Multitrim Choke Valves
Modular solutions to suit changing conditions
Versatility to adapt to evolving operating conditions

Cameron multitrim choke valves for production and drilling applications introduce the ability to match the trim configuration to the individual field conditions on a continuous basis. This configurability saves crucial time and avoids the cost of replacing chokes when challenging well conditions occur.

Production applications
- CAM20-MT: 2-in nominal multitrim choke with an angled body
- CAM20-MT inline: 2-in nominal multitrim choke with an inline (axial) body
- CAM30-MT: 3-in nominal multitrim choke with an angled body

Drilling applications
- CAM30-DC: 3-in nominal multitrim drilling choke with an angled body
- CAM40-DC: 4-in nominal multitrim drilling choke with an angled body
- CAM70-DC: 7-in nominal multitrim drilling choke with an angled body
**Multiple Trims, One Choke Body**

Trim interchangeability delivers clear benefits for operational efficiency. Because one choke can cover all eventualities, Cameron multitrim choke valves help operators enhance maintenance and minimize ordering of spares. Multitrim chokes also significantly extend service life with enhanced controllability through their innovative trim design. For the operator, this results in more efficient well production and extended life of the equipment.

**Examples of trim changeout scenarios with evolving operating conditions.**

### Interchangeable solutions

<table>
<thead>
<tr>
<th>Choke Model</th>
<th>Trim Type</th>
<th>Maximum Orifice, in [mm]</th>
<th>Cₚ Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N₆S</td>
<td>1.25 [32]</td>
<td>44.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 [25]</td>
<td>28.5</td>
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<tr>
<td></td>
<td></td>
<td>0.75 [19]</td>
<td>16</td>
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<td></td>
<td></td>
<td>0.50 [13]</td>
<td>7.1</td>
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<tr>
<td></td>
<td>Positive bean</td>
<td>0.0625–1.25 [2–32]</td>
<td>0.1–44.5</td>
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<td>CAM30-MT and CAM30-DC</td>
<td>External FS</td>
<td>1.625 [41]</td>
<td>59.9</td>
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<td></td>
<td>Gate and seat (G&amp;S)</td>
<td>1.75 [44]</td>
<td>62.5</td>
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<td></td>
<td></td>
<td>1.50 [38]</td>
<td>50.5</td>
</tr>
<tr>
<td></td>
<td>N₆S</td>
<td>2 [51]</td>
<td>86</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.50 [38]</td>
<td>50.5</td>
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<tr>
<td></td>
<td></td>
<td>1 [25]</td>
<td>28.5</td>
</tr>
<tr>
<td></td>
<td>Positive bean</td>
<td>0.0625–2 [2–51]</td>
<td>2–86</td>
</tr>
<tr>
<td>CAM40-DC</td>
<td>External FS</td>
<td>3.10 [79]</td>
<td>168.1</td>
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<tr>
<td></td>
<td>G&amp;S</td>
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<td></td>
<td></td>
<td>2 [51]</td>
<td>86</td>
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<tr>
<td>CAM70-DC</td>
<td>External FS</td>
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<td></td>
<td>G&amp;S</td>
<td>6 [152]</td>
<td>735</td>
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<td></td>
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<td>5 [127]</td>
<td>510</td>
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<tr>
<td></td>
<td></td>
<td>4 [102]</td>
<td>327</td>
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</table>
Multitrim drilling choke valves are a creative solution for a broad spectrum of drilling and well testing related applications, including well control, choke and kill, MPD, flowback, and well testing manifold systems.

They include the long-established G&S-type drilling trims and offer the versatility to switch between this and a variety of other trim styles—all within a single choke. The G&S trim can be easily replaced with the external FS trim for greater controllability and erosion resistance. These chokes also offer multiple actuation options, from manual handwheel to hydraulic and variable speed electric actuation types.

Interchangeability is the cornerstone of these products. For instance, a common choke body across the entire CAM30 series of chokes ensures direct interchangeability of trims and the utmost level of versatility. For enhanced operational flexibility, the multitrim drilling chokes offer a range of orifice sizes for each trim style to complement the operational conditions associated with each individual job.

Optimize MPD and dual-gradient operations
The key to unlocking the full benefit of advanced drilling techniques like MPD and dual-gradient drilling is rapidly and accurately responding to fluctuating well parameters on a continuous basis. Because MPD uses lighter-weight drilling mud compared with conventional applications, the drilling choke must enable greater controllability to maintain a stable wellbore pressure in the event of gas kicks or changing pressure conditions.

In response to this challenge, the external FS drilling trim provides the high-level control resolution needed for MPD, combined with the durability and erosion resistance to maintain this stability over the prolonged operating cycles involved. This is crucial to maintaining swift progress in drilling the well while avoiding shut-in caused by unsatisfactory wellbore pressure control. The external FS trim is engineered to handle debris and avoid the risk of blockage, while the option remains to deploy the field proven gate-and-seat trim for more challenging situations.

Easily convert between electrical and manual operation
Accurate pressure and flow rate control relies not only on the trim design but also on the capabilities of the actuator and control system. Consequently, variable speed electric actuation is provided as the leading option, especially for MPD applications, giving rapid adjustment to safely control sudden spikes or surges in pressure, with positional accuracy to achieve small incremental changes. Additionally, multitrim drilling chokes offer a modular top-end design for easy conversion between electric and manual operation without the need to disassemble the bonnet or affect the pressure integrity of the choke.

Since drilling manifold equipment may be deployed in a wide variety of locations from job to job, a further benefit of electric actuation is that its performance is not a function of the ambient temperature, whereas this is a strong consideration in the case of hydraulic actuation, where the behavior of the hydraulic fluid changes substantially with temperature.
Multitrim Drilling Choke Valve Specifications

Multiple trim options
- G&S trim
- N&S
- External FS
- Positive bean (fixed orifice)
- Plug and cage

Multiple actuation options
- Manual handwheel
- Variable speed electric actuation as standard
- Extensive list of electric actuation specifications and features available
- Wired or SCADA wireless remote control
- Control and position-feedback via 4–20 mA or multiple other protocols
- Modular top end design for easy conversion between manual and electric actuation.
- Further options of pneumatic or hydraulic actuation

Other specifications
- Up to API 10,000 psi [69 MPa] working pressure rating as standard
- API 15,000-psi [103-MPa] working pressure rating also available per individual requirements
- Standard flange and end connection options
- Common interface dimensions with H2\* N&S chokes
- Alternative end connections and dimensions also available
- API Specification 6A material classes EE, FF, and HH
- API 6A temperature classification over standard P–U range (extended temperature ratings also available)
- Complete API 6A Annex F PR2 and API 16C qualification

Spares and maintenance
- Spares: trim kits, seal kits, and replaceable needle tips
- Manual: actuation conversion kits
- N&S: external FS cage trim conversion kits
- Conversion from positive to adjustable and vice versa
Multitrim Production Choke Valves

When specifying chokes for production-based applications, a fundamental challenge is accurately defining the flowing conditions and identifying potential complexities for the intended service. This information is vital in selecting the most appropriate choke type, trim style, and flow capacity for the choke such that it correctly aligns with the actual field conditions.

Adapt the choke to the operating environment
Although fully predicting the range of operating conditions is impossible, managing these unknowns and mitigating the potential risk requires versatility. Multitrim chokes provide a complete array of trim styles, orifice sizes, and flow characteristics, all interchangeable within a single choke. This capability to quickly and easily reconfigure the choke to any trim type offers a solution to the many unknowns at the start-up of a well.

This successfully mitigates the risk of incorrectly specified equipment and the loss of production that may arise from that. Because no two wells are the same, this also offers an innovative way to adapt the equipment as well conditions evolve to preserve operational efficiency throughout the well’s producing life.

Improved erosion resistance
With multiple trim options to suit changing conditions, multitrim choke valves are suitable for a range of oilfield applications, including production, flowback, injection, gas lift, well cleanup, and severe service operations. Because chokes are frequently at risk from erosion and wear because of sand and particulates in the flow, the external FS trim is the most advanced trim for handling these challenging conditions. The trim is proved to deliver long-lasting performance in the most challenging conditions, with a vast improvement over conventional N&S trims. Using the FS trim in erosive service mitigates choke failure and washout, which may jeopardize production and endanger personnel and environmental safety.

Maximized uptime through automation and maintenance
With a modular bonnet design, multitrim chokes use a common set of top end and trim components for manual and electric actuated configurations. This facilitates standardization and enables actuators to be easily retrofitted over time if automation is required. Interchangeable trims and component commonality helps simplify maintenance and spares ordering. Further enhancements include a replaceable needle tip (for N&S trims) to significantly shorten trim replacement time.
Multitrim Production Choke Valve Specifications

Multiple trim options
- N&S
- External FS
- Positive bean (fixed orifice)
- Plug and cage
- Easy conversion from N&S to cage-style trims (FS or plug and cage) and vice versa
- N&S trim: removable needle tip, entire stem replacement not necessary
- External FS trim: cage and external-sleeve components easily replaced

Multiple actuation options
- Manual handwheel
- Electric actuation (extensive range of available features and specifications)
- Wired or SCADA wireless remote control
- Control and position feedback via 4–20 mA signal or a variety of digital protocols

Other specifications
- Up to 10,000-psi [68.9-MPa] working pressure rating as standard
- API 15,000-psi [103-MPa] working pressure rating also available
- Standard flange and end connection options
- Common interface dimensions with Cameron H2 N&S chokes
- Alternative end connections and dimensions options
- API Specification 6A material classes EE, FF, and HH
- API 6A temperature classification over full P–U range
- Complete API 6A Annex F PR2 and API 16C qualification

Spares and maintenance
- Spares: trim kits, seal kits, and replaceable needle tips
- Mode of operation: conversion kit from manual to actuated, and vice versa
- Trim selection: conversion kit from N&S to external FS trim and vice versa
- Choke configuration: conversion kit from positive to adjustable and vice versa

Actuated CAM30-MT with FS trim.
Choke Selection

Cameron multitrim chokes provide the options and versatility needed to support operational excellence through effective choke management. These methods can be divided into two categories:

Proven methods
- Choke types — selection of positive or adjustable chokes, with positive bean, NBS, or cage-type trims.
- Conversion kits — versatility to convert from positive to adjustable or change trim type to a more suitable alternative.
- Choke sizing — matching the choke capacity and flow characteristic to the anticipated flowing conditions, thus achieving accurate controllability combined with satisfactory flow capacity for the job.
- Choke performance — recognition of choke solutions and configurations with proven performance for a diversity of choke applications, including production, injection, hydraulic fracturing, and flowback.
- Maintenance and spares — fast and efficient choke refurbishment to replace trim components following wear or erosion in severe operating conditions. This is crucial for operational efficiency and to avoid equipment failure.

Progressive methods
- Controllability — advanced multiport cage designs afford a superior level of controllability for closely managed well startup and efficient commencement of production. At this most critical phase of asset life, the choke management strategy plays a considerable role in avoiding initial damage to the well. Such damage can limit the achievable production rate and compromise the ultimate recovery possible from the well.
- Trim versatility — with a dedicated range of directly interchangeable trim styles, capacities, and configurations to overcome any challenge, trim kit replacement options are now a key part of choke management.
- Erosion performance — external FS trim offers a new level of erosion resistance for the trim and overall protection for the body and overall choke assembly.
- Maximum capacity — large-capacity trims can achieve consistently high flow rates even when the well pressure has substantially depleted. For instance, this may facilitate production control during the decline or artificial lift phase.
- Automation — modularity of the bonnet design enables quick and easy conversion between manual and actuated configurations, thus providing greater efficiency, safety, and responsiveness. This is a major benefit where field automation is cited as a priority either now or in the future.
- Application versatility — driven by trim interchangeability, this provides unprecedented versatility in utilizing the choke for drilling, well testing, hydraulic fracturing, flowback, injection, and production applications, which greatly extends choke value and applicability.

Choke Applications

In general, a choke is a sudden, defined restriction in the system with the role of managing the pressure reduction from wellhead (high pressure) to the flowline (reduced pressure) or a similar arrangement. The choke must also control the flow rate by adjusting the flow area while enduring the challenges associated with sour and erosive service.

A key function of the choke is to closely control well startup and early life production, which is key to safeguarding the formation permeability or preserving shale fractures from potential damage due to rapid depressurization of the well. The choke must also provide sufficiently large flow capacity for mid- to late-life production as well pressure depletes. In conjunction with this, the choke must successfully contend with a range of challenges depending on the particular application:
- erosion during hydraulic fracturing
- solids impact during plug drillout
- solids impact and erosion during flowback
- erosion during sandy production service
- corrosion during sour production service
- cavitation during water injection.

Critical control

Although a small element in the overall wellsite system, the choke is the key controlling element, and as such, is one of the most hard-working valves. Because avoiding equipment downtime is paramount in achieving optimal production levels and maintaining viability, the performance of the choke is instrumental in ensuring success.

A well-selected, optimally sized, and expertly operated choke is the primary means of avoiding a variety of adverse operational issues. Deploying the right choke is the principal way of managing severe service conditions and mitigating the risk of premature trim deterioration. This in turn avoids progressive erosion of the body that could possibly lead to a release of pressure to the environment — a worst-case event for any operator.

In addition to enhancing HSE profiles, minimizing choke replacement saves money in terms of downtime and equipment maintenance expenses. Reliable chokes greatly improve control and sustained hydrocarbon recovery from the well, which extends the ultimate production that may be achieved and the period of time before artificial lift techniques are required to sustain production from the well.
Multitrim Choke Valves

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