

# WiFire™ Acoustic Firing Head

## INITIATING TUBING-CONVEYED PERFORATING WITH ACOUSTIC TELEMETRY

### OVERVIEW

The WiFire™ acoustic firing head initiates tubing-conveyed perforating (TCP) guns by using the DynaLink® telemetry system. As part of the RezConnect® well testing system, the WiFire acoustic firing head provides an alternative activation method to applied-pressure or bar-drop systems, and can reduce the uncertainty of TCP firing operations. Multiple fire interrupt systems are incorporated into the WiFire tool to ensure that the highest level of safety is in place while the guns are at or near surface. The WiFire tool enables an operator to know that the firing head is available and ready to initiate the gun systems with downhole feedback prior to perforating. After the fire command has been sent, the WiFire acoustic firing head responds to the surface with confirmation that the command to initiate the TCP guns has been received and acted upon.

### FEATURES

- » Four independent safety mechanisms: two mechanical and two electrical
- » Reliable acoustic communication
- » Confirmation before and after the firing operation
- » Used with redundant firing heads
- » Complies with the proposed API RP-67

### BENEFITS

- » No applied pressure required
- » No intervention required
- » Real-time confirmation
- » Increases dual-zone testing capabilities
- » Ideal for highly deviated wells
- » Can be connected above or below guns

### SAFETY

#### Software Security

The fire command feature in the software is protected with a username and password. Only the responsible operator will be allowed to issue the fire command.

#### Encrypted Code

The fire command has a unique encrypted code that is created each time the tool is programmed on surface, and the electronics will not issue the fire command to the initiator unless the fire command received from surface contains the encrypted code.

#### 256-bit Encrypted Key

Only the responsible operator will have the key that contains the encrypted code that will be sent with the command to fire the tool downhole.

#### Electronic Temperature Check

The minimum arming temperature programmed in the tool must be reached before a fire command can be executed.

#### Mechanical Pressure Switch

The configurable pressure switch prevents any signal from reaching the initiator until wellbore hydrostatic pressure is sufficient to close the pressure switch, preventing a premature fire on surface.

#### Mechanical Thermal Switch

The mechanical thermal switch also prevents any signal from reaching the initiator before the minimum temperature of 145°F (63°C) is met, preventing a premature fire on surface.

#### Secondary Firing Head

A secondary firing head can be installed in series to provide another level of safety.



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## Equipment Specifications

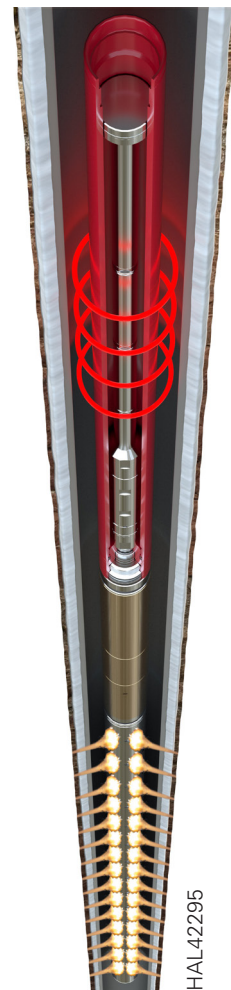
Outer Diameter in. (cm)	3.38 (8.5)
Makeup Length in. (cm)	4.92 (12.5)
Overall Length in (cm)	94.5 (240)
Weight lb (kg)	34 (15)
End Connections	3-3/8 in. VannGun® assembly
Absolute Pressure <sup>1</sup> psi (bar)	20,000 (1379)
Minimum Pressure <sup>2</sup> psi (bar)	1000 (68.9)
Tensile Load <sup>3</sup> lb (kg)	208,000 (94,347) <sup>5</sup>
Service Temperature <sup>4</sup> °F (°C)	150 - 350 (65 - 177)
Battery Life	Up to 40 days
Gun Applications	3-3/8 in. to 7 in.

### Notes:

- <sup>1</sup> Absolute pressure is the total hydrostatic pressure plus applied pressure.
  - <sup>2</sup> This is based on the mechanical pressure switch safety device.
  - <sup>3</sup> The values of tensile, burst, and collapse strength are calculated with new tool conditions, Lamé's formulas with Von Mises' distortion energy theory for burst and collapse strength, and stress area calculations for tensile strength.
  - <sup>4</sup> This is the minimum temperature based on the mechanical thermal switch safety device.
  - <sup>5</sup> Rating for 3-3/8-in. Halliburton gun systems only. Tensile ratings for larger applications will be determined by the gun system.
- » These ratings are guidelines only. Refer to the equipment data book for individual equipment specifications.

## OPERATION

With the guns at depth, the status of the WiFire tool can be checked by using the DynaLink acoustic system. Once communication is established and minimum pressure/temperature safety mechanisms have been met, the guns are ready to be fired. The responsible TCP operator will use his encrypted key and enter his username/password in the software before the unique fire command is sent to the WiFire tool. Once the WiFire tool receives the acoustic command with the encrypted code, it will activate the initiator that starts the detonation train. A confirmation after the initiator is fired is sent to surface via the DynaLink acoustic system, giving the operator confidence that the gun's detonation has begun.



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