Cameron Conventional Surface Wellheads
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Cameron Conventional Wellhead Systems provide the flexibility, compatibility and interchangeability required for a wide range of surface applications. With the proven features of Cameron systems comes reduced inventory requirements, lower costs and the ability to provide standard components. Cameron provides two Conventional Wellhead Systems, the S Wellhead and IC Wellhead. The Cameron S Conventional Wellhead System offers the industry’s highest capacity conventional spool-type wellhead and is designed for use with all well depths and types of completions. The IC Wellhead is a cost-effective, reliable system for a variety of applications. Although components are not interchangeable, the S Wellhead may be used in place of the IC Wellhead for all applications. In addition, both wellheads are compatible with most Cameron tubing spool and hanger configurations. Cameron has earned a reputation for quality wellhead products that meet or exceed API 6A specifications. Cameron offers a complete line of conventional wellheads and Christmas trees to suit all casing and tubing programs for working pressures up to 30,000 psi. Equipment for surface applications ranges from low pressure, conventional equipment to systems for severe service and geothermal applications. For equipment requirements not covered in this brochure, contact your Cameron representative.

Selecting a Wellhead System

The first step in determining which Cameron wellhead system is best for your application is to determine the casing hanger style to be used. Each hanger profile is unique and is generally compatible with only a limited number of casing head/spool bowls. Cameron has a complete line of slip-type casing hangers divided into two segments, SB and IC, each serving different applications.

Casing Hanger Selection Chart

<table>
<thead>
<tr>
<th>Temperature Range</th>
<th>IC-1, IC-1-P, IC-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>-20°F to 150°F (-29°C to 65°C)</td>
<td>SB-6</td>
</tr>
<tr>
<td>-20°F to 180°F (-29°C to 82°C)</td>
<td>SB-6</td>
</tr>
<tr>
<td>-20°F to 250°F (-29°C to 121°C)</td>
<td>SB-3 and SB-5</td>
</tr>
</tbody>
</table>

Note: Although final production may be at one temperature, operating temperature at the casing hanger may be lower.

- Hang-Off Capacity
  - Up to 50% of pipe body yield ....... IC-1, IC-1-P, IC-2
  - Up to 70% of pipe body yield ......... SB-6
  - Up to 80% of pipe body yield ........... SB-3, SB-5

- Working Pressure
  - 5000 psi WP ........ IC-1, SB-3, SB-6
  - 10,000 psi WP .......... IC-1-1-P, IC-2
  - 10,000 and 15,000 psi WP .......... SB-5

- Method to Set Annulus Seal
  - Manual ........ IC-1, IC-1-P, IC-2
  - Automatic ........ SB-3, SB-5, SB-6, IC-1, IC-1-P

- Seal Replaceable with Load on Hanger
  - Yes ........ SB-3, SB-5, SB-6, IC-1, IC-1-P
  - No ........ IC-2

- Spool/Housing Compatibility
  - Single 45° shoulder (IC-2 Series) .... IC-1, IC-1-P, IC-2
  - Double 45° shoulder (S Series) ........ SB-3, SB-5, SB-6

Major Considerations for Casing Hanger Selection

- Temperature Range
- Hang-Off Capacity
- Working Pressure
- Method to Set Annulus Seal
- Seal Replaceable with Load on Hanger
- Spool/Housing Compatibility
Cameron Conventional Wellhead Systems

S Conventional Wellhead System
The Cameron S Conventional Wellhead System offers the industry’s highest capacity conventional spool-type wellhead and is designed for use with all well depths and all types of completions. The Cameron S Wellhead incorporates the lower casing head housing and hanger and the subsequent casing head spools and hangers. This wellhead is the preferred wellhead for the conditions noted below. It is compatible with any of the Cameron tubing spool and hanger configurations shown on pages 12-18.

Features:
Two 45° shoulders. Upper shoulder supports the pack-off hydraulic pressure and test loads. Lower shoulder provides independent support for the casing load. Selection of secondary seals and pack-off bushings provide versatility.

Working Pressure:
Up to 15,000 psi (Excluding tubing spool)

Operating Temperatures:
-20°F to +250°F (-29°C to +121°C)

Hang-Off Capacity:
Up to 80% of pipe body yield

Casing Head Spools:
S, S-11, S-3 (See page 4)

Casing Hangers:
SB-3, SB-5, SB-6 slip and seal assemblies (See page 6)

Tubing Spools and Hangers:
C tubing spool: HT, HT-2, T, TCL, C-SRL, CXS hangers
MTB tubing spool: MTBS hanger
CD-2 tubing spool: CD-2, CD-T, CD-TCL hangers

S Casing Hanger Application Chart

Cameron S Wellhead System
Cameron Conventional Wellhead Systems

IC Conventional Wellhead System

The Cameron IC Conventional Wellhead System incorporates the lower casing head housing and hanger and the subsequent casing head spools and hangers. This wellhead is the preferred wellhead for the conditions noted below. Although components are not interchangeable, the S Wellhead may be used in place of the IC Wellhead for those applications as well. Both wellheads are compatible with any of the Cameron tubing spool and hanger configurations shown on pages 12-18.

Features:
- Straight-bore design with 45° load shoulder. Selection of secondary seals and pack-off bushings provide versatility.

Working Pressure:
- Up to 10,000 psi (Excluding tubing spool)

Operating Temperatures:
- -20°F to +150°F (-29°C to +65°C)

Hang-Off Capacity:
- Up to 50% pipe body yield

Casing Head Housings:
- IC-2, IC-2-BP (See page 8)

Casing Head Spools:
- IC-2, IC-2-RF, IC-2-L (See page 8)

Casing Hangers:
- IC-1, IC-1P, IC-2 slip and seal assemblies

Tubing Spools and Hangers:
- C tubing spool: HT, HT-2, T, T-CL, C-SRL, CXS hangers
- MTBS tubing spool: MTBS hanger
- CD-2 tubing spool: CD-2, CD-5, CD-T-CL hangers

Cameron Conventional Wellhead Systems

Tubing Hangers
Tubing hanger designs are available for single, dual and metal-sealing completions.

Casing Hangers
Casing hanger designs are available for the S and IC-2 Casing Spools. Each hanger has a specific application and is available for both bowl types.

Secondary Seals
A variety of secondary seals are available for the S and IC-2 Casing Spools, Casing Spools, Casing Head Housings, and MTBS Tubing Spools.

Casing Spools
The S and IC-2 Casing Spools have several options for top connections. One option features two lock screws, another features two lock screws with a 180° offset, and a final option features a double lock screw configuration depending on the flange size.

Bottom Connections
Bottom connections are available for the S and IC-2 Casing Head Housings.

Secondary Seals
A variety of secondary seals are available for the S and IC-2 Casing Spools as well as the C, CD-2 and MTBS Tubing Spools.

Casing Spool Designs
Tubing hanger designs are available for single, dual and metal-sealing completions.

Casing Spool Designs
Casing spool designs feature several options for top connections. One option features two lock screws, another features two lock screws with a 180° offset, and the final option features a double lock screw configuration depending on the flange size.

Secondary Seals
Secondary seals are available for the S and IC-2 Casing Spools, Casing Spools, Casing Head Housings, and MTBS Tubing Spools.

Casing Spool Designs
The S and IC-2 Casing Spools have several options for top connections. One option features two lock screws, another features two lock screws with a 180° offset, and the final option features a double lock screw configuration depending on the flange size.

Bottom Connections
Bottom connections are available for the S and IC-2 Casing Head Housings.
The S Casing Head Housing seals off the surface casing and provides a landing bowl for the next casing string as well as an attachment for the BOP stack. The S Casing Spool seals off the surface casing string and its landing bowl provides support for the next casing string.

- **Bowl Design**
  Dual 45° shoulder design provides capability to hang heavy casing strings without damage. The upper shoulder supports pack-off hydraulic pressure and test loads while the lower shoulder provides independent support for the casing load.

- **Casing Hanger Compatibility**
  Compatible with the SB-3, SB-5 and SB-6 Casing Hanger series. See pages 6 and 7 for more information.

- **Lock Screw Configurations**
  S Housings and Spools are available with or without Type N Lock Screws in the top flange as follows:
  - S Housing and Spool - no lock screws.
  - S-11 Housing and Spool - two lock screws 180° apart for retention of the wear bushing during drilling.
  - S-3 Housing and Spool - a full compliment of lock screws used for retention of the casing hanger (exact number dependent on flange size). See page 21 for more information on Type N Lock Screws.

- **Side Outlets**
  Available with line pipe threaded and studded outlets. Studded outlets are threaded for valve removal plugs.

- **Housing Bottom Connections**
  S Housings are available with casing box threads, slip on weld (with and without O-ring), SlipLock and CAMFORGE bottom connections. See page 19 for more information.

- **Secondary Seals**
  S Spools are available with Single and Double P, Single and Double T, NX Bushing and CANH secondary seals. Spools supplied with CANH secondary seals are not intended for use over spools other than Cameron S type. See page 20 for more information.

- **Test and Injection Ports**
  All test ports are metal sealing and are designed to allow venting. Injection ports include buried check valves. See page 21 for more information.

- **Landing Base**
  Type CR landing bases can be provided to transfer loads to the conductor. These landing bases do not require welding to the casing head housing.
### Casing Head Housing Dimensions

<table>
<thead>
<tr>
<th>Nominal Size</th>
<th>WP</th>
<th>Casing Size</th>
<th>Threads</th>
<th>Studded</th>
<th>Dimensions (in.)</th>
<th>Dimensions (mm)</th>
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<td>Outlets</td>
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<td></td>
<td></td>
</tr>
<tr>
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<td>(in.) (in.)</td>
<td>Size (in.)</td>
<td>Size (in.)</td>
<td>Size (in.)</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>9</td>
<td>2000 8-5/8</td>
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<td>2-1/16</td>
<td>2000</td>
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<td>10.25</td>
</tr>
<tr>
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<td>5000 10-3/4</td>
<td>2</td>
<td>2-1/16</td>
<td>5000</td>
<td>19.25</td>
<td>10.62</td>
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### Casing Head Spool Dimensions

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<th>WP</th>
<th>Nominal Size</th>
<th>Threads</th>
<th>Studded</th>
<th>Dimensions (in.)</th>
<th>Dimensions (mm)</th>
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<td>Top Flange</td>
<td>Bottom Flange</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(in.) (psi)</td>
<td>(in.) (psi)</td>
<td>Size (in.)</td>
<td>Size (in.)</td>
<td>Size (in.)</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
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<td>3000 11-3/4</td>
<td>2</td>
<td>2-1/16</td>
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<td>11.21</td>
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<td>5000 13-5/8</td>
<td>2</td>
<td>2-1/16</td>
<td>5000</td>
<td>20.75</td>
<td>11.48</td>
</tr>
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<td>16-3/4</td>
<td>9000 16</td>
<td>2</td>
<td>2-1/16</td>
<td>2000</td>
<td>17.50</td>
<td>11.21</td>
</tr>
</tbody>
</table>

### Dimensional Data:
- **A** = Maximum height
- **B** = Height from centerline of outlet to top of flange
- **C** = Maximum through bore

Note: All dimensions are estimates and finished dimensions may vary.

Note: C dimensions for spools may be smaller in order to match casing ID.
Casing Hangers for S Casing Head Housings and Spools

Cameron S Casing Head Spools and Housings accept all three hangers in the SB hanger family. SB hangers can be lowered through the BOP as soon as the cement plug hits bottom. Once in place, they support the entire casing weight and seal the annulus. Mandrel style casing hangers can also be supplied.

The unique slip design of the SB family of hangers achieves controlled friction when precision-machined slips with sharp inner teeth securely bite casing, while dull outer teeth on the backside contact the slip bowl. Because these hangers are installed in the double 45° shoulder housing design, the mechanical load is completely separated from the hydraulic load. This allows the assembly to hold full test pressure while varying the slip load from zero to full joint strength without changing deflection of casing in the pressured zone.

- **SB-3 Casing Hanger**
  
The SB-3 Casing Hanger is a wrap-around slip and seal assembly designed for 5000 psi WP service. It is rated for a hang-off capacity of 80% of pipe body yield. Like the other slips in the SB family, it requires a load of only 15,000 lb to set the seal. In addition, the seal can be re-energized by tightening the cap screws. The seal can be replaced with the full rated load on the hanger.

- **SB-5 Casing Hanger**
  
The SB-5 Casing Hanger is a wrap-around slip and seal assembly designed for 10,000 and 15,000 psi WP service. It is rated for a hang-off capacity of 80% of pipe body yield. Like the other slips in the SB family, it requires a load of only 15,000 lb to set the seal. In addition, the seal can be re-energized by tightening the cap screws. The seal can be replaced with the full rated load on the hanger.

- **SB-6 Casing Hanger**
  
The SB-6 Casing Hanger is a wrap-around slip and seal assembly designed for 5000 psi WP service. It is rated for a hang-off capacity of 70% of pipe body yield. Like the other slips in the SB family, it requires a load of only 15,000 lb to set the seal. In addition, the seal can be re-energized by tightening the cap screws. The seal can be replaced with the full rated load on the hanger.
# Casing Hangers for S Casing Head Housings and Spools

## SB Casing Hanger Comparison

<table>
<thead>
<tr>
<th>Model</th>
<th>Spool Compatibility</th>
<th>Hanger Type</th>
<th>Operating Temperature</th>
<th>Working Pressure (psi)</th>
<th>Rated Load Capacity</th>
<th>Method to Set Seal</th>
<th>Seal Replaceable with Load on Hanger</th>
</tr>
</thead>
<tbody>
<tr>
<td>SB-3</td>
<td>S, S-11, S-3</td>
<td>Wrap-Around Slip and Seal Assembly</td>
<td>-20° to 250°F -29° to 121°C</td>
<td>5000</td>
<td>80% minimum pipe body yield</td>
<td>Casing Weight or Manual</td>
<td>Yes</td>
</tr>
<tr>
<td>SB-5</td>
<td>S</td>
<td>Wrap-Around Slip and Seal Assembly</td>
<td>-20° to 250°F -29° to 121°C</td>
<td>10,000/15,000</td>
<td>80% minimum pipe body yield</td>
<td>Casing Weight or Manual</td>
<td>Yes</td>
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<tr>
<td>SB-6</td>
<td>S, S-11, S-3</td>
<td>Wrap-Around Slip and Seal Assembly</td>
<td>-20° to 180°F -29° to 82°C</td>
<td>5000</td>
<td>70% minimum pipe body yield</td>
<td>Casing Weight or Manual</td>
<td>Yes</td>
</tr>
</tbody>
</table>
The IC-2 Casing Head Housing seals off the surface casing and provides a landing bowl for the next casing string as well as an attachment for the BOP stack. The IC-2 Casing Spool seals off the surface casing string and its landing bowl provides support for the next casing string.

- **Bowl Design**
  A straight bore with a single 45° shoulder design provides support for the casing load and reduces the risk of bowl damage due to drill stem rotation. This design minimizes hoop load on the housing while maintaining high hanging capacity.

- **Casing Hanger Compatibility**
  Accommodates a wide variety of slip-type and mandrel hangers including the IC-1, IC-1-P and IC-2. See pages 10 and 11 for more information.

- **Lock Screw Configurations**
  IC-2 Housings and Spools are available with or without Type N Lock Screws in the top flange as follows:
  - IC-2 Housing and Spool - no lock screws.
  - IC-2-BF Housing and Spool - two lock screws 180° apart for retention of the wear bushing during drilling.
  - IC-2-L Housing and Spool - a full complement of lock screws used for retention of the casing hanger (exact number dependent on flange size).
  See page 21 for more information on Type N Lock Screws.

- **Side Outlets**
  Available with line pipe threaded and studded outlets. Studded outlets are threaded for valve removal plugs.

- **Housing Bottom Connections**
  IC-2 Housings are available with casing box threads, slip on weld (with and without O-ring), SlipLock and CAMFORGE bottom connections. See page 19 for more information.

- **Secondary Seals**
  IC-2 Spools are available with Single and Double P, Single and Double T, and NX Bushing secondary seals. See page 20 for more information.

- **Test and Injection Ports**
  All test ports are metal sealing and are designed to allow venting. Injection ports include buried check valves. See page 21 for more information.

- **Landing Base**
  Type CR landing bases can be provided to transfer loads to the conductor. These landing bases do not require welding to the casing head housing.
IC-2 Casing Head Housings and Spools

**Dimensional Data:**
- **A** = Maximum height
- **B** = Height from centerline of outlet to top of flange
- **C** = Maximum through bore

Note: All dimensions are estimates and finished dimensions may vary.
Note: C dimensions for spools may be smaller in order to match casing ID.

### IC-2 Casing Head Housing Dimensions

<table>
<thead>
<tr>
<th>Top Flange</th>
<th>Nominal Size</th>
<th>WP</th>
<th>Casing Size</th>
<th>Outlets</th>
<th>Dimensions (in.)</th>
<th>Dimensions (mm)</th>
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<td>(in.)</td>
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<td>(in.)</td>
<td>Size (in.)</td>
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<td>B</td>
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<th>Nominal Size</th>
<th>WP</th>
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<td>Size (in.)</td>
<td>WP (psi)</td>
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<td>10,000</td>
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<td>5000</td>
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<td>13-5/8</td>
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<td>2</td>
<td>2-1/16</td>
<td>5000</td>
<td>25.25</td>
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</table>
Cameron IC-2 Casing Head Spools and Housings accept all three hangers in the IC hanger family. IC hangers offer a selection of manually energized seals or weight set seals, depending upon application requirements. They also offer a choice of one-piece and two-piece design so that use of IC-2 equipment for different applications can be varied by slip selection alone. IC Hangers land on the single 45° shoulder in IC-2 bowls. Mandrel style casing hangers can also be supplied.

- **IC-1 Casing Hanger**
  The IC-1 Casing Hanger is an independent slip and seal assembly. The slip assembly is latched around the casing and lowered into the casing head. The seal assembly is installed over the casing after it is cut-off. Pressure applied to the top of the seal assembly is transferred to the casing head, not the slips. This hanger can only be used in the IC-2 bowl profile (i.e. cannot be used with spools provided with lock screws).

- **IC-1-P Casing Hanger**
  The IC-1-P Casing Hanger is a one-piece, non-automatic, wrap-around hanger which is ideal for use where casing weight is insufficient to energize the hanger seal. The seal is energized using cap screws and can be replaced with rated load on the hanger. This hanger can only be used in the IC-2 bowl profile (i.e. cannot be used with spools provided with lock screws).

- **IC-2 Casing Hanger**
  The IC-2 Casing Hanger is a wrap-around hanger with an annulus seal which is energized by casing weight. The weight to energize the seal varies with the casing and slip size. The hanger uses a heavy duty latch and hinge design which creates a reliable, strong and stable hanger structure after closing. The hinge mechanism enables the hanger halves to pivot out of the way during “wrap-around.” Tapered “rough backs” allow a quick, secure bite of the casing, restrict continued downward movement, and prevent collapse of the casing. A guide ring maintains slip alignment during installation and operation.
## Casing Hangers for IC-2 Casing Head Housings and Spools

### IC Casing Hanger Comparison

<table>
<thead>
<tr>
<th>Model</th>
<th>Spool Compatibility</th>
<th>Hanger Type</th>
<th>Operating Temperature</th>
<th>Working Pressure (psi)</th>
<th>Rated Load Capacity</th>
<th>Method to Set Seal</th>
<th>Seal Replaceable with Load on Hanger</th>
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<td>IC-1</td>
<td>IC-2</td>
<td>Independent Slip and Seal Assembly</td>
<td>-20°F to 158°F</td>
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<td>50% minimum pipe body yield</td>
<td>O-rings</td>
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<td>IC-1-P</td>
<td>IC-2</td>
<td>Wrap-around Slip and Seal Assembly</td>
<td>-29°F to 65°C</td>
<td>10,000</td>
<td>50% minimum pipe body yield</td>
<td>Cap Screws</td>
<td>Yes</td>
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<tr>
<td>IC-2</td>
<td>IC-2, IC-2-BP, IC-2-L</td>
<td>Wrap-around Slip and Seal Assembly</td>
<td>-20°F to 158°F</td>
<td>10,000</td>
<td>50% minimum pipe body yield</td>
<td>Casing Weight</td>
<td>No</td>
</tr>
</tbody>
</table>

IC-2 Casing Hanger

IC-2 Casing Head Spool
Cameron offers a wide variety of tubing spools and hangers for all types of completions: single, dual, high pressure, and severe service.

The standard Cameron C bowl design is utilized in both the C and CD-2 Tubing Spool designs. Use of this profile as standard allows Cameron to offer the widest possible array of tubing hanger choices while minimizing tubing spool requirements. Of the tubing hangers offered all but one, the MTBS (designed for critical service applications), fit the C profile.

Like our wellhead components, all Cameron completion components meet or exceed API 6A specifications. Included in these products is a complete line of completion equipment and Christmas trees to suit all tubing programs for working pressures up to 30,000 psi. Equipment for surface applications range from low pressure, conventional equipment to systems for severe service and geothermal applications. For completion equipment not covered in this brochure, contact your Cameron representative.

### Selecting a Completion System

The first step in determining which Cameron completion system is best for your application is to determine the tubing hanger style to be used. Each hanger profile is unique and is generally compatible with only a limited number of casing head/spool bowls.

### Major Considerations for Tubing Hanger Selection

- **Completion Type**
  - Single: HT, HT-2, T, T-CL, C-SRL-CL, CXS, MTBS
  - Dual: CD-2, CD-T, CD-T-CL
- **Tubing Hanger Type**
  - Coupling Assembly: HT, HT-2
  - Mandrel: T, T-CL, C-SRL-CL, CXS, MTBS
  - Split Dual Split Mandrel: CD-2, CD-T, CD-T-CL
- **Working Pressure**
  - 5000 psi: CXS, CD-2
  - 10,000 psi: HT, HT-2
  - 15,000 psi: T, T-CL, C-SRL-CL, CD-T, CD-T-CL
  - 20,000 psi: MTBS
- **Annulus Seal Type**
  - Metal: MTBS
- **Neck Seal Type**
  - Elastomer: HT, HT-2, CXS, CD-2
- **Control Line Capability**
  - No: HT, HT-2, T, CD-T
  - Standard, continuous: T-CL, C-SRL-CL, MTBS, CD-T-CL
  - Optional, non continuous: CXS, CD-2

### Tubing Spool, Tubing Hanger Compatibility Chart

<table>
<thead>
<tr>
<th>Tubing Hangers</th>
<th>Tubing Spools</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>C</td>
</tr>
<tr>
<td>HT Tubing Hanger</td>
<td>•</td>
</tr>
<tr>
<td>HT-2 Tubing Hanger</td>
<td>•</td>
</tr>
<tr>
<td>T Tubing Hanger</td>
<td>•</td>
</tr>
<tr>
<td>T-CL Tubing Hanger</td>
<td>•</td>
</tr>
<tr>
<td>C-SRL-CL Tubing Hanger</td>
<td>•</td>
</tr>
<tr>
<td>CXS Tubing Hanger</td>
<td>•</td>
</tr>
<tr>
<td>MTBS Tubing Hanger</td>
<td>•</td>
</tr>
</tbody>
</table>

Cameron Tubing Spools and Hangers
C Tubing Spool

The C Tubing Spool is Cameron’s standard spool for single completions in 7-1/16” and 9” nominal top flange sizes. For 11” and 13-5/8” nominal tubing spools, the IC-2-L Spool is utilized. Features include:

- **Bowl Design**
  A straight bore with a single 45° shoulder design provides support for the tubing load and reduces the risk of bowl damage due to drill stem rotation. This design minimizes hoop load on the spool while maintaining high hanging capacity.

- **Tubing Hanger Compatibility**
  Accommodates a wide variety of tubing hangers for single completions including HT, HT-2, C-SRL-CL, T, T-CL, and CXS designs. See pages 14 and 15 for more information.

- **Type N Lock Screws**
  Reliable Type N Lock Screws feature packing installed in front of the threads. This prevents contamination of threads by wellbore fluids and helps eliminate build-up of solids behind the screw. See page 21 for more information on Type N Lock Screws.

- **Side Outlets**
  Available with line pipe threaded and studded outlets. Studded outlets are threaded for valve removal plugs.

- **Secondary Seals**
  C Tubing Spools are available with Single and Double P, Single and Double T, and NX Bushing and CANH secondary seals. See page 20 for more information.

- **Test and Injection Ports**
  All test ports are metal sealing and are designed to allow venting. Injection ports include buried check valves. See page 21 for more information.

### C Tubing Spool Dimensions

<table>
<thead>
<tr>
<th>Bottom Flange</th>
<th>Nominal Size (in.)</th>
<th>WP (psi)</th>
<th>Top Flange</th>
<th>Nominal Size (in.)</th>
<th>WP (psi)</th>
<th>Outlets</th>
<th>Threaded</th>
<th>Studded</th>
<th>Dimensions (in.)</th>
<th>Dimensions (mm)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Size (in.)</td>
<td>Size (in.)</td>
<td>WP (psi)</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>11</td>
<td>2000</td>
<td>7”-1/6”</td>
<td>3000</td>
<td>2 2-1/16”</td>
<td>3000</td>
<td>20.00</td>
<td>10.00</td>
<td>6.81</td>
<td>530.23</td>
<td>261.62</td>
</tr>
<tr>
<td>11</td>
<td>3000</td>
<td>7”-1/6”</td>
<td>5000</td>
<td>2 2-1/16”</td>
<td>5000</td>
<td>22.00</td>
<td>11.44</td>
<td>6.81</td>
<td>588.80</td>
<td>305.58</td>
</tr>
<tr>
<td>11</td>
<td>3000</td>
<td>7”-1/6”</td>
<td>5000</td>
<td>2 2-1/16”</td>
<td>5000</td>
<td>22.56</td>
<td>12.10</td>
<td>8.22</td>
<td>573.00</td>
<td>290.74</td>
</tr>
<tr>
<td>11</td>
<td>3000</td>
<td>9”</td>
<td>5000</td>
<td>2 2-1/16”</td>
<td>5000</td>
<td>25.00</td>
<td>11.44</td>
<td>8.22</td>
<td>635.00</td>
<td>338.87</td>
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<td>7”-1/6”</td>
<td>10,000</td>
<td>2 2-1/16”</td>
<td>10,000</td>
<td>25.00</td>
<td>11.05</td>
<td>8.77</td>
<td>635.00</td>
<td>338.87</td>
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<td>5000</td>
<td>9”</td>
<td>5000</td>
<td>2 2-1/16”</td>
<td>5000</td>
<td>22.56</td>
<td>11.13</td>
<td>8.22</td>
<td>573.00</td>
<td>282.70</td>
</tr>
<tr>
<td>11</td>
<td>10,000</td>
<td>7”-1/6”</td>
<td>10,000</td>
<td>2 2-1/16”</td>
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<td>25.50</td>
<td>11.50</td>
<td>8.77</td>
<td>647.70</td>
<td>323.10</td>
</tr>
</tbody>
</table>

**Dimensional Data:**

- **A** = Maximum height
- **B** = Height from centerline of outlet to top of flange
- **C** = Maximum through bore

Note: All dimensions are estimates and finished dimensions may vary.

Note: Spool through bore may be smaller to match casing ID.
**HT and HT-2 Tubing Hanger Assemblies**

The HT and HT-2 Tubing Hanger Assemblies are all single completion hanger assemblies for use in either the C Tubing Spool or the CD-2 Tubing Spool. Both designs are made up of a coupling, adapter and Type C wrap-around style casing hanger. The HT-2 also includes a suspension nut which allows installation without rotating the Christmas tree. The HT-2 is preferred for stainless steel hanger and adapter applications due to decreased risk of galling. Both assemblies are rated up to 10,000 psi WP and are simple and quick to install without special running tools.

- **HT and HT-2 Couplings**
  Both designs include coarse ACME threads which make up easily with minimum risk of damage. Self-energizing seals isolate threads from well fluids, allowing testing of flange ring gasket.

- **HT and HT-2 Adapters**
  Both adapter top and bottom connections are normally configured with a flanged bottom and studded top. The designs provide a test port for verification of adapter flange connection and coupling seal integrity.

- **HT-2 Suspension Nut**
  The HT-2 Suspension nut is made of a high-strength, low-alloy, gall resistant material. A coupling seal isolates the nut from flow pressure, preventing corrosion.

- **C Tubing Hanger**
  The C Tubing Hanger is a wrap-around slip and seal assembly. The annulus seal is energized by tubing weight or tiedown screws and controls pressure in the casing annulus during installation of the Christmas tree.

**Comparison of Tubing Hangers for Single Completions**

<table>
<thead>
<tr>
<th>Model</th>
<th>Spool Compatibility</th>
<th>Hanger Type</th>
<th>Working Pressure</th>
<th>Method to Set Seal</th>
<th>Annulus Seal</th>
<th>Neck Seal</th>
<th>Control Line</th>
<th>BPV Preparation</th>
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</thead>
<tbody>
<tr>
<td>HT</td>
<td>C and CD-2</td>
<td>Coupling Assembly with Type C Wrap-Around Hanger</td>
<td>10,000</td>
<td>Radial Interference</td>
<td>Elastomer</td>
<td>Elastomer</td>
<td>Not Available</td>
<td>Standard</td>
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<tr>
<td>HT-2</td>
<td>C and CD-2</td>
<td>Rotatable Coupling Assembly with Type C Wrap-Around Hanger</td>
<td>10,000</td>
<td>Radial Interference</td>
<td>Elastomer</td>
<td>Elastomer</td>
<td>Not Available</td>
<td>Standard</td>
</tr>
<tr>
<td>T</td>
<td>C and CD-2</td>
<td>Mandrel</td>
<td>15,000</td>
<td>Lock Screws</td>
<td>Elastomer</td>
<td>Metal</td>
<td>Not Available</td>
<td>Standard</td>
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<tr>
<td>T-CL</td>
<td>C and CD-2</td>
<td>Mandrel</td>
<td>15,000</td>
<td>Lock Screws</td>
<td>Elastomer</td>
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<td>Standard</td>
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<td>CSRL-CL</td>
<td>C and CD-2</td>
<td>Mandrel</td>
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<td>CSX</td>
<td>C and CD-2</td>
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<td>Elastomer</td>
<td>Optional</td>
<td>Standard</td>
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<tr>
<td>MTBS</td>
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<td>Mandrel</td>
<td>20,000</td>
<td>Lock Screws</td>
<td>Metal</td>
<td>Metal</td>
<td>Continuous</td>
<td>Standard</td>
</tr>
</tbody>
</table>
Tubing Hangers for Single Completions

T, T-CL, C-SRL-CL and CXS Tubing Hangers

The T, T-CL, C-SRL-CL and CXS Tubing Hangers are all single completion, mandrel-type hangers for use in either the C Tubing Spool or the CD-2 Tubing Spool.

- **T Tubing Hanger**
  The T Tubing Hanger withstands stress of high pressure, corrosive/erosive elements associated with well flow. Its flexible neck maintains the metal seal despite thermal or pressure cycling.

- **T-CL Tubing Hanger**
  The T-CL Tubing Hanger withstands stress of high pressure, corrosive/erosive elements associated with well flow. A control line exit block is available in either a bull plug style or block needle valve style.

- **C-SRL-CL Tubing Hanger**
  The C-SRL-CL Tubing Hanger incorporates a pressure energized SRL neck seal which accommodates vertical movement in the tubing hanger during BOP testing. A control line exit block is available in either a bull plug style or block needle valve style. The C-SRL-CL hanger should be used in 7-1/16” 10,000 psi Type C Tubing Spools.

- **CXS Tubing Hanger**
  The CXS Tubing Hanger includes two neck seals which may be used to isolate one control line.
The CD-2 Tubing Spool features the same bowl as the C Tubing Spool but incorporates alignment pins for dual completions. The CD-2 can also be used for single completions by retracting the alignment pins. Features include:

- **Bowl Design**
  A straight bore with a single 45° shoulder design provides support for the tubing load and reduces the risk of bowl damage due to drill stem rotation. This design minimizes hoop load on the spool while maintaining high hanging capacity.

- **Tubing Hanger Compatibility**

- **Type N Lock Screws**
  Reliable Type N Lock Screws feature packing installed in front of the threads. This prevents contamination of threads by wellbore fluids and helps eliminate build-up of solids behind the screw. See page 21 for more information.

- **Alignment Pins**
  Alignment pins for dual completions are located below the load shoulder to avoid test plug interference and provide alignment without reducing load shoulder capacity.

- **Side Outlets**
  Available with line pipe threaded and studded outlets. Studded outlets are threaded for valve removal plugs.

- **Secondary Seals**
  CD-2 Tubing Spools are available with Single and Double P, Single and Double T, and NX Bushing secondary seals. See page 19 for more information.

- **Test and Injection Ports**
  All test ports are metal sealing and are designed to allow venting. Injection ports include buried check valves. See page 21 for more information.

### CD-2 Tubing Spool Dimensions

<table>
<thead>
<tr>
<th>Nominal Size (in.)</th>
<th>WP (psi)</th>
<th>Nominal Size (in.)</th>
<th>WP (psi)</th>
<th>Threaded Size (in.)</th>
<th>Studded Size (in.)</th>
<th>WP (psi)</th>
<th>A (in.)</th>
<th>B (in.)</th>
<th>C (in.)</th>
<th>Dimensions (in.)</th>
<th>Dimensions (mm)</th>
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<td>2000</td>
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<td>2-1/16</td>
<td>3000</td>
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<td>5000</td>
<td>2</td>
<td>2-1/16</td>
<td>5000</td>
<td>22.56</td>
<td>12.10</td>
<td>8.22</td>
<td>573.09</td>
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<td>2-1/16</td>
<td>5000</td>
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<td>6.81</td>
<td>635.00</td>
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<td>7-1/16</td>
<td>10,000</td>
<td>2</td>
<td>2-1/16</td>
<td>10,000</td>
<td>25.50</td>
<td>11.50</td>
<td>6.77</td>
<td>647.70</td>
<td>322.10</td>
</tr>
</tbody>
</table>

**Note:** All dimensions are estimates and finished dimensions may vary. Spool through bore may be smaller to match casing ID.

**Dimensional Data:**
- A = Maximum height
- B = Height from centerline of outlet to top of flange
- C = Maximum through bore

**Note:** Spool through bore may be smaller to match casing ID.

**CD-2 Tubing Spool Dimensions**

- **Bottom Flange**
- **Top Flange**
- **Outlets**
- **Dimensions (in.)**
- **Dimensions (mm)**
Cameron’s dual completion tubing hangers include three designs: the CD-2 Tubing Hanger, CD-T Tubing Hanger and CD-T-CL Tubing Hanger. These hangers are used with the CD-2 Tubing Spool.

These hangers are split dual mandrel style hangers which can be run and pulled independently. Alignment slots located below the load shoulder protect the alignment pins and allow maximum load capacity.

- **CD-2 Tubing Hanger**
  The CD-2 Tubing Hanger is a two-piece mandrel hanger which provides a reliable, economical elastomer seal for use with pressures up to 10,000 psi. It is available with one or two continuous control lines per string.

- **CD-T Tubing Hanger**
  The CD-T Tubing Hanger is a one-piece mandrel style hanger with a tapered metal-to-metal neck seal for superior sealing up to 15,000 psi.

- **CD-T-CL Tubing Hanger**
  The CD-T-CL Tubing Hanger is identical to the CD-T Tubing Hanger except that it includes standard control line exits for one or two continuous control lines per string.

### Comparison of Tubing Hangers for Dual Completions

<table>
<thead>
<tr>
<th>Model</th>
<th>Spool Compatibility</th>
<th>Hanger Type</th>
<th>Working Pressure</th>
<th>Method to Set Seal</th>
<th>Annulus Seal</th>
<th>Neck Seal</th>
<th>Control Line</th>
<th>BPV Preparation</th>
</tr>
</thead>
<tbody>
<tr>
<td>CD-2</td>
<td>CD-2</td>
<td>Split Dual Mandrel (two piece)</td>
<td>10,000</td>
<td>Lock Screws</td>
<td>Elastomer</td>
<td>Elastomer</td>
<td>Optional, Continuous</td>
<td>Standard</td>
</tr>
<tr>
<td>CD-T</td>
<td>CD-2</td>
<td>Split Dual Mandrel (one piece)</td>
<td>15,000</td>
<td>Lock Screws</td>
<td>Elastomer</td>
<td>Metal</td>
<td>Not Available</td>
<td>Standard</td>
</tr>
<tr>
<td>CD-T-CL</td>
<td>CD-2</td>
<td>Split Dual Mandrel (one piece)</td>
<td>15,000</td>
<td>Lock Screws</td>
<td>Elastomer</td>
<td>Metal</td>
<td>Standard</td>
<td>Continuous</td>
</tr>
</tbody>
</table>
MTBS Tubing Spool and MTBS Tubing Hanger

The MTBS Tubing Spool is a single completion, metal-to-metal sealing spool for critical service applications to 20,000 psi WP. Features include:

- **Metal-to-Metal Sealing**
  The MTBS Tubing Spool and MTBS Tubing Hanger provide complete metal-to-metal sealing. The annulus seal is radially squeezed into contact with parallel cylindrical sealing surfaces in the spool bore. The annulus and neck seals are simultaneously pressure-energized with flange makeup. The annulus seal is retrieved when the hanger is pulled from mating bowl preparation.

- **MTBS Tubing Hanger**
  The MTBS Tubing Hanger is made of high alloy materials to withstand corrosive and high temperature environments. The extended neck ensures positive alignment for the seal during installation. The hanger is reusable and the metal seals are replaceable.

- **Bowl Design**
  A straight bore bowl design provides a large through bore and allows a 7-1/16” flange to be used over a 7-5/8” casing string.

- **Type N Lock Screws**
  Reliable N Lock Screws feature packing installed in front of the threads. This prevents contamination of threads by wellbore fluids and helps eliminate build-up of solids behind the screw. See page 21 for more information on N Lock Screws.

- **Side Outlets**
  MTBS Spools are available with studded outlets threaded for valve removal plugs.

- **Secondary Seals**
  MTBS Tubing Spools are available with Single and Double P, Single and Double T, and NX Bushing and CANH secondary seals. See page 20 for more information.

- **Test and Injection Ports**
  All test ports are metal sealing and are designed to allow venting. Injection ports include buried check valves. See page 21 for more information.

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### MTBS Spool Dimensions

<table>
<thead>
<tr>
<th>Nominal Size (in)</th>
<th>WP (psi)</th>
<th>Nominal Size (in)</th>
<th>WP (psi)</th>
<th>Threaded Size (in)</th>
<th>Flanged Size (in)</th>
<th>Dimensions (in)</th>
<th>Dimensions (mm)</th>
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<td>2</td>
<td>2-1/16</td>
<td>10,000</td>
<td>28.88</td>
</tr>
</tbody>
</table>

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### Dimensional Data:

- **A** = Maximum height
- **B** = Height from centerline of outlet to top of flange
- **C** = Maximum through bore

Note: All dimensions are estimates and finished dimensions may vary. Note: Spool through bore may be smaller to match casing ID.
Auxiliary Equipment

Casing Head Housing Bottom Connection Options

- **SlipLock™ Casing Connection System**
  The SlipLock Casing Connection System is a simple slip mechanism which reduces installation time because welding is eliminated. Sealing is achieved with elastomeric P-Seals. The SlipLock system can be used for working pressures up to 10,000 psi and is reusable for exploration wells.

- **CAMFORGE™ Casing Connection System**
  The CAMFORGE Casing Connection System requires no welding and no premachining of casing. The casing is mechanically cut so that existing production does not have to be shut in. The connection is made using hydraulic pressure to expand the surface casing and housing. The system establishes a pressure-tight, metal sealing connection suitable for working pressures up to 10,000 psi. The CAMFORGE system minimizes rig time and duration of open hole time without BOP protection. Annulus hydro-testing simulates working conditions prior to BOP nipple up.

- **Slip-On Weld**
  Slip-on weld bottom connections are standard with O-rings for both S and IC-2 casing heads with 10-3/4" or smaller casing preparations. For larger casing sizes, the O-ring seal option is not available. If utilized, the O-ring seal requires only one external weld. Slip-on weld connections include a 1/2" line pipe test port to validate the integrity of both the weld and the O-ring seals.

- **Casing Box Thread**
  Casing threads are intended for use where threaded connections are specified for casing heads. In this case, the lower connection outside diameter is standardized where possible to allow use of raw material for either S or IC-2 style heads.
Auxiliary Equipment

Secondary Seals
Cameron offers a wide range of secondary seals for use in casing and tubing spools. These secondary seals are installed in the bottom of spools with corresponding preps.

- **Single and Double P Seals**
The Single and Double P Seals are ideal for use as crossovers where moderately severe service is expected. Each P Seal consists of a large elastomer seal with separate anti-extrusion rings. Both Single and Double P Seals are sized to accommodate the tolerance range of casing and may be used on machined hanger necks. Double P Seals can be tested with pressure applied between the seals.

- **Single and Double T Seals**
Single and Double T Seals are interference-fit, elastomeric seals for use with casing sizes 10-3/4” and smaller. They are ideal for use as crossovers where moderately severe service is expected. Both Single and Double T Seals are sized to accommodate the tolerance range of casing and may be used on machined hanger necks. Double T Seals can be tested with pressure applied between the seals.

- **NX Bushing**
NX Bushings accommodate variations in casing programs. The NX Bushing utilizes a P seal and is retained in the spool with a retainer wire. Either integral or separate bit guides can be provided.

- **CANH™ Seal**
The CANH Seal is a metal-to-metal crossover seal which has been designed for severe service and corrosive environments. This seal can be installed and tested on standard “rough” pipe with minimal cleanup. Field machining is not required in normal applications. Its simple, flange-energized design achieves a gas-tight seal. Sealing occurs at four nibs machined into the inner and outer seal rings. Note: The CANH Seal is not recommended for use with IC-2 slips. Spools equipped with CANH Seal bottoms require special CANH Seal support rings when making up to an IC-2 Spool.

### Secondary Seals Comparison Chart

<table>
<thead>
<tr>
<th>Model</th>
<th>Casing Spool Compatibility</th>
<th>Tubing Spool Compatibility</th>
<th>Maximum Service Rating</th>
<th>Working Pressure (psi)</th>
<th>Seal Type</th>
<th>Means of Energizing Seal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Double P Seal</td>
<td>S, S-11, S-3, IC-2, IC-2-BP, IC-2-L</td>
<td>C, CD-2, MTBS</td>
<td>Moderately Severe</td>
<td>15,000</td>
<td>Elastomeric</td>
<td>Plastic Packing</td>
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<tr>
<td>Double T Seal</td>
<td>S, S-11, S-3, IC-2, IC-2-BP, IC-2-L</td>
<td>C, CD-2, MTBS</td>
<td>Moderately Severe</td>
<td>10,000</td>
<td>Elastomeric</td>
<td>Radial Interference</td>
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<tr>
<td>CANH Seal</td>
<td>S, S-11, S-3</td>
<td>C, CD-2, MTBS</td>
<td>Severe/Corrosive</td>
<td>20,000</td>
<td>Metal</td>
<td>Flange Make-up</td>
</tr>
</tbody>
</table>

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**Single P Seal**

**Double P Seal**

**Single T Seal**

**Double T Seal**
Auxiliary Equipment

Lock Screws, Test Ports and Injection Ports

- **N Lock Screw**
  All Cameron spools and housings utilize N Lock Screws. This design features packing in front of the threads to help prevent contamination of the threads by wellbore fluids and eliminate build-up of solids behind screw which could prevent proper retraction. An external oil seal protects threads from atmospheric corrosion. N Lock Screws are field replaceable.

- **Test Ports**
  All test ports in Cameron conventional wellhead equipment are the API 6A Type II metal seal design for safety and reliability. These ports are applicable to all pressure ratings and can be safely vented.

- **Injection Ports**
  For casing and tubing spools which require injection of sealant in order to energize or re-energize the secondary seal, two styles of fittings are available. Each style has a buried ball check (without spring). For applications 10,000 psi WP and below, the port features a simple plug with a 1" NPT thread. For working pressures above 10,000 psi WP, plugs incorporate a two-piece plug with a pressure vent.