MAXFIRE™ ELECTRONIC FIRING SYSTEMS

FLEXIBILITY AND RELIABILITY FOR CHALLENGING AND COMPLEX WELLS

Solving challenges.™
Two MaxFire™ Electronic Firing System Alternatives Improve Safety and Performance

Understanding Their Unique and Different Capabilities

The Halliburton MaxFire™ electronic firing system (EFS) has numerous built-in features, which enable explosive tools to be deployed and initiated safely. Halliburton makes two versions of the MaxFire system – one for tubing-conveyed perforating (TCP), the other for slickline and coiled tubing (CT). Regardless of conveyance, the MaxFire system has become synonymous with safety, precision and flexibility.

The versions differ mainly in pressure ratings (40,000 psi vs. 20,000 psi or 276 MPa vs. 138 MPa) and outside diameter (2.125 in. vs. 1.69 in. or 53.98 mm vs. 42.93 mm). However, other important differences exist, including their ability to record data, speed of deployment, triggering options, and the weight they can support because of the conveyance. (See comparison on pages 4 and 5.)

Meeting Today’s Toughest Challenges

As wells become more challenging and complex, the MaxFire systems’ unmatched specifications and flexibility help manage exploration and production efforts cost effectively.

Flexible Enough for Virtually Any Need

The two different tools make the Halliburton MaxFire EFS family ideal for a variety of challenging applications and environments. This brochure will help you understand each tool so you can determine which best fits your needs.

Perforating
The high load-bearing capacity of the MaxFire tool for TCP can perforate several kilometers per run, saving significant cost.

Cutting Pipe/Pipe Recovery
The slickline version’s speed makes it ideal for cutting pipe during interventions, which can also result in significant cost savings. MaxFire tools can initiate any type and size of cutter for severing pipe.

Setting Plugs and Packers
The speed of the slickline version also makes it attractive for setting plugs and packers in situations when customers wish to use explosives for that purpose.
Both variations of the MaxFire™ system use Halliburton’s industry-leading RED® Detonator for initiating perforating guns. It has proven its value in thousands of wells.

**Multiple levels of safety protection built in**
Top-fire design provides significantly improved safety compared to conventional resistor-based devices. And because the RED Detonator is RF-safe, wellsite communication can continue during perforating without fear of accidental detonation from radio signals.

**Better than conventional detonators**
The RED Detonator is a simple, economical, offshore-safe substitute for resistorized, EBW, and EFI detonators. When used with a scalloped gun where a fluid-disabled feature is not required, the RED Detonator is rated up to 375°F (191°C) for an hour. It can also be used with tubing and casing cutters – in essence, all pipe recovery operations. In addition to being RF-safe, the RED Detonator allows many normal rig operations, including welding and cathodic protection, to continue uninterrupted while perforating. It does not require special firing panels or downhole firing units.

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**Radio-Frequency-Safe RED® (Rig-Environment Detonator)**

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**Sensor/Trigger Options Improve Safety**

To prevent accidental detonation, the MaxFire system uses multiple sequences to activate the trigger. The tool can monitor temperature, pressure, tool motion and time. In specific applications, an initial run in the hole can gather this data so the tool can be precisely set to each unique initiating environment. The MaxFire tool will only go into firing mode when conditions and preprogrammed sequences match the distinctive planned values or the specified combinations of these variables, thus ensuring a safe electronic firing system.

Operators can reset or halt the firing sequence at any time using controlled pressure cycles, by bleeding down the pressure in the well, or by moving the tool.
For Slickline or Coiled Tubing

Benefits
The small, slickline/CT MaxFire tool can:
• Record data before, during and after detonation
• Record days longer than competing tools, at greater frequencies and higher resolutions

Such data can provide valuable insights that lead to better decisions and higher production.

Key Capabilities
- Memory = 16 MB
- Can record downhole for up to 6 days
- Captures data before, during and after detonation
- Sampling rates
  - Normal Mode – 1 sample/second
  - Trigger Mode – 10 samples/second for 2 minutes and 1 sample/second after 2 minutes
- Ideal for pipe recovery
- Load capacity limited only by strength of conveyance
- Tool must sit still to enter firing mode

Can be actuated with any combination of:
• Time
• Pressure
• Temperature
• Electronic motion sensor

20,000 psi (138 MPa)
1.69 in. OD (42.93 mm)

ACTUAL DIAMETER

7.43 ft (2.26 m) Long

The many ways to trigger the slickline/CT version of the MaxFire™ electronic firing system improve worksite safety. They also eliminate the need for electric line to trigger explosives, creating a cost advantage over many competing systems.
For Tubing-Conveyed Perforating

Benefits
Compared to competitive solutions, the MaxFire system designed for tubing-conveyed perforating:
• Is rated to an industry-leading 40,000 psi
• Can trigger after recognizing a specific pressure variation sequence
• Can record downhole data for up to 30 days, approximately five times longer than the next best competing tool
• Can detonate strings of perforating guns several kilometers long
• Can act as primary or secondary firing head

Key Capabilities
• Memory = 16 MB
• Can record downhole for up to 30 days
• Captures data before detonation
• Sampling rates
  – 0.25 samples/second in normal mode
  – 10 samples/second in trigger mode, lasting for 2 minutes
• Ideal for ultrahigh-pressure wells
• Load capacity limited only by strength of shroud
• Can perforate thousands of feet at a time

The MaxFire™ electronic firing system for tubing-conveyed perforating differs from the slickline version. Optimized for different applications and environments, it boasts the highest pressure rating in the industry – 40,000 psi (276 MPa). That makes it the tool of choice in ultradeepwater. Triggering pressure of other tools may exceed the pressure limit of the casing used at the bottom of ultradeep wells. In such cases, you can program the MaxFire system to trigger after recognizing a specific sequence of very small pressure variations over time.

With the escalating costs of rig time and the safety concerns with running a perforating string, it is necessary to have the ability to run redundant firing heads. The TCP Maxfire EFS has mutable accessories that provide the ability to run redundant systems in tandem above or below on any string design. The dual-firing-head carrier allows two TCP Maxfire systems to be run on top and/or bottom of the perforating string. This translates into the capability to run four independent firing heads at once.
The MaxFire™ System Makes the Difference

Why Halliburton?

Flexibility
No other firing system on the market offers the flexibility of the MaxFire electronic firing system. You can safely deploy it in any situation that calls for perforating casing, cutting pipe, or setting plugs – without calling out multiple service providers and bringing more people to the job site than necessary.

Safety
The RED® Detonator, used in conjunction with the MaxFire system, provides triggering options suited to virtually any well. And because the RED Detonator is radio-frequency safe, rigsite communications can safely continue during perforation operations.

Data and Pressure Ratings
Finally, no other firing system in the world offers the data recording capabilities and pressure ratings of the MaxFire electronic firing system.

To learn more, call your Halliburton representative today.
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