Setting a New Pace in Perforating

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Tempo Instrumented Docking Perforating Gun System

Agenda

- Tempo System Overview
- Testing and Design
- Field Tests Results
- Q&A
The Tempo System – Measurements While Perforating

**Measurement Module**
- Active casing collar locator (CCL)
- Gamma ray correlation
- Pressure and temperature logging
- Fast pressure and shock data

**Docking Gun System**
- Engineered design, eliminates human errors
- Compact system enables maximum gun deployment
- Plug-in, RF-Safe (API RP 67 Group 2), addressable initiation system
Measurement Module Design

Vision:

- Measurements before, during, and after perforating:
  - **Shock and Pressure data** optimizes gun string design
  - **Battery less** design

- Improved reliability and efficiency:
  - **Ruggedized tool** design eliminates need for shock absorbers and prevents misruns
  - **Improved CCL** makes tie-in process faster and easier; ensuring on-depth perforation
- Superior measurement in casings up to 9-5/8 in. and in chrome tubulars
- Fast measurement of dynamic pressure while perforating
- Peak shock measurement to optimize job planning and gun length
Shock Testing

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**Project Objective:** To improve **reliability**, **efficiency**, and **safety** while addressing directly the main failure modes:

- Wiring
- Flooded Guns
- RF initiator reliability

**Legacy system**
- 12 manual electrical connections
- 19 sealing O-rings
- 39 parts
- Time to arm: 10-20 minutes each

**TEMPO Docking System**
- 2 manual electrical connections (selective)
- 10 sealing O-rings
- 20 parts
- Time to arm: 1-5 minutes each
Key Performance Parameters:

- Confining material density
- Surface to surface spacing
- Transfer window height
- Transfer window edges
Rapid and Reliable Arming

- Docking module firing system **eliminates**:
  - Crimping and complex terminations
  - Port plug designs

While greatly reducing time to arm
Selectivity with Ease

- **Simplified** selective gun wiring and arming
- **Integrated** addressable technology enables assurance of system integrity
## Docking Perforating Gun Mechanical Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>2³⁄₈</th>
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<tbody>
<tr>
<td>Outside diameter, in</td>
<td></td>
</tr>
<tr>
<td>Shot density (spf), phasing (*)</td>
<td>3, 120; 4, 120; 4, 180; 6, 60</td>
</tr>
<tr>
<td></td>
<td>PowerJet Omega* 2906</td>
</tr>
<tr>
<td></td>
<td>PowerJet* 2906</td>
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<td></td>
<td>CleanPACK* 38C</td>
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<tr>
<td>Temperature rating, degF</td>
<td>340</td>
</tr>
<tr>
<td>Pressure rating¹, psi</td>
<td>15,000–25,000</td>
</tr>
<tr>
<td>Min. casing size, in</td>
<td>4¹⁄₂</td>
</tr>
<tr>
<td></td>
<td>3¹⁄₂- and 3.67-in guns: 5</td>
</tr>
<tr>
<td>Max. number of selective guns</td>
<td>40</td>
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</tbody>
</table>

¹ Configuration dependent
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QUESTIONS? THANK YOU

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