The DeepStar™ Perforating System
More High Performance Products From JRC

The proven DeepStar system welcomes three new patent-pending phasings to the family — Pentaphase, Heptaphase and Octaphase. The Pentaphase and Heptaphase are oscillating spirals and are available at 6 shots per foot. All systems are available in flat DeepStar strips and are unmatched for retrievability after firing, especially in gas. Problems inherent to helical strip systems, such as twisting, expansion and distortion are avoided.

JRC uses proven engineering concepts, high-grade materials, quality-controlled manufacturing and years of practical experience to give you these high performance products. When you're planning through-tubing perforating operations, you'll see there's only one choice — the DeepStar Perforating system.

The small diameter, expendable, retrievable DeepStar guns are perfectly suited for through-tubing applications. Using flexible strip carriers, they pass easily through doglegs and corkscrewed tubing. And their light weight makes them ideal for completing long intervals. In addition to perforating for production, DeepStar guns can also be used to establish circulation through drill collars, drill pipe or heavy walled casing.

Big Gun Performance
Since strip carriers are used, the largest possible charges can be transported through tubing. And unlike running smaller diameter, hollow carrier guns, no allowances for gun-wall thickness are required. With scientifically engineered DeepStar charges, you get the best possible performance from a through-tubing gun — consistently round, large diameter, deep penetrating perforations.

Reliable Operation Under Harsh Conditions
DeepStar charges are enclosed in abrasion resistant alloy steel cases to ensure reliable operation under harsh downhole conditions. The strip carriers are manufactured from an annealed, stainless steel material and are resistant to damage from exposure to hostile fluids. The guns can also be fired dry without the carrier parting. So no matter what the conditions, carriers are completely retrievable and the wellbore is left open for future operations.

Versatility
Various phasing operations are available, including 0 degree, 90 degree downside, 90 degree spiral, Triphase, as well as the new Pentaphase, Heptaphase, and Octaphase.
DeepStar™ Carrier Specifications

<table>
<thead>
<tr>
<th>Carrier Type</th>
<th>Nominal gun OD</th>
<th>Minimum allowable restriction</th>
<th>Carrier type</th>
<th>Nominal gun OD</th>
<th>Minimum allowable restriction</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 1/4 in. Carrier</td>
<td>2.125 in. (5.39 cm)</td>
<td>2.188 in. (5.55 cm)</td>
<td>1 11/16 in. Carrier</td>
<td>1.687 in. (4.28 cm)</td>
<td>1.718 in. (4.36 cm)</td>
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</tbody>
</table>

- **Maximum gun length:** Unlimited
- **Maximum operating temperature (with RDX charge):** 325°F (162°C) for one hour
- **Maximum operating temperature (with HMX charge):** 375°F (191°C) for one hour
- **Pressure rating:** 20,000 psi (137,900 kPa) for one hour
- **Wellbore conditions:** Dry gas or fluid
- **Shot density:** 1-6 spf (3-20 spm)
- **Phasing:** 0° Triphase, 90° Downside Triphase, 90° Spiral, Pentaphase, Heptaphase, Octaphase
- **Selective fire capability:** Two gun sections

JRC provides the best through-tubing, expendable perforating system available in the industry today. To see how the DeepStar Perforating System can help get maximum production from your well, contact Jet Research Center.

www.jetresearch.com

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