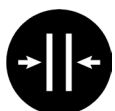


PRECISION MICRO

CT Fracturing System



15,000 PSI
[103 Mpa]



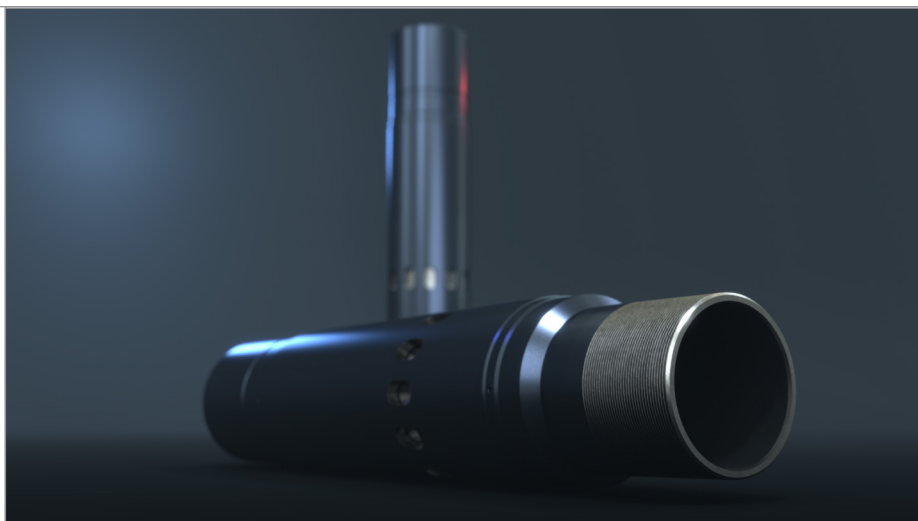
285 °F
[140 °C]

APPLICATIONS

- Cemented multistage stimulation with single-entry fracture placement
- Openhole multistage stimulation, deployed with openhole packers
- Engineered for low pressure environments

FEATURES

- Reclosable sleeve for cemented and openhole completions uses
- CT tension to open sleeves
- Large flow port area ensures access to fracture planes
- Fullbore has no effect on cementing or re-entry for subsequent stimulation
- Reliable shifting tool technology provides positive sleeve actuation
- Short length of sleeve facilitates handling and installation



The Precision Micro Sleeve is part of a robust cemented or coil tubing fracturing sleeve design to allow operators to perform selective single-point multistage fractures.

The sleeve is a two-position, fullbore, reclosable fracturing sleeve designed for the most common high-pressure and high-rate fractures. It can be opened, closed, and reopened, allowing operators to tailor production over the life of the well using the Harrier™ Shifting Tool. This has been accomplished through premium manufactured sealing technology, incorporating materials and coatings that have been proven in the harshest thermal environments. In addition, the sleeve utilizes an adjustable detent locking system that locks the inner sleeve to prevent accidental manipulation and provides operators with reliable weight indicators to mark when the sleeve has shifted.

Positive sleeve actuation

The shifting tool that actuates the sleeve is compact (2.5 ft [0.8 m]), featuring a self-centralizing design with individual hydraulically controlled keys to ensure maximum performance during actuation up to 38,000 lbf [169,032 N] of overpull without releasing the sleeve unless desired.

The shifting tool has been engineered as a fracture-in-place solution with no requirements for isolation or related service tools, even after hundreds of stages are fractured. The fully compartmentalized and hydraulically balanced design with multiple layers of solids control ensures no solids will interfere with the tool's operation.

Fail-safe operation

The shifting tool, in combination with the reclosable cemented fracturing sleeves' adjustable detent lock mechanism, provides operators with reliable surface indication of when a sleeve has shifted, determined by positive indication on the weight indicator combined with the release of the shifting tool. The shifting tool is designed to release the sleeve even when actuated only once the sleeve has shifted or once the operators have stopped pumping.



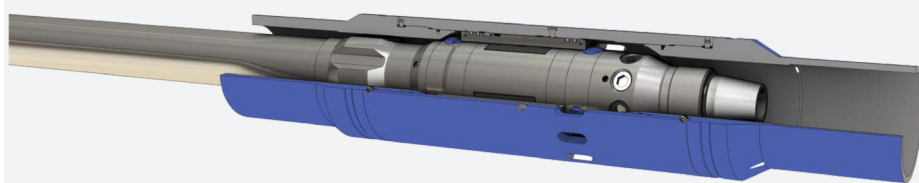
PRECISION MICRO

CT Fracturing System



Stage 1

A hydraulic differential extends the keys of the shifting tool. Even up to a 10,000-psi [69-MPa] differential, the keys deflect the same amount and engage the sleeve.



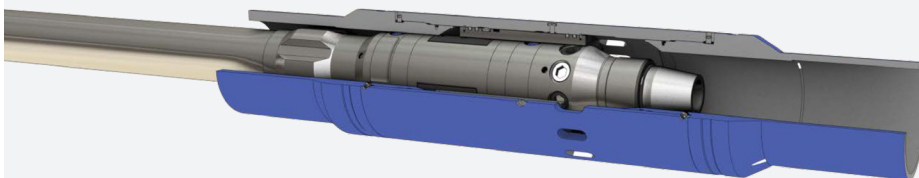
Stage 2

The leading key deflects over the sleeve. The grappling face of the rear key grabs the sleeve and the sleeve is pulled open, shearing the shear screw. Shifting indication is seen at surface.



Stage 3

The kickoff profile of the lead key hits the kickoff profile in the sleeve and both keys deflect the same amount to release the sleeve.



Stage 4

If the shifting tool releases while pumping when going through the sleeve, then the sleeve has shifted. The system was engineered to eliminate false positives.

PRECISION MICRO

CT Fracturing System

Fracturing Sleeve Performance Specifications											
Casing Size in [mm]	Casing Weight lbm/ft [kg/m]	OD in [mm]	ID in [mm]	Sleeve Weight lbm [kg]	Total Length in [mm]	Up Position/ Lower Position	Fracture Port Area in ² [cm ²]	Max Pressure psi [MPa]	Temp. F [C]	Up Shift Weight lbf [N]	Down Shift Weight lbf [N]
4.5 [114]	11.6 - 15.1 [17.3 - 22.5]	5.0 [127]	3.89 [99]	50 [23]	31.5 [800]	Stimulation/Closed	10.6 [68.38]	7,500 [52]	285 [141]	3,000 - 5,000 [13,344 - 22,241]	3,000 - 5,000 [13,344 - 22,241]
5.5 [140]	17.0 - 23.0 [25.3 - 34.2]	6.6 [167.6]	4.80 [122]	95 [43]	33.5 [851]	Stimulation/Closed	11.94 [77.03]	7,500 [52]	285 [141]	3,000 - 5,000 [13,344 - 22,241]	3,000 - 5,000 [13,344 - 22,241]

Shifting Tool Performance Specifications									
Casing Size in [mm]	Casing Weight lbm/ft [kg/m]	OD in [mm]	ID in [mm]	Total Length in [mm]	Top Connection in [mm]	Bottom Connection in [mm]	Working Pressure psi [MPa]	Temperature F [C]	
4.5 [114]	11.6 - 13.5 [17.3 - 20.0]	3.75 [95.3]	.75 [19.05]	24.2 [614.68]	2.375 [63] PAC DSI	2.375 [63] PAC DSI	3,000 [20.65]	285 [141]	
4.5 [114]	15.1 [22.5]	3.65 [92.7]	.75 [19.05]	24.2 [614.68]	2.375 [63] PAC DSI	2.375 [63] PAC DSI	3,000 [20.65]	285 [141]	
5.5 [140]	17.0 - 23.0 [25.3 - 34.2]	4.44 [112.7]	1.0 [25.4]	26.0 [660.4]	2.375 [63] PAC DSI	2.375 [63] PAC DSI	3,000 [20.65]	285 [141]	

STEELHAUS

