Chlorine Valves – Bellows Sealed
Model 350EC4-5
Successful Concept

The industrial success of PHOENIX bellows sealed globe valves in critical service applications is based on:

- **Over 40 years experiences** in bellows sealed technology worldwide and nearly 100 years in valve manufacturing
- **Own manufacturing in Germany with a huge manufacturing penetration**
- **Manufacturing with latest in machining and technology** using a wide range of high performance CNC-machining equipment
- **Many years of working in umpteen national and international committees** like EURO CHLOR, Chlorine Institute, …
- **Over 200 well qualified and dedicated employees**
- **Our certificates and approvals** like ISO 9001, HP0, PED 97/23, Euro Chlor, API, GOST, Fire Safe, KTA 1401, CE 0525, Stoomwezen, …
Experience since 1910

Application

The most common application for PHOENIX bellows sealed globe valves is dry chlorine (Cl2). Special materials and unique design features permit using model 350EC4-5 in other critical services.

They are also successfully used for:

- Anhydrous hydrogen chlorine (HCl)
- Anhydrous hydrofluoric acid (HF)
- Phosgene (COCl2)
- Vinyl chloride monomer (VCM)
- Ethylene dichloride (EDC)
- Isocyanites (MDI, TDI, HDI, etc.)
- and fluids of similar hazardous nature
PHÖNIX bellows sealed globe valve model 350EC4-5 has a many special design features that make it especially suitable for toxical service.

- **Bellows protected** in extended body against direct impingement from product flow
- **High-cycle, multiple wall hydroformed bellows**
- **Packing area integral** with bonnet – no welded-in sleeve
- **Metal-to-metal back seat** on stem
- **Stem is guided** on top and bottom. Stem guide designed for easy decontamination of bellows area
- **Bodies are one-piece forging or casting** with larger than required wall thickness and integral flanges
- **No welds in pressure boundary**
- **Body bonnet joint gasket is fully confined** to prevent gasket flow or blowout
- **Replaceable disc** for low maintenance cost
- **Lubrication feature for the seat area** (HF-service)
Research and Development

Over **20 well-qualified engineers** in our engineering department develop solutions to customers problems every day. Latest calculation and CAD programs and Phoenix' **own valve testing facility** allow for permanent improvement of our products.
Technical Details of Model 350EC4-5

PHOENIX bellows sealed globe valve model 350EC4-5 meets all requirements of the EURO CHLOR and CHLORINE INSTITUTE Standards to handle hazardous fluids in widely different applications.
A simple design and structure was the target for development because it guarantees an optimal behavior in service.

- Handwheel
- Coupling and position indicator
- Packing as secondary sealing element
- Bonnet
- Back-seat
- Bellows
- Guide ring
- Renewable Disc
- Screwed seat
- Body
- Lubrication feature (for HF-service)
Technical Details of Model 350EC4-5

Extended valve body neck allows positioning of bellows in the valve body, the stem is guided close to the disc.

Available Materials:

- Low temperature carbon steel for Chlorine service
- Carbon steel
- Stainless steel
- Hastelloy
- Monel
- Inconel
- Pure nickel
- Titanium
- other special materials
Technical Details of Model 350EC4-5

Material and design of the bonnet are especially suited for toxic and hazardous fluids.

- Integral machined stuffing box, no weld required
- Larger than required wall thickness
- Round and confined bonnet gasket
- Approved bellows-bonnet weld (Zero emissions)
Technical Details of Model 350EC4-5

Bellows welded to bonnet and stem guarantees reliable and long lasting zero emission performance.

- Standard material for chlorine service: A350 Gr. LF2 or A352 LCC
- Hydroformed, multiple-wall design
- Minimum 50,000 full-stroke operations at 38 DegC (100 DegF) valve rating
- Welded to bonnet and stem
- Approved welders and welding processes
- Bellows, upper and lower ring made from same material
- Bellows does not protrude into flow path and is therefore protected from direct impingement and abrasion
The standard disc-seat combination for chlorine service is an integral seat with a Stellite 21 hardfacing and a hardfaced Stellite 6 disc. A special disc-seat combination is selected and designed especially for HF service.

- Disc can be easily replaced
- Integral seat for chlorine service or screwed-in, replaceable seat for HF-service
- Conic metal-to metal seating with available lubrication feature especially for HF-service
  - Min. seat hardness 300HB
  - Stainless steel seat

- Lubrication feature in the seat area
- Nickel layer below the Stellite 21 hardfacing
- A groove and several holes on the circumference of the seat guarantees a perfect grease distribution
Technical Details of Model 350EC4-5

The stem properties guarantee a perfect guide and lowest friction.

- Rising non-rotating stem
- Surface roughness 0.4 μm (polished or cold rolled for improved hardness)
- Eccentricity < 0.01 mm
- Linearity > 0.005 % of stem length
- Prevention of wear and galling
  - Material selection
  - Special Graphite or PTFE packing rings
  - Special stem guide design, surface coating, hardfacing
Technical Details of Model 350EC4-5

Backup packing serves as a secondary sealing element in case of bellows failure.

- One-piece gland follower
- Wiper, prevents entry of moisture and dirt into packing
- O-Ring, prevents entry of moisture and dirt into packing
- One-piece bonnet with integral machine packing area, no welded packing sleeve
- 5 packing rings as secondary sealing system
- Packing area with lapped surface (3.2 µm)
- Graphite rings
## Standard Materials of Construction for 350EC4-5 for chlorine service

<table>
<thead>
<tr>
<th>Part</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body &amp; Bonnet</td>
<td>A350 Gr. LF2 / A352 LCC</td>
</tr>
<tr>
<td>Integral seat with hardfacing</td>
<td>Stellite 21</td>
</tr>
<tr>
<td>Renewable disc</td>
<td>316Ti / A350 LF2</td>
</tr>
<tr>
<td>Disc hardfacing</td>
<td>Stellite 6</td>
</tr>
<tr>
<td>Bellows</td>
<td>Hastelloy C-276</td>
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<tr>
<td>Upper stem</td>
<td>A 276 Gr. 431</td>
</tr>
<tr>
<td>Lower stem</td>
<td>Hastelloy C-276</td>
</tr>
<tr>
<td>Handwheel</td>
<td>Cast iron / Steel</td>
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<tr>
<td>Packing</td>
<td>PTFE-Rings</td>
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<tr>
<td>Bolts</td>
<td>A320 Gr. L7/L7M</td>
</tr>
<tr>
<td>Nuts</td>
<td>A194 Gr. 4</td>
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</tbody>
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Testing and Preservation

PHOENIX has a standard test procedure that is performed on every assembled valve prior to leaving the factory. Additional testing (e.g. Helium leak test) will be performed per customer specification. Inspection certificates and material test reports are available upon request.