

# Sealmatic Mechanical Seals



## Sealmatic Seals in the production of Bioethanol



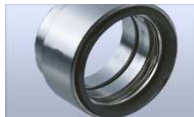
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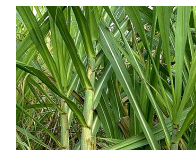
**4. Seal recommendations for standardisation**



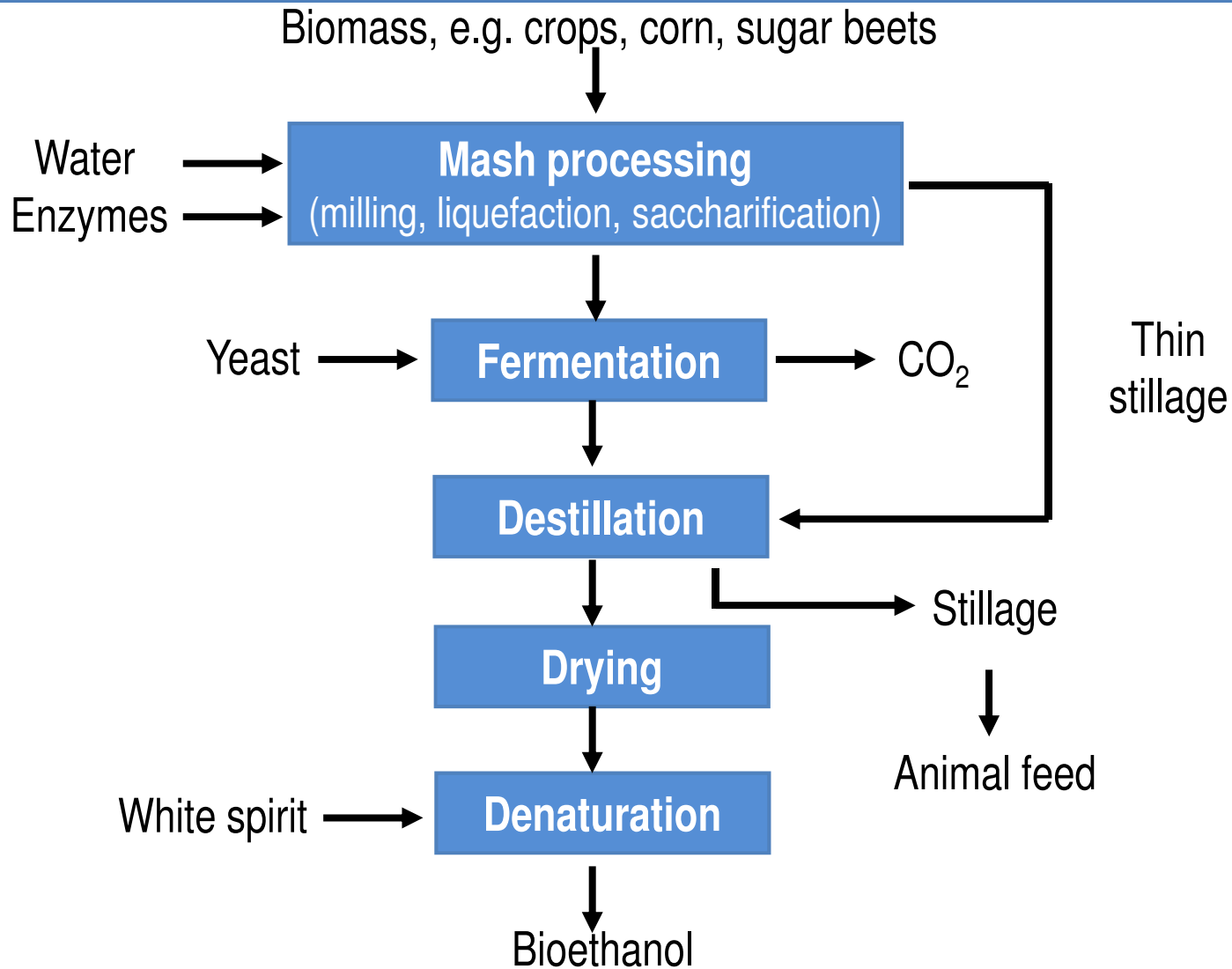
# General information

## What is bioethanol?

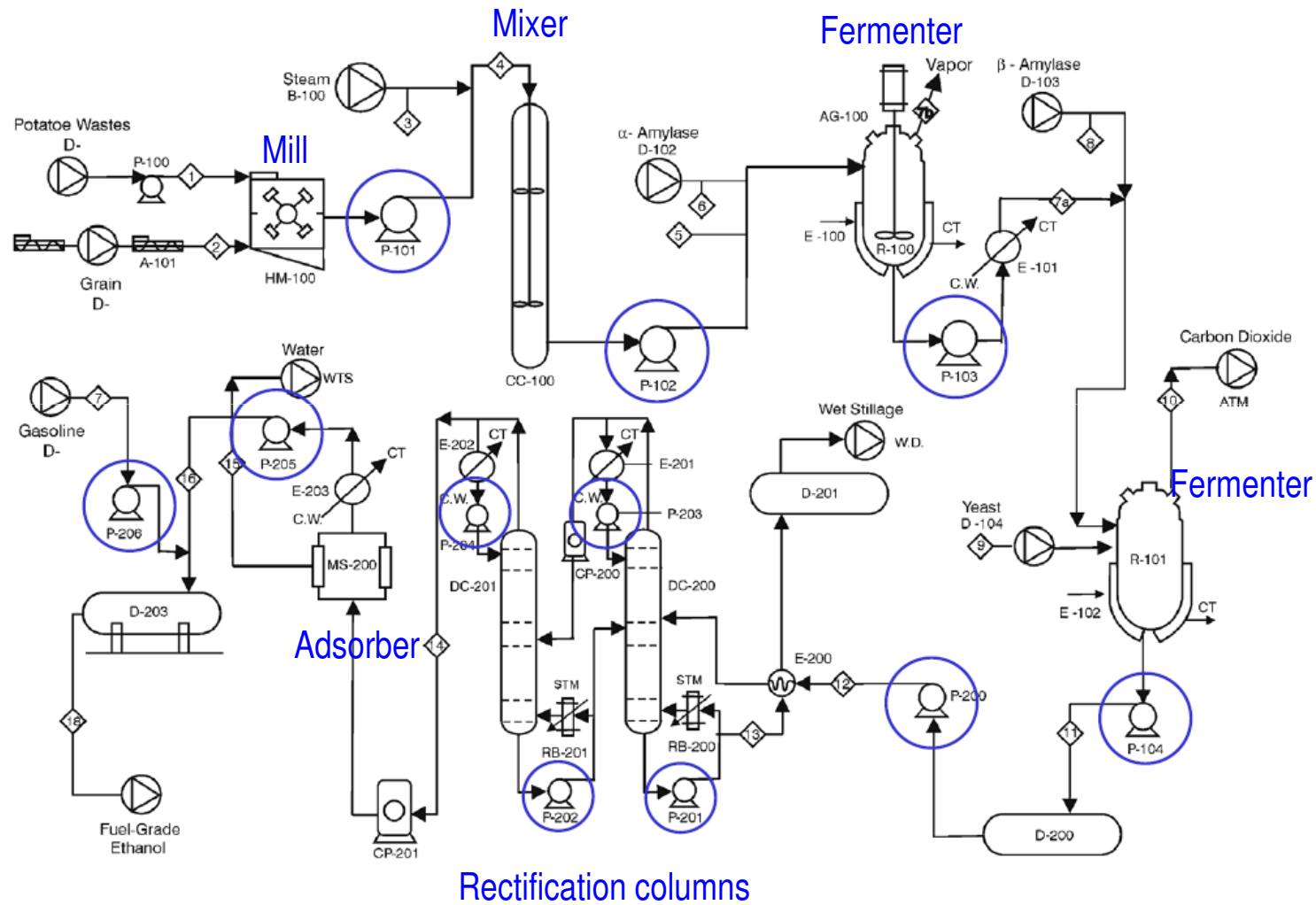
- Ethanol obtained by fermentation of biomass
- Main raw materials are all crops with a sufficient sugar resp. starch content as e.g. rye, wheat, barley, corn but also sugar beets or sugar cane
- Ethanol may be added to spark-ignited (Otto) fuel
- Further applications: Solvent, detergent, intermediate for the chemical industry
- By-product: Animal feed (DGS = Distiller's Grain with Solubles)



# Production process – Bioethanol



# Production process – Bioethanol (flow sheet)





# Mash - Properties

- **Appearance:** **Organic, alcohol and solids containing sludge**
- **Hazardous classification:** **None**
- **Viscosity (at 20°C):** **Low to high (dependent on concentration)**
- **Further remarks:** **Tendency to glue / solidify**



# Thin stillage, stillage - Properties

- Appearance: Organic, solids containing sludge
- Hazardous classification: None
- Viscosity (at 20°C): Low to high (dependent on concentration)
- Further remarks: Tendency to glue / solidify




# Enzyme solution, yeast solution - Properties

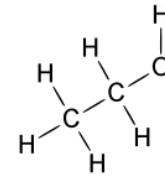
- Appearance: Organic, solids containing slurry
- Hazardous classification: None
- Viscosity (at 20°C): Low to high (dependent on concentration)
- Further remarks: Tendency to glue / solidify







# Ethanol - Properties

- Appearance: Transparent liquid
- Boiling point: 78,4 °C
- Melting point: -114,4 °C
- Hazardous classification: F: Highly flammable 
- Risk phrases: R11: Highly flammable
- Flash point: 12 °C
- Autoignition temperature: 425 °C
- Flammability range: 3,5 – 15 Vol% in air
- Vapour pressure at 20°C: 0,06 bar
- Density (20°C): ~0,79 g/cm<sup>3</sup>
- Viscosity (at 20°C): 1,2 mPas (1,52 mm<sup>2</sup>/s)



# White spirit - Properties

- Appearance: Transparent liquid with characteristic smell
- Chemical characterisation: Mixture of aliphatic / aromatic hydrocarbons mainly C8 – C12
- Boiling point range: 153 - 198 °C
- Melting point: < -15 °C
- Hazardous classification: Xn: Harmful   
N: Dangerous for the environment 
- Most important risk : R10: Flammable  
phrases  
R51/53: Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment  
R65: Harmful, may cause lung damage if swallowed



# White spirit - Properties

- Flash point: > 34 °C
- Autoignition temperature: 235 °C
- Flammability range: 0,6 – 8,0 Vol% in air
- Vapour pressure at 20°C: 4 mbar
- Density (20°C): 0,788 g/cm<sup>3</sup>
- Viscosity (at 20°C): 0,97 mPas (1,23 mm<sup>2</sup>/s)
- Further remarks:
  - Flammable, formation of explosive, highly flammable vapour-air mixtures possible
  - Keep away from ignition sources
  - Avoid contact with strong oxidants



# Standardisation – Why?

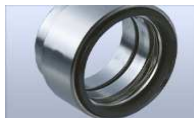
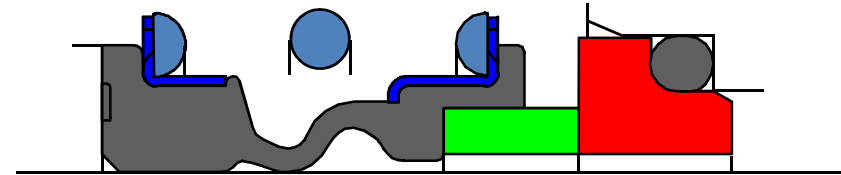
- ✓ **Advantages "standard" seals**
  - Proven technology
  - Short delivery times
  - Optimal cost-performance ratio
  
- ✓ **Advantages standardisation**
  - Reduction of parts diversity
  - Reduction of stock positions
  - Reduction of stock costs  
(administration effort, capital employed)



# Standardisation

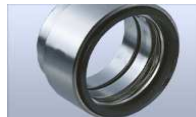
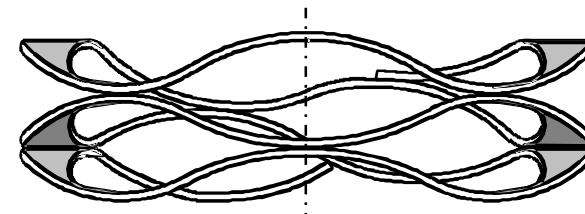
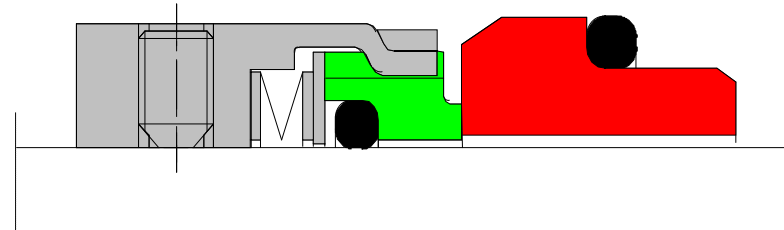
## Universal bellow seal

- UG100
- Single seal
- Materials: Q1Q1EGG
- Pressure limits: 0,5 up to 12 bar
- Temperature limits: -20 up to +120 °C
- Sliding velocity: max. 10 m/s
- Recommended seal for:
  - - Harmless media with low viscosity
  - - Certain content of solids possible
- Application examples:
  - Thin stillage, Enzyme solution, Yeast solution, Waste water, Mash with low viscosity



# Standardisation Component seal

- U700N
- Single seal
- Materials: Q1Q1M1GG
- Pressure limits: 25 bar
- Temperature limits: -50 up to +220 °C
- Sliding velocity: max. 20 m/s
- Not suitable for reversed pressure
- Recommended seal for:
  - Harmless media with low viscosity
  - No solids
- Application examples:
  - Clean ethanol

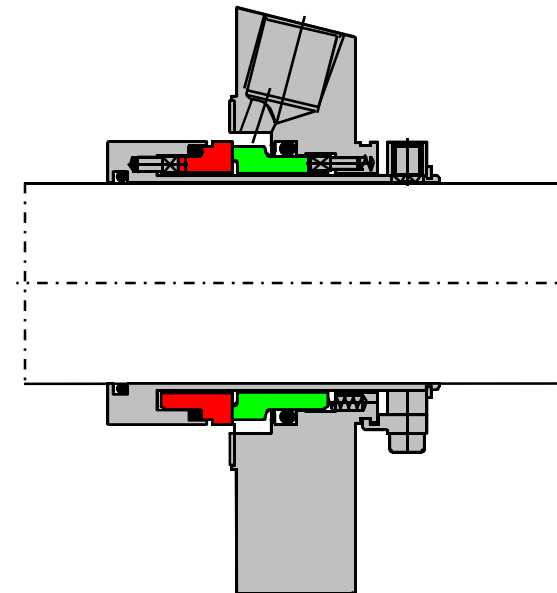




# Standardisation

## Cartridge seals

- CTX-SN
- Single seal
- Materials: Q1Q1KMG
- Pressure limits: 12 bar
- Temperature limits: -40 up to +220 °C
- Sliding velocity: max. 10 m/s
- Suitable for reversed pressure
- Recommended seal for:
  - Harmless media with low viscosity
  - No solids
- Application examples:
- Clean ethanol



# Standardisation Component seal

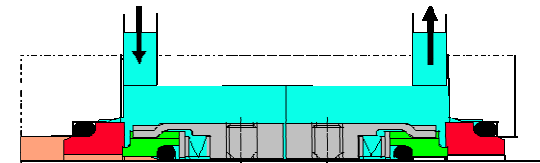
- U700N – U700N(F)
- Multiple seal
- Materials: Q1Q1M1GG-Q1BVGG
- Pressure limits: 25 bar
- Temperature limits: -50 up to +220 °C
- Sliding velocity: max. 20 m/s
- Plan: 52 (pressureless with tandem arrangement)  
resp. 53 (pressurized with back-to-back arrangement)
- Specific feature: Integral stationary seat lock at product side

## Recommended seal for:

- Media with higher viscosity
- Media containing solids
- Suitable for many chemicals

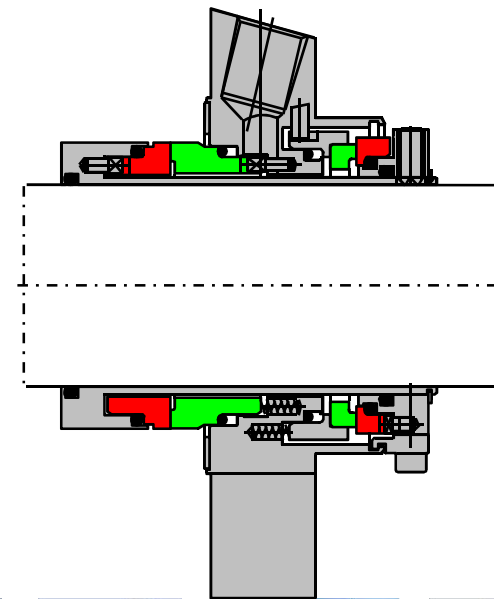
## Application examples:

Ethanol, Crude alcohol, Stillage,  
Mash with higher viscosity, White  
spirit



# Standardisation Cartridge seals

- CTX-DN
- Double acting seal (back-to-back)
- Materials: Q1Q1KMG-BQ1VMG
- Pressure limits: 20 bar
- Temperature limits: -40 up to +220 °C
- Sliding velocity: max. 10 m/s
- Plan: 52 resp. 53
- Suitable for reversed pressure
- Recommended seal for:
  - Media with higher viscosity
  - Media containing solids
  - Suitable for many chemicals
- Application examples:
  - Ethanol, Crude alcohol, Stillage,
  - Mash with higher viscosity, White spirit



# Standardisation

## Cartridge seals

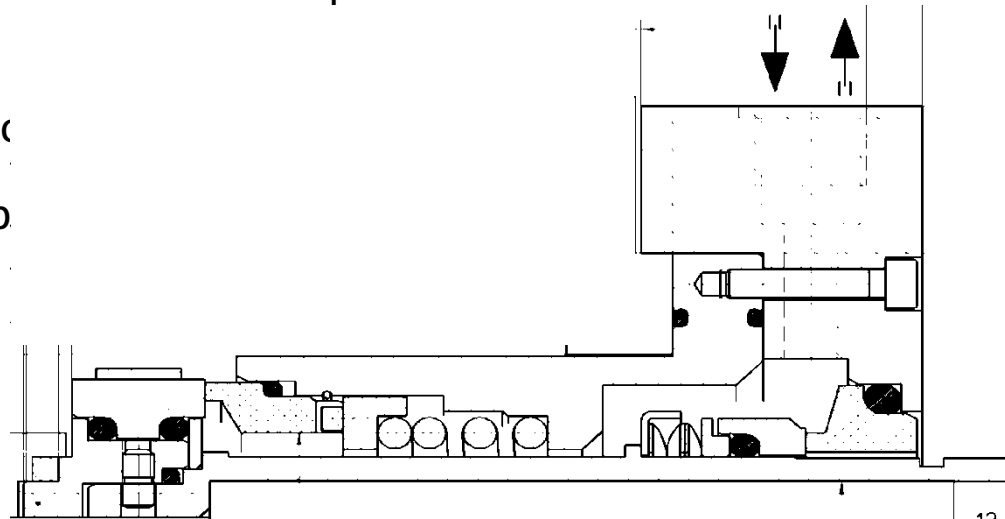
- BRZ + U300 or U700
- Multiple seal, back-to-back arrangement
- Materials: Q1Q1KGG-Q1BVGG
- Pressure limits: 16 bar
- Temperature limits: -20 up to +160 °C
- Sliding velocity
- Plan: 53 (p)

### Recommended seal for:

- Media with higher viscosity
- Media containing solids

### Application examples:

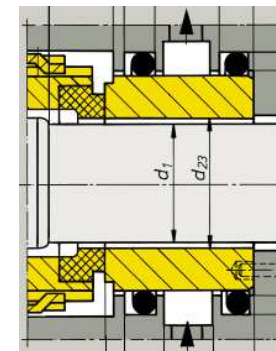
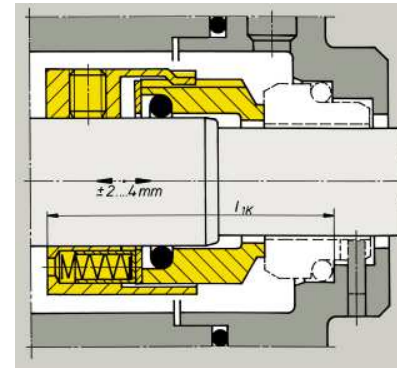
Stillage, Mash with higher viscosity,  
Crude alcohol



# Standardisation

## Hot water sealing

- B750N
- Single seal
- Materials: AQ1EGG
- Pressure limits: 40 bar
- Temperature limits: -50 up to +220 °C
- Sliding velocity: max. 20 m/s
- Not suitable for reversed pressure
- Recommended seal for:
  - - Hot water applications, e.g. condensate
- Option: Seat cooling



# Agitators in the production process of bioethanol

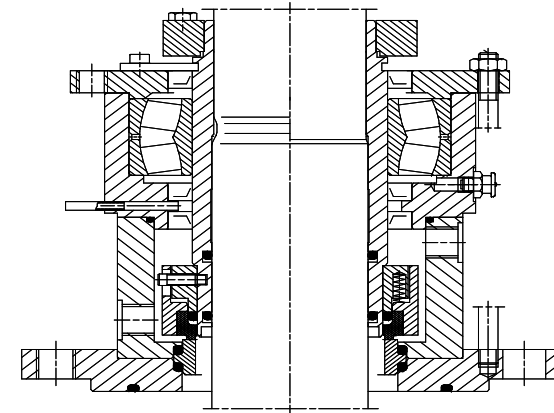
- Storage tanks with side entry → CTX-DN
- Mixer for the mash preparation → Single seal U184KL20
- Preparation tanks with top entry for the enzyme and yeast solutions → Single seal U184KL20
- Fermenter with top entry → Double acting seal U184KL-D20
  
- Typical operation conditions:
  - Atmospheric pressure
  - Temperatures <100°C





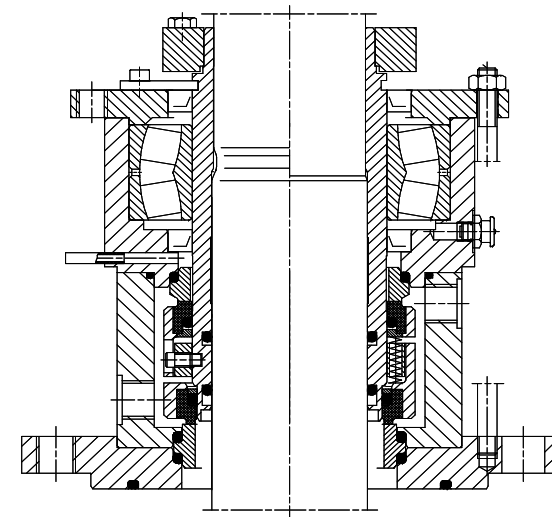
# Standardisation Agitator seals

- U184KL20
- Single seal with integrated floating bearing
- For top entry applications according to DIN
- Materials: BQ2M1/VGE
- Pressure limits: Vacuum up to 6 bar
- Temperature limits: -30 up to +150 °C
- Sliding velocity: max. 2 m/s
- Plan: 62
- Recommended seal for:
  - - Harmless media



# Standardisation Agitator seals

- U184KL-D20
- Double acting seal (back-to-back) with integrated floating bearing
- For top entry applications according to DIN
- Materials: BQ2M1GE – BQ2VGE
- Pressure limits: Vakuum up to 16 bar
- Temperature limits: -30 up to +200 °C
- Sliding velocity: max. 2 m/s
- Plan: 52 resp. 53
- Recommended seal for:
  - - Harmful media
- Application examples:
  - Fermenter



Your Partner for Sealing Technology

**Thank You**

