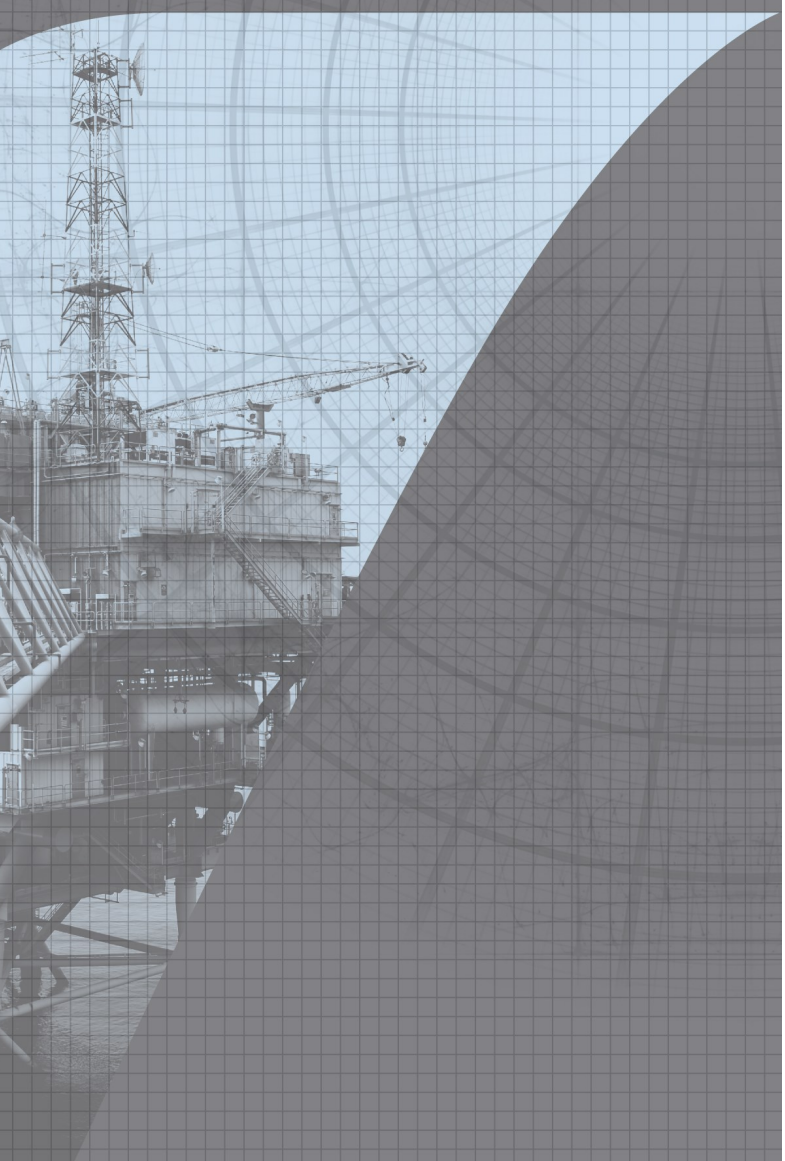
SPEX Severance Tools



SPEX Offshore (UK) Ltd. offers a complete range of 'RF-safe' **Drill String Severing Tools** which are designed to sever stuck drill strings, regular drillpipe, heavy weight drillpipe, and drill collars.
Tools are available up to 400 °F and 25,000 psi.

Principles of Operation

Each severing tool consists of a carrier tube which contains the explosive charge assembly, a collapsible shock attenuating steel extension mandrel, which helps absorb the shock from the explosive charge, and an electrical crossover to connect the tool to the wireline weight bars and the Casing Collar Locator (CCL). A specialised fuse or twin detonator assembly in the carrier tube ensures that the explosive column detonates at each end simultaneously, resulting in the collision of two powerful shock waves at the centre of the tool enhancing severance capability. To initiate the tool, SPEX uses one of two radio safe detonating systems, depending on which tool type is selected.

The severing tool is run on electric wire line and requires weight bars and a CCL. Usually, a wireline Freepoint Indicator Tool is run in the hole first to determine the position of the free pipe.

This greatly reduces the risk of positioning the severing tool in a stuck part of the drill string. When the severing tool is roughly in position, tension is applied to the drill string to give optimum severing performance of the tool. A final correlation of the shooting position with the CCL tool will ensure the severing tool is in the required position.

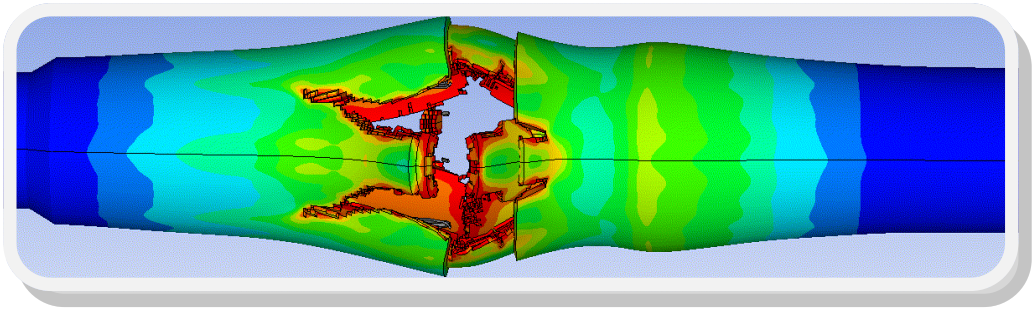
Alternatively, the severing tool can be run on coiled tubing with an Absolute Pressure Firing Head (APFH), with internal electric wireline or on a Slickline trigger.

Equipment Specification

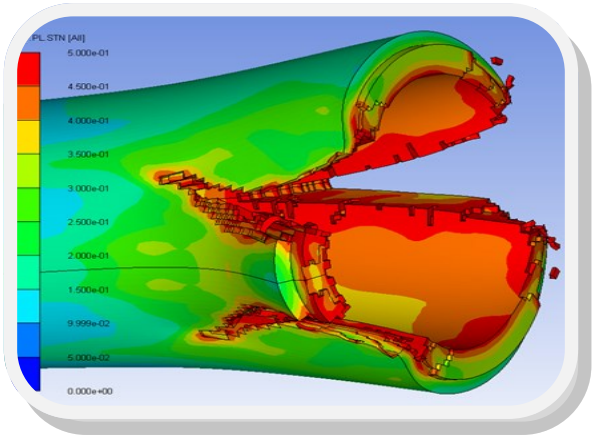
Severing tools are available in sizes ranging from 1-$^{3}/_{8}$" to 2-$^{5}/_{8}$". The tool sizes are designed for various pipe size applications. For large drill collars the largest size that will pass through the minimum restriction is always recommended. Full sets of equipment are held on standby at all times for rapid mobilisation when required.

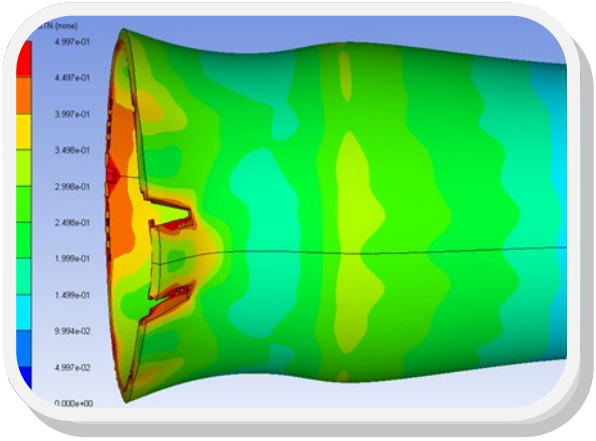
All SPEX severing tools have been developed to offer unmatched performance with high levels of safety. The system allows the pipe recovery specialist to assemble the tool confidently and efficiently and includes the functionality to test the detonator for continuity during safe arming. The electrical assembly contains a safety tube to aid safe arming and testing. Depending on the tool selection, the detonators to be used are the Exploding Bridgewire (EBW) or an Electronic coded detonator. Each of these is designed to provide reliable and safe initiation without the need for radio silence.

The Mild Detonating Fuse (MDF) assembly is designed to simultaneously initiate the explosive column at the top and bottom to produce a colliding shock wave effect in the middle of the tool. Alternatively, two EBW detonators can be used to produce the same effect, resulting in an efficient and powerful cutting tool.



SPEX Offshore (UK) Ltd has in-house **Advanced Analysis** techniques such as Finite Element Analysis (FEA) which can accelerate and verify job design. Our custom-built super-computer operates over 1,000 times faster than conventional workstations.





The findings from our simulations are completely validated via a rigorous physical testing programme which reflects deployment and working environments. Through computer simulations the effects on surrounding structures and environment can also be assessed

The above images are examples of the empirical testing undertaken to validate our severing tool performance at 450 ^{o}F. Note how the physical test is also validated by that of the FEA shown in the above strain plot images.

Tool Specification Table

Severing Tool 400 °F and 20,000 psi

Tool OD	1-3/8”	1-3/4”	1-3/4”
Tool Explosive Weights	0.64 kg	1.10 kg	1.25 kg
Explosive Type	HMX	HMX	HMX
Detonator Type	EBW / HNS	EBW / HNS	EBW / HNS
Temperature Rating	400 °F — 1 Hour	400 °F — 1 Hour	400 °F — 1 Hour
Pressure Rating	20,000 psi	20,000 psi	20,000 psi
Designed to Sever	2-7/8” Drillpipe	4”-5” Drill Collar	Up to 6-1/2” Drill Collar

Severing Tool 400 °F and up to 25,000 psi

Tool OD	2-1/8”	2-3/8”	2-5/8”
Tool Explosive Weights	2.93 kg	2.20 kg	4.52 kg
Explosive Type	HMX	HMX	HMX
Detonator Type	EBW / HNS	EBW / HNS	EBW / HNS
Temperature Rating	400 °F — 1 Hour	400 °F — 1 Hour	400 °F — 1 Hour
Pressure Rating	25,000 psi	20,000 psi	25,000 psi
Designed to Sever	Up to 8” Drill Collar	9”-11” Drill Collar	Up to 11” Drill Collar

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