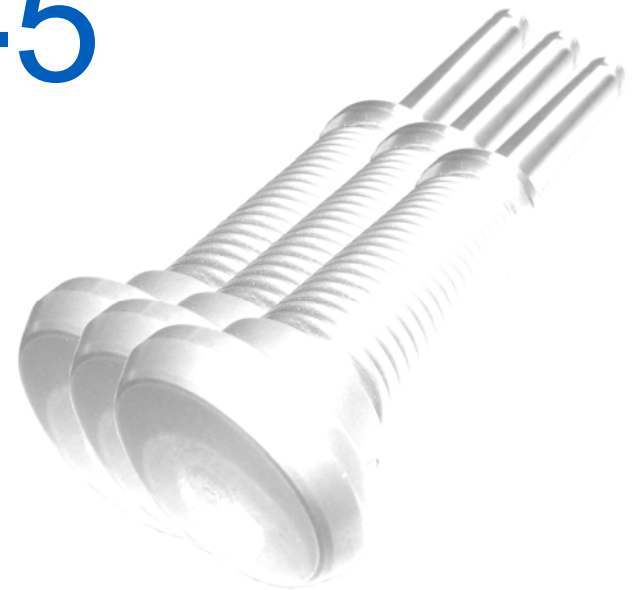


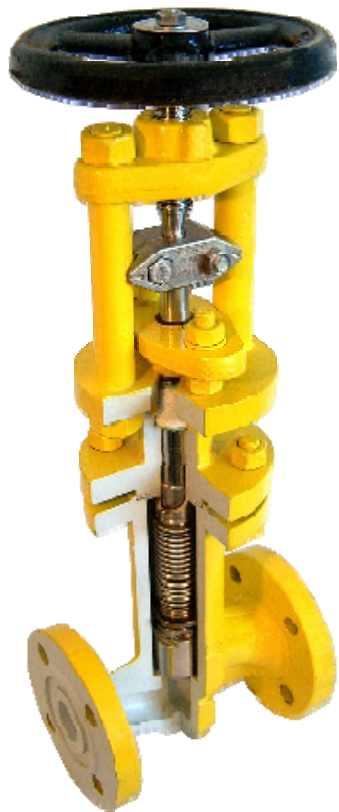
# Chlorine Valves – Bellows Sealed

## Model 350EC4-5



## Successful Concept

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



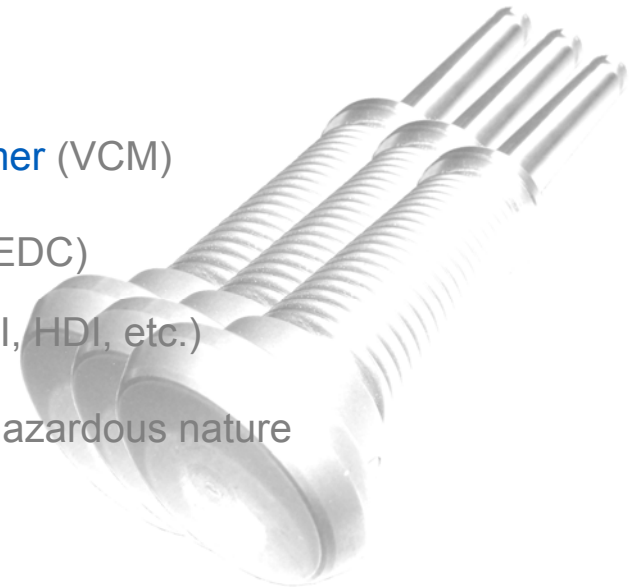
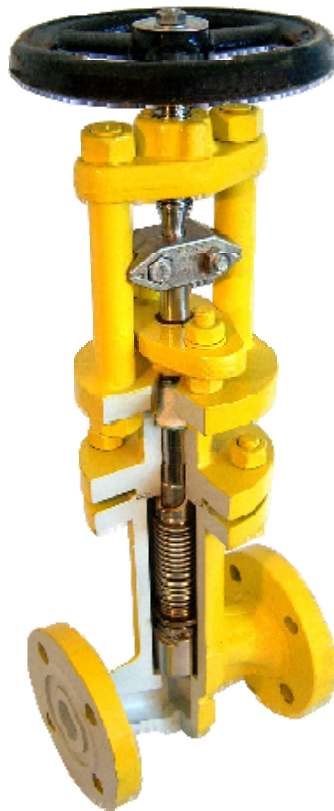
- **Over 40 years experiences** in bellows sealed technology worldwide and nearly 100 years in valve manufacturing
  - Own manufacturing in Germany with a **huge manufacturing penetration**
  - **Manufacturing with latest in machining and technology** using a wide range of high performance CNC-machining 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, ...
- 

## Application

The most common application for PHOENIX bellows sealed globe valves is **dry chlorine** ( $\text{Cl}_2$ ). Special materials and unique design features permit using model 350EC4-5 in **other critical services**.

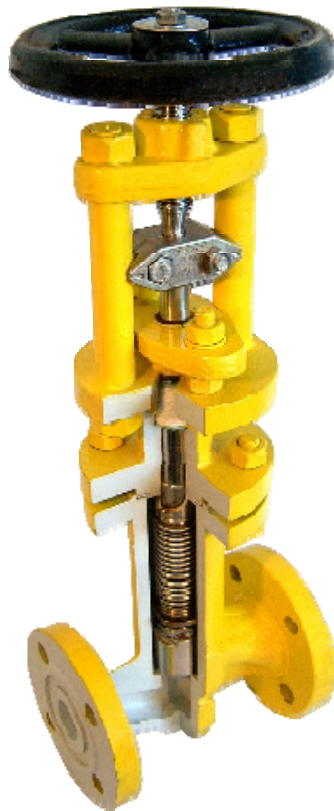
*They are also successfully used used for:*

- **Anhydrous hydrogen chloride** ( $\text{HCl}$ )
- **Anhydrous hydrofluoric acid** ( $\text{HF}$ )
- **Phosgene** ( $\text{COCl}_2$ )
- **Vinyl chloride monomer** ( $\text{VCM}$ )
- **Ethylene dichloride** ( $\text{EDC}$ )
- **Isocyanites** ( $\text{MDI}$ ,  $\text{TDI}$ ,  $\text{HDI}$ , etc.)
- and fluids of similar hazardous nature

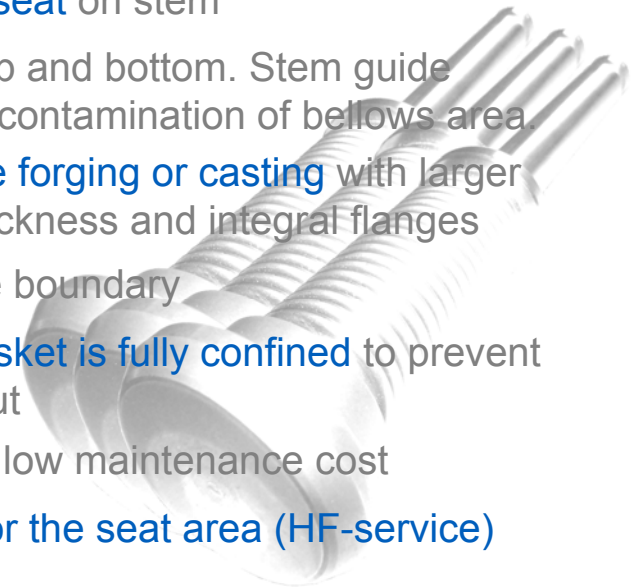


## Design Features

PHOENIX 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

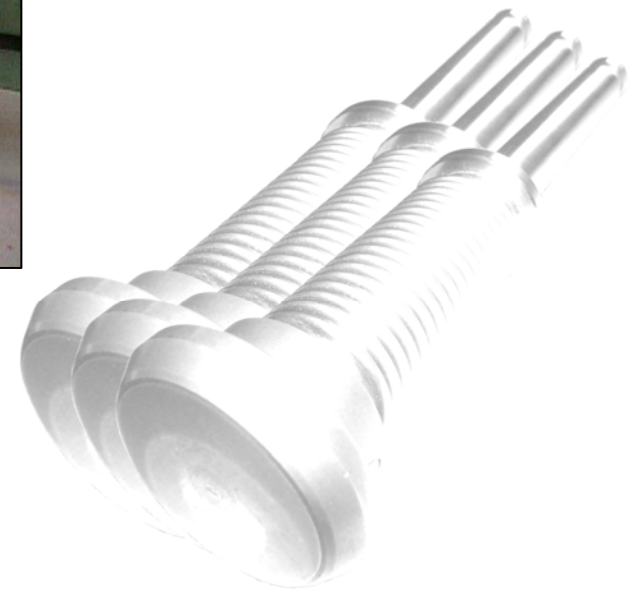
Over **20 well-qualified engineers** in our engineering department develop solutions to customers problems every day. Latest calculation and CAD programs and Phoenix' **own valve testing facility** allow for permanent improvement of our products.





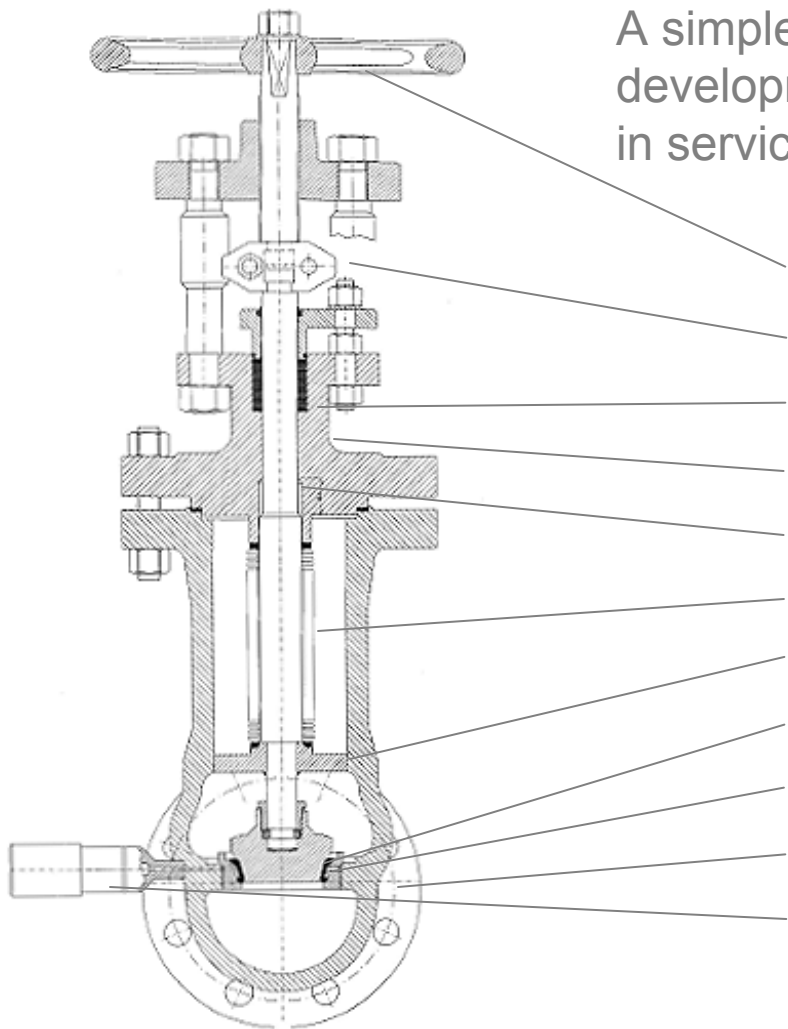
## Technical Details of Model 350EC4-5

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.

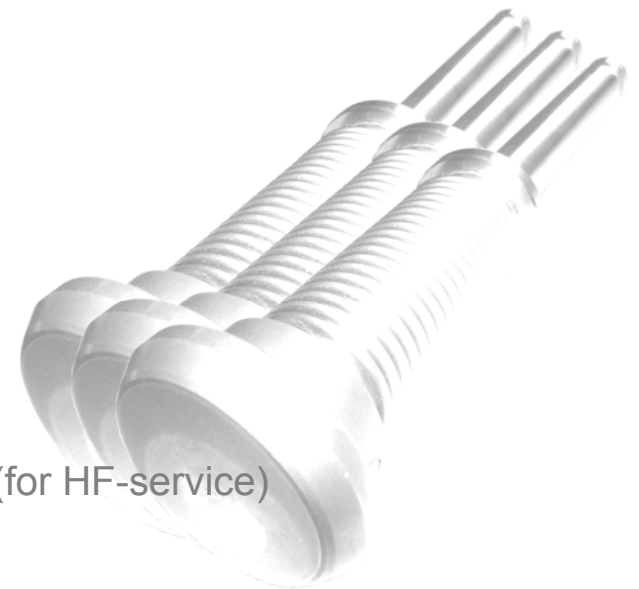


## Technical Details of Model 350EC4-5

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

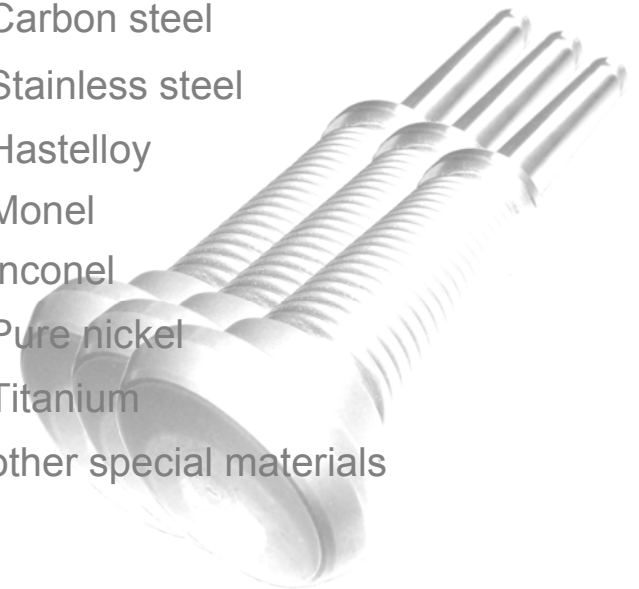
Extended valve body neck allows positioning of bellows in the valve body, the stem is guided close to the disc.



### *Available Materials:*

• *Low temperature carbon steel for Chlorine service*

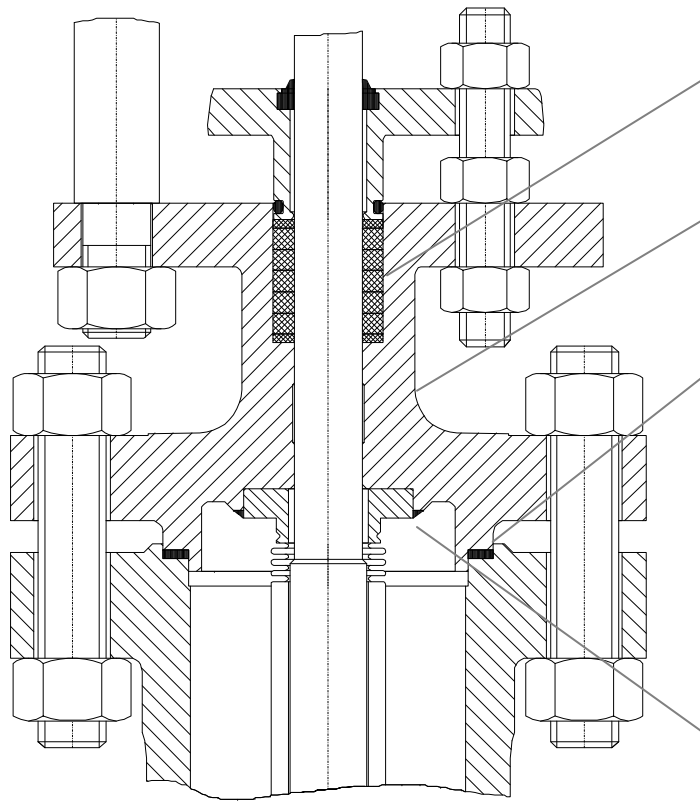
- Carbon steel
- Stainless steel
- Hastelloy
- Monel
- Inconel
- Pure nickel
- Titanium
- other special materials



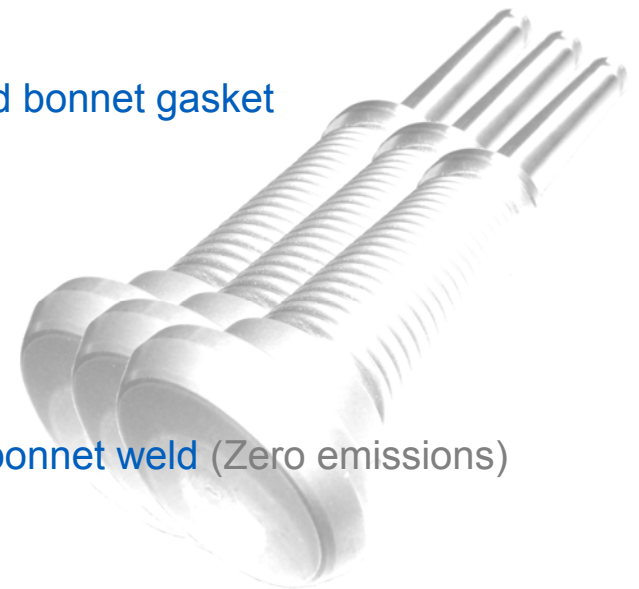


## Technical Details of Model 350EC4-5

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

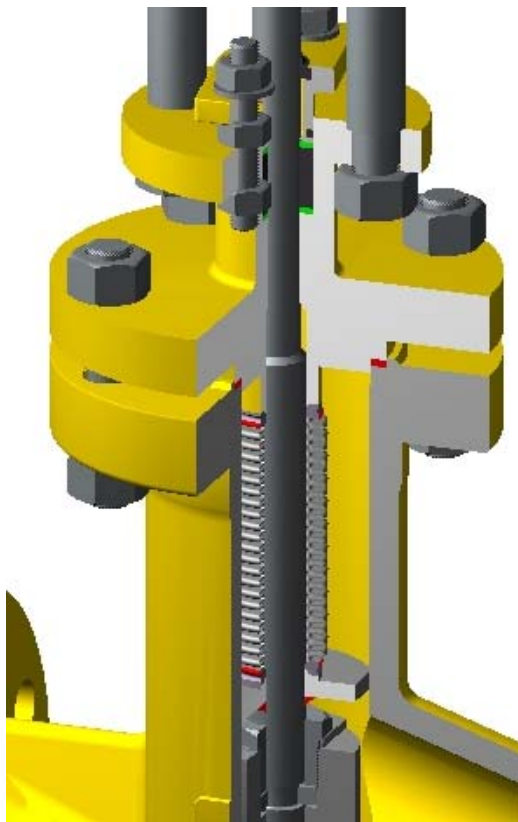


- Integral machined stuffing box, no weld required
- Larger than required wall thickness
- Round and confined bonnet gasket
- Approved bellows-bonnet weld (Zero emissions)

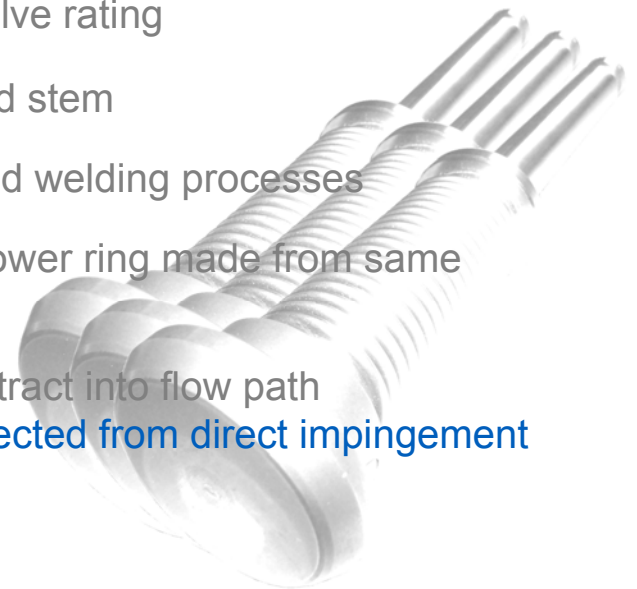


## Technical Details of Model 350EC4-5

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

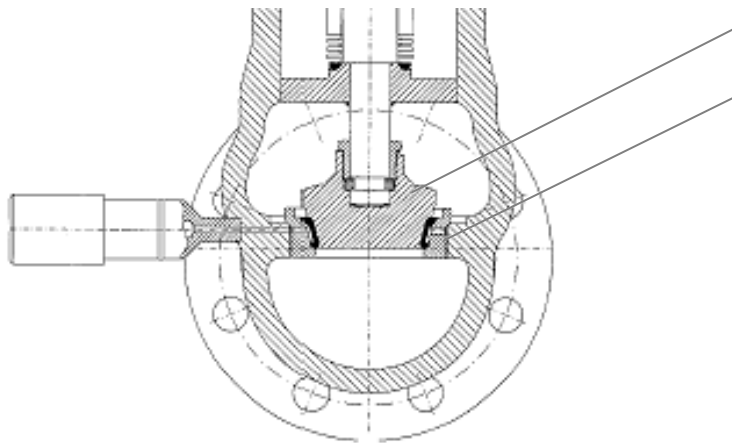


- Standard material for chlorine service: **A350 Gr. LF2** or **A352 LCC**
- Hydroformed, **multiple-wall design**
- **Minimum 50,000 full-stroke operations** at 38 DegC (100 DegF) valve rating
- **Welded** to bonnet and stem
- **Approved welders** and welding processes
- Bellows, upper and lower ring made from same material
- **Bellows** does not protract into flow path and is therefore **protected from direct impingement and abrasion**

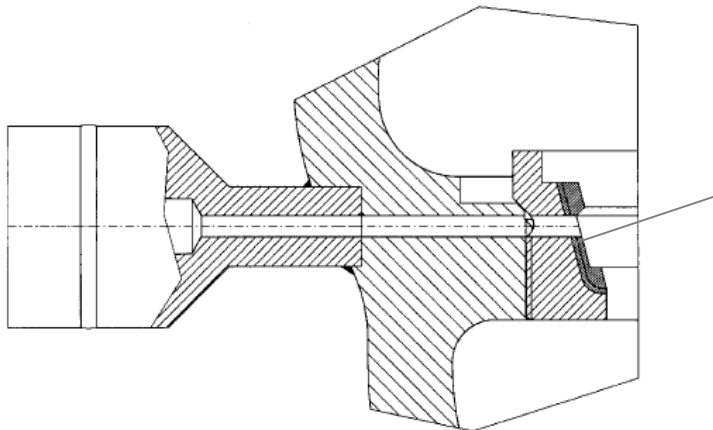


## Technical Details of Model 350EC4-5

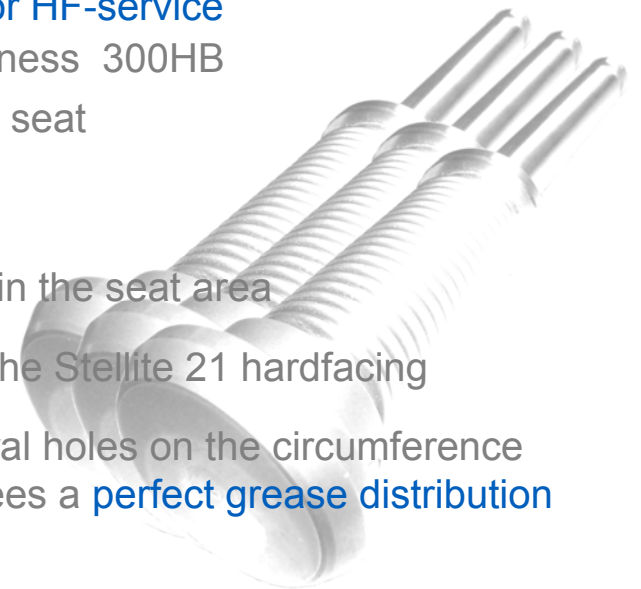
The standard disc-seat combination for chlorine service is an integral seat with a Stellite 21 hardfacing and a hardfaced Stellite 6 disc. A special disc-seat combination is selected and designed especially for HF service.



- 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

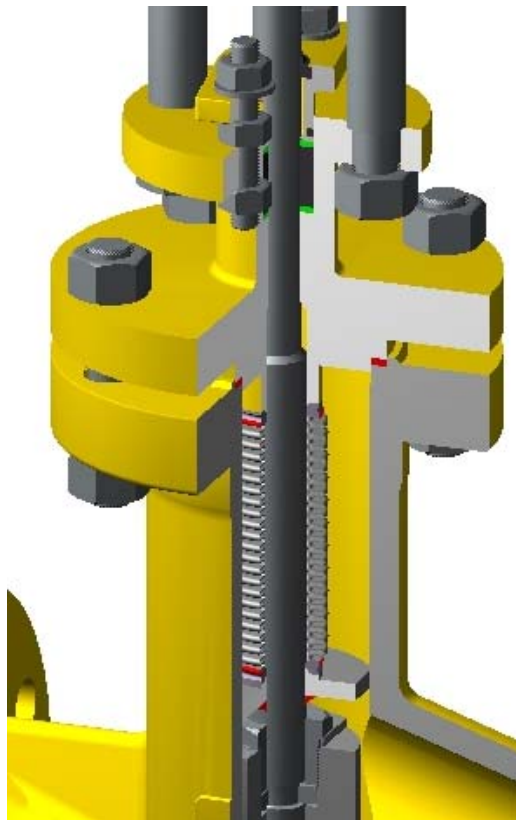


- Lubrication feature in the seat area
- Nickel layer below the Stellite 21 hardfacing
- A groove and several holes on the circumference of the seat guarantees a perfect grease distribution

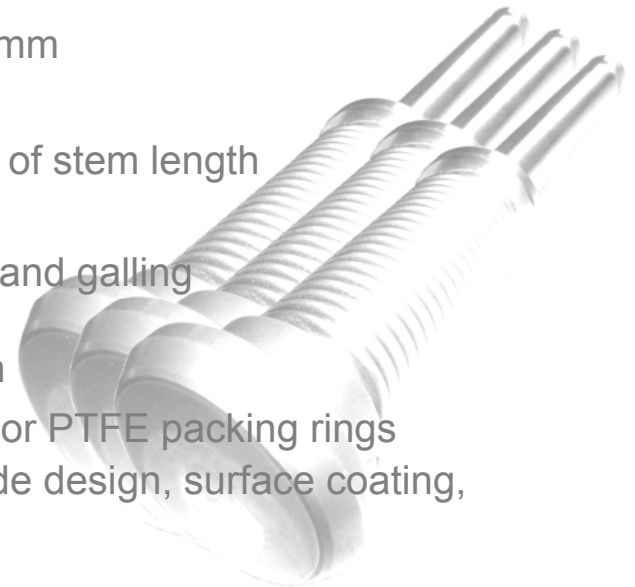


## Technical Details of Model 350EC4-5

The stem properties guarantee a perfect guide and lowest friction.



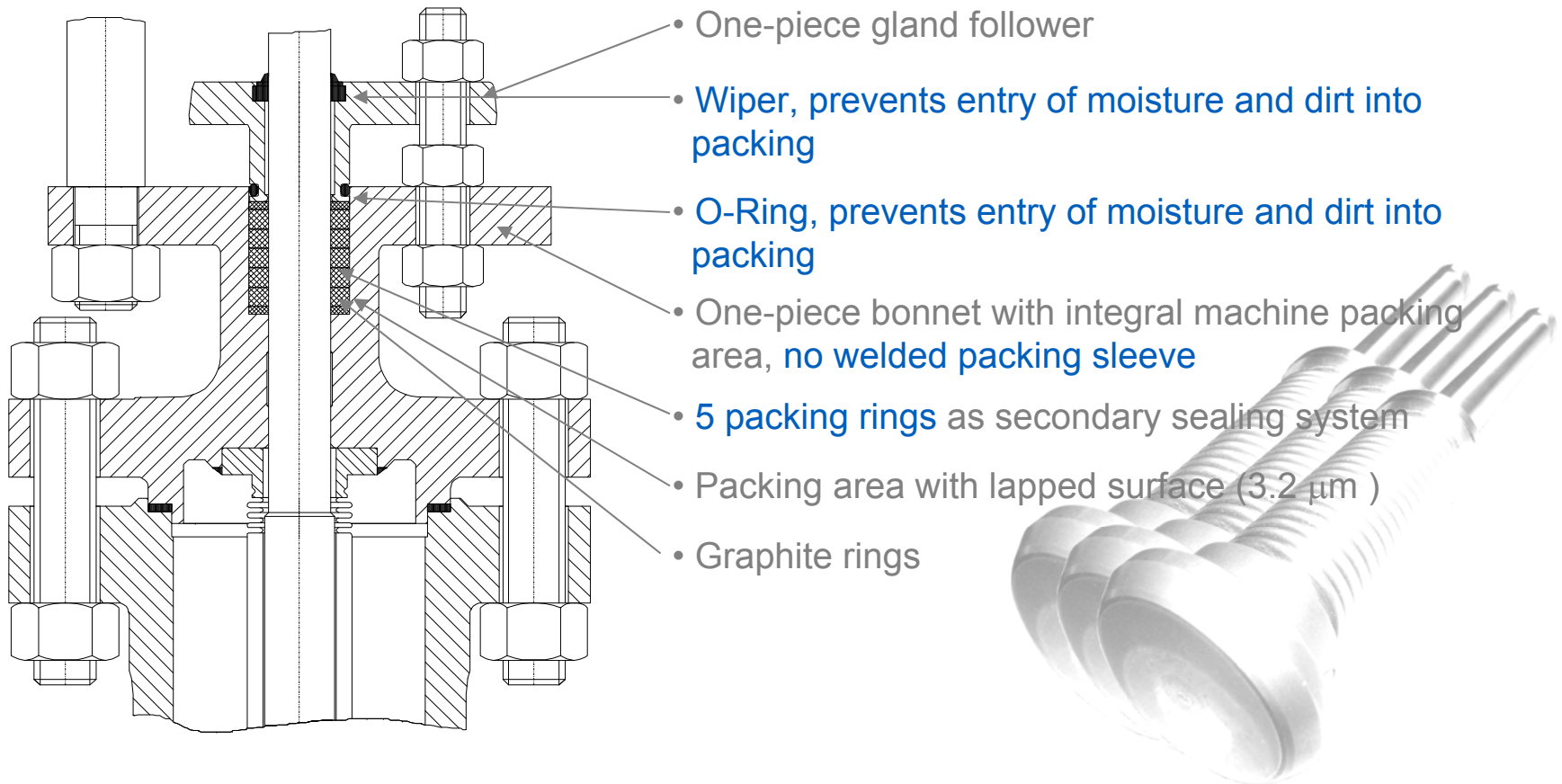
- Rising non-rotating stem
- Surface roughness  $0.4 \mu\text{m}$  (polished or cold rolled for improved hardness)
- Eccentricity  $< 0.01 \text{ mm}$
- Linearity  $> 0.005 \%$  of stem length
- Prevention of wear and galling
  - Material selection
  - Special Graphite or PTFE packing rings
  - Special stem guide design, surface coating, hardfacing





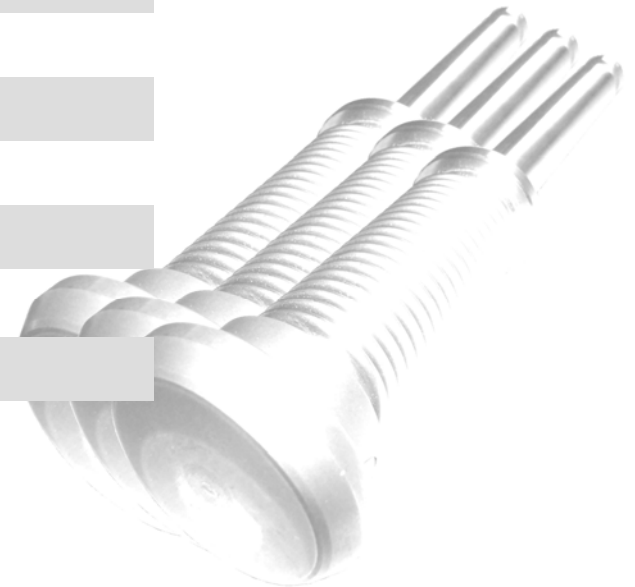
## Technical Details of Model 350EC4-5

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



## Standard Materials of Construction for 350EC4-5 for chlorine service

Part	Material
Body & Bonnet	A350 Gr. LF2 / A352 LCC
Integral seat with hardfacing	Stellite 21
Renewable disc	316Ti / A350 LF2
Disc hardfacing	Stellite 6
Bellows	Hastelloy C-276
Upper stem	A 276 Gr. 431
Lower stem	Hastelloy C-276
Handwheel	Cast iron / Steel
Packing	PTFE-Rings
Bolts	A320 Gr. L7/L7M
Nuts	A194 Gr. 4



## 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.

