five-wiper cementing plugs

24-tooth NR five-wiper plugs are designed with 24 locking lugs on the insert. When landed on the SuperSeal II NR float collar, the locking teeth latch, locking the plug to the float collar. These high-strength plastic inserts used in NR plugs increase plug landing pressure and allow easy drillout with roller cone rock-bits or PDC bits.

Features and benefits

- Locking teeth NR inserts designed to land on MEGO NR float collars and help-prevent spinning at drillout
- High-strength inserts available to increase plug-landing pressure, enabling casing pressure testing after bumping the plug
- Combination plugs available for tapered strings
- Compatible with WBM, OBM, and SBM systems
- Suitable for use up to 400°F (204°C)

24-tooth NR five-wiper plug

SSR-II™ subsurface release cementing plug systems

The SSR-II™ plug system is a step change in design for improved drillability of subsurface release cementing plug systems using PDC bits. This second generation plug system consists of composite inner mandrels and release mechanisms, another first for the industry. A separate retrievable swivel/ equalizer assembly is run with the SSR-II plug system to equalize pressure above the top plug and drill-pipe and allow the casing or liner hanger running tool to be turned during makeup.

The SSR-II plug system is available in multiple options:

- Single-plug system (top plug only) or dual-plug system (top and bottom plugs)
- The industry's first triple-plug system (top, middle, and bottom plugs) recommended to separate well fluid and improve displacement volume accuracy on longer strings
- Optional ball catcher feature (up to 1 .875-in . OD)
- Combination plug sets available for tapered strings

SSR-II™ plug system

Features and benefits

- Plug system made of composite material, which improves drillability, thus reducing operational cost
- Top and bottom plugs released with an MCXV wiper dart
  - Wiper darts selected using a Dart Selector Tool
- Wiper plugs utilize HWE High Wiping Efficiency cementing plug design in many sizes
- Rated at 300°F and flow tested at 20 bbl/min for 24 hours
- HS (high strength) versions available with increased bump ratings for setting expandable liner hangers
- Compatible with WBM, OBM, and SBM systems

SSR-II™ landing collar

SSR-II landing collars are run as the uppermost component of the casing shoe track. When a SSR-II bottom plug lands on a landing collar, a bypass feature is pumped out the bottom of the plug. The plug's inner mandrel falls below the landing collar and allows the cement to pump through the bore's increased flow area. The landing seat is made of composite material cemented into a cased body and is easily drillable with any bit type.

- Compatible with WBM, OBM, and SBM systems
- Suitable for up tp 400ºF (204ºC)

SSR-II™ landing collar

VersaFlex® liner hanger plug assembly

VersaFlex® expandable liner hanger plug assemblies are specially designed for use with liner hangers. SSRII subsurface release cementing plug systems and VersaFlex plugs overlap in size offerings, with specific features that complement smaller liner operations available to the VersaFlex plug system. High-strength plug bodies provide higher landing pressure typically necessary to set VersaFlex expandable liner hangers.

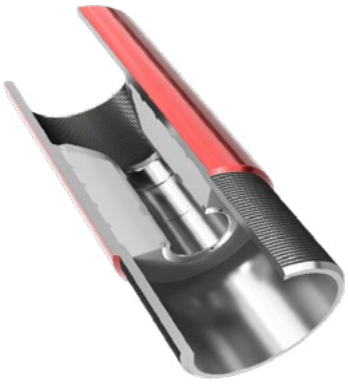
VersaFlex® liner hanger plug

VersaFlex liner hanger cementing plug systems are available in the following styles:

- Single-plug system (top plug only) with 1 .75-in. ball catcher option
- Double length single-plug system (top plug only), 4 to 5 1/2-in. casing
- Dual-plug system (top and bottom plug), 5 to 5 1/2-in. casing
- Single-plug system (top plug only) for wet-shoe applications

Features and benefits

- Plugs released with an MCXV wiper dart
  - Wiper darts selected using a proprietary Dart Selector Tool
- HWE wiper plug style offers proven performance for optimal fluid separation and casing wiping
  - Additional wiper cup configurations available
  - Combination plug sets available for tapered strings
- Plugs have field adjustable release pressure
- Wet shoe design allows spotting non-settable fluid in the shoe track to create wet shoe, as necessary, for completion operations once cementing is complete



VersaFlex® liner hanger plug landing collar

VersaFlex® liner hanger plug landing collar

VersaFlex liner hanger plug landing collars are run as the uppermost component of the shoe track. The VersaFlex liner hanger plug assembly incorporates a sealing and latching feature that increases plug bump and backpressure capability after landing the plug.

For the dual-plug system, the landing collar houses an internal bypass feature when the bottom plug lands during cementing operations. The dual-plug landing collar is integrated with a Super Seal II float valve in a landing/float collar assembly that removes the need for two additional casing connections from the shoe track.

MCXV drillpipe wiper darts

MCXV drillpipe wiper darts serve two main functions: to wipe the drillpipe wall as it travels toward casing/liner hanger running tools to provide mechanical separation between fluids and to create a seal when the drillpipe dart enters the bore of a subsurface release plug system (SSRII system or VersaFlex system).
MCXV darts are available for a variety of drillpipe designs and sizes. A proprietary Dart Selector Tool determines the optimized drillpipe wiper cup configuration and ensures the correct dart part numbers are selected for each operation. MXCV drillpipe wiper darts are also used to operate the BHKA disconnect tool detailed in the Specialty Tools section of this catalog.

Features and benefits

- Lead cup protects nose components and helps prevent hanging in transitions
- Drive cup specifically designed for casing/liner running tool ID profiles to drive the dart through restrictions, regardless of friction from large cups
- Robust single mandrel and threaded nose helps ensure safe passage over thousands of feet of drillpipe and through the restricted IDs of casing/liner hanger running tools
- Each cup on the dart is meant to wipe a specific ID range

MCXV wiper dart, SSR-II™ top plug

MCXV wiper dart, SSR-II™ bottom plug

SUBSURFACE RELEASE PLUGS

HWE® (high wiping efficiency) cementing plugs

Features		
Recommended Applications	Universally recommended cementing plug that provides easy drillout	
Casing Size (in .)	4 1/2 to 13 3/8 and 24	
Service Temperature, °F (°C)	Up to 400 (204 .4)	
Plug Landing Profile	Flat	
Compatible Landing Equipment	Float collar with flat surface	
Bottom Plug Bypass Pressure (psi)	750	
Top Plug Landing Pressure (psi)	Casing Size, in. (Min./Max. Wiping Range, in.)*	Pressure (psi)
	4 1/2 (3 .65/4 .14)	8,000
	5 (3 .83/4 .69)	8,000
	5 1/2 (4 .38/5 .09)	5,200
	6 (4 .84/5 .63)	5,200
	7 (5 .66/6 .54)	8,000
	7 5/8 (6 .24/7 .13)	8,000
	8 5/8 (7 .20/8 .10)	6,600
	9 5/8 (8 .16/9 .06)	6,300
	10 3/4 (9 .09/10 .09)	5,200
	13 3/8 (11 .79/12 .72)	4,700
	24 (22 .25/23 .50)	3,000 (Tested at 150°F)

*11 3/4-, 16-, 18 5/8-, and 20-in. plugs are all available in a fivewiper design with a flat landing surface.

Notes:

- Pressure ratings are based on tests performed at 300°F (149°C) unless otherwise noted.
- For plug landing pressure at a service temperature of 400°F (204 .4°C), multiply the published rating above by 0.75.
- Listed pressures might exceed the pressure limits of casing or pumping equipment and indicate the operating limits of the equipment only.
- Pressure ratings and landing profiles are subject to change without notice. Contact a Casing Equipment representative for possible revisions.
- Always capture the pressure limit of both the plugs and collar. The lesser value should be considered the limit.
- Reference the Stage Tool chapter for cementing plugs used for multiple stage cementing.

24-tooth NR (non-rotating) five-wiper cementing plug

Features		
Recommended Applications	Universally recommended cementing plug used when a NR feature is desired *(HS) = high strength	
Casing Size (in .)	7 to 20	
Service Temperature, °F (°C)	Up to 400 (204 .4)	
Plug Landing Profile	NR	
Compatible Landing Equipment	24-Tooth NR float collar	
Bottom Plug Bypass Pressure (psi)	750	
Top Plug Landing Pressure (psi)	Casing Size, in. (Min./Max. Wiping Range, in.)*	Pressure (psi)
	7 (5 .87/6 .54)	4,000 (8,000 HS)
	7 5/8 (6 .24/7 .13)	3,200
	8 5/8 (7 .20/8 .10)	3,200
	9 5/8 (8 .40/9 .06)	4,000
	10 3/4 (9 .00/10 .19)	6,400 (10,000 HS)
	11 3/4 (10 .42/11 .15)	3,000 (6,000 HS)
	13 3/8 (11 .86/12 .72)	2,800 (7,000 HS)
	16 (14 .00/15 .25)	1,600
	18 5/8 to 20 (17 .03/19 .25)	2,100

Notes:
- Pressure ratings are based on tests performed at 300°F (149°C) unless otherwise noted.
- For plug landing pressure at a service temperature of 400°F (204 .4°C), multiply the published rating above by 0.75.
- Listed pressures might exceed the pressure limits of casing or pumping equipment and indicate the operating limits of the equipment only.
- Pressure ratings and landing profiles are subject to change without notice. Contact a Casing Equipment representative for possible revisions.
- Always capture the pressure limit of both the plugs and collar. The lesser value should be considered the limit.
- Reference the Stage Tool chapter for cementing plugs used for multiple stage cementing.

IsoLatch™ multiple plug cementing system

Features		
Recommended Applications	For use in horizontal production casing strings where high-pressure testing (completion toe sleeves) or wet shoe applications occur	
Casing Size (in .)	4 1/2 to 6 5/8 and 7 x 5 1/2	
Service Temperature, °F (°C)	Up to 400 (204 .4)	
Plug Landing Profile	2 .75 or 3 .5 (5 1/2 2-in. and larger) latch adapter	
Compatible Landing Equipment	IsoLatch cementing float collar (Plugs also compatible with mating latch down baffle adapters)	
Bottom Plug Bypass Pressure (psi)	750	
Top Plug Landing Pressure (psi)	Casing Size, in. (Min./Max. Wiping Range, in.)*	Pressure (psi)
	4 1/2 (3 .65/4 .00)	12,000
	5 (3 .65/4 .50)	12,000
	5 1/2 × 4 1/2 (3 .65/5 .00)	12,000
	5 1/2 × 5 (3 .65/5 .00)	12,000
	5 1/2 (4 .36/5 .00)	15,000
	6 (4 .38/5 .50)	15,000
	6 5/8 × 5 1/2 (4 .36/6 .12)	15,000
	7 × 5 1/2 (4 .36/6 .50)	15,000

*Rupture disc options for wet shoe range of 1,500 to 3,000 psi

Notes:

- Pressure ratings are based on tests performed at 300°F (149°C) unless otherwise noted.
- For plug landing pressure at a service temperature of 400°F (204 .4°C), multiply the published rating above by 0.75.
- Listed pressures might exceed the pressure limits of casing or pumping equipment and indicate the operating limits of the equipment only.
- Pressure ratings and landing profiles are subject to change without notice. Contact a Casing Equipment representative for possible revisions.
- Always capture the pressure limit of both the plugs and collar. The lesser value should be considered the limit.
- Reference the Stage Tool chapter for cementing plugs used for multiple stage cementing.

Omega™ HWE® top plugs

Features		
Recommended Applications	For use in production casing strings to prevent plug from free-falling and improve wiping of settled solids at low displacement rates	
Casing Size (in .)	4 1/2 to 7	
Service Temperature, °F (°C)	Up to 400 (204 .4)	
Plug Landing Profile	Flat	
Compatible Landing Equipment	Float collar with flat surface	
Bottom Plug Bypass Pressure (psi)	N/A	
Top Plug Landing Pressure (psi)	Casing Size, in. (Min./Max. Wiping Range, in.)*	Pressure (psi)
	4 1/2 (3 .65/4 .09)	8,000
	5 (3 .83/4 .56)	8,000
	5 1/2 (4 .38/5 .04)	5,200
	7 (5 .66/6 .54)	8,000

Notes:
- Pressure ratings are based on tests performed at 300°F (149°C) unless otherwise noted.
- For plug landing pressure at a service temperature of 400°F (204 .4°C), multiply the published rating above by 0.75.
- Listed pressures might exceed the pressure limits of casing or pumping equipment and indicate the operating limits of the equipment only.
- Pressure ratings and landing profiles are subject to change without notice. Contact a Casing Equipment representative for possible revisions.
- Always capture the pressure limit of both the plugs and collar. The lesser value should be considered the limit.
- Reference the Stage Tool chapter for cementing plugs used for multiple stage cementing.

SSR-II™ cement plugs

Features		Single Plugs	
Recommended Applications		• Casing and liner hangers at any depth • Composite materials can provide shorter drillout times without costly bit damage if drillability is a concern	
Casing Size (in.)		7 to 10 3/4	
Plug Minimum ID (in.)		ID (in.)	Casing Size (in.)
		2 .25	7 to 10 3/4
Drillpipe Dart Minimum Drift (in.)		2 .44	
Integral Ball Seat		No	
Allowable Drop Ball Size (in.)		OD	Casing Size (in.)
		2 .125	7 to 10 3/4
Service Temperature, °F (°C)		300 (149)	
Compatible Drillpipe Darts/Balls	Plug Launch	2 .375-in . Dart shoulder	
Plug Landing Profile**		45° or Flat	
Compatible Landing Equipment		SSR -II landing collar or flat float collar if landing profile is also flat	
Plug Landing Pressure (psi)		Casing Size, in. (Min./Max. Wiping Range, in.)	Pressure (psi)
		7 (5 .66/6 .54)	8,000
		7 5/8 (6 .24/7 .13)	8,000
		8 5/8 (7 .20/8 .10)	5,000 (6,000 at 200°F)
		9 5/8 (8 .16/9 .06)	5,000
		10 3/4 (9 .09/10 .09)	5,000
Calculated Plug Release Pressure (psi)		7 to 8 5/8	1,800
		9 5/8 to 10 3/4	1,800

*Additional sizes of SSR-II single plugs are available upon request.

Notes:

- Pressure ratings are based on tests performed at 300°F (149°C) unless otherwise noted.
- Listed pressures might exceed pressure limits of casing or pumping equipment and indicate the operating limits of the equipment only.
- Pressure ratings and landing profiles are subject to change without notice. Contact a Casing Equipment representative for possible revisions.
- Always capture the pressure limit of both the plugs and collar. The lesser value should be considered the limit.

VersaFlex® expandable liner hanger plugs

Features		Single Plugs	
Recommended Applications		• Designed for use with cementing liner casing string suspended below VersaFlex expandable liner hanger • High-strength aluminum plug bodies provide higher landing pressure sometimes necessary to set VersaFlex expandable liner hangers	
Casing Size (in.)		4 to 11 3/4	
Plug Minimum ID (in.)		ID (in.)	Casing Size (in.)
		1 .375	4 to 5 1/2
		1 .875	7 to 11 3/4
Drillpipe Dart Minimum Drift (in.)		ID (in.)	Casing Size (in.)
		1 .81	4 to 5 1/2
		2 .44	7 to 11 3/4
Integral Ball Seat		Optional in sizes 7 to 11 3/4	
Allowable Drop Ball Size (in.)		OD	Casing Size (in.)
		1 .75	All sizes
Service Temperature, °F (°C)		300 (149)	
Compatible Drillpipe Darts/Balls	Plug Launch	1 .50-in. Dart shoulder	4 1/2 to 5 1/2
		2 .06-in. Dart shoulder	7 to 11 3/4
Plug Landing Profile**		Latch in	
Compatible Landing Equipment		VersaFlex landing collar	
Plug Landing Pressure (psi)		Casing Size, in. (Min./Max. Wiping Range, in.)	Pressure (psi)
		4 (3 .25/3 .75)	10,000
		4 1/2 (3 .65/4 .14)	10,000
		5 (3 .83/4 .69)	8,000
		5 1/2 × 4 1/2 (3 .65/5 .00)	10,000
		5 1/2 (4 .38/5 .09)	8,000
		7 × 4 1/2 (3 .65/6 .54)	10,000
Calculated Plug Release Pressure (psi)		All sizes	1,500 to 3,000
		Release pressure is adjustable (500 psi/shear pin)	

*For wet shoe applications, reference the rupture disc pressure for the maximum landing pressure of the top plug.

Notes:

- Pressure ratings are based on tests performed at 300°F (149°C) unless otherwise noted.
- Listed pressures might exceed pressure limits of casing or pumping equipment and indicate the operating limits of the equipment only.
- Pressure ratings and landing profiles are subject to change without notice. Contact a Casing Equipment representative for possible revisions.
- Always capture the pressure limit of both the plugs and collar. The lesser value should be considered the limit.

SSR-II™ cement plugs

Features		Dual Plugs	
Recommended Applications		• Casing and liner hangers at any depth • Composite materials can provide shorter drillout times without costly bit damage if drillability is a concern • VersaFlex® expandable liner hangers or other hydraulic liner hangers requiring high landing pressure to set the packer and/or pressure •*(HS) = high strength	
Casing Size (in.)		7 to 20	
Plug Minimum ID (in.)		2 .00	
Drillpipe Dart Minimum Drift (in.)		2 .44	
Integral Ball Seat		Optional	
Allowable Drop Ball Size (in.)		1 .875	
Service Temperature, °F (°C)		300 (149)	
Compatible Drillpipe Darts/Balls	Top Plug Launch	2 .375-in. Dart shoulder	
	Bottom Plug Launch	2.125-in. Dart shoulder	
Plug Landing Profile**		45° or Flat	
Compatible Landing Equipment		SSR-II landing collar	
Top Plug Landing Pressure (psi) *For high-strength applications where high-strength plugs are used, a high-strength collar should also be used.		Casing Size, in. (Min./Max. Wiping Range, in.)	Pressure (psi)
		7 (5 .66/6 .54)	8,000
		7 5/8 (6 .24/7 .13)	8,000
		9 5/8 (8 .16/9 .06)	5,000 (6,000 HS)
		10 3/4 x 9 5/8 (8 .40/10 .19)	5,000
		10 3/4 (9 .09/10 .09)	5,000 (6,000 HS)
		11 3/4 (10 .4/11 .15)	5,000 (6,000 HS)
		13 3/8 (11 .79/12 .72)	5,000
		14 (12 .70/13 .19)	1,600
		16 (13 .50/15 .25)	1,600
		18 (14 .11/17 .12)	1,600
		18 5/8 and 20 (17 .03/19 .25)	2,100
Calculated Bottom Plug Release Pressure (psi)		7 to 7 5/8	1,300
		9 5/8 to 11 3/4	1,700
		13 3/8 to 20	1,530
Calculated Top Plug Release Pressure (psi)		7 to 7 5/8	1,800
		9 5/8 to 11 3/4	1,680
		13 3/8 to 20	2,100
Calculated Bottom Plug Bypass Pressure (psi)		7 to 7 5/8	1,625
		9 5/8 to 11 3/4	1,675
		16 to 20	1,100

Notes:
• Pressure ratings are based on tests performed at 300°F (149°C) unless otherwise noted.
• Listed pressures might exceed pressure limits of casing or pumping equipment and indicate the operating limits of the equipment only.
• Pressure ratings and landing profiles are subject to change without notice. Contact a Casing Equipment representative for possible revisions.
• Always capture the pressure limit of both the plugs and collar. The lesser value should be considered the limit.

VersaFlex® expandable liner hanger plugs

Features		Dual Plugs	
Recommended Applications		• Designed for use when cementing liner casing string is suspended below a VersaFlex expandable liner hanger • High-strength aluminum plug bodies provide higher landing pressures sometimes necessary to set VersaFlex expandable liner hangers	
Casing Size (in.)		5 to 5 1/2	
Plug Minimum ID (in.)		1 .375	
Drillpipe Dart Minimum Drift (in.)		1 .81	
Integral Ball Seat		No	
Allowable Drop Ball Size (in.)		1 .25	
Service Temperature, °F (°C)		300 (149)	
Compatible Drillpipe Darts/Balls	Top Plug Launch	1 .70-in. Dart shoulder	
	Bottom Plug Launch	1 .475-in. Dart shoulder	
Plug Landing Profile**		Latch in	
Compatible Landing Equipment		Integrated landing / float collar	
Top Plug Landing Pressure (psi) *For high-strength applications where high-strength plugs are used, a high-strength collar should also be used.		Casing Size, in. (Min./Max. Wiping Range, in.)	Pressure (psi)
		5 (3 .65/4 .50)	8,000
		5 1/2 (4 .38/5 .00)	8,000
Calculated Bottom Plug Release Pressure (psi)		All sizes	1,420
Calculated Top Plug Release Pressure (psi)		All sizes	2,000
Calculated Bottom Plug Bypass Pressure (psi)		All sizes	1,300

Notes:
• Pressure ratings are based on tests performed at 300°F (149°C) unless otherwise noted.
• For plug landing pressure at a service temperature of 400°F (204.4°C), multiply the published rating above by 0.75.
• Listed pressures might exceed pressure limits of casing or pumping equipment and indicate the operating limits of the equipment only.
• Pressure ratings and landing profiles are subject to change without notice. Contact a Casing Equipment representative forpossible revisions.
• Always capture the pressure limit of both the plugs and collar. The lesser value should be considered the limit.
• Reference the Stage Tool chapter for cementing plugs used in multiple stage cementing.

SUBSURFACE RELEASE PLUGS - TRIPLE

SSR-II™ cement plugs

Features		Triple Plugs	
Recommended Applications		• Casing and liner hangers • Long casing strings where displacement accuracy is difficult • Any well where improved fluid separation is desired with water depth less than 3,000 ft	
Casing Size (in.)		10 3/4 x 9 5/8, 13 3/8 and 14	
Plug Minimum ID (in.)		1 .50	
Drillpipe Dart Minimum Drift (in.)		2 .44	
Integral Ball Seat		No	
Allowable Drop Ball Size (in.)		1 .375 (Through plug system)	
Service Temperature, °F (°C)		300 (149)	
Compatible Drillpipe Darts/Balls	Top Plug Launch	2 .375-in . Dart shoulder	
	Middle Plug Launch	2 .125-in . Dart shoulder	
	Bottom Plug Launch	1 .75-in . Ball	
Plug Landing Profile		45° or Flat	
Compatible Landing Equipment		SSR-II landing collar	
Top Plug Landing Pressure (psi) *For high-strength applications where high-strength plugs are used, a high-strength collar should also be used.		Casing Size, in. (Min./Max. Wiping Range, in.)	Pressure (psi)
		9 5/8 (8 .16/9 .06)	4,000
		10 3/4 x 9 5/8 (8 .40/10 .19)	4,000
		10 3/4 (9 .09/10 .09)	4,000
		11 3/4 (10 .42/11 .15)	4,000
		13 3/8 (11 .79/12 .72)	4,000
		14 (12 .70/13 .19)	1,600
		16 (13 .50/15 .25)	2,100
		18 5/8 and 20 (17 .03/19 .25)	2,100
Calculated Bottom Plug Release Pressure		9 5/8 and 10 3/4 x 9 5/8	510
		10 3/4 to 20	712
Calculated Middle Plug Release Pressure		9 5/8 and 10 3/4 x 9 5/8	1,700
		10 3/4 to 20	1,530
Calculated Top Plug Release Pressure		9 5/8 and 10 3/4 x 9 5/8	1,680
		10 3/4 to 20	2,100
Calculated Bottom Plug Bypass Pressure		9 5/8 and 10 3/4 x 9 5/8	1,515
		10 3/4 to 20	1,150
Calculated Middle Plug Bypass Pressure		9 5/8 and 10 3/4 x 9 5/8	1,675
		10 3/4 to 20	1,680

*Additional sizes of SSR-II triple plugs are available upon request.
Notes:
• Pressure ratings are based on tests performed at 300°F (149°C) unless otherwise noted.
• Listed pressures might exceed pressure limits of casing or pumping equipment and indicate the operating limits of the equipment only.
• Pressure ratings and landing profiles are subject to change without notice. Contact a Casing Equipment representative for possible revisions.
• Always capture the pressure limit of both the plugs and collar. The lesser value should be considered the limit.

MEGO CENTRALIZERS

We offer a variety of options to properly centralize the casing inside a wellbore. Its cementing experts can recommend the best centralizer for a well, considering factors such as casing size and material, connection type, casing rotation and reciprocation requirements, and overall cementing objectives.

Centralizers offered by MEGO provide the following:

• Casing standoff (centralize pipe in the wellbore, prevent channeling, achieve a proper seal between the casing and open hole)

• Aid in getting casing to bottom (reduce friction forces and mitigate differential sticking)

• Improved hole cleaning (improve circulation at TD, mud removal, and cement bond between casing and wellbore)

To achieve specific centralization plans and limit centralizer movement along the string, centralizers are most often installed between stop collars, a combination of a stop collar and a casing coupling, or between holding profiles. Stop collars are designed and manufactured to withstand axial forces applied to the centralizer as casing is RIH.

MEGO can supply stop collar designs to hold each centralizer in place and provide the desired standoff.

Following are some of the common methods for securing stop collars to the outside of the casing:

• Single- or double-row of set screws that grip the casing

• Internal grooves with locking pins to wedge the collar to the casing

• Cross-bolt that secures the collar in place by applying a clamping force to the hinged bands

• Premium solutions
  - Hydraulically pressed double bands
  - Ceramic and carbon fiber blades molded onto the pipe

CENTRALIZERS

The MEGO portfolio of centralizers is a comprehensive lineup of multiple designs and materials to help operators select the best centralizers for their operational and economic targets. Separated into three main categories, centralizers provide durability, premium quality, and optional features while maintaining optimal drag reduction at economical price.

MEGO single piece centralizer features and benefits

- Ideal for both onshore and offshore for vertical, deviated, and horizontal sections during challenging operations
- Robust, single piece, non-welded bow spring design can withstand heavy loads while running casing
- Designed with a near gauge OD to help reduce insertion and running forces while RIH and minimizing flow restrictions and ECDs
- Exceeds API 10D standards to help ensure the best possible performance and quality

Single-piece centralizer (slip on)

MEGO hinged centralizer features and benefits

- Offers a diverse and cost-effective set of solutions for most operations in vertical sections
- Uses over-gauge bows for high restoring force and improved standoff to enhance zonal isolation
- Available in welded and non-welded options with hinged or slip-on configurations and double-bow designs

Centralizer (hinged welded)

ICCS-II CENTRALIZER SUBS

ICCS-II centralizer subs are designed for use in the most challenging wellbore configurations where tight clearances are expected and optimal centralization is necessary. ICCS-II centralizer bodies are manufactured with an ID that matches the drift requirements and a maximum OD equivalent to the casing threads, sufficient to protect the end rings of the centralizer while running in the well. These centralizer subs do not use clamp or collar attachments because of their engineered material selection and heat treatment. A specially designed single piece centralizer enables this assembly to be run into wellbores with ultra-close annular clearances while maintaining centralizer performance in the openhole section.

Features and benefits

- Features and benefits
- Designed to be run as an integral part of the casing string, compatible with the material grade and strength
- Minimal OD profile maximizes annular flow area during cementing
- Premium single piece centralizer specially designed for under-reamed sections with reduced start and running forces
- When fully compressed, bows match the maximum OD of the centralizer sub body
- Casing string can be rotated with the centralizers fully compressed

ICCS-II centralizer sub

STAGE TOOL AND PACKER PORTFOLIO

Introduced in the 1940s, this tool became an industry standard that today is referred to as the DV™ multiple stage cementing tool . It remains a term used industry-wide to refer to multiple stage cementing equipment or operations. Multiple stage cementing tools are used in the following applications:

- Significantly reduces the breakdown of low-pressure formations
  - Lift cement to surface
- Selective intervals for cement placement
  - Off-bottom cementing
  - Separate different types or blends of cement
- Deep, hot wells where pump time is limited
  - Geothermal applications
- Horizontal wellbores
  - Placing cement in the bend radius of the well
- Carbon capture, utilization and storage (CCUS) wells
  - Class V and Class VI requirements

Standalone stage cementers

Collars are designed to allow multiple stage cementing operations. These tools connect directly to casing joints and are strategically positioned on the string to achieve zonal isolation objectives.

- ES II™ cementers
- ES II™ HD cementer
- Fidelis™ cementer
- NO-Dull™ composite seat stage cementer

Integrated stage cementers – inflatable packer collars

An inflatable packer below a stage cementer isolates the first stage or open hole from second-stage hydrostatic and dynamic pressure to achieve second- stage top of cement. The packer is inflated when an annular support barrier is established on completion of the first stage and the stage cementer is opened. The integrated solution helps improve logistics and ensure compatibility between inflatable packer and stage cementer operations.

- MSIPC packer collar
- ESIPC™ packer collar
- V0 ESIPC™ packer collar (API 19AC)

STANDALONE STAGE CEMENTERS

ES II™ stage cementers

The ES II™ cementer is a robust multiple stage cementer with a short, single piece mandrel without threaded or welded segments. The name ES II is derived from the tool's external sleeve dual lock ring mechanism. Multiple locking positions engage consecutively as the sleeve closes. The external closing sleeve mechanically covers the cementing ports to eliminate exposure to the open formation after drill out.

ES II™ Type P cementers

ES II™ Type H cementers

Features and benefits

- Robust seals and backup rings help minimize seal damage to ensure reliable operations
- Multiple internal lock rings maintain the closing sleeve in the closed position
- Adjustable opening and closing pressure
- Easily converts into a three-stage tool
- Short, single-piece mandrel design eliminates threaded or welded segments to simplify installation and help reduce potential failure points
- PDC-drillable seats interlock to prevent rotation during drill out to help ensure stability and efficiency

Type P – plug operated

- Mechanically shift opening seat with:
  - Standard composite free fall plug
  - Displacement type plug set for deviated wells ≥30°

Type H – hydraulically operated

- Hydraulically shift opening seat with:
  - Shutoff plug against baffle collar
  - Type H SR plug set for liner applications
- Used at lower or upper tool in a three-stage application
- Operated mechanically with the Type P plug set

ES II™ HD stage cementer

The ES II™ HD cementer is the stage cementing tool of choice for gas wells that use the Obex GasLock® compression-set packer to support the higher-pressure second-stage cementing requirements. The ES II HD stage tool is V0-rated per ISO 14998 and API 19AC. The tool increases performance of the ES II with a more robust closing sleeve design and an improved sealing mechanism to isolate the cementer ports with a high-pressure, gas-tight zero bubble seal. The ES II HD cementer is not exclusive for use with Obex GasLock packer operations and is configurable in any application that requires a V0-rated stage cementer to perform multiple stage cementing. The rigorous V0 rating provides enhanced confidence in the tools' capability to withstand demanding cementing operations, to help ensure optimal zonal isolation, improved well integrity, and enhanced overall well performance.

Features and benefits

- External sleeve features redundant FKM (Viton) O-rings with PEEK backup rings to provide exceptional gas-tight sealing
- Multiple internal lock rings securely maintain the closing sleeve in the closed position
- Bidirectional rupture disk port design for use with the Obex GasLock packers
- Easily converts into a three-stage tool
- Short, single-piece mandrel design eliminates threaded or welded segments, simplifying installation and reducing potential failure points
- PDC-drillable seats interlock to help prevent rotation during drill out

Type P – plug operated

- Mechanically shift opening seat with:
  - Standard composite free fall plug
  - Displacement type plug set for deviated wells ≥30°

ES II™ HD stage cementer

Fidelis™ stage cementer

The Fidelis™ stage cementer facilitates the staged placement of cement during well completions and can withstand high-pressure stimulation treatments. The Fidelis stage cementer employs an internal closing sleeve along with two sets of CO2 resistant, high-pressure seals to help ensure casing integrity is restored once the cementing process is completed. The closing sleeve is equipped with double lock rings that securely latch into the outer case to effectively seal the tool after the second cementing stage. These innovative features help ensure the tool's structural integrity even after cementing operations, which enable the tool to endure cumulative stresses and subsequent well events, such as well testing, injection and simulation, and production cycling throughout the well's lifespan.
The 7-in. tool is V0 rated. Validation is available for additional sizes on request.

Features and benefits

- Internal sleeve features redundant FKM (Viton) "packer-type" seal rings to help ensure isolation of the cementing ports and the capability to withstand the cyclic loading experienced throughout the life of the well
- Multiple internal lock rings secure the closing sleeve in the closed position
- Compatible with first and second-stage bottom plug set
- Easily converts into a three-stage tool
- PDC-drillable seats interlock to help prevent rotation during drill out

Fidelis Stage Cementer

Type P – plug operated

- Mechanically shift opening seat with:
  - Standard composite free fall plug
  - Displacement type plug set for deviated wells ≥30°

Type H – hydraulically operated

- Hydraulically shift opening seat with:
  - Shutoff plug against baffle collar
  - Type H SR plug set for liner applications
- Used at lower or upper tool in a three-stage application
- Operated mechanically with the Type P plug set

NO-Dull™ composite seat stage cementer

Stage cementers typically use aluminum plug and seat materials to open and close the tool during operation. However, aluminum material can impact drill bit performance during drillout. The MEGO NO-Dull stage cementer uses low-profile composite seat and plug materials rather than aluminum to minimize drillout time and help mitigate wear on the PDC and roller cone bits.
The NO-Dull stage cementing ports are isolated with the same seals used in the field-proven Fidelis™ cementers and MSIPC packer collars. These large sets of packer-type seal rings can maintain high pressure differentials to help eliminate potential weak points in the casing. The NO-Dull cementer drillout is easily performed with bent sub/motor or conventional bottomhole assemblies (BHAs) without damage to the tool's internal sleeves and seals.

NO-Dull™ composite seat stage cementer

Features and benefits

- Fully composite system helps prevent wear on PDC and roller cone bits during drilling and reduces drillout time
- Cementer ports isolated by large sets of "packer-type" seals that match the casing strength
- Robust lock ring to help ensure the tool remains closed after drillout
- Integrated composite baffle/float collar rated to 5,000 psi at 300ºF to set inflatable packers and test casing

Type P – plug operated

- Mechanically shift opening seat with:
  - Standard composite free fall plug
  - Displacement type plug set for deviated wells ≥30°

Integrated composite baffle and Super Seal II® float collar

MEGO provides an entire system of easy to drill tools that remove aluminum materials from the path of the drill bit. Cementing plug sets, floats, and baffles are made from the same composite materials used in the NO-Dull cementer operating seats. The inclusion of an integrated high-pressure composite baffle and float collar eliminates the use of an accessory baffle collar and operating plug in the well to perform casing pressure tests. This feature reduces the time and expenses to drill out additional components in the casing string.

Integrated composite baffle and Super Seal® II float collar

INTEGRATED STAGE CEMENTERS - PACKER COLLARS

MSIPC packer collar

The multistage inflatable packer collar (MSIPC) is a combination of a reliable plug-operated internal sleeve cementer tool and a metal bladder casing inflation packer. This economical tool provides controlled packer element inflation through the stage-tool opening seat, which eliminates hydraulic valve bodies normally used with inflatable packer elements. Metal bladder tools are recommended for use when setting in a hard rock formation or applications inside casing.

Integration of the metal bladder helps reduce risk associated with inflatable packers where high circulating pressure can cause premature inflation of the packer elements.

MSIPC stage cementing packer collar

Features and benefits

- Internal sleeve features redundant “packer-type” seal rings to help ensure isolation of the cementing ports and the capability to withstand the internal loading from pressure tests and drillout activities
- Multiple internal lock rings maintain the closing sleeve in the closed position
- Integrated design simplifies operating procedures compared to operating a stage tool and packer separately
- Easily converts into a three-stage tool
- PDC-drillable seats interlock to help prevent rotation during drill out
- Maximum one-direction packer rating of 4,000 psi dependent on parent casing ID/hole OD

Type P – plug operated

- Mechanically shift opening seat with:
  - Standard composite free fall plug
  - Displacement type plug set for deviated wells ≥30°

ESIPC™ stage cementer packer collar

The ESIPC™ external sleeve inflatable packer collar is a combination of the ES (Type P or Type H) cementer and a casing inflation packer. This tool provides controlled packer element inflation through the stage-tool opening seat, which eliminates the hydraulic valving bodies normally used with inflatable packer elements. The external closing sleeve mechanically covers the cementing ports and eliminates exposure to the open formation after drill out.

Applied casing pressure opens the ESIPC tool after the opening plug lands in the opening seat or when the seat is shifted hydraulically by pressurizing the casing string against a landed first-stage shutoff plug below the tool. After this “primary” opening, fluid passes through the cementing ports to inflate the packer. A “secondary” opening occurs when a rupture disk opens after the packer is inflated and circulation is established before pumping a second stage.

Features and benefits

- Integrated design simplifies operating procedures compared to separate operation of a stage tool and packer
- Inflatable rubber packer element constructed with reinforced metal slats to help reduce packer element damage during inflation
  - Available in 3- and 10-ft lengths and as an 18-in . metal bladder inflation packer
- Packer elements support differential pressures up to 4,000 psi from above the packer

Type P – plug operated

- Mechanically shift opening seat with:
  - Standard composite free fall plug
  - Displacement type plug set for deviated wells ≥30°

Type H – hydraulically operated

- Hydraulically shift opening seat with:
  - Shutoff plug against baffle collar
  - Type H SR plug set for liner applications
- Used at lower or upper tool in a three-stage application
- Operated mechanically with the Type P plug set

ESIPC™ stage cementer packer collar

ESIPC™ HD packer collar

The V0-rated ESIPC™ HD inflatable packer collar is a combination of the field- proven ES II™ HD cementer and a casing inflation packer. This tool provides all the benefits of the ESIPC packer collar with the addition of a V0 rating per ISO 14998 and API 19AC. The tool offers increased performance with a more robust closing sleeve design and an improved sealing mechanism to isolate the cementer ports with a high-pressure, gas-tight zero bubble seal. The ESIPC HD inflatable packer collar is configurable for any application where a V0-rated stage cementer is necessary to perform multiple stage cementing. The rigorous V0 rating enhances the tool's capability to withstand challenging cementing operations to help ensure optimal zonal isolation, improve well integrity, and enhance overall well performance.

ESIPC™ HD packer collar

Features and benefits

- External sleeve features redundant FKM (Viton) O-rings with peek backup rings to provide advanced gas-tight sealing
- Multiple internal lock rings maintain the closing sleeve in the closed position
- Easily converts into a three-stage tool
- PDC-drillable seats interlock to help prevent rotation during drill out
- Available in 3- and 10-ft lengths and as an 18-in . metal bladder inflation packer
- Inflatable packer elements support differential pressure up to 4,000 psi from above the packer

Type P – plug operated

- Mechanically shift opening seat with:
  - Standard composite free fall plug
  - Displacement type plug set for deviated wells ≥30°

Type H – hydraulically operated

- Hydraulically shift opening seat with:
  - Shutoff plug against baffle collar
  - Type H SR plug set for liner applications
- Used at lower or upper tool in a three-stage application
- Operated mechanically with the Type P plug set

OBEX® COMPRESSION-SET CASING ANNULUS PACKERS

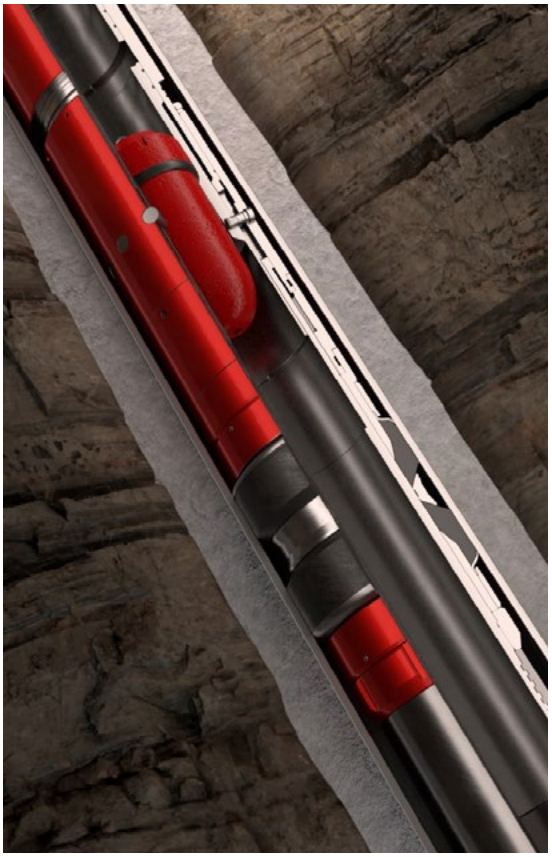
Most wells that use a barrier tool rely on inflatable packers during multiple- stage cementing. Designed to only support second-stage cementing pressure or short-term overpressure from below, inflatable packers can allow some pressure to penetrate. This pressure can disturb the cement setting process, cause loss of well integrity, and impact wellbore isolation, emissions, and well production. The Obex® family of compression-set packers are mechanically set to address a range of wellbore conditions and offer levels of support to improve well integrity, maximize production, and reduce future remediation efforts.

API/ISO specification ratings for casing-to-casing annulus packers
API 11D1/ISO 14998

Standards, such as API 11D1 and ISO 14998, provide a framework for design validation and qualification. Adherence to these standards helps ensure the effectiveness and reliability of casing-to-casing packers as pressure barriers.

A critical aspect of the validation process is the attainment of specific grades or ratings.

- V0 grade is considered the highest rating achievable in design validation and signifies the packer has successfully passed rigorous gas pressure tests and demonstrated its capability to withstand axial loads, temperature cycling, and meet a zero-bubble acceptance criterion.
- V3 grade is the most stringent liquid pressure bearing rating. Packer designs that achieve this rating have undergone thorough liquid tests, surpassing the requirements for axial loads and temperature cycling.
- V6 grade packer designs have successfully undergone thorough MEGO testing specifications for bidirectional pressure bearing under temperature.



Obex® packers are mechanically set, not inflated.

Obex GasLock® packer

The Obex GasLock® casing annulus packer is a mechanical barrier that provides a high-pressure, gas-tight, casing-to-casing seal. Qualified at the industry's strongest ISO 14310/API 11D1 V0 rating, the Obex GasLock casing annulus packer provides an enhanced seal to help mitigate annular gas migration and support the hydrostatic weight of annular well fluids above the casing packer in wells with weak formation zones. The Obex GasLock casing annulus packer can be used as a standalone packer or coupled with the V0-rated ES II HD stage cementer for multiple stage cementing operations.

The bidirectional pressure ratings of the Obex GasLock packer allow this tool to be set deeper in the well and lift cement to the surface, particularly in wells with expected fluid loss below the packer. The Obex GasLock casing annulus packer can help prevent well integrity issues by means of an effective barrier to mitigate sustained casing pressure that can cause fugitive missions.

Obex GasLock® packer

Features and benefits

- Field-proven packer mechanically set element and internal ratchet mechanism
- V0-rated bidirectional packer element ratings up to 10,000 psi at 300°F
- High-strength barrel slips provide bidirectional anchoring up to 425,000 lbf
- Promotes well integrity in deep, hot wells with high differential pressure
- Can support multiple stage cementing when run in conjunction with the V0-rated ES II HD stage cementer
- Easy fullbore drillout of setting plug and seat using PDC or rock bits

Type P – plug operated

- Mechanically shift opening seat with:
  - Standard composite free fall plug
  - Displacement type plug set for deviated wells ≥30°

Obex IsoLock® packer

The Obex IsoLock® packer collar provides a mechanical barrier that bridges the cost and capability gap between an inflatable packer/cementer and a premium gas-tight packer and cementer run in tandem. With the integration of a packer and cementer into a single assembly, the Obex IsoLock packer collar can help minimize well integrity issues, even after a multiple-stage cementing operation is complete Built on the MEGO gas-tight Obex GasLock V0-rated packer design, the Obex IsoLock packer collar provides ISO 14310/API 11D1 V3-rated pressure- holding capacity and increased reliability compared to inflatable packer options.
The compact design of the Integrated stage cementer and casing annulus packer allows for two lower-profile seats, one seat to set the packer and expose the dedicated cement ports and a second seat to shift and lock the stage tool closed. This compact design, along with 70% fewer internal components compared to traditional stage tool design, results in simplified drillout and reduced debris volumes.

Obex IsoLock® packer

Features and benefits

- Mechanically set tool that promotes well integrity through integration of a packer and cementer into a single assembly
- Field-proven packer element and internal ratchet mechanism
- Bidirectional packer element ratings up to 6,000 psi
- ISO 14310 and 19AC V3-rated
- Simple and reliable design that eliminates leak paths from the setting operation
- Easy fullbore drillout of setting plug and seat using PDC or rock bits

Type P – plug operated

- Mechanically shift opening seat with:
  - Standard composite free fall plug
  - Displacement type plug set for deviated wells ≥30°

Obex EcoLock® packer

In less-challenging, low-pressure environments, cement designs or inflatable packers are typically used to help mitigate sustained casing pressure (SCP). Expansive and self-healing cement additives are costly and do not always eliminate SCP because of the severity of the pressure cycles encountered during unconventional completions operations. Inflatable packers, while cost-effective, are designed to provide a short-term barrier for lifting cement and are not reliable barriers for long-term zonal isolation. Because inflatable packers are hydraulically set through valving systems, their setting process might not reliably indicate whether a proper set and seal is achieved.

The Obex EcoLock® casing annulus packer provides a cost-effective mechanical barrier to help mitigate SCP and deliver life of the well integrity. The Obex EcoLock casing annulus packer provides ISO 14310/API 11D1 V6-rated mechanical barrier support to significantly minimize low-pressure gas or fluid migration and can support multiple stage cementing when run as a packer collar with optional integral cementing ports and closing sleeve.

(Left) Obex EcoLock® standalone packer and (right) Obex EcoLock® packer collar

Features and benefits

- Mechanically set tool promotes well integrity in a compact robust design
- Field-proven packer element and internal ratchet mechanism
- Supports multiple stage cementing with optional integral cementing ports and closing sleeve
- Easy fullbore drillout of setting plug and seat using PDC or rock bits

Type P – plug operated

- Mechanically shift opening seat with:
  - Standard composite free fall plug
  - Displacement type plug set for deviated wells ≥30°

STAGE CEMENTING OPERATING PLUG SETS

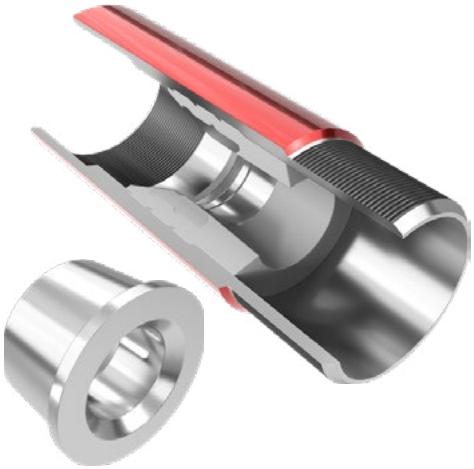
Plug sets are necessary to operate both Type P and Type H stage cementers and integrated stage cementer packer collars. Plug sets are ordered separately from the cementers, and the individual components of each plug set are dependent on the type of tool to be operated. Wells are also cemented in three stages with two-stage cementing tools and three-stage plug sets. For a given casing size range, the operating seats within the different tools have similar dimensions, intended to maximize compatibility, and simplify the plug set selection process for a range of applications.

Free fall plug set for two-stage cementing

First-stage shutoff baffle or (optional) baffle adapter collars are available in specially tailored plug kits and are necessary for premium threads to provide a reliable high-pressure plug seat to support the differential pressure necessary to open Type H cementers and packer collars.

- First-stage shutoff plug (for both Type P and Type H cementers)
- Composite, free-fall, second-stage opening plug (required for the Type P cementer; optional as a backup to open the Type H cementer)
- Second-stage closing plug (for both Type P and Type H cementers)
- Free fall plug sets should not be used in wells with more than 30° deviation

First-stage shutoff plug



(Left) Shutoff baffle and (right) optional baffle adapter collar

Optional first- and second-stage bottom plugs

Optional bottom plugs are available for first-stage and second- stage cementing and are separate from the basic operating plug sets. A standard top cementing plug is used with a second-stage bottom plug (rupture disk feature to allow bypass) to close the cementer on completion of second-stage cement placement.

Composite free fall opening plug

Second-stage closing plug

Contingency free fall closing plugs for two-stage cementing

When a stage cementer is run as a contingency but not used (in case a second stage of cement is necessary to achieve cement to surface), second-stage cancellation rings (in all sizes) and cancellation plugs (8 5/8-in. and larger) are available. If the stage cementer is not used, these free fall accessories fully cycle the stage cementer (open then closed) in a single operation in preparation for drilling ahead.

Contingency closing plugg

Free fall plug set for three-stage cementing using two-stage cementer

Special free fall plug sets available for three-stage cementing that uses two-stage cementers and/or packer collars.

Third-stage closing plug
(upper stage tool)

Third-stage composite
free fall opening plug
(upper stage tool)

Second-stage closing
opening plug and closing
seat insert (lowerstage tool)

Second-stage composite
free fall opening plug and
opening seat insert (lower
stage tool)

First-stage
Shutoff Plug

(Left) Shutoff baffle and (right) optional
baffle adapter collar

Displacement type plug sets

Displacement plug sets are used in the following situations:

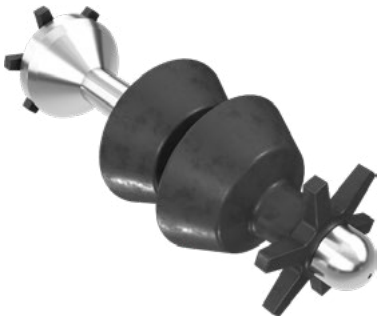
- When cement must be surfaced beyond a Type P stage tool on the first stage to fill the entire annulus with cement; otherwise, sufficient shutdown time should be considered during the cement design to allow the free fall opening plug to operate the cementer.
- When the hole is deviated 30° or more off vertical at or above a Type P stage tool.
- When the cementer is placed closer than 500 ft from the shutoff baffle, which could cause excessive opening pressure because of the obligation to compress the fluid in a closed free fall plug setup
- When using a hydraulically opened stage tool that cannot overcome any of the above considerations.
- When continuous pumping operations are required.

Detailed casing specifications review and accurate displacement volumes calculations are required to prevent excessive over-displacement that could risk the effectiveness of the shoetrack of the first stage.

This plug set contains:

- First-stage bypass baffle
- First-stage bypass plug
- Second-stage displacement opening plug
- Second-stage closing plug

Second-stage closing plug



Displacement type opening plug

First-stage bypass baffle

First-stage bottom (bypass) plug

Displacement plug set for three-stage cementing with two-stage cementers

Special displacement plug sets are available for three-stage cementing using two ES II cementers . When used for three-stage cementing, the displacement method is only used on the first two stages. The third stage must use the free fall method to open the uppermost stage tool as the casing is closed to flow by the lower stage tool's closing plug.

Third-stage closing plug
(upper stage tool)

Third-stage composite
free fall opening plug
(upper stage tool)

Second-stage closing
opening plug and closing
seat insert (lowerstage tool)

Second-stage opening plug
and opening seat insert
(lower stage tool)

First-stage bypass baffle

First-stage bottom (bypass) plug

Type H selective-release (SR) plug set

SR plug systems allow two-stage cement operations in liners and/or offshore applications where casing is installed using a subsea hanger system. A separate retrievable swivel/equalizer assembly is run with the Type H SR plug set to equalize pressure above the top plug and drillpipe and allow the casing or liner hanger running tool to be turned during makeup.

- Used with Type H stage cementers and integrated stage cementers – packer collars
- The plug set allows two-stage cementing of liner or casing strings suspended from a casing hanger
- For use when cementing (off-bottom) a slotted liner suspended below a Type H ESIPC packer collar or an external casing packer below a Type H stage cementer
- Compatible with both hydraulic set and mechanical set hanger systems
- The setting ball for hydraulic-set liner hangers should be small enough to pass through the plug set and first-stage shutoff baffle adapter
- The SR feature helps prevent the closing plug from premature release before the first-stage latchdown shutoff plug release (7 in. and larger)
- A separate latchdown baffle adapter collar is available for use with this plug set

SR Type H plug set

MCXV wiper darts (top and bottom)

Latchdown baffle adapter collar

Multiple stage cementers (stand stand-alone stage tools)			
External closing sleeve		Internal closing sleeve	
ES II™	ES II™ HD	Fidelis™	NO-Dull™
Application: - Cased hole/open hde - Two-and three-stage cementing Two setting type: - Set with plug (type P) - Freefall or displacement plug sets - Set hydraulically (type H) - Subsea offshore (type H SR plug set)	**Application:** - V0 -rated 19AC – 9 5/8 in. - Cased hole/open hole - Used with Obex GasLock® packer in cased hole applications - Two and three-stage cementing - Set with plug (type P) - Freefall or displacement plug sets	**Application:** - V0 -rated 19AC – 7 in. - Cased hole/open hole - Two and three-stage cementing - Set with plug (type P) - Freefall or displacement plug sets - Designed and tested for use in production strings where hydraulic fracturing is common - CCUS (premium sealing)	**Application:** - Composite setting seats - Cased hole/open hde - Two-and three-stage cementing Two setting type: - Set with plug (type P) - Freefall or displacement plug sets - Set hydraulically (type H) - Subsea offshore (type H SR plug set)

Multiple stage packer collars (integral cementer/packer)		
Obex® family of compression-set packers		
Obex EcoLock®	Obex IsoLock®	Obex GasLock®
Application: - Cased hole only - Standalone packer with packer collar option - API 11D1 V6-rated for less challenging environments - Two-and three-stage cementing - Set with plug (type P) - Freefall or displacement plug sets - Premium/API threads	**Application:** - Cased hole only - Packer collar - API 11D1 and 19AC V3-rated isolation assurance - Integral two-and three-stage cementing capability - Set with plug (type P) - Freefall or displacement plug sets - Premium/API threads	**Application:** - Cased hole only - Standalone packer - API 11D1 V0-rated gas tight barrier - Two-and three-stage cementing with ES II™ HD cementer - Set with plug (type P) - Freefall or displacement plug sets - Premium/API threads

Inflatable packer collars			
ESIPC™ (external sleeve) - three different packer configurations			MSIPC (internal sleeve)
18-in. metal bladder	3-ft elastomer	10-ft elastoner	18-in. metal bladder
Application: - Cased hole only - Two- and three-stage cementing - Two setting types: Set with plug (Type P) - Freefall or displacement plug sets - Set hydraulically (Type H) - Subsea offshore (Type H SR plug set)	**Application:** - Cased hole/hard rock OH - Two- and three-stage cementing - Two setting types: - Set with plug (Type P) - Freefall or displacement plug sets - Set hydraulically (Type H) - Subsea offshore (Type H SR plug set)	**Application:** - Cased hole/open hole - Two- and three-stage cementing - Two setting types: - Set with plug (Type P) - Freefall or displacement plug sets - Set hydraulically (Type H) - Subsea offshore (Type H SR plug set)	**Application:** - Cased hole only - Two- and three-stage cementing - Set with plug (Type P) - Freefall or displacement plug sets

PLUG SETTING AID

BHKA™ plug setting disconnect tool

The bottomhole kickoff assembly (BHKA) disconnect tool helps place a competent cement plug on the first attempt. With a mechanical operated single-collet release system, the tool is ideal for plug and abandonment (P&A) campaigns. It can meet multiple isolation requirements in a single cement operation and is also useful to place reduced volume kickoff or sidetrack cement plugs.

The tool is combined with a sacrificial tailpipe (aluminum, fiberglass, or steel) and minimizes swab of the cement plug while the work string is POOH. This ensures safer operations across loss zones or unstable wellbores.

BHKA disconnects are often deployed with a flow diverter on the lower end to aid filter-cake removal by jetting the bore ID during circulation.

Features and benefits

- Dart-operated disconnect mechanism allows tool placement anywhere in the well trajectory
- Design allows torque transmission through the tool to help circulate the well clean and reach planned depth
- Disconnection of the work string from the tailpipe enables longer cement plugs, which advances cement slurry design for compressive and gel strength development. This reduces the risk the string will become stuck, which provides a more effective solution for multiple cement plug stacks
- Available in aluminum for drillable plug tops and steel for high tensile and torque ratings

BHKA™ plug setting disconnect tool

Advanced cement support tool

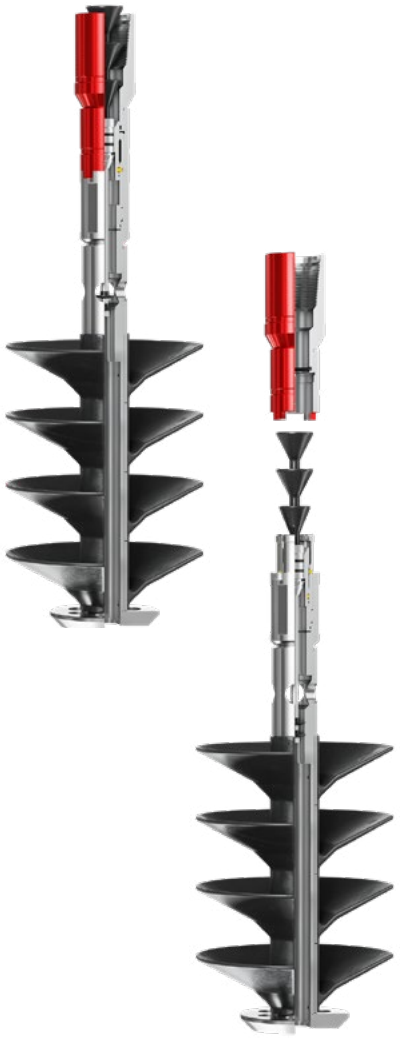
The advanced cement support tool provides a robust stand-alone fundament for a cement plug in the wellbore during plug and abandon (P&A) operations.

The tool design is beneficial when casing is recovered or a window is milled on the casing through the P&A activities. This creates a requirement for spotting a cement plug across multiple IDs, which often results in ineffective isolations and a need to repeat the cement operation.

Supporting cups are positioned with a dart-operated disconnect mechanism that enables tool placement anywhere in the well trajectory.

Features and benefits

- Flexible supporting cups to pass through wellbore restrictions where conventional bridge plugs or packers cannot pass
- Tailorable cups are adjustable on the wellsite to match hole size and reduce required inventory
- Shortens cut and pull and section milled intervals through elimination of the extra length often necessary to place high-viscous supporting pills
- Interchangeable nose configurations
- Bull nose for easy pass-through shoulders from liner tops and casing milled windows
- No-go nose to tag casing stump allows precise depth correlation and cement plug placement
- Large flow-through area for surge reduction while RIH with option for swarf filtering device



Advanced cement support tool

CASING FLOATATION

Running casing in highly deviated or horizontal wellbores with a high ratio of MD vs. TVD is a challenge to operators that want to maximize wellbore production. The excessive drag force between the casing run and the wellbore is difficult to overcome. Drag forces often exceed the available hook weight of the casing and can exceed their buckling capacity, which results in the inability to run casing to the desired setting depth.

To minimize negative impact on asset production and return, casing floatation is often used to create a buoyant chamber, which helps reduce RIH drag force and enables casing to run to final depth.

AirGlide™ floatation collar

The AirGlide™ casing floatation collar lowers drag and frictional forces to allow casing to get to bottom faster. Because the AirGlide floatation collar uses an innovative glass disk rather than ceramic components, there is no risk of plugoff or damage to float equipment and the need for a debris catcher is eliminated.

The AirGlide collar's glass disk acts as a fluid barrier in the well and traps an atmospheric chamber of air or a lighter weight fluid in the bottom section of the casing from the float equipment to the casing floatation sub. This trapped air creates a buoyant chamber that can reduce the casing weight and allows the casing string to lift away from the wellbore. This feature reduces drag force between the casing and the formation to provide improved casing running capabilities.

Features and benefits

- Innovative glass disk disintegrates into fine, sand-like particles upon activation
  - Zero risk of plugoff or damage to float equipment
  - Eliminates the need for a debris barrier
  - No debris or restrictions after activation for fullbore access
- Custom activation pressure tailorable to wellbore depth and pressures
  - Capable to withstand differential pressure up to 12,500 psi

AirGlide™ floatation collar

CEMENTING SERVICE EQUIPMENT

Indicating ball catcher

Understanding fluid positions throughout the cement operation is critical for perforation squeeze applications to ensure cement is properly placed and that non-cementitious fluids are not injected into the perforations.

When combined with a pumped down rubber wiper ball, the indicating ball catcher provides a clear surface indication when the rubber ball passes through the top adapter of the tool. When the ball reaches the restrictive ID, it creates a shut-in event that is represented as a steep pressure increase, which causes the rubber ball to deform and squeeze into the larger retaining chamber. The chamber consists of a tube that traps the ball, allows pressure bleed-off, and enables continued displacement or reverse circulation around the ball. This pressure indication helps identify when to close/open circulating valves or when to sting into/out of an annular packer.

Several rubber wiper balls can be pumped into the tool, which allows use of the indicating ball catcher in multiple squeeze operations without the need to trip out of the hole with the work string. Useof rubber wiper balls also helps prevent fluid overrun and can help separate incompatible fluids. If the formation packs off before the balls BACE™ buoyancy-assisted casing equipment enter the ball catcher, the balls can safely reverse out to the surface with the fluid.

Indicating ball catcher

Indicating dart catcher

The MEGO indicating dart catcher enables utilization of a latch-down wiper dart for use as job progress indicator. The tool can also encapsulate cement fluids in a variety of applications to provide an effective mechanical barrier.

When combined with surface released wiper darts, the indicating dart catcher provides a clear surface pressure indication when the dart lands on its seat, which is useful as an end-of-job or downhole fluid position indicator.

The latched-down dart helps prevent heavier fluid from reversing into the work string—or additional pressure can be applied to shear retaining pins and drive the latch-down dart into a larger retaining chamber—a tube that traps the dart and allows fluid bypass to help safely POOH the work string without fluid overflow on the rig floor.

Indicating dart catcher

Foam wiper balls

Foam wiper balls are designed to wipe clean the most challenging drillpipe or tubing ID configurations. Often used with cement plug placement and after inner string cement operations, these wiper balls deform and adjust to the inner geometry of the string's multiple inner dimensions. This allows efficient fluid film wiping, minimizes contamination with displacement fluid, and helps ensure minimum cement sheath remains when displacement wiper darts are not used.

These foam wiper balls are compatible with all known drilling and displacement fluids and can pass and shred through bit nozzles, if necessary, to safely wipe the drillpipe with the drillstring on bottom.

Features and benefits

- Parting stretch of 380 to 440%, which allows passage through small restrictions without damage
  - Easy passes through internal upset restrictions, such as mechanical setting tools, diverters, and casing/liner hanger running tools with low pump pressure required
- Made of natural rubber with open cell design to ensure bottomhole pressure is equalized into the foam structure
  - Efficient wiping as foam does not collapse when exposed to downhole environment
- Suitable for temperatures of 40 to 300°F (4 to 150°C) and available in large variety of wiping range intervals

Foam wiper balls

Inflatable Casing Annulus Packer (CAP)

The Casing Annulus Packer (CAP) is run as an integral part of the casing string and inflated to provide an annular seal between the casing and open hole or previous casing string. It can be inflated by applying pressure to the casing after a plug bump or by using an inflation tool run on pipe. The CAP is constructed utilizing the unique TAM slat element, a fully reinforced design mounted on a pup joint of API casing with threads and weight matching the casing string. CAPs range from 1.90 in. to 22 in. (48 mm to 559 mm) with seal lengths from 3 ft. to 20 ft. (0.9 m to 6.1 m). In addition to the standard range, TAM is able to design, verify, and manufacture special customer-specific products.

CAPs are superior for a wide variety of applications where a seal is required between the casing and open hole (or previous casing string). CAPs can inflate to greater than 2.5 times their run-in diameters. Customers may supply premium threaded pup joints of their casing to TAM and have the inflatable CAP built on their pipe. This maintains complete integrity and traceability in their casing string, especially for critical well completions using exotic metals. The greatest advantage is that CAPs enhance customer flexibility in planning a completion.

A CAP can be inflated by straddling the inflation port or by simply applying pressure to the entire casing string.

Features and benefits

- Two distinct constructions:
  - The TAMCAP and LONGCAP products use high-strength stainless steel slats to reinforce the full length of the inflatable element from 3 ft. to 10 ft.
  - The XTRACAP product is partially reinforced the full length of the inflatable element from 5 ft. to 20 ft., enabling the element to seal in irregular-shaped wellbores
- • The reliable SafeLok™ inflation valve system can be run above or below the inflation element
- • Ultra-slim designs are available for tight downhole applications
- Smart well completion features are available on request
- Constructed using a one-piece casing mandrel
- No hidden internal connections
- No welding to the casing mandrel during construction
- SafeLok valve system
  - Maintains casing string integrity
  - Provides delayed opening

Provide solutions for:

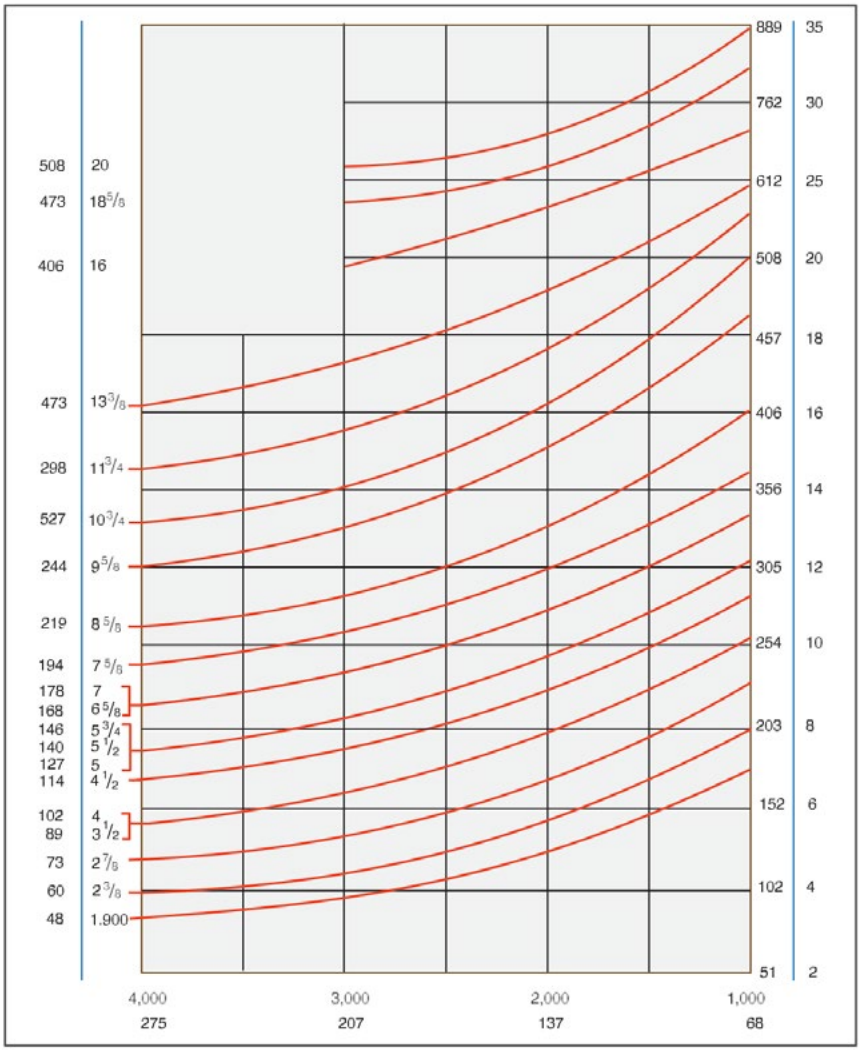
- Two-stage cementing
- Annular gas migration
- Wellbore compartmentalization
- One trip, off bottom cement operations
- Annular isolation for multi-stage fracture treatments
- Water shut off or cement squeeze in open hole

Tool size and difeerential pressure rating:

Use the chart by drawing a horizontal line from the casing or open hole ID on the right side of the chart to intersect the curve corresponding to the selected CAP casing size (OD). Drawing a vertical line to the bottom of the chart from the intersection defines the rated working pressure of the CAP. If anticipated differential pressures exceed the rated working pressure, the CAP must be inflated with a solidifying fluid such as cement, or operations must be changed to reduce the applied differential.

Inflatable CAP

Casing Size		Element outside diameter	
(in.)	(mm)	(in.)	(mm)
1.90	48	3.06	78
2.38	60	3.50	89
2.88	73	4.00	102
3.50	89	4.63	118
4.00	102	5.13	130
4.50	114	5.56	141
5.00	127	6.06	154
5.50	140	6.56	167
6.63	168	7.69	195
7.00	178	8.06	205
7.63	194	8.75	222
8.63	219	10.25	260
9.63	244	10.88	276
10.75	273	12.75	324
11.75	298	13.75	349
13.38	340	15.25	387
16.00	406	18.50	470
18.63	473	20.63	524
20.00	508	23.00	154
22.00	559	25.00	635



SWELLABLE PACKERS FREECAP® – Fluid Reactive Expanding Elastomer Casing Annulus Packer

The FREECAP® is a packer that swells upon contact with wellbore fluids. Different elastomers are available that will expand in water-based fluids or oil-based fluids. Two basic configurations of FREECAP are currently available: FREECAP I, which is integral to the casing, and FREECAP II, which is a slide-on version. FREECAP I packers are made by bonding the swellable elastomer onto any oilfield tubular. Metal end rings assist in increasing the differential pressure rating by reducing the extrusion gap between the packer and the borehole/casing ID.

The length of time required to swell and seal off a particular annulus is dependent on several factors. Factors common to both the oil and water swell compounds are fluid temperature and the difference between the initial packer OD and the average borehole ID. For the oil-activated packers, oil composition is the controlling factor. For the water swellable packers, water salinity is the controlling factor.

Each swellable elastomer compound developed by TAM is custom designed and tested to meet customer needs. FREECAPs are highly reliable, have no moving parts, and require no inflation or manipulation to seal, removing the inherent risks of mechanical tools.

Features and benefits

- Anti-extrusion end rings for FREECAP I, FREECAP II, and FREECAP III packers
- Modular slide-on FREECAP II and FREECAP III allow for last-minute placement flexibility
- Set in permeable formations, a long FREECAP, 10 ft. to 20 ft. (3 m to 6 m), seals more efficiently as it reduces bypass through the formation
- Manufactured to accommodate control lines
- Provides effective sealing in irregular wellbore shapes or corroded casing
- Can be supplied with both water and oil swell elastomers on the same mandrel to ensure swelling in either environment
- Temperature ratings from 50°F to 575°F (10°C to 302°C)
- 10,000 psi differential capability
- Good alternative to cementing and perforating
- Reduces rig time and construction costs

Provide solutions for:

- Zonal isolation
- Flow diversion
- Stimulation placement
- Intelligent well completions
- Water/gas shut off
- Open and cased hole scab liners
- Cement integrity
- Selective production

Swellable CAP

Tool type:

- FREECAP I packers are offered in 3 ft. to 20 ft. (1 m to 6 m) lengths on 10 ft. to 30 ft. (3 m to 9 m) casing or tubing joints. They can be manufactured with any seal up to 6 ft. less than a full casing joint, but special tooling and handling may apply. When they are made up as part of the regular casing/liner string, no specialized tools or personnel are needed.
- FREECAP II packers are built as slide-on packers, which allows on-site placement on either blank pipe or at the end of the screen section. They are offered in 1 ft. to 3 ft. (0.3 m to 0.9 m) lengths with IDs designed to slide over the maximum API casing OD tolerance. O-rings installed in both ends seal the annulus between the ID of the packer and the OD of the casing. The packers can be manufactured with custom seal lengths.
- FREECAP III packers are built as slide-on packers which allow on-site placement on either blank pipe or at the end of screen section. The elastomer section slides directly onto the casing with each two part end ring securing the elastomer to the base pipe. Set screws are used to anchor the end ring to the base pipe to back up the swellable elastomer when under differential load.

Common Tool Sizes*

Base Pipe OD		Element OD	
(in.)	(mm)	(in.)	(mm)
2.88	73.2	4.13 - 5.25	104.9 - 133.4
3.50	88.9	4.75 - 5.88	120.6 - 149.4
4.00	101.6	5.25 - 6.25	133.4 - 158.8
4.50	114.3	5.63 - 7.00	143 - 177.8
5.00	127	6.25 - 7.25	158.8 - 184.1
5.50	139.7	7.00 - 8.13	177.8 - 206.5
6.63	168.3	8.00 - 9.25	203.2 - 235
7.00	177.8	8.00 - 9.25	203.2 - 235
7.63	193.7	9.25 - 10.25	235 - 260.3
9.63	244.5	11.63 - 14.38	295.4 - 14.38

*Packer dimensions can be adjusted to fit specific scenarios.

Parameter	General specifications	Comment
Manufacturing Process	Wrapped and bonded to base pipe	Same process for all elastomers
Percent Swell	200% volumetric swell	4.5 x 5.75 in. (114.3 mm x 146 mm) - Max OD 7.66 in. (194.6 mm)
Temperature Limits	70-220°F (21-104°C); 220-375°F (104-191°C), 375-575°F (191-302°C)	Elastomer dependent. Oil and water swell available in all temperature ranges.
Swell Times*	5 to 17 days	A variety of oil and water swell elastomers available to work in this time frame
Seal Lengths	1, 3, 5, 10, 15, 20, and 30 in. (25, 76, 127, 254, 381, 508, and 762 mm)	Custom lengths can easily be manufactured
Differential Pressure	1000 psi to 15,000 psi	Ratings may vary depending on difference between manufactured packer OD and sealing ID
Running Procedure	Typical casing handling procedures	No problems to circulate past packer or rotate to get in well
Dogleg Severity	Standard mandrel length up to 30 deg/100ft	Using a longer mandrel will allow deployment in wells with dogleg severity greater than 30 deg/100ft
Packer Manufactured OD	Standard is 3/8 in. (9.5 mm) less than sealing ID Some	Some applications such as cement enhancement by require reduced ODs to accommodate flow rate during cementing
Centralization	1/4 in. (6.4 mm) less than sealing ID	Typical for horizontal applications

*General averages, dependent on temperature and fluid composition.

For more information, contact your local MEGO representative or visit us on the web at www.MEGO.com

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