

# Valbart™ CEGV Compact Expanding Gate Valve



## Expanding gate reliability

The Valbart CEGV compact expanding gate valve is a fabricated body-expanding gate valve manufactured and tested in accordance with API 6D, latest edition. Its design is fully compliant to ASME Section VIII, Division 1 (ASME Boiler and Pressure Vessel Code: Rules for Construction of Pressure Vessels). Additionally, the design meets API 6D isolation features of block and bleed, double isolation bleed (DIB), double block and bleed, cavity relief, and other requirements

commonly specified in the pipeline industry. The compact expanding gate design features a full-bore diameter, with a compact, non-through conduit design providing a compact and lightweight valve package. Valbart expanding gate valves are engineered to achieve tight shutoff at high and/or low pressures in liquid or gas services. The expanding gate and segment design provides a high-integrity seal for a variety of critical applications, while affording lower operating friction.

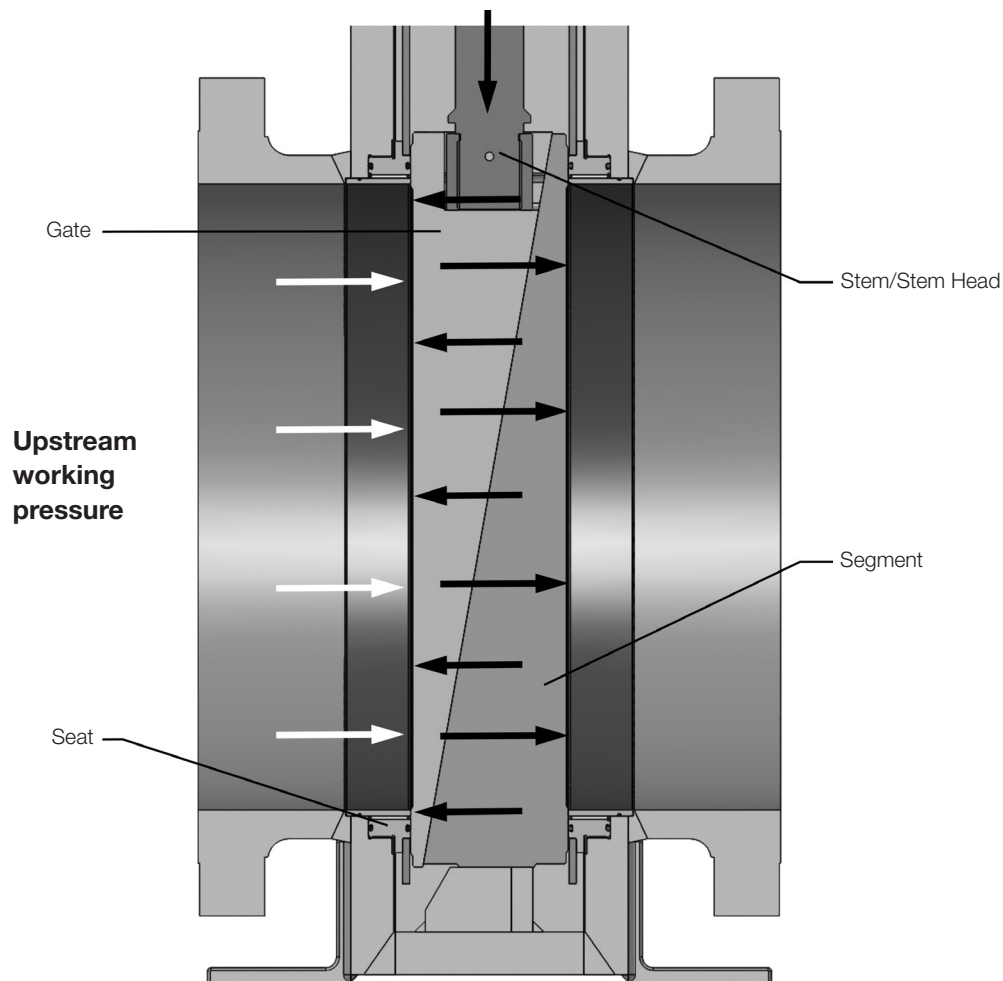


Figure 1: Compact expanding gate sealing

## Positive sealing mechanism

The expanding gate and segment design of the CEGV is designed to push against the seats for positive sealing, even at low pipeline pressures. As the gate and segment expand against each other and move into the closed position, the contact pressure against the seats increases, creating a positive seal in both the upstream and downstream directions. The mechanical action of the gate/segment expansion does not require pipeline pressure to assist in the sealing, providing a positive seal at low pipeline pressures. In addition, the wedging action of the gate/segment multiplies the loading against the seats, creating high seating forces that are unaffected by higher pipeline pressures. A positive seal is accomplished, regardless of the pressure within the pipe.

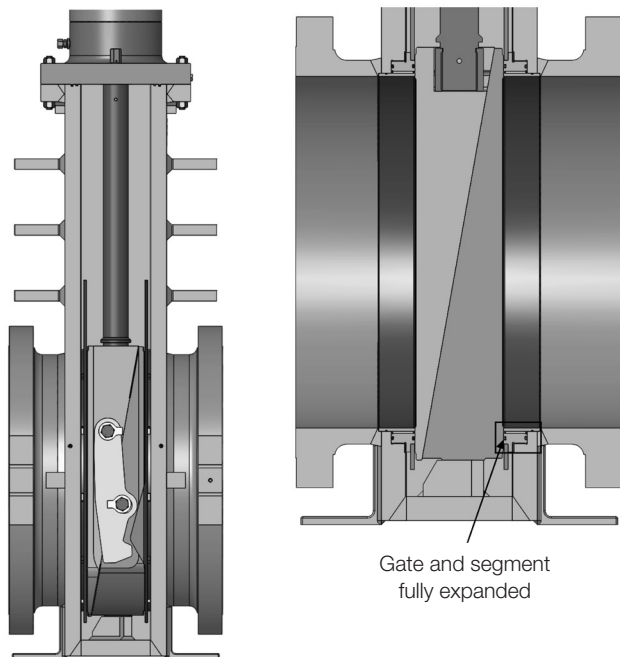


Figure 2a: CEGV sealing mechanism in fully closed position

The sealing mechanism of the CEGV operates as follows:

- Gate and segment components move up and down to open and close positions of the valve.
- At the closed position **Figure 2a**, a stop in the body stops motion of the segment, while the stem continues to drive the gate downward. This relative motion causes the gate and segment to expand outward against the seats.
- The gate and segment expand against both seats, allowing simultaneous upstream and downstream sealing.
- Positive contact between the gate/segment and seats creates a tight seal, regardless of pipeline pressure.
- In the open position **Figure 2b**, the gate and segment are contracted, allowing contact-free movement during opening and closing strokes, which extends the lifespan of the valve based on friction-free operation.
- On opening stroke from the closed position, the control arm engages the guide plate and pivots, causing the gate and segment to un-wedge and contract inward, away from the seats.
- As the stem travels to the fully open position, the gate and segment remain contracted together, allowing for friction free movement, with lower operating torque.

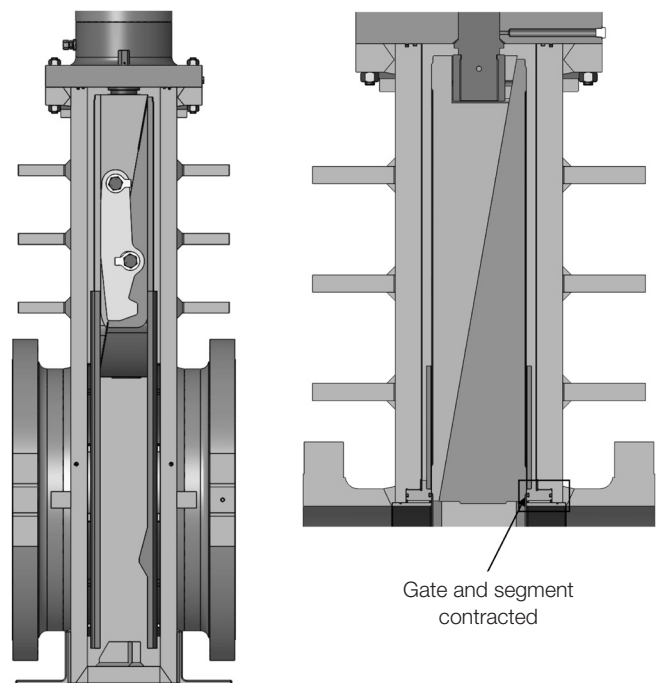


Figure 2b: CEGV sealing mechanism in fully open position

## Sealing application capabilities

Compact expanding gate valves are typically used in the oil and gas industry for installation in liquid products and secondary recovery, midstream and downstream pipelines. Typical applications include, but are not limited to:

- Tank and station valves
- Manifold valves
- Kicker valve on launcher/receiver stations
- Meter bypass valves
- Emergency shutdown valves
- Transmission and distribution pipelines

The CEGV engineered bore sealing mechanism utilizes a soft seal enclosed within a metal-to-metal seat providing positive uncompromising isolation for severe/heavy-duty services involving:

- Abrasive fluids/sandy services
- High-temperature services
- Service conditions requiring full reliability such as emergency shutdown valves (ESDV)

### Double block and bleed (DBB) (API 6D)

In its closed position, two seating surfaces provide sealing against pressure from both ends of the valve, with a means of venting or bleeding pressure in the cavity between the seating surfaces. See **Figure 3**.

### Double isolation and bleed (DIB) (API 6D)

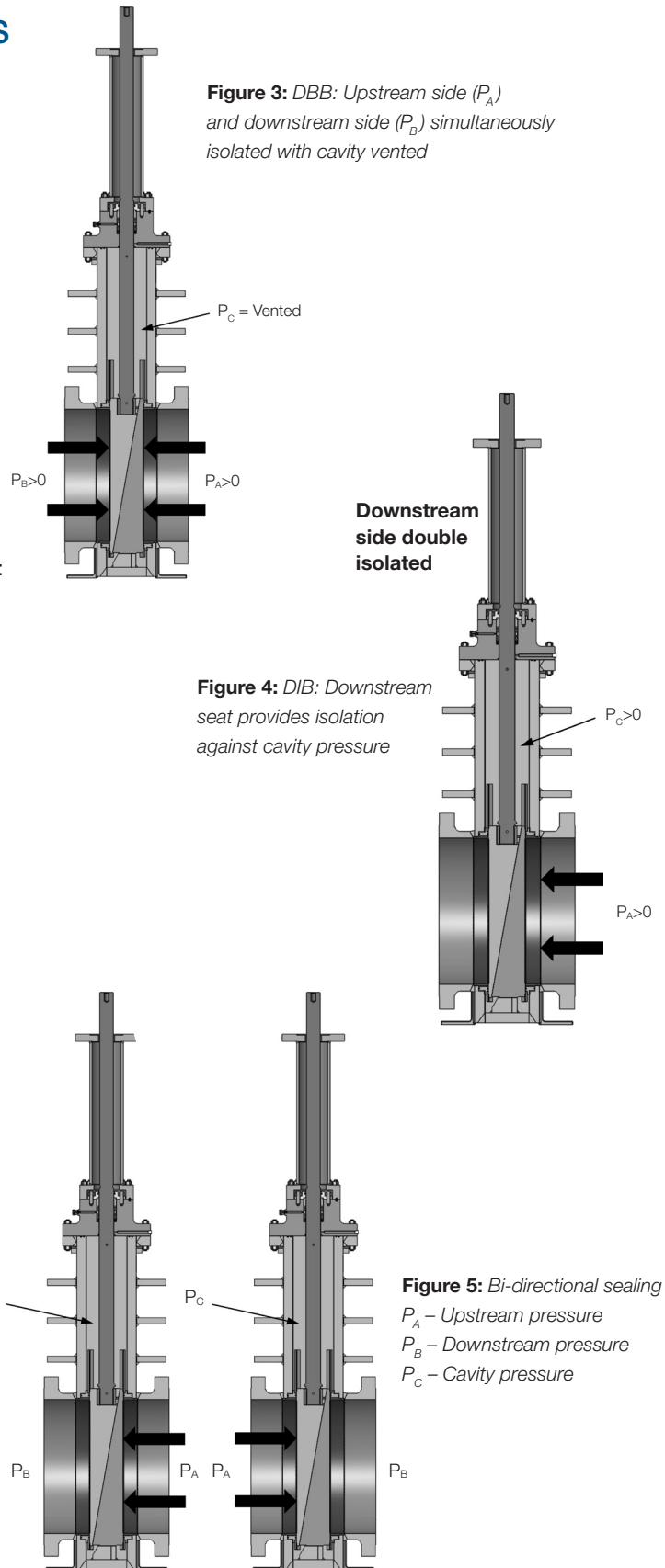
In its closed position, each of the two seating surfaces provides a seal against pressure from a single source, with a means of venting or bleeding pressure in the cavity between the seating surfaces. See **Figure 4**.

### Bi-directional, bubble-tight sealing

Valve seats are designed to seal against upstream or downstream pressure sources in either direction with the cavity vented. See **Figure 5**.

### Block and bleed (BB) types A and B (API 6D):

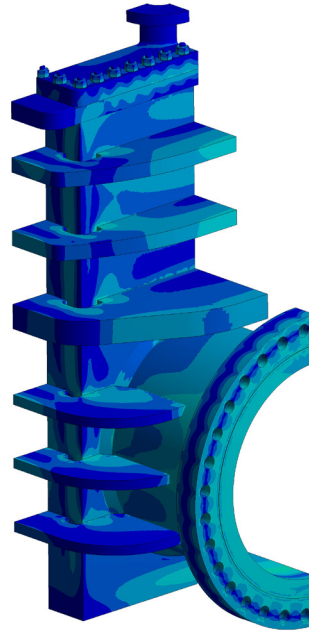
In the closed position, at least one sealing surface provides sealing against pressure from one end of the valve ( $P_A$  or  $P_B$ ) with the body cavity vented ( $P_C = 0$ ).



## Design features

### Fabricated body construction with engineered ribs profile

The compact expanding gate valve has a robust fabricated design with a high strength-to-weight ratio. The wall sections and ribs have been engineered using state-of-the-art finite element analysis for optimizing strength over weight and ensuring material is placed where needed. This minimizes body and seat deflection and assures solid sealing performance up to the valve's rated pressure. See **Figure 6**.



**Figure 6:** FEA analysis on valve body

### Positive sealing at all line pressures

The wedging action of the gate and segment components against the seats ensures a positive seating load at all line pressures. As the operating force is increased, the wedging mechanism increases the load against the seats, creating an even tighter seal. See **Figure 7a**.



**Figure 7a:** Gate and segment expanded against seats

### Low-friction, long-life seats

A control arm contacts the guide plate as the valve is opened, causing the control arm to pivot and “un-wedge” the gate and segment from each other. This allows friction-free travel to the open position, reducing operating loads and decreasing wear on the sealing components. See **Figure 7b**.

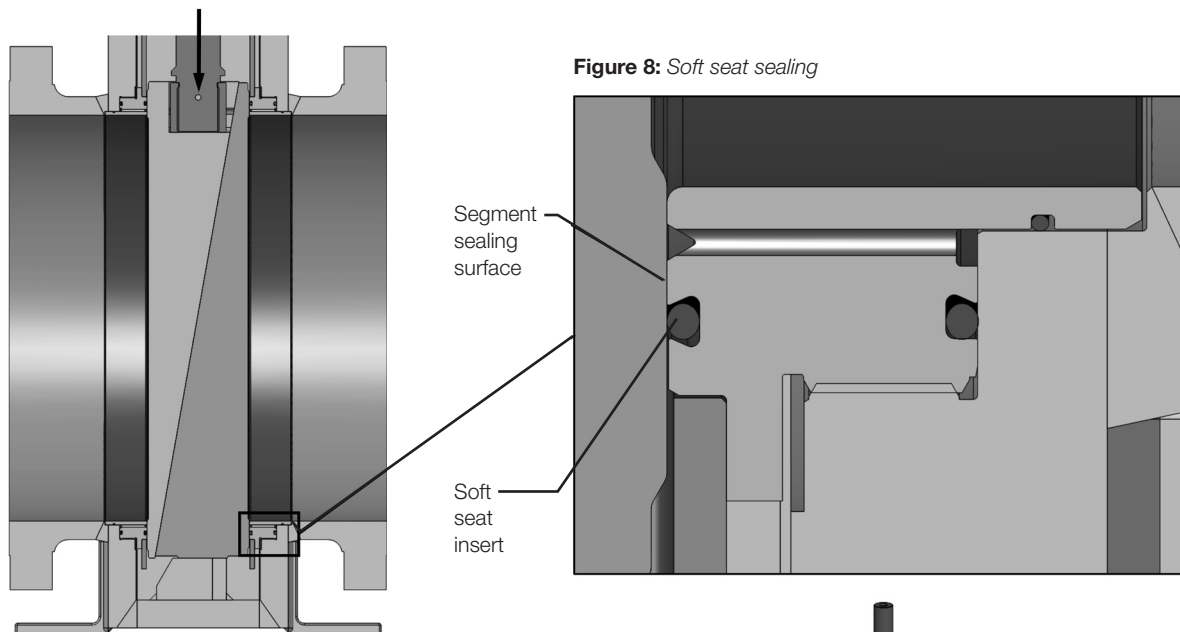


**Figure 7b:** Gate and segment contracted by connected arm

## Design features — Continued

### Soft seat enhances sealing

A soft seat insert provides added sealing capability and ensures positive sealing in cases of intermittent wear of the seating surfaces during regular operation. The soft seat insert adapts itself to any minor surface irregularities on the gate or segment and provides optimal sealing. See **Figure 8**.



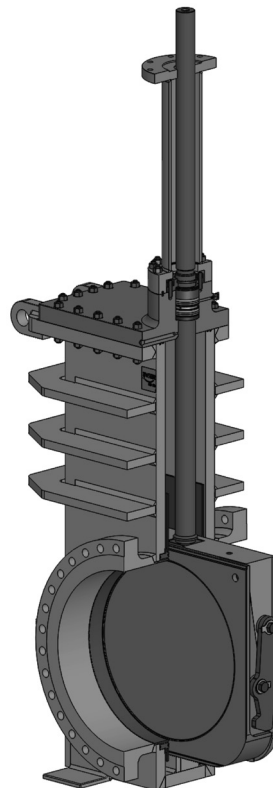
**Figure 8:** Soft seat sealing

### Compact design

The non-through conduit design allows for a much more compact installation with associated weight savings over the through conduit design, where there are no requirements for pipeline pigging.

### No side loads to the stem

The expanding gate and segment design ensures low operating thrust. The stem is guided by a low-friction coated bearing. See **Figure 9**.



**Figure 9:** Stem guiding

## Design features — Continued

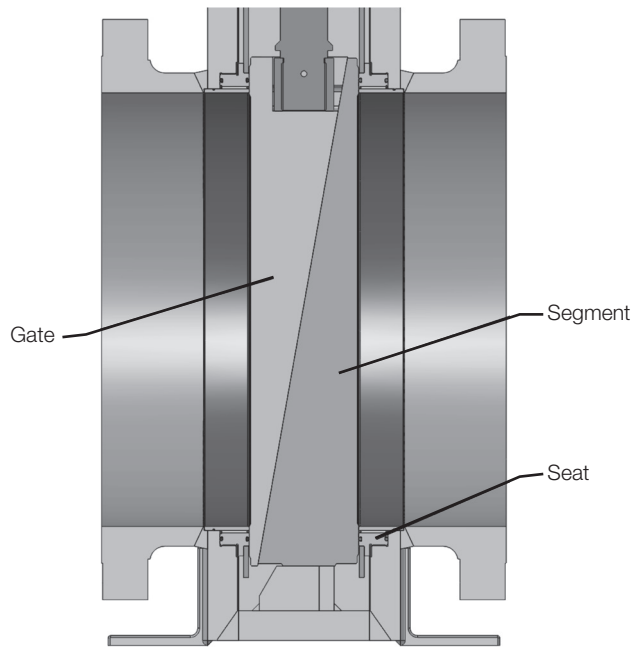


Figure 10: ENP sealing surfaces

### ENP-coated sealing surface

The gate and segment sealing surfaces are machined, lapped and plated with electroless nickel (ENP) for a robust sealing area that minimizes friction between sealing surfaces.

See **Figure 10**.

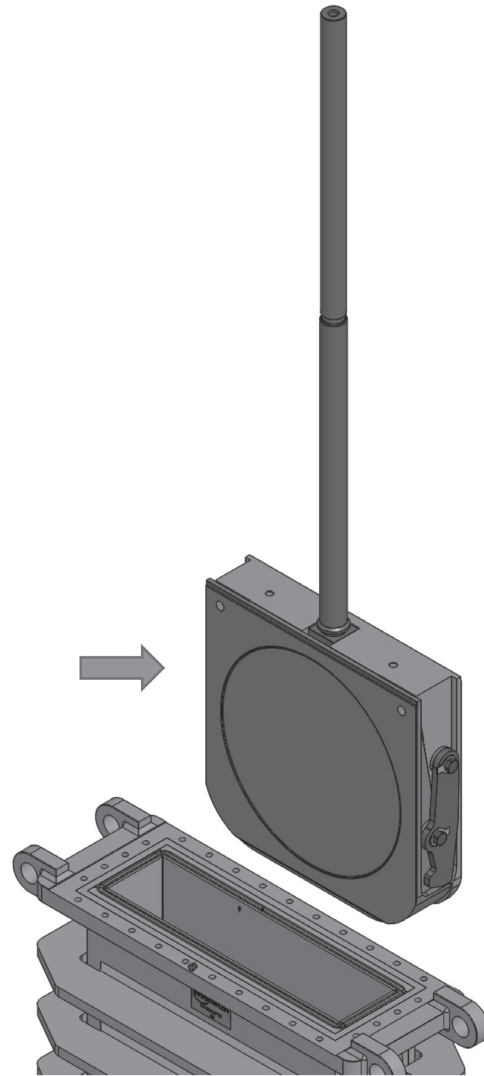


Figure 11: Top-entry design

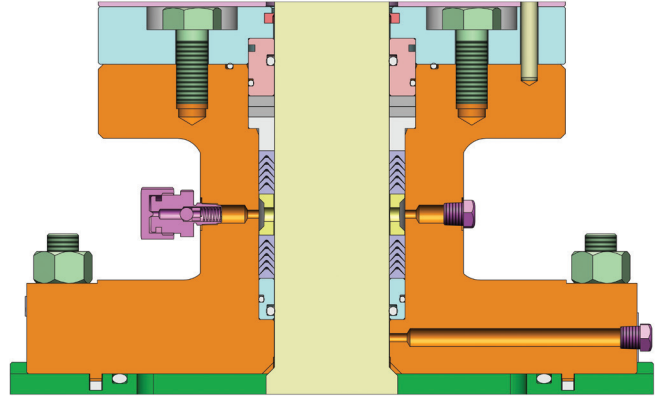
### Top-entry design

Simplified maintenance and repair are enabled by the top-entry design that allows for easy access to valve components while the valve is still in-line. Equipment downtime is dramatically reduced as trim and internal components can be replaced with ease in a relatively short period of time. See Figure 11.

## Design features — Continued

### Chevron-style stem seal

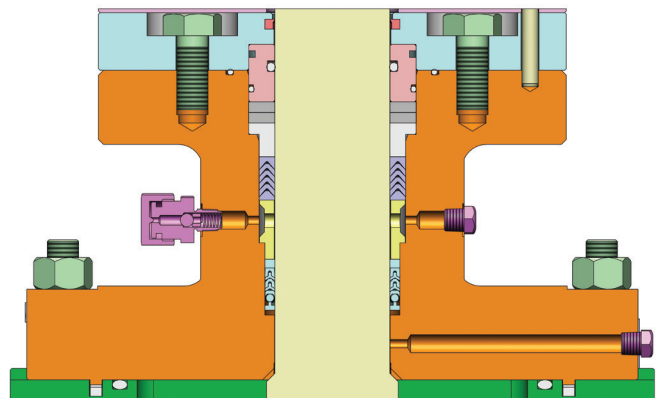
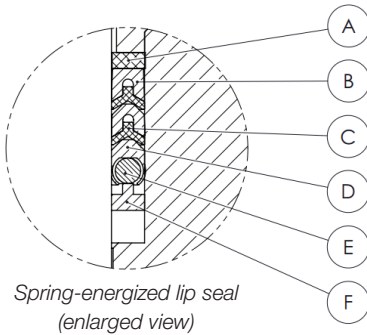
PTFE chevron packing provides an effective, low-friction stem seal, for long life under adverse operating conditions. The double packing set design has been emissions tested and certified to ISO 15848-1, while the additional graphite ring provides compliance to API 607/6FA fire safety standards. A sealant injection fitting is provided for emergency sealing if needed. See **Figure 12**.



**Figure 12:** Stem and body to bonnet sealing arrangement design, stem guiding system and emergency seal injection point

### Flowserve Energized Packing (FEP)

Spring-energized lip seal combined with proven Chevron packing technology makes this the ideal packing to eliminate emissions in critical applications. Qualified to the rigorous requirements of the ISO 15848-1 standard. See **Figure 13**.



**Figure 13:** Stem seal showing Flowserve Energized Packing (FEP) configuration

| FEP packing details |             |          |
|---------------------|-------------|----------|
| Item                | Description | Material |
| A                   | Backup      | PEEK®    |
| B                   | V-ring      | TFM      |
| C                   | Spacer      | RPTFE    |
| D                   | Jacket      | TFM      |
| E                   | Spring      | ELGILOY® |
| F                   | Retainer    | PEEK     |

® PEEK is a registered trademark of Victrex plc Corp.

® ELGILOY is a registered trademark of Elgiloy Specialty Metals.



### Sealant injector

The Valbart CEGV incorporates a stem sealant injector design to enable the injection of sealant to restore the sealing capability of the valve in the event of stem seal failure. See **Figure 14**.

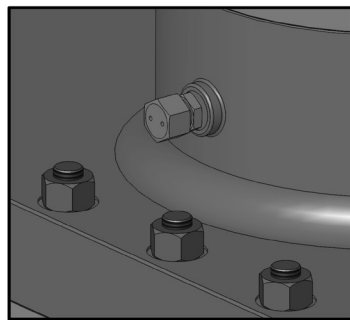
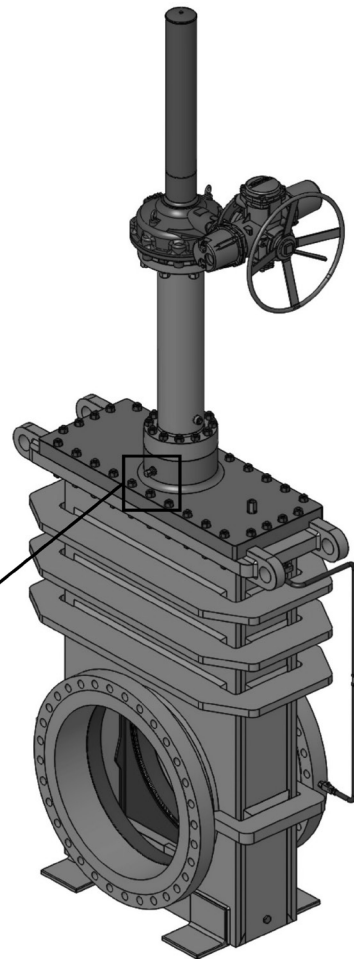


Figure 14: Sealant injector



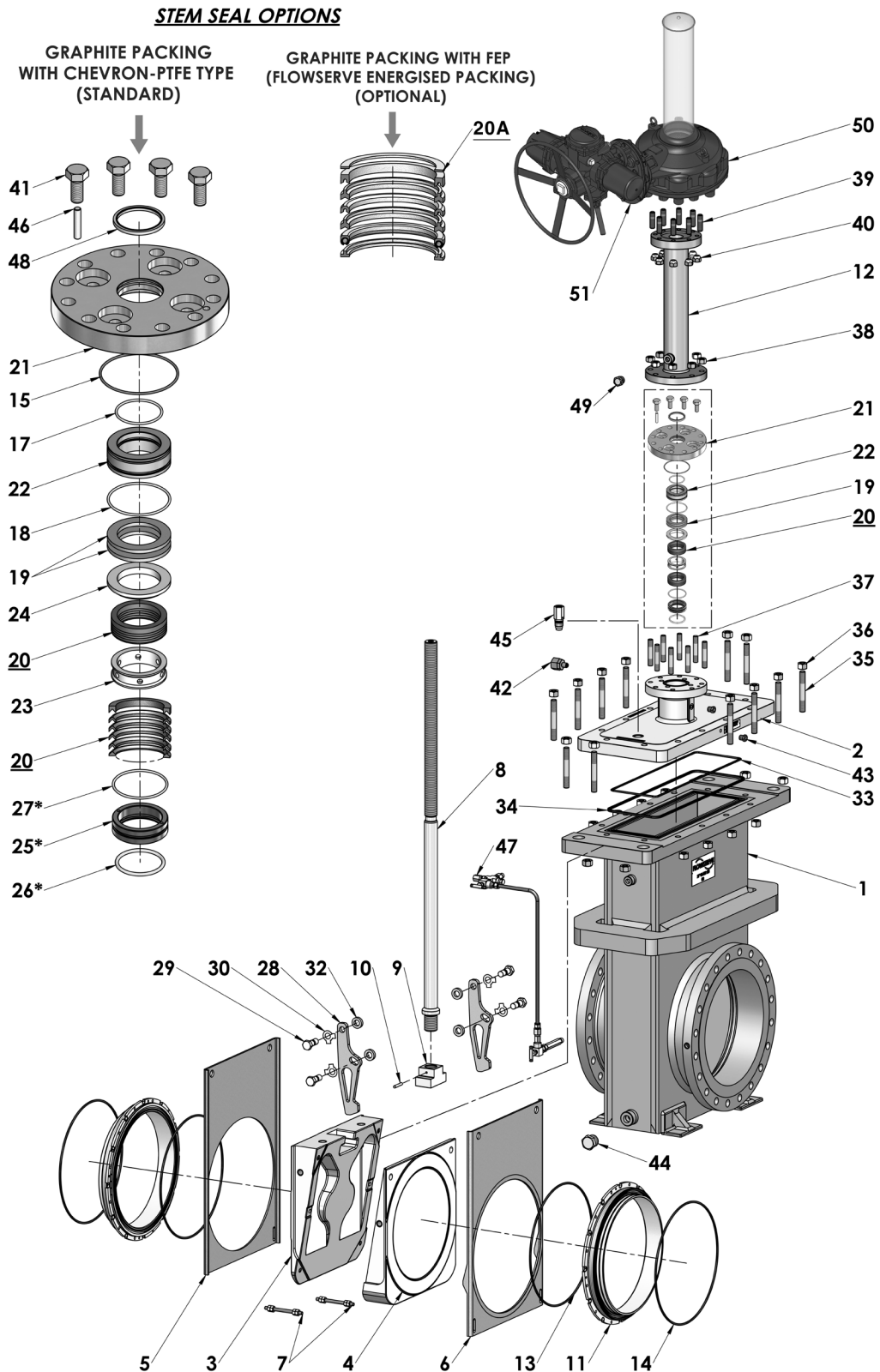
## CEGV specifications

Table 1: Specification compliance summary

|                                    |  |                                   |
|------------------------------------|--|-----------------------------------|
| <b>Sizes</b>                       | 12 to 36 in <sup>(1)</sup>                             |                                   |
| <b>Pressure ratings</b>            | ASME Classes 150 and 300                               |                                   |
| <b>Design</b>                      | API 6D, ASME BPVC SEC VIII                             |                                   |
| <b>End connection</b>              | Flanged RF/RTJ   |                                   |
| <b>Face to face</b>                | As per API 6D – B16.10                                 |                                   |
| <b>Trim area</b>                   | Full bore to API 6D dimensions                         |                                   |
| <b>Stem seal</b>                   | PTFE (Chevron) / Flowserve Energized Packing (FEP)     |                                   |
| <b>Flow direction</b>              | Bi-directional (preferred segment side upstream)       |                                   |
| <b>Leakage rates</b>               | API 6D, ISO 5208 (rate A soft seat; rate D metal seat) |                                   |
| <b>Operating temperature range</b> | <b>Standard carbon steel</b>                           | -29°C to 121°C (-20.2°F to 250°F) |
|                                    | <b>Low-temperature carbon steel</b>                    | -46°C to 121°C (-50.8°F to 250°F) |
| <b>Fire-safe</b>                   | API 6FA, API 607                                       |                                   |
| <b>Fugitive emissions</b>          | ISO 15848 – 1 (BH)                                     |                                   |

(1) Other sizes available upon request

# CEGV exploded view



## CEGV bill of materials

**Table 2: Compact expanding gate valve bill of materials**

| No.    | Component                       | Material (-29°C to 121°C) (-20.2°F to 250°F)                    | Material (-46°C to 121°C) (-50.8°F to 250°F)                    |
|--------|---------------------------------|---|---|
| 1      | Body                            | ASTM A516 Gr. 70 (ASTM A105N - WN Flange/PUP)                   | ASTM A516 Gr. 70 (ASTM A350 Gr. LF2 - WN Flange/PUP)            |
| 2      | Bonnet                          | ASTM A216 Gr. WCB/WCC   | ASTM A352 Gr. LCC/LCB   |
| 3      | Gate                            | ASTM A216 Gr. WCB/WCC + ENP + AFT <sup>(2)</sup>                | ASTM A352 Gr. LCC/LCB + ENP + AFT <sup>(2)</sup>                |
| 4      | Segment                         | ASTM A216 Gr. WCB/WCC + ENP + AFT <sup>(2)</sup>                | ASTM A352 Gr. LCC/LCB + ENP + AFT <sup>(2)</sup>                |
| 5      | Guide                           | ASTM A516 Gr. 70 + ENP  | ASTM A516 Gr. 70 + ENP  |
| 6      | Guide reaction                  | ASTM A516 Gr. 70 + ENP  | ASTM A516 Gr. 70 + ENP  |
| 7      | Guide holder assembly           | ASTM A322 Gr. 4140 + A193 Gr. B7M + A194 Gr. 2HM                | ASTM A322 Gr. 4140 + A320 Gr. L7M + A194 Gr. 7M                 |
| 8      | Stem                            | ASTM A564 TP.630 (17-4 PH) + AFT <sup>(2)</sup>                 | ASTM A564 TP.630 (17-4 PH) + AFT <sup>(2)</sup>                 |
| 9      | Stem head                       | ASTM A564 TP.630 (17-4 PH) + AFT <sup>(2)</sup>                 | ASTM A564 TP.630 (17-4 PH) + AFT <sup>(2)</sup>                 |
| 10     | Stem head pin                   | ASTM A564 TP.630 (17-4 PH)                                      | ASTM A564 TP.630 (17-4 PH)                                      |
| 11     | Seat                            | ASTM A105N + ENP + AFT <sup>(2)</sup>                           | ASTM A350 Gr. LF2 + ENP + AFT <sup>(2)</sup>                    |
| 12     | Yoke                            | ASTM A516 Gr. 70 + A106 Gr. B (PIPE)                            | ASTM A516 Gr. 70 + A333 Gr. 6 (PIPE)                            |
| 13     | Seat face O-ring                | FKM   | FKM / HNBR  |
| 14     | Seat backface O-ring            | FKM   | FKM / HNBR  |
| 15     | Environmental O-ring            | FKM   | FKM / HNBR  |
| 17     | Gland inner O-ring              | FKM   | FKM / HNBR  |
| 18     | Gland outer O-ring              | FKM   | FKM / HNBR  |
| 19     | Stem packing fire-safe          | Graphite  | Graphite  |
| 20/20A | Stem packing                    | PTFE (Chevron)/Flowserve Energized Packing (FEP) <sup>(3)</sup> | PTFE (Chevron)/Flowserve Energized Packing (FEP) <sup>(3)</sup> |
| 21     | Packing retainer                | ASTM A322 Gr. 4140  | ASTM A322 Gr. 4140  |
| 22     | Gland                           | ASTM A276 Gr. 410 / SS316                                       | ASTM A276 Gr. 410 / SS316                                       |
| 23     | Lantern ring                    | ASTM A276 Gr. 410 <sup>(3)</sup> / SS316 <sup>(3)</sup> / PTFE* | ASTM A276 Gr. 410 <sup>(3)</sup> / SS316 <sup>(3)</sup> / PTFE* |
| 24     | Spacer                          | Tin bronze  | Tin bronze  |
| 25*    | Bearing                         | ASTM A276 Gr. 410 / SS316                                       | ASTM A276 Gr. 410 / SS316                                       |
| 26*    | Bearing inner O-ring            | FKM   | FKM / HNBR  |
| 27*    | Bearing outer O-ring            | FKM   | FKM / HNBR  |
| 28     | Arm                             | ASTM A516 Gr. 70  | ASTM A516 Gr. 70  |
| 29     | Arm pin (shoulder screw)        | ASTM A193 Gr. B7M   | ASTM A320 Gr. L7M   |
| 30     | Tab washer                      | SS 316  | SS 316  |
| 31     | Pin holder                      | ASTM A516 Gr. 70 <sup>(1)</sup>                                 | ASTM A516 Gr. 70 <sup>(1)</sup>                                 |
| 32     | Arm spacer                      | ASTM A516 Gr. 70  | ASTM A516 Gr. 70  |
| 33     | Bonnet gasket                   | FKM   | FKM / HNBR  |
| 34     | Bonnet fire-safe gasket         | Graphite  | Graphite  |
| 35     | Body to bonnet stud             | ASTM A193 Gr. B7M   | ASTM A320 Gr. L7M   |
| 36     | Body to bonnet nut              | ASTM A194 Gr. 2HM   | ASTM A194 Gr. 7M  |
| 37     | Yoke to bonnet stud             | ASTM A193 Gr. B7M   | ASTM A320 Gr. L7M   |
| 38     | Yoke to bonnet nut              | ASTM A194 Gr. 2HM   | ASTM A194 Gr. 7M  |
| 39     | Yoke to gear stud               | BS 3692 Gr. 8.8   | ASTM A320 Gr. L7  |
| 40     | Yoke to gear nut                | ASTM A563 Gr. B   | ASTM A194 Gr. 7   |
| 41     | Packing retainer to bonnet bolt | ASTM A193 Gr. B7M   | ASTM A320 Gr. L7M   |
| 42     | Stem injection fitting          | SS316 / SS316L  | SS316 / SS316L  |
| 43     | Stem backseat port plug         | ASTM A105N  | ASTM A350 Gr. LF2   |
| 44     | Drain fitting                   | ASTM A105N  | ASTM A350 Gr. LF2   |
| 45     | Bleeder                         | SS 316 / SS316L   | SS 316 / SS316L   |
| 46     | Dowel pin                       | SS 316  | SS 316  |
| 47     | Relief valve fitting            | SS316 / SS316L  | SS316 / SS316L  |
| 48     | Dust seal                       | Nitrile / Nylon   | Nitrile / Nylon   |
| 49     | Yoke plug                       | ASTM A105N  | ASTM A350 Gr. LF2   |
| 50     | Gear unit                       | Limitorque® manufacturer standard                               | Limitorque manufacturer standard                                |
| 51     | Actuator                        | Limitorque manufacturer standard                                | Limitorque manufacturer standard                                |

(1) - Only for size 30 in and larger

(3) - Applicable for FEP stem seal design

(2) - AFT: Anti-friction treatment

(\*) - Not applicable for FEP stem seal design

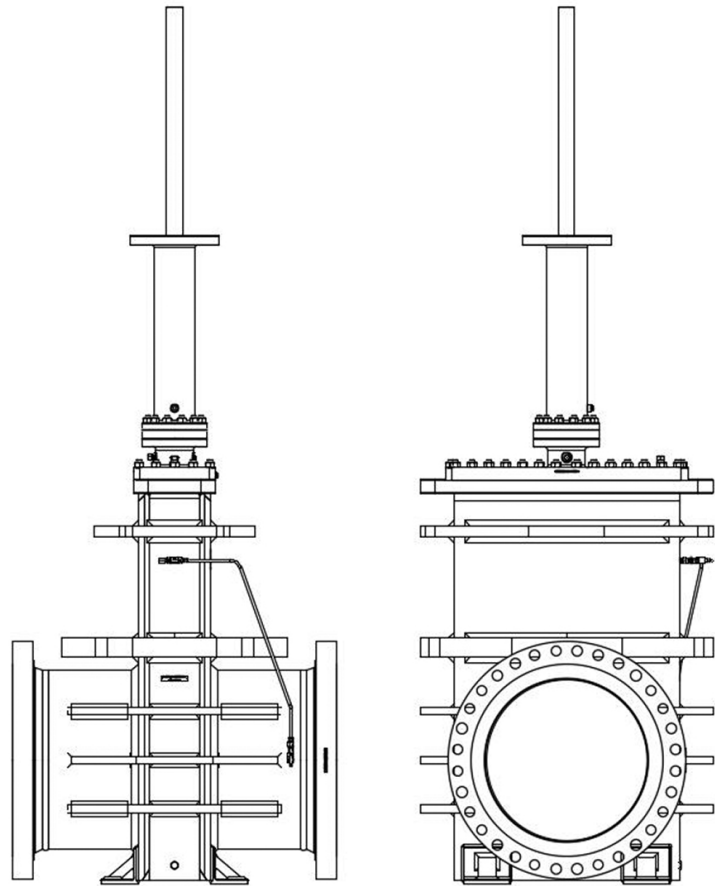
## Configurations and options

### Actuation

Hand-operated valves are supplied with a multi-turn gear operator based on the size, rating and customer requirements.

For automated operation, valves can be supplied with the following actuation types.

- Electric actuators
- Pneumatic actuators
- Hydraulic actuators
- Gas over oil actuators



### Available configurations

|  |   |
|--|---|
| <b>Size and pressure ratings<sup>1</sup></b> | 150 to 300; 12 to 36 in <sup>1</sup>  |
| <b>Flow direction</b>                        | Bidirectional   |
| <b>End connection</b>                        | Flanged RF/RJ   |
| <b>Stem seal</b>                             | PTFE Chevron packing with graphite ring/<br>Flowserve Energized Packing (FEP) |
| <b>Seating</b>                               | Elastomeric seated  |
| <b>Gaskets</b>                               | Elastomeric seals, fire-safe graphite   |
| <b>Operating Standard Temperature Range</b>  | -29°C to 121°C (-20°F to 250°F)   |

(1) Contact Flowserve for other sizes.

## Engineering data

### Valve testing

Each Flowserve Compact Expanding Gate Valve is tested in accordance with API 6D prior to shipping.

### Standard performance tests

- Visual and dimensional check
- High-pressure hydrostatic shell test
- High-pressure hydrostatic seat test
- Low-pressure pneumatic seat test
- Double block and bleed
- Cavity relief seat test
- Stem backseat test

### Qualification and certifications

- API 6D monogram
- Fire safe – API 6FA
- Fugitive emissions – BS EN ISO 15848-1

**Table 3: Leakage rate specification compliance<sup>1</sup>**

| Standard | Soft Seated     | Cryogenic       |
|----------|-----------------|-----------------|
| API 6D   | ISO 5208 Rate A | Consult factory |

(1) Leakage rates mentioned above are standard.

**Table 4: API 6D standard testing pressure values<sup>2,3</sup>**

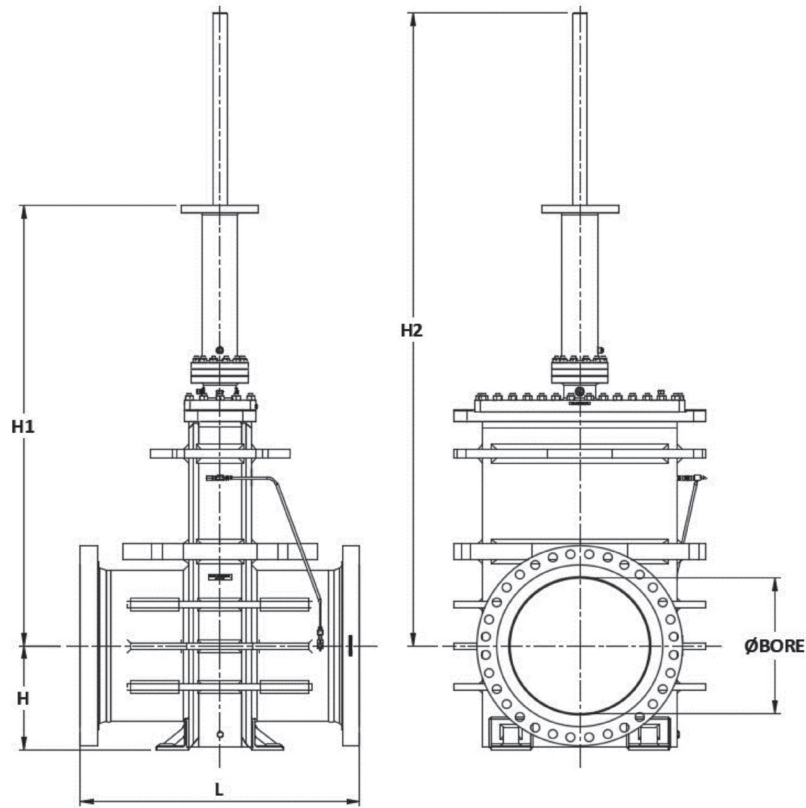
| ASME Class | Body Hydrotest Pressure |       | Seat Hydrotest Pressure |     | Pneumatic Seat Test Pressure <sup>4</sup> |     |
|------------|-------------------------|-------|-------------------------|-----|---|-----|
|            | bar                     | psi   | bar                     | psi | bar                                       | psi |
| 150        | 30                      | 435   | 22                      | 319 | 5.5                                       | 80  |
| 300        | 77.55                   | 1,124 | 57                      | 825 |   |     |

(2) Typical, but rating pressure could change for different materials.

(3) Conversion factors: 1 bar = 14.5 psi

(4) Pneumatic seat test is optional; test pressures provided as reference.

## Dimensions and weights – Classes 150 and 300



**Table 5: Class 150**

| Nominal Valve Size [in] | Nominal Bore Passage [mm]-[in] |       | L [mm]-[in] |       |       |       |     |       | H [mm]-[in] |       | H1 [mm]-[in] |        | H2 [mm]-[in]-stem fully extended- |        | Weight*         |        |              |        |
|-------------------------|--------------------------------|-------|-------------|-------|-------|-------|-----|-------|-------------|-------|--------------|--------|-----------------------------------|--------|-----------------|--------|--------------|--------|
|                         |                                |       | RF          |       | WE    |       | RJ  |       |             |       |              |        |                                   |        | RF/RJ [kg]-[lb] |        | BW [kg]-[lb] |        |
| 12                      | 303                            | 11.94 | 356         | 14.00 | 502   | 19.75 | 368 | 14.50 | 320         | 12.60 | 1,230        | 48.43  | 1,706                             | 67.15  | 630             | 1,389  | 592          | 1,305  |
| 16                      | 385                            | 15.19 | 406         | 16.00 | 610   | 24.00 | 419 | 16.50 | 381         | 15.00 | 1,416        | 55.75  | 1,986                             | 78.19  | 996             | 2,196  | 930          | 2,050  |
| 18                      | 436                            | 17.19 | 432         | 17.00 | 660   | 26.00 | 445 | 17.50 | 391         | 15.39 | 1,571        | 61.85  | 2,202                             | 86.67  | 1,400           | 3,086  | 1,260        | 2,778  |
| 20                      | 487                            | 19.19 | 457         | 18.00 | 711   | 28.00 | 470 | 18.50 | 400         | 15.75 | 1,726        | 67.95  | 2,459                             | 96.81  | 1,750           | 3,858  | 1,520        | 3,351  |
| 24                      | 589                            | 23.19 | 508         | 20.00 | 813   | 32.00 | 521 | 20.50 | 492         | 19.37 | 1,971        | 77.60  | 2,837                             | 111.69 | 2,166           | 4,775  | 2,130        | 4,696  |
| 30                      | 735                            | 28.94 | 660         | 26.00 | 914   | 36.00 | (1) | (1)   | 557         | 21.93 | 2,384        | 93.86  | 3,468                             | 136.54 | 3,850           | 8,488  | 3,280        | 7,231  |
| 36                      | 874                            | 34.44 | 813         | 32.00 | 1,016 | 40.00 | (1) | (1)   | 661         | 26.02 | 2,754        | 108.43 | 3,978                             | 156.61 | 6,052           | 13,342 | 5,250        | 11,574 |

\* Weight tolerance: ± 5%

**Table 6: Class 300**

| Nominal Valve Size [in] | Nominal Bore Passage [mm]-[in] |       | L [mm]-[in] |       |       |       |       |       | H [mm]-[in] |       | H1 [mm]-[in] |        | H2 [mm]-[in]-stem fully extended- |        | Weight*         |        |              |        |
|-------------------------|--------------------------------|-------|-------------|-------|-------|-------|-------|-------|-------------|-------|--------------|--------|-----------------------------------|--------|-----------------|--------|--------------|--------|
|                         |                                |       | RF          |       | WE    |       | RJ    |       |             |       |              |        |                                   |        | RF/RJ [kg]-[lb] |        | BW [kg]-[lb] |        |
| 16                      | 385                            | 15.19 | 838         | 33.00 | 838   | 33.00 | 854   | 33.63 | 381         | 15.00 | 1,421        | 55.94  | 2,083                             | 82.01  | 1,368.0         | 3,016  | 1,200        | 2,646  |
| 20                      | 487                            | 19.19 | 991         | 39.00 | 991   | 39.00 | 1,010 | 39.75 | 413.5       | 16.28 | 1,736        | 68.35  | 2,468.5                           | 97.19  | 2,241.5         | 4,942  | 2,022        | 4,458  |
| 24                      | 589                            | 23.19 | 1,143       | 45.00 | 1,143 | 45.00 | 1,165 | 45.88 | 492         | 19.37 | 1,999        | 78.68  | 2,856.5                           | 112.46 | 2,984.0         | 6,579  | 2,890        | 6,371  |
| 30                      | 735                            | 28.94 | 1,397       | 55.00 | 1,397 | 55.00 | 1,422 | 56.00 | 571         | 22.48 | 2,404        | 94.65  | 3,487                             | 137.28 | 4,640.0         | 10,229 | 4,295        | 9,469  |
| 36                      | 874                            | 34.44 | 1,727       | 68.00 | 1,727 | 68.00 | 1,756 | 69.13 | 661         | 26.02 | 2,809        | 110.59 | 4,033                             | 158.78 | 7,956.0         | 17,540 | 7,806        | 17,209 |

\* Weight tolerance: ± 5%

## Mounting operators

Flowserve offers Limitorque actuation to provide reliable automation of the Flowserve CEGV. Limitorque has a long history of engineering high-performance, long-lasting actuators for a variety of industries. Matching the Limitorque actuator with the Flowserve compact expanding gate valve results in an automated valve package complete with single-source engineering, supply and service.

Limitorque offers MX electric actuators **Figure 15**, complete with V Series **Figure 16** gearbox and controls, to meet any valve thrust and customer application requirement. State-of-the-art, non-intrusive control systems allow operators to calibrate and locally control the actuator and valve without removing the actuator cover.



**Figure 15:** Limitorque MX electric actuator

Actuators are available with SIL capability for meeting enhanced safety integrity requirements. Various digital protocols and network communications can be offered for compatibility with numerous controls systems, including Modbus, DeviceNet and Foundation Fieldbus. Limitorque heavy-duty electric actuators provide the reliability, robustness and features to meet the needs of the oil and gas industry.

Different actuators or special applications are available upon request.



**Figure 16:** Limitorque V Series bevel gearboxes are easily adapted for motorized operation by MX actuators

**Table 7: Topworks data**

| Valve Size | Class | ASME Working Pressure | Stem Data           |         |        | Block and Bleed Thrust | Block and Bleed Torque | Stroke |      | Turns to Open Valve |
|------------|-------|-----------------------|---------------------|---------|--------|------------------------|------------------------|--------|------|---------------------|
|            |       |                       | ACME <sup>(1)</sup> | Threads | Starts |                        |                        | mm     | in   |                     |
| NPS        | Class | psig                  | in                  | per in  | #      | lbf                    | ft lb                  | mm     | in   | # of turns          |
| 12         | 150   | 285                   | 1.5                 | 6       | 2      | 11,769                 | 162                    | 355.6  | 14.0 | 42                  |
| 12         | 300   | 740                   | 1.5                 | 6       | 2      | 30,780                 | 425                    | 355.6  | 14.0 | 42                  |
| 16         | 150   | 285                   | 1.5                 | 6       | 2      | 21,200                 | 293                    | 455.7  | 18.0 | 54                  |
| 16         | 300   | 740                   | 1.75                | 5       | 2      | 55,438                 | 765                    | 455.7  | 18.0 | 45                  |
| 18         | 150   | 285                   | 1.75                | 5       | 2      | 27,136                 | 423                    | 510.5  | 20.1 | 50                  |
| 18         | 300   | 740                   | 2                   | 4       | 2      | 71,193                 | 1,108                  | 510.5  | 20.1 | 40                  |
| 20         | 150   | 285                   | 2                   | 4       | 2      | 32,648                 | 601                    | 555.0  | 21.9 | 44                  |
| 20         | 300   | 740                   | 2.25                | 4       | 2      | 85,542                 | 1,574                  | 555.0  | 21.9 | 44                  |
| 24         | 150   | 285                   | 2.25                | 4       | 2      | 45,156                 | 934                    | 663.3  | 26.1 | 52                  |
| 24         | 300   | 740                   | 2.375               | 3       | 2      | 118,190                | 2,445                  | 663.3  | 26.1 | 39                  |
| 30         | 150   | 285                   | 2.675               | 3       | 2      | 67,424                 | 1,663                  | 810.0  | 31.9 | 48                  |
| 30         | 300   | 740                   | 2.875               | 3       | 2      | 177,446                | 4,348                  | 810.0  | 31.9 | 48                  |
| 36         | 150   | 285                   | 3.125               | 3       | 2      | 91,054                 | 2,680                  | 947.0  | 37.3 | 56                  |
| 36         | 300   | 740                   | 3.375               | 3       | 2      | 238,288                | 7,013                  | 947.0  | 37.3 | 56                  |

(1) For Acme threads 2.875 to 3.375 in, stem can be provided with 2.5 TPI as an option on customer request.



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