

<b>ANLAGEN</b>	<b>PILOT PLANTS</b>	<b>GRUPPE / ITEM</b>	<b>1</b>
<b>APPARATE UND ZUBEHÖR</b>	<b>APPARATUS EQUIPMENT AND DEVICES</b>	<b>GRUPPE / ITEM</b>	<b>2</b>
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Alle Angaben in diesem Katalog sind nach bestem Wissen zusammengestellt worden .  
Dies entbindet den Anwender nicht, die Einsatzbedingungen und –Möglichkeiten, wie auch Werkstoff / Material und Dimensionierung zu überprüfen. Irrtum und Änderungen vorbehalten.

All information given in this catalouge has been provided to the best of our knowleg and bilief.  
The foregoing does not inply the user to be released from examining the utilization and application of the material and dimension of the product question. Errors and Omissions Expected.

technical alterations possible 11/2003



## **COMPANY PROFILE**

### **Establishment**

**CETEC** – Chemical Equipment and Technology – **GMBH** was established in 1985. **CETEC** is an ideal partner for producing units intended for research, development and education, as well as for "kilo"/batch production (technical expression).

### **Consulting and Planning**

**CETEC** today, is specialised in providing Chemical Pilot Plants according to individual requirements, giving on-site advice, whereas the planning takes place in Leverkusen, Germany. Complete reaction plants are constructed by combining stirring vessels, filters, distillation apparatus, thin film evaporators, exhaust gas washers, etc. Additional components are e.g., pumps, vacuum apparatus, heating/cooling equipment as well as measuring, monitoring, controlling and regulating devices.

### **Quality and Safety**

The highest quality and safety standards can only be achieved by using optimum materials.

**CETEC** only employs materials which have undergone rigorous physical and chemical tests, e.g. borosilicate glass 3.3, enamelled steel, stainless steel (SS), alloys PTFE or product specific materials, rendering the plants versatile and profitable. The glass parts are manufactured and tested according to the highest German standards (ADM-N4). The steel parts are checked for leaks and/or must comply either with corresponding German (TÜV) regulations, or others e.g. (ASME ANSI, etc.) on request. Compliance with GMP and FDA regulations optional.

### **Innovation and Conformity**

The permanent contact with clients and experts guarantees active innovation and maximum conformity to customer requirements. The modular design of our units conforms to general guidelines and safety regulations and also complies with current environmental recommendations. Extensions and modifications to existing units to accommodate customers' growing demands, are unproblematic, thus ensuring years of service.

### **Construction and Pre-Assembly**

The components and units are designed resp. constructed according to customer requirements. In addition to our office in Leverkusen, we also have a small factory (approx. 250 m<sup>2</sup>) where the units are pre-assembled and can be inspected by the customer prior to delivery.

### **Assembly and Test Runs**

The partially dismantled units can be quickly re-assembled on site by the customer or by experienced **CETEC** employees. If required, **CETEC** specialists will instruct in operating the unit and assist in carrying out the test runs. **CETEC** employees will also assist in assembling units from other sources.

### **Consulting**

**CETEC** advises not only German but also foreign companies on the acquisition of high quality chemical plants including the relevant components and accessories. Due to their vast experience in this field, **CETEC** has a reputation as a reliable partner. Where there is a demand for second hand, operable units, such as stirring vessels, pumps, filters, heat exchangers, containers, valves, etc., **CETEC** can also offer assistance here.

### **General Information**

The following is a brief summary of our complete range. By means of the questionnaire you can let us know what you are interested in and we will be able to let you have a detailed offer. However, specific information is required.

LEV, April 2001

## Catalogue

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### **G 1 PLANTS (Photos)**

- 1.1 Reactor Unit with Vacuum Distillation
- 1.2 Reactor Unit with Spherical Vessel
- 1.3 Steam Distillation, Steam - Heating
- 1.4 Continuous Distillation for solvent recovery
- 1.5 Continuous Evaporation
- 1.6 Thin Film - Evaporator
- 1.7 Rotary Evaporator
- 1.8 Extraction Plant, Solids/Liquids
- 1.13.1 Exhaust Gas Washer
- 1.13.2 Exhaust Gas Washer (Venturi)
- 1.14 Crossflow-Filtration
- 1.15.1 Crystallization Unit, Type OSLO
- 1.20 OZONE- Process Technology and Equipment

### **G 2 Equipment / Apparatus and Accessories (Photos)**

- 2.0.1 Questionnaire – Mixing Vessel
- 2.0.1.1 Questionnaire – Accessoires – Mixing Vessel
- 2.0.2 Questionnaire – Distillation of Solvents
- 2.0.3 Questionnaire – Thin-Film-Evaporator
- 2.0.4 Questionnaire – Gas-Washer (Absorber)
- 2.0.4.1 Questionnaire – Gas-Washer (Absorber)
- 2.0.5 Questionnaire – Suspension Filtration
- 2.0.6 Questionnaire – Absorption of Aérosols
- 2.0.6.1 Questionnaire – Absorption of Exhaust Gas (Solvents)
- 2.0.7 Questionnaire – OZONE-Equipment & Process Technology
- 2.0.8 Questionnaire – Treatment of waste water
- 2.0.9 Questionnaire – Treatment of crude water
- 2.100.1 Questionnaire – for the Quotation of a production line or machinery
- 2.1.1.1 Glass Mixing Vessel with/without jacket (casing)
- 2.1.2.1 Combined Stirring Vessel with observation zone, for Labs- & Pilot plant
- 2.2.1 CETEC- Thin Film Evaporator DN 25/230 cm<sup>2</sup>
- 2.2.2 CETEC- Thin Film Evaporator DN 50/475 cm<sup>2</sup>
- 2.4.1 Exhaust Gas Washer Borosilicate glass 3.3
- 2.5.1 Glass Filter Strainer with PTFE-/PP- or SS-filter bottom
- 2.6.1 Vertical Peeling Centrifuge Type V 50 U and V 63 U
- 2.7.1 OZON-Generators for Laboratory and Industry
- 2.10.1 Agitators – Actuators for GRB and CRB up to 50 L
- 2.11.1 Stainless Steel Stirring Propeller three blade steel casting unit
- 2.11.1.1 High-grade steel anchor-/propeller and PTFE diagonal sheet-/ turbine-agitator
- 2.12.1 Mechanical Seal with PTFE-bellow and Al<sub>2</sub>O<sub>3</sub>-counter
- 2.15.1 Glass covers (hoods)
- 2.15.2 Cylindrical Vessel
- 2.15.3 Reaction Vessel
- 2.15.3.1 Reaction Vessel with jacket/beaker shape
- 2.15.4 Spherical Vessel
- 2.15.6 Column with metering nozzle
- 2.15.7 Reflux divider DN 80/100 &150 - manual controls
- 2.16.6 Laboratory-Tower-Packing of glass, ceramics and stainless steel
- 2.16.7 COLUMN PACKING made in ceramic

- G 3**            **Heat Exchanger / Oil-Thermostat (Photos)**
  - 3.0.1            Questionnaire – Heat Exchanger
  - 3.1.1            Heat Exchanger, Coil condenser with / without jacket (glass)
  - 3.2.3            Bayonet Heater in SS, Single tube for glass equipment DN 80
  - 3.2.3.1          Bayonet Heater for glass apparatus DN 150 - DN 300
  - 3.2.4            Coil Heat Exchanger in SS for glass apparatus DN 150 - DN 300
  
- G 4**            **Pumps (Photos)**
  - 4.0.1            Questionnaire – Pumps
  - 4.3.3            Vacuum Pump Unit
  
- G 5**            **Pipes, Valves and Filter (Photos)**
  - 5.1.1            Flanges for Glass Apparatus Connections/dimensions and types)
  - 5.1.2            Glass tubing (straight, elbows ...)
  - 5.1.3            Glass tubing (U / T / + ...)
  - 5.1.4            Glass tubing (spec. ...)
  - 5.2.1            Valves in BSG 3.3
  - 5.2.2            Pipeline-Filter in BSG 3.3
  - 5.2.3            Graphite-Bursting Discs
  
- G 6**            **Flexible Hoses and Bellows**
  - 6.0.1            Questionnaire – Hosepipes
  - 6.1.1            PTFE- Convuluted Hose highly flexible (PWS)
    - 6.1.1.1          Fittings for PTFE convuluted hose
    - 6.1.2            PTFE Chemical Convuluted Hose high flexible/without braiding (FCS)
      - 6.1.2.1          Fittings for FEP convuluted hose
    - 6.1.3            FEP Convuluted Hose highly flexible / transparent / without braiding (FWS)
      - 6.1.3.1          Fittings for FEP convuluted hose
  - 6.1.4            Plastic tubes / Hoses PE / PA / PVDF / PFA / PTFE
  - 6.2.1            PTFE High Pressure and high temperature hoses (PHS)
  - 6.2.4            Silicone High Temperature Hoses (SHS)
  - 6.5.1            PTFE Heavy Duty Expan. Bellow (PHK)
  - 6.5.2            PTFE- Flange Expansion Joint acc. to DIN/PN 10 (PFF)
  - 6.5.3            PTFE Bellows Acc. to DIN/ISO 3587 (PFB)
  - 6.5.4            PTFE Bellows – DUO for facing acc. to DIN/ISO 3587 (PFD)
  
- G 7**            **Flanged Joint; Fittings, Couplings etc.**
  - 7.1.5            Backing flange DIN/ISO (PN 10) for Glass tubing with Collar Flange
  - 7.4.1            CAM ACTION Couplings for Hoses - with varied connection possibilities
    - 7.4.1.1          CAM ACTION Couplings for Hoses - Dimensions for all parts
  - 7.8.1            Metal Adapter for transition onto glass tubing
  - 7.8.4            Reducing Bush for DIN-Flange Glass- SS Tubing – PN 10
  - 7.8.5            COMPRESSION SPRINGS for glass couplings



**Catalogue**

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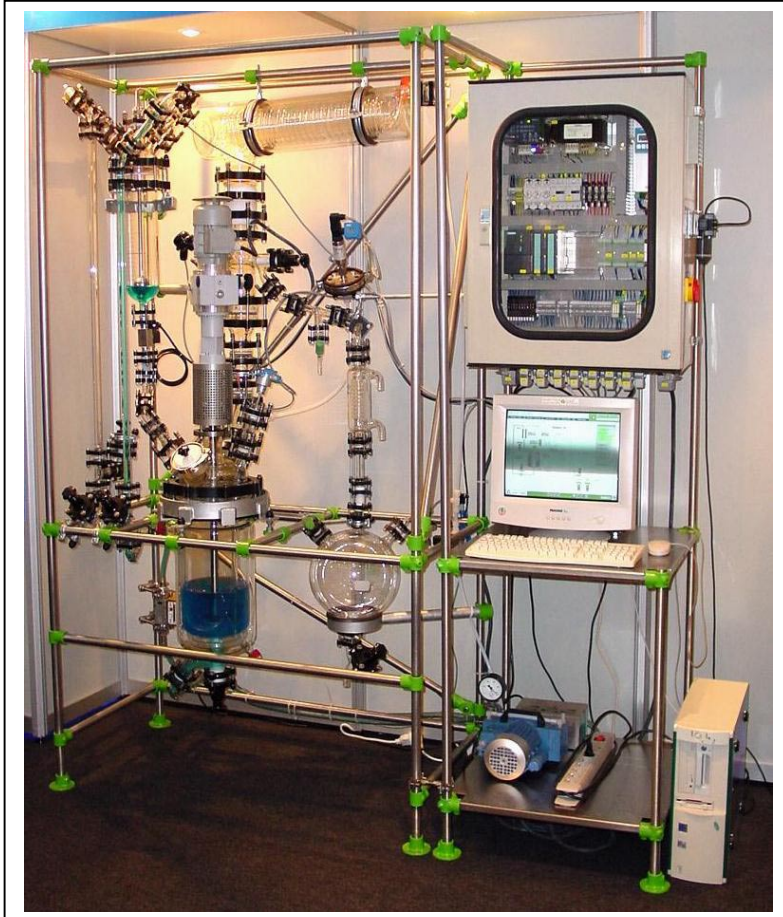
- G 8            Gaskets & Seals**
  - 8.0.1            Questionnaire – Seals / Packing
  - 8.1.1.2         Flat Seals / Gaskets According to DIN 2690 /...91 /...92
  - 8.1.1.3         PTFE Flat Seals / Gaskets DIN 2690 with perforated stainless steel inlays
  - 8.1.2            PTFE Envelope Gasket
  - 8.1.2.1         PTFE Envelope Gasket Envelope shapes and inserts
  - 8.1.3            PTFE Glass Flange Seal for facing acc. to DIN/ISO 3587
  - 8.1.4            PTFE Grooved Seal for facing according to DIN/ISO 3587
  - 8.2.1            PTFE Adapter Ring for facing according to DIN/ISO 3587
  - 8.2.2            Mould Seal for rapid action hose coupling (SSK)
  - 8.2.3            Form Seal for DIN 11851
  - 8.3.3            FEP / PFA – encapsulated-O-Ring full – or hollow core
  - 8.3.3.1         FEP / PFA – O-Rings Installation, dimensions, details
  - 8.4.1            Levlon-Soft-Seal – Flat Sealing Tape of expanded PTFE
  - 8.4.2            PTFE Threaded Sealing Tape of pure expanded PTFE
  - 8.5.1            PTFE Glass Enamel Gasket for DIN connection
  - 8.5.2            Protecting Collar for filter flaks
  
- G 9            Measuring-/Control-/Conduction-Process Techniques**
  - 9.1.1            Resistance Thermometer with safety glass tube (BSG 3.3)
  - 9.1.2            Resistance Thermometer with casing tube (BSG 3.3)
  - 9.1.2.1         Read thermometer with casing tube
  - 9.1.3            Glass Flow Meter with floater
  - 9.1.5            Diaphragm Pressure Gauge 0 - 1,5 bar with PTFE – lining/coating
  - 9.4.1            Level Gauge in Stainless Steel with transparent FEP-/ PFA-lining
  - 9.4.2            Level Control – Inductive
  - 9.6.1            PTFE Thread Adapter for glass tubing with collar flange
  - 9.6.1.1         PTFE Thread Adapter Installation details
  - 9.7.1            EX Proof Lampe Series USL-06/75 Ex
  
- G 10          Framework, Pipe support and Accessories**
  - 10.1.1          Rack Pipe Connectors for Rack / Storage / Railing Construction
  - 10.1.1.1        Rack Pipe Connectors Application and Construction Examples
  - 10.1.1.2        Rack-Pipe-Connectors for Rack-/Shelf-/Storage-/Platform-/Railing-/Construction
  - 10.1.1.3        Rack-Pipe-Connectors for Rack-/Shelf-/Storage-/Platform-/Railing-/Construction
  - 10.1.5          Supporting Ring for Glass tubing – flange couplings
  - 10.1.6          Trifurcate Support for Glass tubing – flange couplings
  - 10.1.7          Supporting Ring for Glass Cylinder e. Spherical Vessel
  - 10.2.1          Pipe clamps for glass pipes with Gi(Rubber) - or Si(Silicon)-insert
  
- G 11          Technical Data and Developments**
  
- G 12          Terms and Conditions of Sale**



**MPU mit GRB 15 I und SPS 7**  
**Glass Multi Purpose Equipment 15L with SPS 7**

**Gruppe / Item 1.1-1**

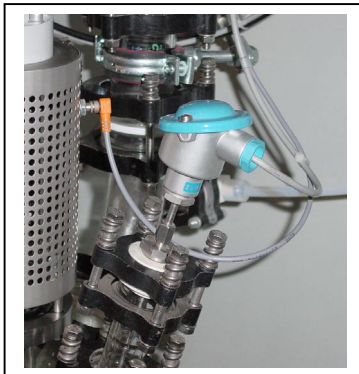
**Anlage GRB 15 I mit Glasaufbauten und PC-Steuerung**  
**Glass-Equipment GRB 15 I with PC + Electric-Panel**



**PC mit Schaltschrank incl. S7-SIEMENS und Thyristor für Motordrehzahl**  
**PC with Electric-Panel + S7 (SIEMENS) and Thyristor for Motorspeed-Control**



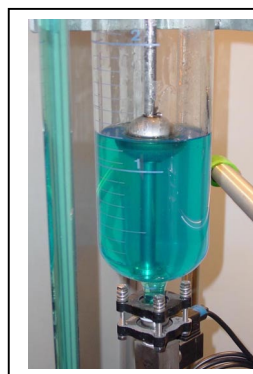
**PT 100 und Drehzahlsensor**  
 Temperature + Speed-Control



**Durchflussmesser**  
 Flow-Control



**Niveaumessung**  
 Level-Control



**Druckmessung**  
 Pressure-Control

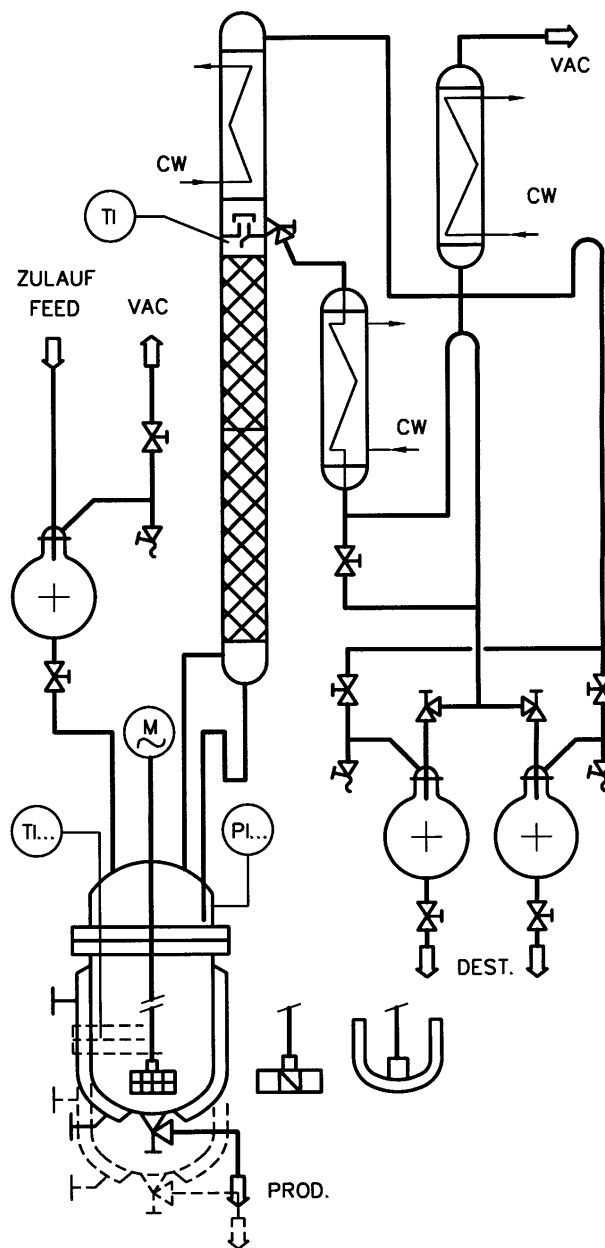


**Reactor:**

- Vessel (10-100 l) made of glass, enamel, stainless steel or combined (see catalogue sheet 2.1.1 / 2.1.2)
- Stirrer with fixed / variable speed
- PTFE / VA-shaft with turbine, impeller or anchor
- Unit cpl. with feed, column, condensers, product cooler, interchangeable container, heating and cooling circuit, measuring and control equipment
- mounted in a pipe framework (galvanized steel or SS)

**Measuring and control equipment:**

- Switch box cpl. with:
- Temperature adjuster
- Stirrer speed control
- Vacuum control etc.
- Explosion – proof model



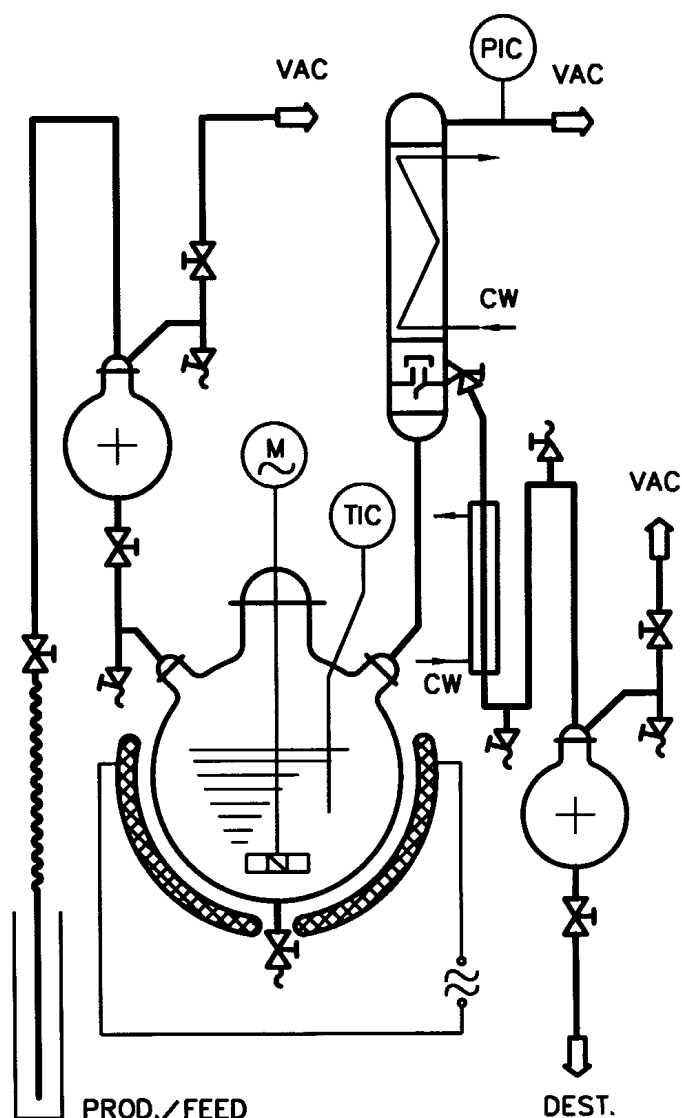
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**Reactor:**

- Glass spherical vessel (10-100 l) with various accessories (feed, collectors, condenser, product cooler, etc.)
- Stirrer with fixed / variable speed or speed adjuster
- PTFE-stirrer shaft with turbine, impeller or anchor. Shape special stirrer for liquids with high viscosity with metal stirrer shaft
- Unit is complete with feeding vessel, column, condenser, product cooler, changeable collector vessels, heating / cooling circuit as well as measuring and controlling devices
- Electrical heating device (EX)
- Mounting in pipe framework (galvanized steel or SS)

**Measuring and control equipment:**

- Switch box cpl. with:
- Temperature adjuster
- Stirrer speed control
- Vacuum control etc.
- Explosion – proof model



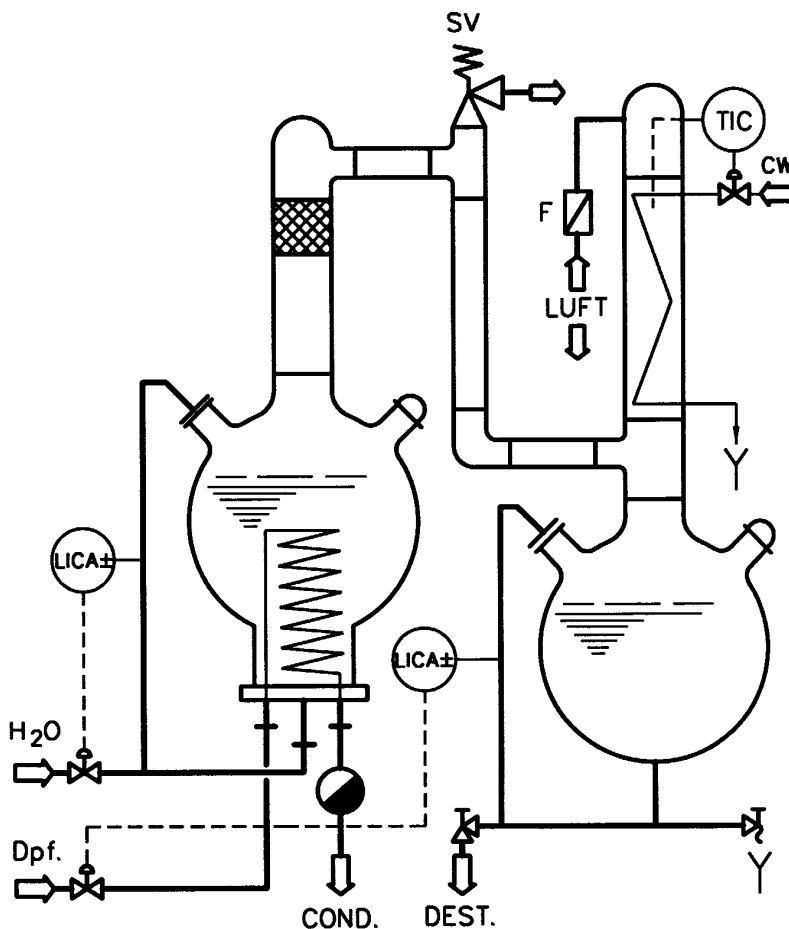
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**Reaction Vessel:**

- Spherical flask up to 50 l with electric or steam heating, capacity up to 100 l/h
- For the pharmaceutical industry sterile and pyrogenic free, water bi-distillation possible
- Installation cpl. with SS-heater, aeration filter, measuring and control devices
- Mounted in a pipe framework (galvanized steel or SS)

**Measuring and control equipment:**

- Switch box cpl. with:
- Temperature adjuster
- Level control
- Vacuum control etc.
- Explosion – proof model



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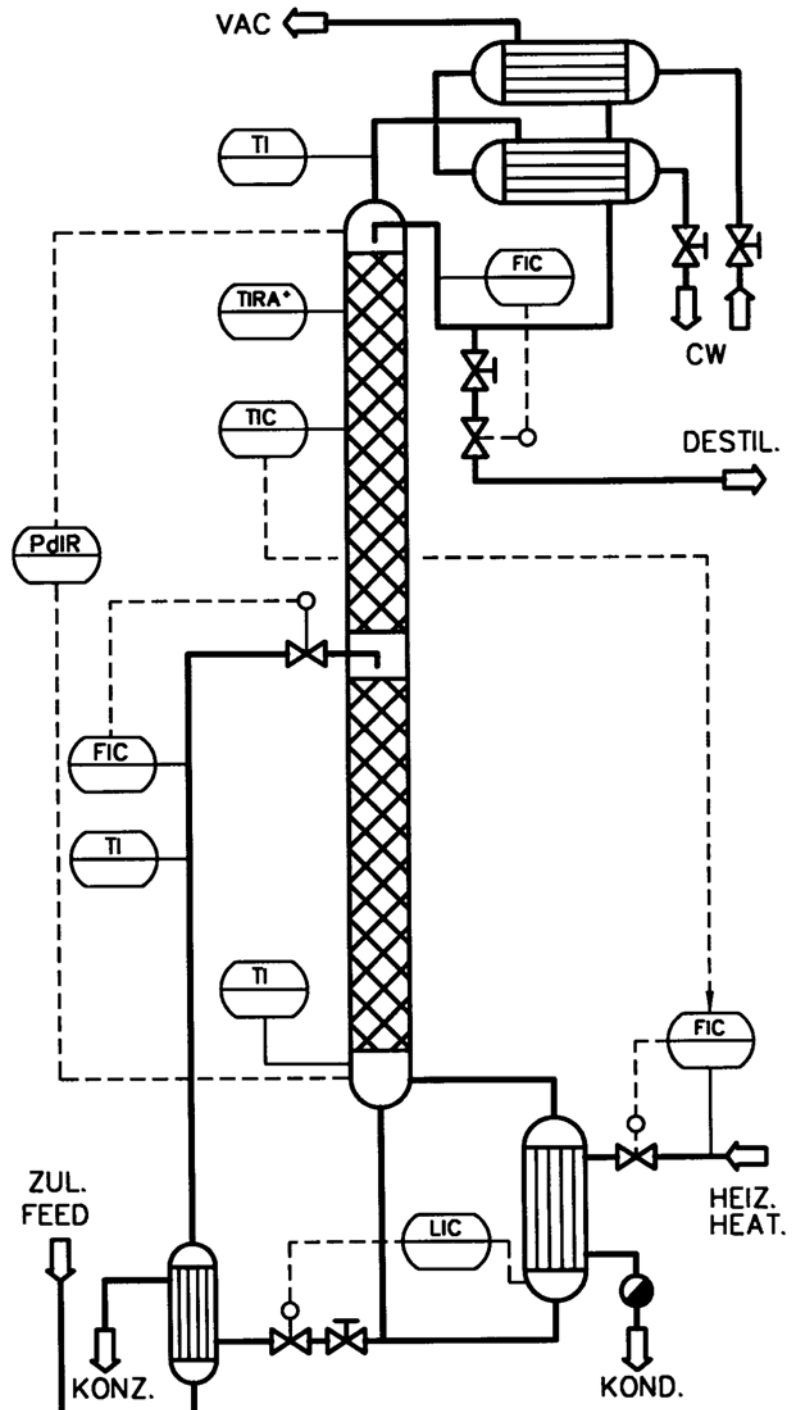


**Distillation column:**

- Packed column / packing
- Stainless steel or other material
- Heating by self-circuited evaporator
- Heated by steam and various heat transfer media
- Mounted in a pipe framework (galvanized steel or SS)

**Measuring and control equipment:**

- Switch box cpl. with:
- Flow metering for feed and re-flux divider
- Steam control
- Temperature limit with alarm for maintenance of quality
- Vacuum control etc.
- Explosion – proof model



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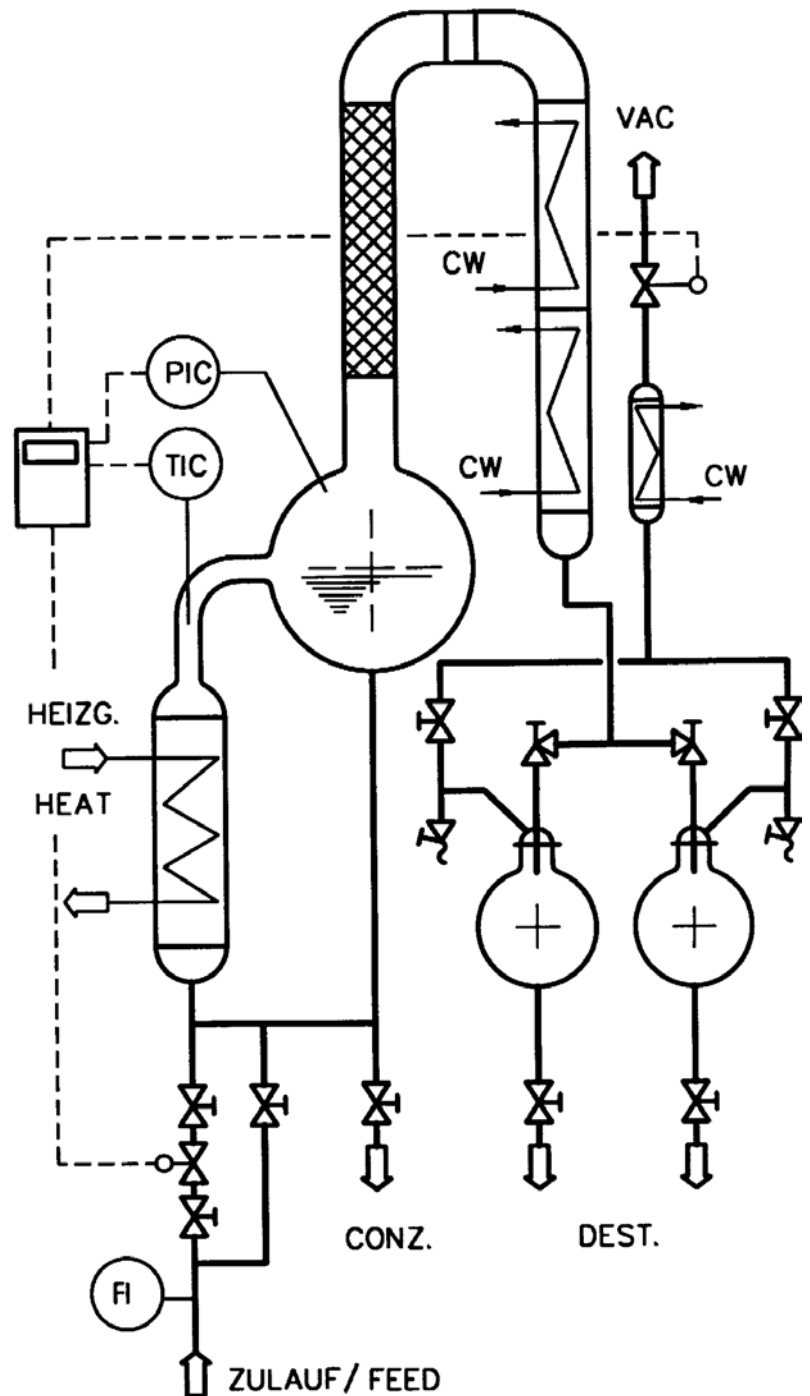


## Distilling flask:

- Glass equipment (10-100 l) cpl. with accessories
- Heater made of glass or metal
- Heating by self – circuiting evaporator
- Heated by steam and various heat transfer media
- Mounted in a pipe framework (galvanized steel or ss)

## Measuring and control equipment:

- Switch box cpl. with:
- Flow metering
- Feed control by temperature measurement in heater
- Vacuum regulation etc.
- Explosion – proof model



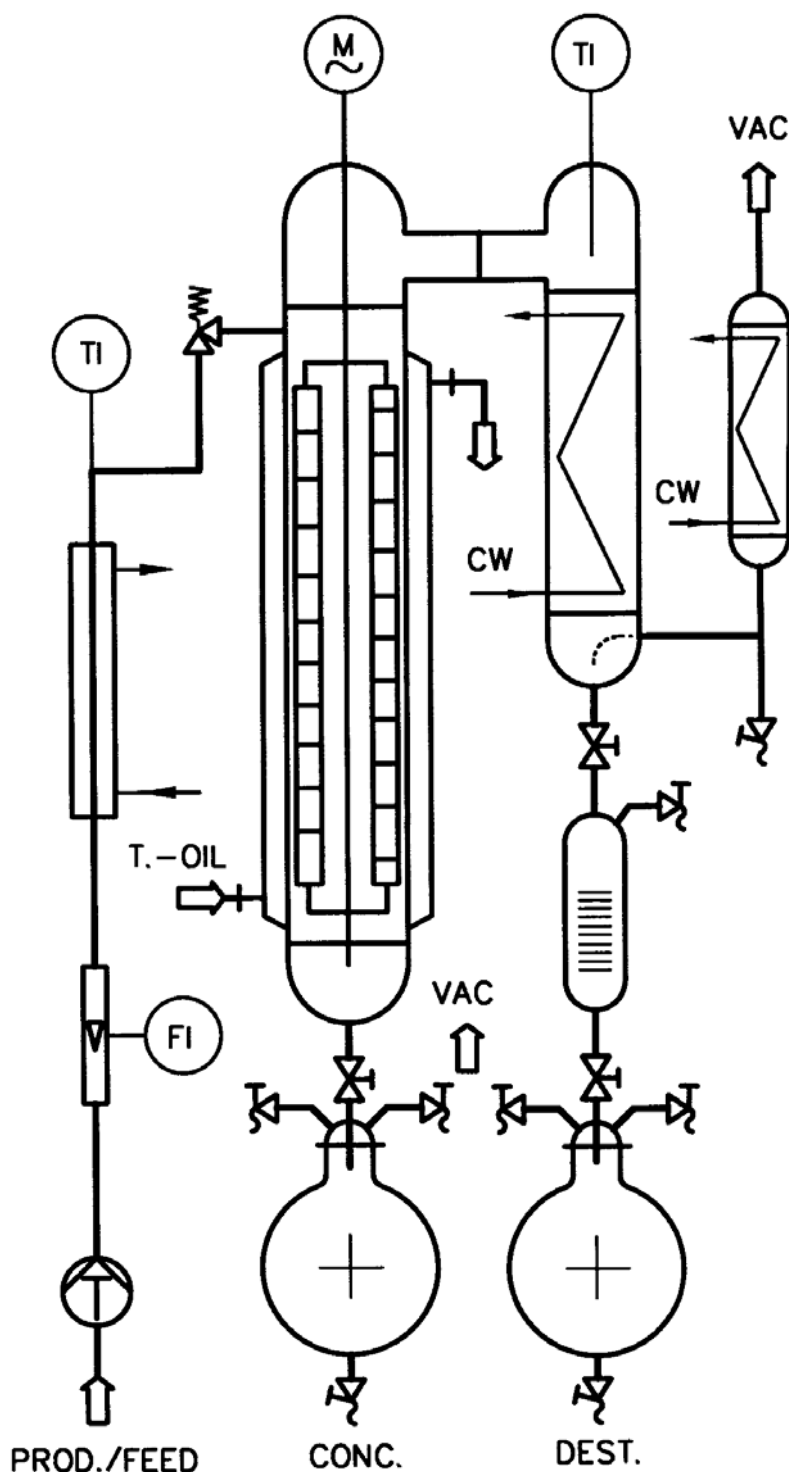
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**Evaporator:**

- Size DN 25-150; PTFE rotary wiper with variable speed (r.p.m.) (see catalogue sheet 2.2..)
- Material: borosilicate glass 3.3, PTFE, stainless steel etc.
- Installation cpl. with dosage pump, heating device, measuring as well as pipe framework equipment control
- Mounted in a pipe framework (galvanized steel or SS)

**Measuring and control equipment:**

- Switch box cpl. with:
- Temperature adjuster
- Rotary wiper speed
- Measurement of the feed and jacket temperature
- Vacuum regulation etc.
- Explosion – proof model



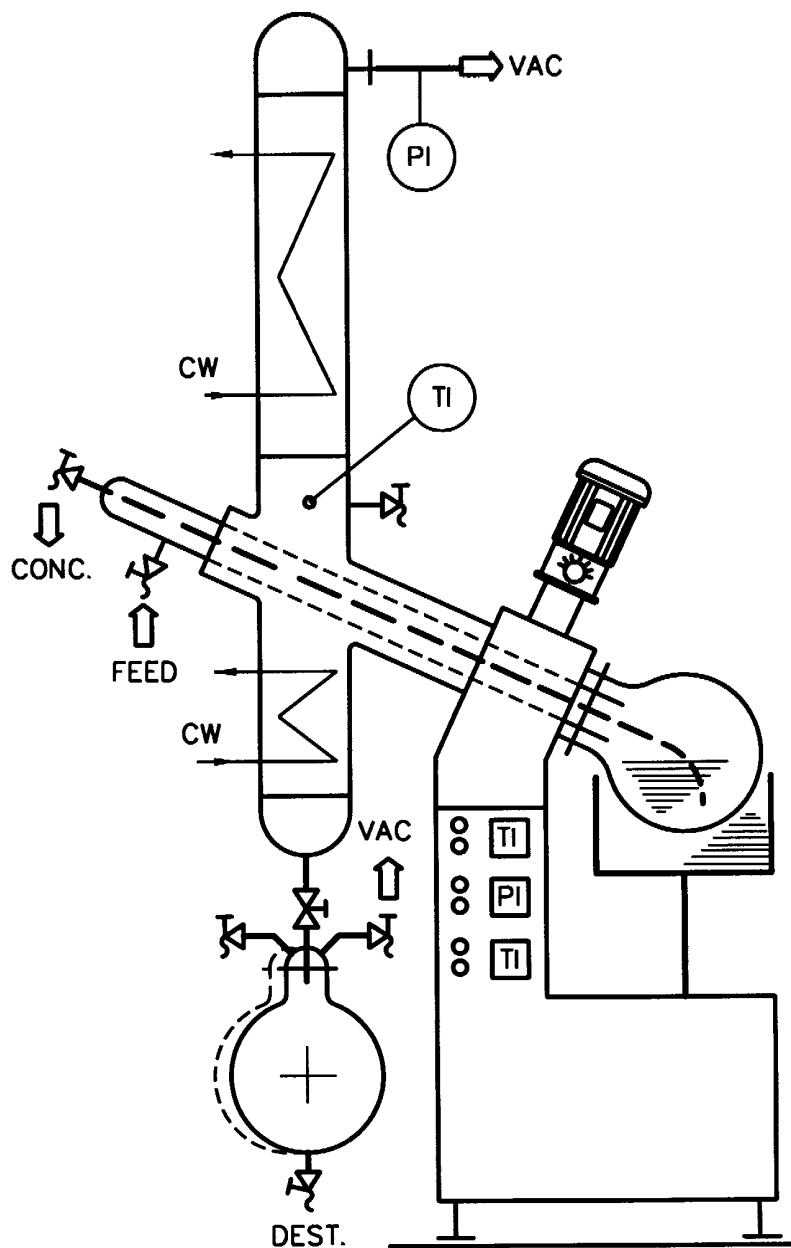
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## Rotary evaporator:

- Evaporator flask (10-100 l) with variable RPM
- Material: borosilicate glass 3.3, PTFE etc.
- Device cpl. with oil / water bath (lowerable), condenser, collecting vessels, measuring and control equipment, accessories

## Measuring and control equipment:

- Built in control console with temperature regulator
- Vacuum – control etc.
- Explosion – proof model



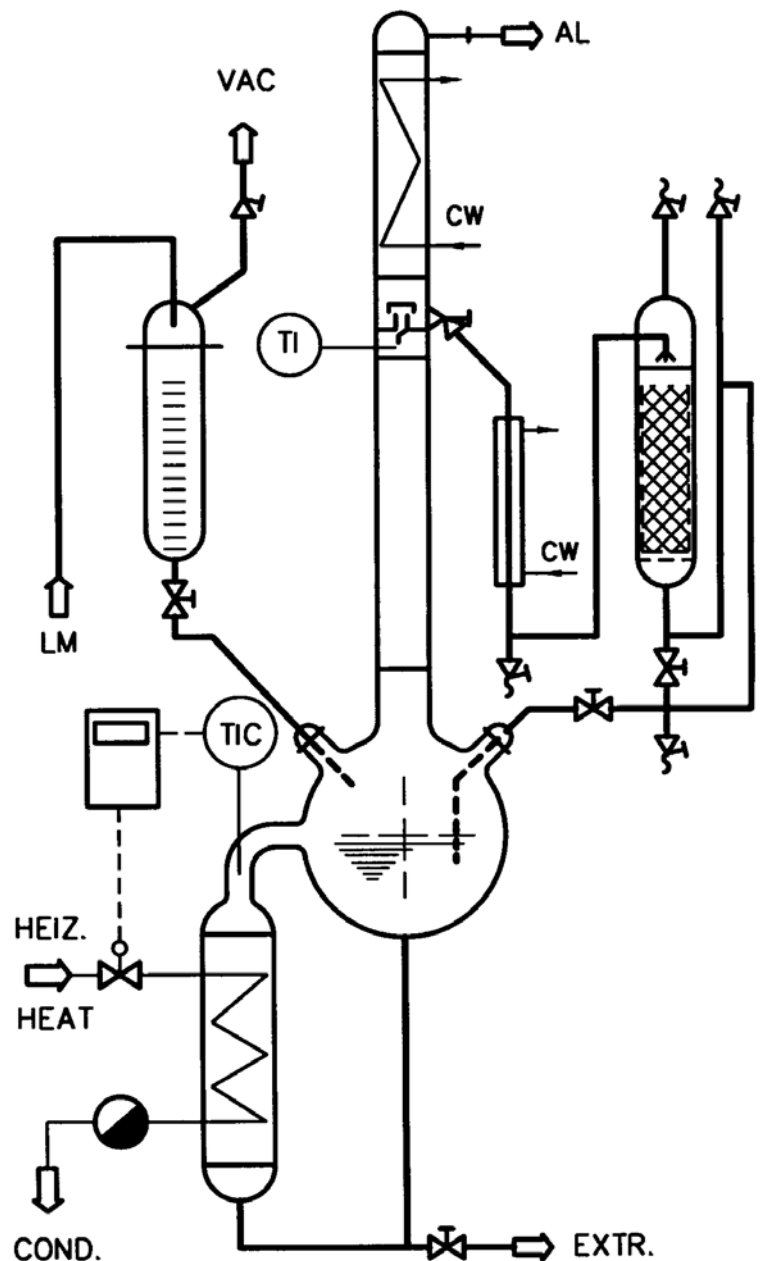
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**Extraction:**

- Continuous evaporator (10-100 l) with heater made of glass or metal
- Multiple extraction vessel (5-50 l) also available for simultaneous extraction
- Extraction as per soxhlet or in through-flow with cold / hot solvents
- Further distillation after extraction possible, to obtain stronger concentrate
- Installation cpl. with measuring and control equipment
- Mounted in a pipe framework (galvanized steel or ss)

**Measuring and control equipment:**

- Switch box cpl. with:
- Temperature regulator
- Yale control
- Explosion – proof model



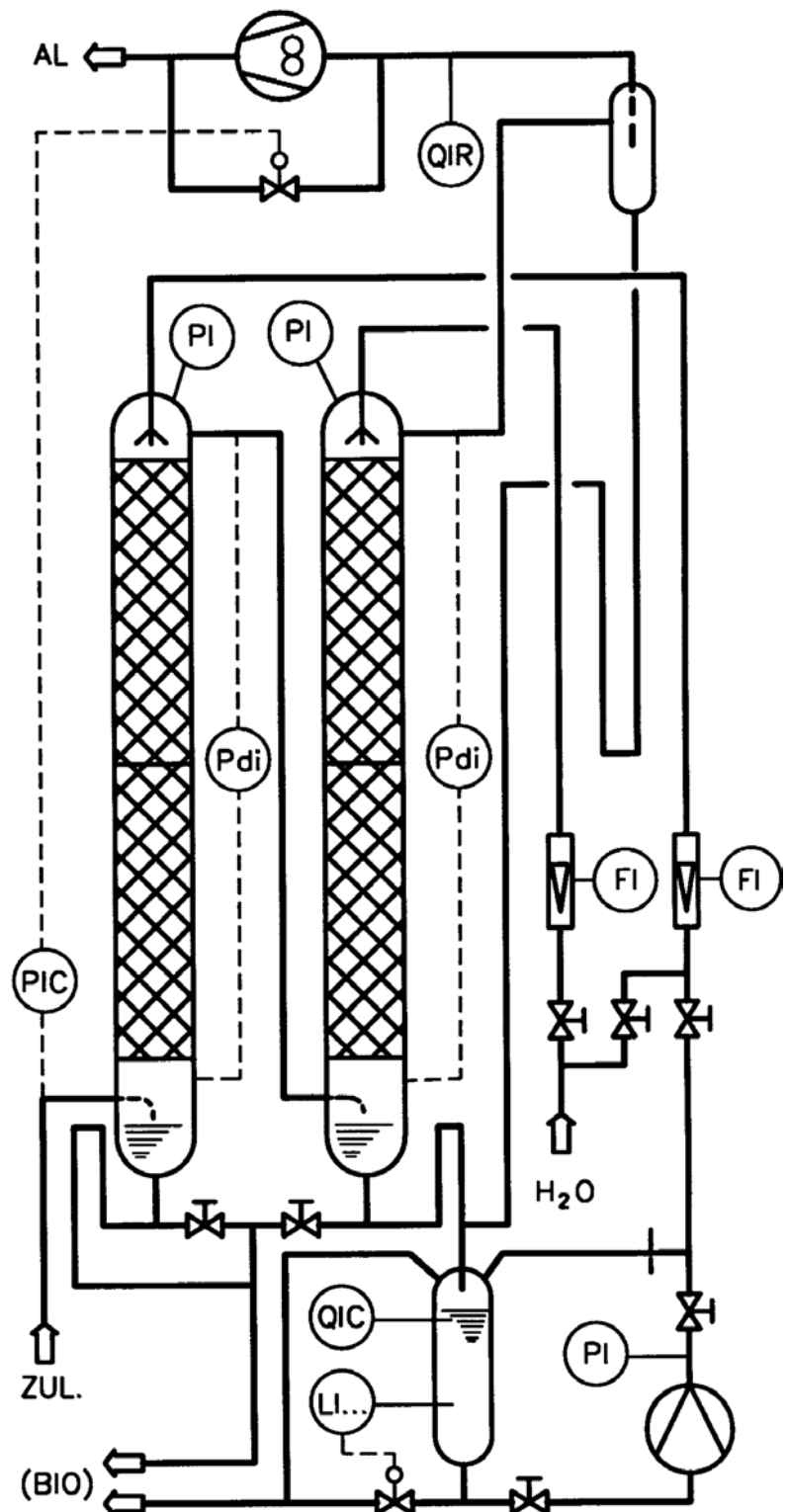
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## Exhaust Gas Washer:

- For operational exhaust gas (HCL, organic solvent etc.) Up to about 2000 m<sup>3</sup>/h
- In glass or other materials, according to the chemical requirements
- Available also in isothermal / adiabatical combination
- Cpl. with all accessories incl. Measuring and control equipment
- Mounted in a pipe framework (galvanized steel or SS)

## Measuring and control equipment

- Switch box cpl. with:
- Temperature control
- Level control
- Flow metering
- ph-measuring



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# Exhaust Gas Washer (Venturi)

# CETEC

Type

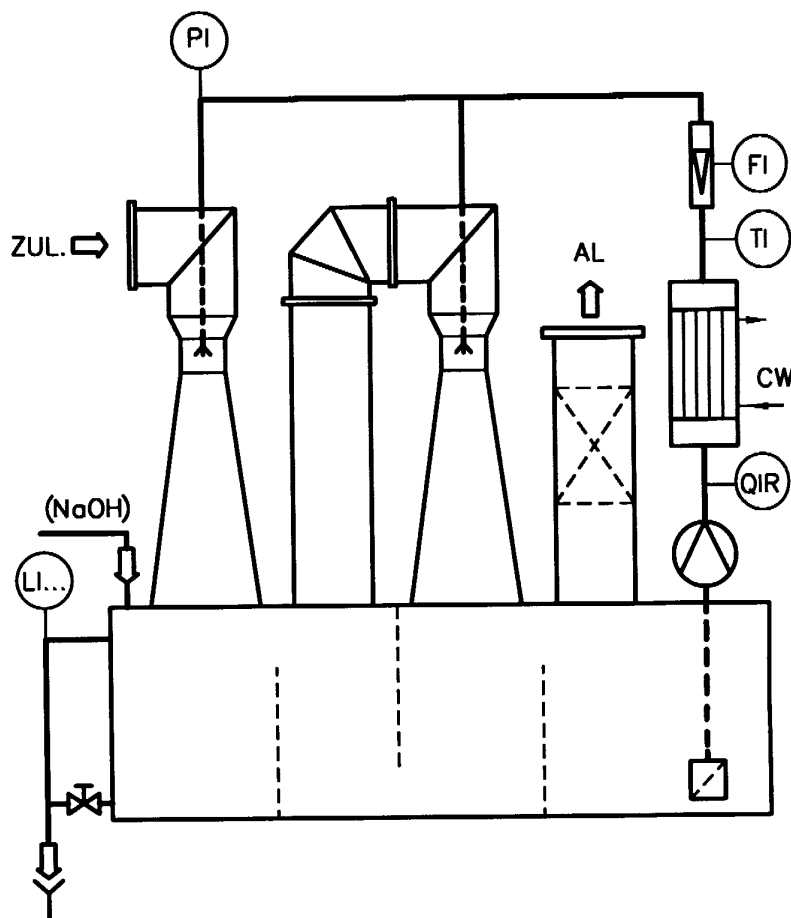
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## Exhaust Gas Washer:

- System injection washer (venturi / injector technique) up to about 2000 m<sup>3</sup>/h
- Self production of a partial vacuum (suction)
- Especially suitable for cleaning of exhaust gas with high pollutant concentration
- High operational safety and compact design

## Measuring and control equipment

- Switch box cpl. with:
- Temperature control
- Level control
- Flow metering
- pH-measuring



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**C E T E C - G M B H**  
CHEMICAL EQUIPMENT AND TECHNOLOGY  
KUNSTFELDSTR.1; D - 51377 LEVERKUSEN

CHEMICAL - & PILOT - Plants / Consulting  
Training / Research / Production Plants  
Planning+Execution+Assembly+Commissioning

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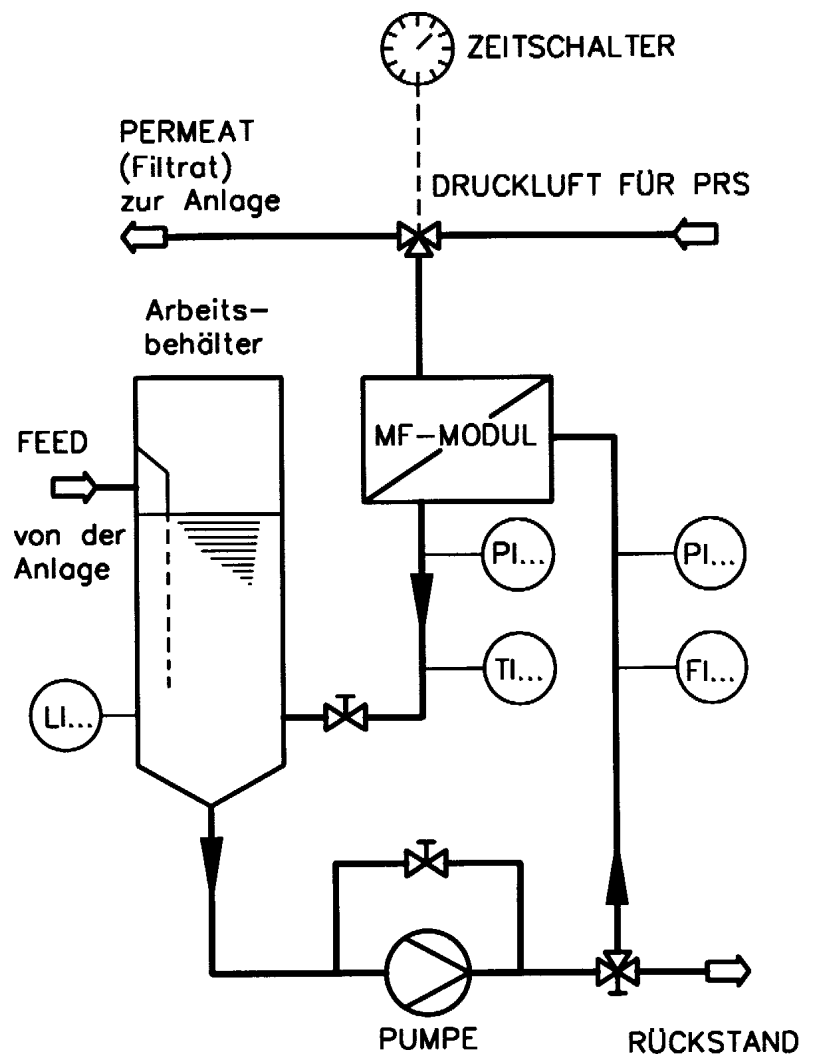


## Crossflow Filtration:

- With micro and ultra filtration membranes, membrane surface from 0,1 to 10 m<sup>2</sup>
- Membranes made of ceramic, pp, polysulfon, pore size 0,005 - 5 µm
- Larger plants possible also through modular construction

## Measuring and control equipment

- Switch box cpl. with:
- Temperature control
- Pressure control
- Flow metering
- pH-measuring



technical alterations possible 11/2003

Type  
OSLO

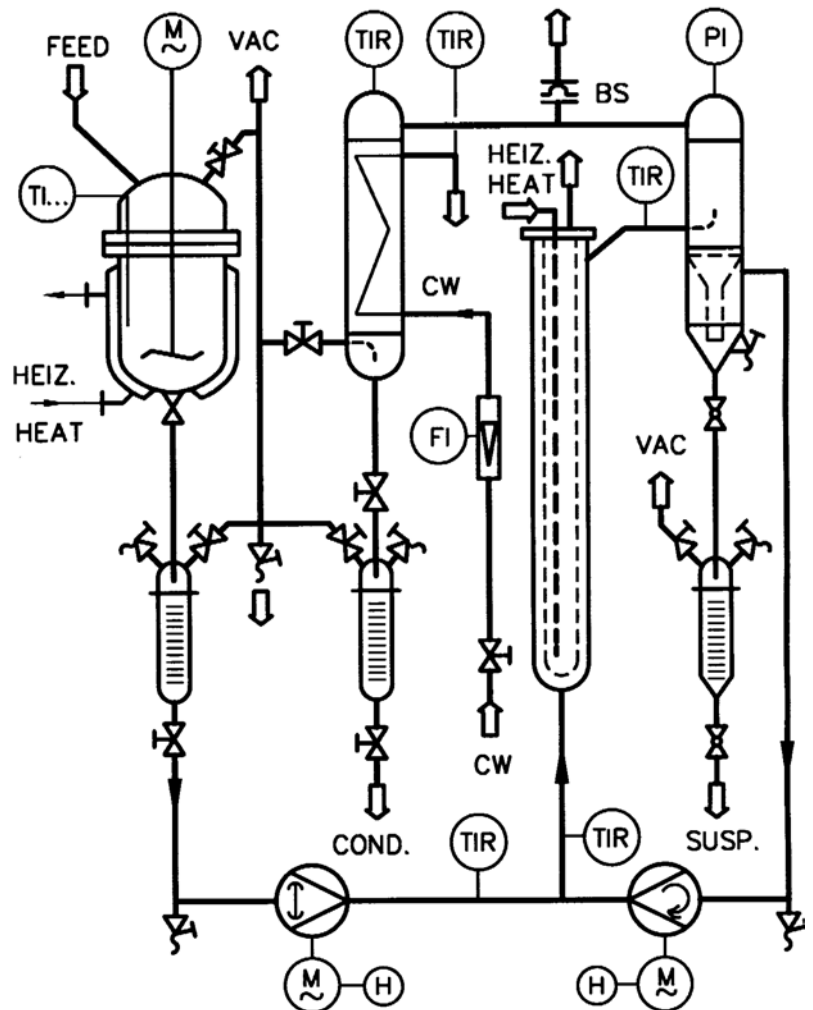
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## Crystallization Unit:

- Crystallizer DN 200 with collecting vessel 35 l., cpl. with volume pump, heater and steam condenser. Dosing and collecting vessels, measuring and control equipment.
- For use in batch production, especially in research and training
- Mounted in a pipe framework (galvanized steel or SS)

## Measuring and control equipment:

- Switch box cpl. with:
- Temperature control
- Flow metering
- Heating regulation etc.



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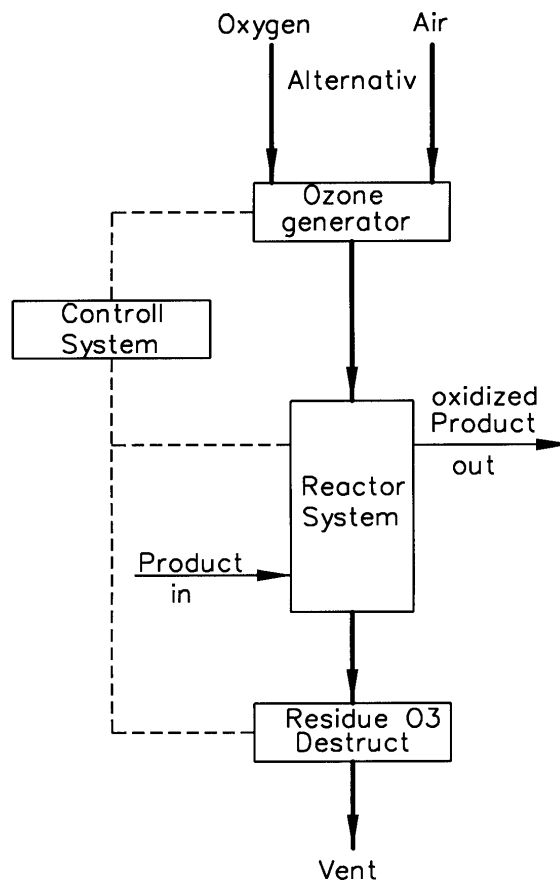
## OZONE-Equipment

### Process Technology :

- Waste Air Purification  
with OZONE-Absorption washer
- Waste Water Stripping  
  
with OZONE/Air Stripper
- Chemical Oxidation  
with agitator reactor
- OZONE-Reaction Column  
  
with bubble- or sieve trays
- OZONE Falling Film Reactor for the  
combination of evaporation and  
  
OZONE-Reaction
- Washing System for BIO-Reactor and  
BIO-Process-Plants
- OZONE-Water-Purification of  
Mineral Water
- OZONE-Water-Purification of  
Swimming Water
- OZON-Reactor and -Injection Systems  
for special customer specification

### Typical Application of OZON:

- Portable Water
- Cooling Towers
- Water Chemistry
- Sterilisation
- Petro Chemistry
- BIO Chemistry
- Aquaculture
- Public Aquaria
- Medicine
- School/Research/Development ec.



technical alterations possible 11/2003

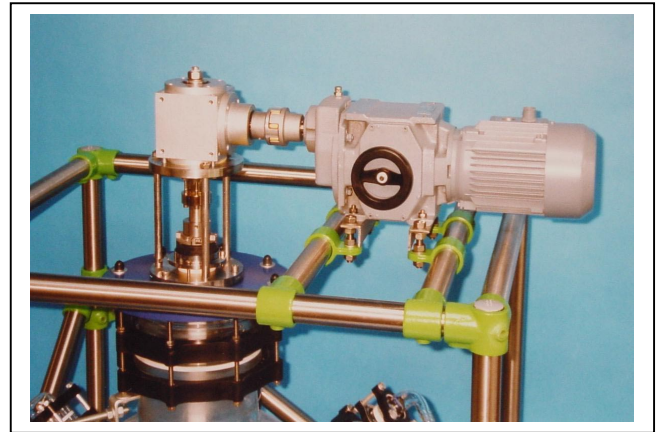


**GLASKUGELGEFÄSS 100 L**  
Glass Ball Vessel 100 L, movable

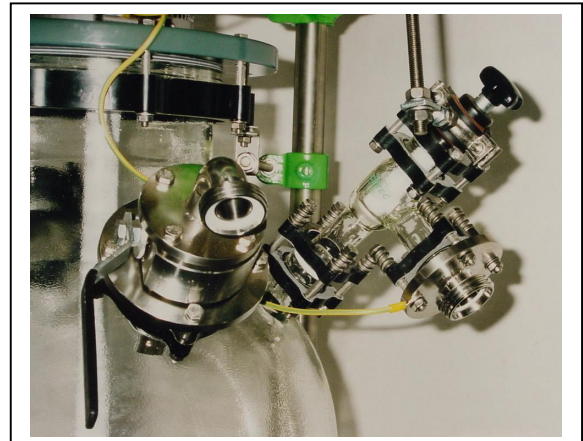
**Gruppe / Item 2.15-2**

Ausrührgefäß 100L/beschichtet - fahrbar -

Regelantrieb (0,33KW/57-570 1/min./EEX...T4)



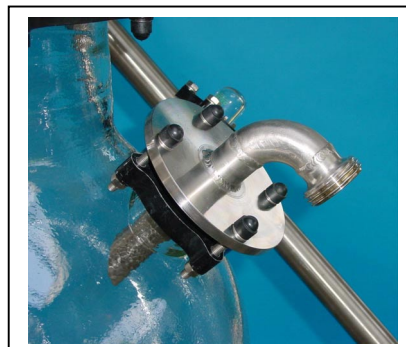
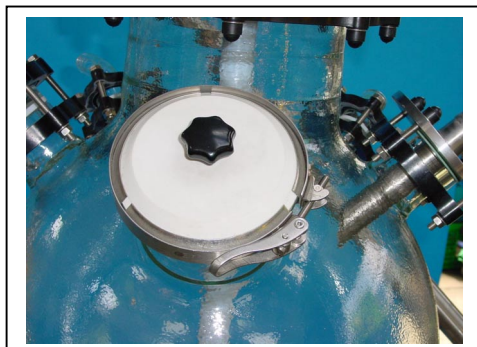
Anschlussarmaturen DN 25 - DIN 11851 / 1.4404



Handlochdeckel DN 100L (PTFE+GF)

Einleitrohr DN 50/25 -MRV- (V4A)

Ablassventil DN 25/20



Type  
GRB / CRB

Group: 2.0  
Sheet: 2.0.1

Company / Address: \_\_\_\_\_

Name / Dept.: \_\_\_\_\_

Tel.: / Fax: \_\_\_\_\_ / \_\_\_\_\_

### Technical data

#### 1. Mixing vessel:

working volume: \_\_\_\_\_ ltr.  
power: \_\_\_\_\_ KW  
revolutions: \_\_\_\_\_ - \_\_\_\_\_ 1/min  
electr. current: \_\_\_\_\_ / \_\_\_\_\_ V; \_\_\_\_\_ Hz; IP \_\_\_\_\_; EEX \_\_\_\_\_

seal: PTFE-mechanical seal  / PTFE-lip seal  / other  \_\_\_\_\_

lid: hood  / flat  split  / (open)   
attachments: DN \_\_\_\_\_ (...x); DN \_\_\_\_\_ (...x); DN \_\_\_\_\_ (...x); (drawing)

vessel: round  / cylinder  cone - shaped  / with casing  /  
with cooling  / heating coil  / with isolation  (drawing)

attachment: bottom - nozzle: DN \_\_\_\_\_  
casing - nozzle: DN \_\_\_\_\_  
bottom valve: DN \_\_\_\_\_

material: borosilicate-glass (BSG 3.3) – (>> **GRB**)  
1.457  / Hastelloy  / enamelled steel  / stainless steel coated  - (>> **GRB**)

mixer: propeller  / anchor  / blade  / turbo  / other  \_\_\_\_\_

working press.: vessel: \_\_\_\_\_ bar; vacuum: \_\_\_\_\_ mbar  
casing: \_\_\_\_\_ bar;

working temp.: \_\_\_\_\_ °C-min \_\_\_\_\_ °C-max

frame: galvanized steel pipe  / SS pipe  / with pipe connector  /  
with hydraulic foot pump lowering system  (**only for CRB**), / other  \_\_\_\_\_

#### 2. Installation:

indoor  / outdoor  on leg  on bracket  with movable frame   
available space (l. x b. x h.) \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_ m (drawing)  
max. load per sq. metre \_\_\_\_\_ kg/m<sup>2</sup>

#### 3. Type / requirements / recommendations:

material: app. / conduit / seals: \_\_\_\_\_  
connection: (DIN / ASA.../ rated pressure): \_\_\_\_\_ / \_\_\_\_\_ bar

#### 4. Available energy:

voltage / type of protection / Ex – class \_\_\_\_\_ V / \_\_\_\_\_ Hz / IP \_\_\_\_\_ / EEx \_\_\_\_\_  
compressed air / vacuum \_\_\_\_\_ bar min / \_\_\_\_\_ mbar  
cooling water; temp. / amount / pressure \_\_\_\_\_ / \_\_\_\_\_ ° C max / min; \_\_\_\_\_ m<sup>3</sup>/h; \_\_\_\_\_ bar  
other energy forms:  
brine  / steam  / thermo oil  \_\_\_\_\_ / \_\_\_\_\_ °C max / min; ; \_\_\_\_\_ m<sup>3</sup>/h; \_\_\_\_\_ bar

technical alterations possible 11/2003



**Type**  
**GRB / CRB**

**Group : 2.0**  
**Sheet : 2.0.1.1**

Company / Address: \_\_\_\_\_

\_\_\_\_\_

Name / Dept.: \_\_\_\_\_

Tel.: / Fax: /E-mail: / \_\_\_\_\_

**Technical data**

**1. Feed Vessel/s:** volume: \_\_\_\_ ltr. / graduated \_\_\_\_ / safety coated \_\_\_\_ / bottom cock \_\_\_\_ number.

**Suck -/ Fill- Pipeline:** with suction hose \_\_\_\_ / with N2-Covering \_\_\_\_ / with \_\_\_\_\_

**Vapour Pipeline:** column \_\_\_\_ / reflux divider \_\_ (manual /pneumatic/ electric) / condenser\_/reflux cooler\_\_\_\_\_

**Alternation Vessel/s :** coil/bullet \_\_\_\_ ltr. / graduated \_\_\_\_ / coated \_\_\_\_ / bottom cock \_\_\_\_ / number.

	<b>Yes</b>	<b>No</b>
<b>Pressure measurement/s:</b>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Temperature measurement/s:</b>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Flow measurement:</b>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Level control:</b>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Visualisation:</b>	<input type="checkbox"/>	<input type="checkbox"/>
<b>PLS-Control-System:</b>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Safety valve:</b>	<input type="checkbox"/>	<input type="checkbox"/> other: description
<b>Feed pump:</b>	<input type="checkbox"/> centrifugal pump <input type="checkbox"/> metering pump	
<b>Vacuum pump:</b>	<input type="checkbox"/> dray <input type="checkbox"/> oil <input type="checkbox"/> water   Nm <sup>3</sup> /h: ____; mbar	

**Heating-/cooling-system:**  water / brine    steam    HT oil Tmin: \_\_\_\_°C Tmax: \_\_\_\_°C

**Other Accessories (scatch and number):**-----  
-----

**2. Type / requirements / recommendations:**

material: app. / conduit / seals: \_\_\_\_\_  
connection: (DIN / ASA.../ rated pressure): \_\_\_\_\_ / \_\_\_\_\_ bar

**3. Available energy:**

voltage / type of protection / Ex – class    \_\_\_\_\_ V / \_\_\_\_\_ Hz / IP \_\_\_\_\_ / EEx \_\_\_\_\_  
compressed air / vacuum    \_\_\_\_\_ bar min / \_\_\_\_\_ mbar  
cooling water; temp. / amount / pressure    \_\_\_\_ / \_\_\_\_ °C max / min; \_\_\_\_\_ m<sup>3</sup>/h; \_\_\_\_\_ bar  
other energy forms:  
brine  / steam  / thermo oil     \_\_\_\_ / \_\_\_\_ °C max / min; ; \_\_\_\_\_ m<sup>3</sup>/h; \_\_\_\_\_ bar

technical alterations possible 11/2003



Type  
DESTGroup: 2.0  
Sheet: 2.0.2

Company / Address: \_\_\_\_\_

Name / Dept.: \_\_\_\_\_

Tel.: / Fax: \_\_\_\_\_ / \_\_\_\_\_

1. Operational area: \_\_\_\_\_

2. Products used: (see reverse side)

	substance name formula	proportion/ weight %	boiling point °C	solid. temperature °C	density kg/m <sup>3</sup>	substance * quality
2.1						
2.2						
2.3						
2.4						
2.5						

\* 1=toxic / 2=sticky / 3=frothy / 4=abrasive / 5=sublimed / 6=explosive / 7=aggressive (acid / pH...) / 8=other

to	specific heat KJ/kg °C	evap. heat KJ/kg	viscosity mm <sup>2</sup> /s-°C	melting point °C
2.1				
2.2				
2.3				
2.4				
2.5				

end product: \_\_\_\_\_

for use in: \_\_\_\_\_

3. Operating method:

product mixture – frequency of use:: continuous  / intermittent 

quant. Used: \_\_\_\_\_ ltr. / \_\_\_\_\_ (day / hour)

daily operating time: \_\_\_\_\_ hour

4. Installation:

indoor  / outdoor 

available space (l. x b. x h.) \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_ m (drawing)

max. load per sq. metre \_\_\_\_\_ kg/m<sup>2</sup>

5. Type / requirements / recommendations:

material: app. / conduit / seals: \_\_\_\_\_

connection: (DIN / ASA.../ rated pressure): \_\_\_\_\_ / \_\_\_\_\_ bar

6. Available energy:

voltage / type of protection / Ex – class \_\_\_\_\_ V / \_\_\_\_\_ Hz / IP \_\_\_\_\_ / EEx \_\_\_\_\_

compressed air / vacuum \_\_\_\_\_ bar min / \_\_\_\_\_ mbar

cooling water; temp. / amount / pressure \_\_\_\_\_ / \_\_\_\_\_ °C max / min; \_\_\_\_\_ m<sup>3</sup>/h; \_\_\_\_\_ bar

other energy forms:

brine  / steam  / thermo oil  \_\_\_\_\_ / \_\_\_\_\_ °C max / min; ; \_\_\_\_\_ m<sup>3</sup>/h; \_\_\_\_\_ bar

technical alterations possible 11/2003

# Questionnaire Thin-Film-Evaporator

# CETEC

Type  
CDV / TFE

Group : 2.0  
Sheet : 2.0.3

Company / Address: \_\_\_\_\_

Name / Dept.: \_\_\_\_\_

Phon: / Fax: / e-Mail: \_\_\_\_\_

## 1. Application:

Concentration  / Evaporation   
others  \_\_\_\_\_

## 2. Specifications:

		<u>Product</u>	<u>Solvent</u>
Medium		_____	_____
(Mass flow)	kg/h	_____	_____
Composition / Concentration	Mass. -%	_____	_____
Solid matters	%	_____	_____
Acids	%	_____	_____
pH - Value		_____	_____
Density	kg/m <sup>3</sup>	_____	_____
Heat capacity	kJ/kg °K	_____	_____
Thermal conductivity	W/m °K	_____	_____
Viscosity at 1. Temperature	m Pas at ...°C	_____	_____
“ 2. “	m Pas at ...°C	_____	_____
Heat of vaporization - / Condensation	kJ/kg	_____	_____
Flow rate	L/h	_____	_____
Pressure / Vacuum (max.)	bar/mbar	_____	_____
Material recommendation (Glass, SS, PTFE...)		_____	_____

## 3. Available energy:

voltage / type of protection / Ex – class \_\_\_\_\_ V / \_\_\_\_\_ Hz / IP \_\_\_\_\_ / EEx \_\_\_\_\_

compressed air / vacuum \_\_\_\_\_ bar min / \_\_\_\_\_ mbar

cooling water; temp. / amount / pressure \_\_\_ / \_\_\_ °C max / min; \_\_\_\_\_ m<sup>3</sup>/h; \_\_\_\_\_ bar

other energy forms:  
brine  / steam  / thermo oil  \_\_\_ / \_\_\_ °C max / min; ; \_\_\_\_\_ m<sup>3</sup>/h; \_\_\_\_\_ bar

technical alterations possible 11/2003

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CHEMICAL EQUIPMENT AND TECHNOLOGY  
KUNSTFELDSTR.1; D - 51377 LEVERKUSEN

CHEMICAL - & PILOT - Plants / Consulting  
Training / Research / Production Plants  
Planning+Execution+Assembly+Commissioning

Phone : ++ 49 / 214 - 7 40 61  
Fax : ++ 49 / 214 - 7 40 62  
E-Mail : info@cetec-gmbh.de

**Questionnaire**  
**Gas – Washer (Absorber)**

**CETEC**

Type  
AAL

Group : 2.0  
Sheet : 2.0.4

Company / Address: \_\_\_\_\_

Name / Dept.: \_\_\_\_\_

Tel.: / Fax: / E-mail \_\_\_\_\_ / \_\_\_\_\_

1. **Problem description:** \_\_\_\_\_

**2.1. Crude Gas** (see also page 2)

Total flow rate \_\_\_\_\_ m<sup>3</sup>/h (norm m<sup>3</sup> incl. Moisture)  
Crude gas temperature / Exhaust gas temperature \_\_\_\_\_ °C / \_\_\_\_\_ °C  
pH - Value \_\_\_\_\_  
Suck pressure for plant \_\_\_\_\_ mbar  
max. limit pressure vacuum \_\_\_\_\_ mbar

**2.2. Crude gas flow rate:**

Components		Concentration
1. Steam	_____ m <sup>3</sup> /h	_____ %
2. CO <sub>2</sub>	_____ m <sup>3</sup> /h	_____ %
3. Others	_____ m <sup>3</sup> /h	_____ %

Absorbate	Concentration	Particle dimension	Concentration
1. _____	_____ g/m <sup>3</sup>	0 – 1 Micron	_____ g/m <sup>3</sup>
2. _____	_____ g/m <sup>3</sup>	1 – 2 Micron	_____ g/m <sup>3</sup>
3. _____	_____ g/m <sup>3</sup>	2 – 3 Micron	_____ g/m <sup>3</sup>
4. _____	_____ g/m <sup>3</sup>	> 3 Micron	_____ g/m <sup>3</sup>

Which absorbent could be used / will use: \_\_\_\_\_  
density: \_\_\_\_\_ kg/m<sup>3</sup> /max. capacity: \_\_\_\_\_ kg/h

**3. Operation:**

waste air: continuo  / discontinue   
wash water / wash solvent: continuo  / discontinue   
operation time per day: \_\_\_\_\_ h.

**4. Installation:**

indoor  / outdoor   
available space (L x D x H) \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_ m (drawing)  
max. load per sq. meter \_\_\_\_\_ kg/m<sup>2</sup>

**5. Type / requirements / recommendations:**

material: app. / conduit / seals: \_\_\_\_\_  
connection: (DIN / ASA.../ rated pressure): \_\_\_\_\_ / \_\_\_\_\_ bar

**6. Available energy:**

voltage / type of protection / Ex – class \_\_\_\_\_ V / \_\_\_\_\_ Hz / IP \_\_\_\_\_ / EEx \_\_\_\_\_  
compressed air / vacuum \_\_\_\_\_ bar min / \_\_\_\_\_ mbar  
cooling water; temp. / amount / pressure \_\_\_\_\_ / \_\_\_\_\_ °C max / min; \_\_\_\_\_ m<sup>3</sup>/h; \_\_\_\_\_ bar  
other energy forms:  
brine  / steam  / thermo oil  \_\_\_\_\_ / \_\_\_\_\_ °C max / min; ; \_\_\_\_\_ m<sup>3</sup>/h; \_\_\_\_\_ bar

-2-

technical alterations possible 11/2003

**Questionnaire**  
**Gas – Washer ( Absorber)**



Type  
**AAL**

Group : 2.0  
 Sheet : 2.0.4.1

-2-

at 2.1 Grude Gas

Table 1

No.	Substans name Chemical formula	Density kg/ m <sup>3</sup>	Boiling Point °C	Air Pollution (TA Luft)	Concentration in – mg/m <sup>3</sup> – out
2.1					
2.2					
2.3					
2.4					
2.5					

Carrier gas: N<sub>2</sub> , Air , Other.: \_\_\_\_\_ / \_\_\_\_\_ Nm<sup>3</sup>/h

Table 2

at	Heat capacity Vapour – KJ/kg K – Liquid	Heat of vaporisation KJ/kg	Melting point °C	Molecular weight kg/kmol	Subst. -* properties
2.1					
2.2					
2.3					
2.4					
2.5					

\*1=toxically / 2=sticky / 3=foams / 4=abrasiv / 5=sublimated / 6=explosively/ 7=aggressivly(argry / pH...) / 8=othres

Other Substances (Solids part.): \_\_\_\_\_

technical alterations possible 11/2003

**Type**  
**FIL****Group: 2.0**  
**Sheet: 2.0.5**

Company / Address: \_\_\_\_\_

Name / Dept.: \_\_\_\_\_

Tel.: / Fax: \_\_\_\_\_ / \_\_\_\_\_

**1. Operational requirements:**Filtration for the extraction of: filtrate  / sediment  / both **2.1 Quantity employed:**

suspension: (type and amount) \_\_\_\_\_ / \_\_\_\_\_ ltr. / \_\_\_\_\_ (hour / day / \_\_\_\_\_)

dry matter: (type and amount) \_\_\_\_\_ / \_\_\_\_\_ kg / \_\_\_\_\_ (hour / day / \_\_\_\_\_)

washing agent: (type and amount) \_\_\_\_\_ / \_\_\_\_\_ ltr. / \_\_\_\_\_ (hour / day / \_\_\_\_\_)

**2.2 Physical data of suspension:**

density	_____ g/h	solid matter: crystalline	<input type="checkbox"/>
solid matt. cont.	_____ g/h	amorphous	<input type="checkbox"/>
average granulate	_____ mym	fibrous	<input type="checkbox"/>
temperature	_____ °C	colloidal	<input type="checkbox"/>
viscosity	_____ m <sup>2</sup> /s		
pH level	_____	residual moisture: _____ %	

**3. Operating method:**open  / closed continuous  / intermittent 

no. of filtration \_\_\_\_\_ x \_\_\_\_\_ (hour / day)

system pressure \_\_\_\_\_ bar

**4. Installation:**indoor  / outdoor  on leg  on bracket  with movable frame 

available space (l. x b. x h.) \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_ m (drawing)

max. load per sq. metre \_\_\_\_\_ kg/m<sup>2</sup>**5. Type / requirements / recommendations:**

material: app. / conduit / seals: \_\_\_\_\_

connection: (DIN / ASA... / rated pressure): \_\_\_\_\_ / \_\_\_\_\_ bar

**6. Available energy:**

voltage / type of protection / Ex – class \_\_\_\_\_ V / \_\_\_\_\_ Hz / IP \_\_\_\_\_ / EEx \_\_\_\_\_

compressed air / vacuum \_\_\_\_\_ bar min / \_\_\_\_\_ mbar

cooling water; temp. / amount / pressure \_\_\_\_\_ / \_\_\_\_\_ °C max / min; \_\_\_\_\_ m<sup>3</sup>/h; \_\_\_\_\_ bar

other energy forms:

brine  / steam  / thermo oil  \_\_\_\_\_ / \_\_\_\_\_ °C max / min; ; \_\_\_\_\_ m<sup>3</sup>/h; \_\_\_\_\_ bar

technical alterations possible 11/2003

Type  
ABSGroup: 2.0  
Sheet: 2.0.6

Company / Address: \_\_\_\_\_

Name / Dept.: \_\_\_\_\_

Tel.: / Fax: \_\_\_\_\_ / \_\_\_\_\_

1. Operation requirements: \_\_\_\_\_

## 2.1 Suction capacity: (see also reverse side)

outgoing airflow (total) \_\_\_\_\_ m<sup>3</sup>/h (nominal m<sup>3</sup> with humidity)  
 air inlet temp. / air exit temp. \_\_\_\_\_ °C / \_\_\_\_\_ °C  
 pH - level \_\_\_\_\_  
 required suction pressure of unit \_\_\_\_\_ mbar  
 max. permitted induction vacuum \_\_\_\_\_ mbar

## 2.2 Extracted gas:

components	concentration
1. steam _____ m <sup>3</sup> /h	_____ %
2. carbon dioxide _____ m <sup>3</sup> /h	_____ %
3. other _____ m <sup>3</sup> /h	_____ %

harmful substances	concentration	size of particle	concentration
1. _____	_____ g/m <sup>3</sup>	0 – 1 Micron	_____ g/m <sup>3</sup>
2. _____	_____ g/m <sup>3</sup>	1 – 2 Micron	_____ g/m <sup>3</sup>
3. _____	_____ g/m <sup>3</sup>	2 – 3 Micron	_____ g/m <sup>3</sup>
4. _____	_____ g/m <sup>3</sup>	> 3 Micron	_____ g/m <sup>3</sup>

Which washing liquid can / should be used? : \_\_\_\_\_  
 density: \_\_\_\_\_ kg/m<sup>3</sup> /max. amount: \_\_\_\_\_ kg/h

## 3. Operating method:

Exhaust frequency: continuous  / intermittent   
 Addition of washing liquid: continuous  / intermittent   
 Daily operating time: \_\_\_\_\_ hours

## 4. Installation:

indoor  / outdoor   
 available space (l. x b. x h.) \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_ m (drawing)  
 max. load per sq. metre \_\_\_\_\_ kg/m<sup>2</sup>

## 5. Type / requirements / recommendations:

material: app. / conduit / seals: \_\_\_\_\_  
 connection: (DIN / ASA.../ rated pressure): \_\_\_\_\_ / \_\_\_\_\_ bar

## 6. Available energy:

voltage / type of protection / Ex – class \_\_\_\_\_ V / \_\_\_\_\_ Hz / IP \_\_\_\_\_ / EEx \_\_\_\_\_  
 compressed air / vacuum \_\_\_\_\_ bar min / \_\_\_\_\_ mbar  
 cooling water; temp. / amount / pressure \_\_\_\_\_ / \_\_\_\_\_ °C max / min; \_\_\_\_\_ m<sup>3</sup>/h; \_\_\_\_\_ bar  
 other energy forms:  
 brine  / steam  / thermo oil  \_\_\_\_\_ / \_\_\_\_\_ °C max / min; ; \_\_\_\_\_ m<sup>3</sup>/h; \_\_\_\_\_ bar

technical alterations possible 11/2003

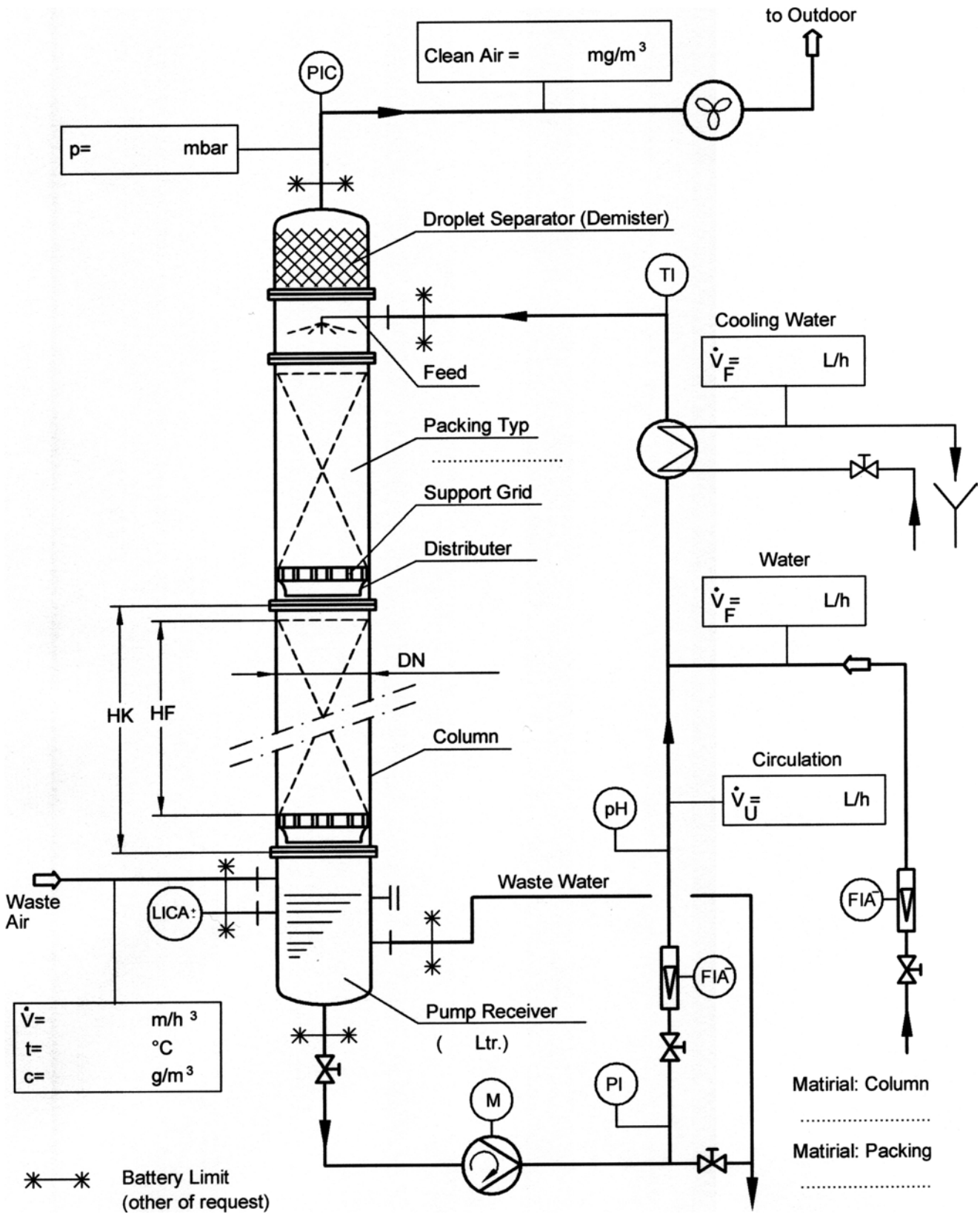


# Gas Washer (Absorber)

# CETEC

Type  
ALW

Group : 2.0  
Sheet : 2.0.6.1



technical alterations possible 11/2003

**CETEC-GMBH**  
CHEMICAL EQUIPMENT AND TECHNOLOGY  
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Type  
ADS

Group: 2.0  
Sheet: 2.0.7

Company / Address: \_\_\_\_\_

Name / Dept.: \_\_\_\_\_

Tel.: / Fax: \_\_\_\_\_ / \_\_\_\_\_

1. Operation requirements: \_\_\_\_\_

**2.1 Suction capacity:** (see also reverse side)

outgoing airflow (total) \_\_\_\_\_ m<sup>3</sup>/h (nominal m<sup>3</sup> with humidity)  
 air inlet temp. / air exit temp. \_\_\_\_\_ °C / \_\_\_\_\_ °C  
 pH - level \_\_\_\_\_  
 required suction pressure of unit \_\_\_\_\_ mbar  
 max. permitted induction vacuum \_\_\_\_\_ mbar

**2.2 Extracted gas:**

<u>components</u>		<u>concentration</u>
1. steam	_____ m <sup>3</sup> /h	_____ %
2. carbon dioxide	_____ m <sup>3</sup> /h	_____ %
3. other	_____ m <sup>3</sup> /h	_____ %

<u>harmful substances</u>	<u>concentration</u>	<u>size of particle</u>	<u>concentration</u>
1. _____	_____ g/m <sup>3</sup>	0 – 1 Micron	_____ g/m <sup>3</sup>
2. _____	_____ g/m <sup>3</sup>	1 – 2 Micron	_____ g/m <sup>3</sup>
3. _____	_____ g/m <sup>3</sup>	2 – 3 Micron	_____ g/m <sup>3</sup>
4. _____	_____ g/m <sup>3</sup>	> 3 Micron	_____ g/m <sup>3</sup>

Which washing liquid can / should be used? : \_\_\_\_\_  
 density: \_\_\_\_\_ kg/m<sup>3</sup> /max. amount: \_\_\_\_\_ kg/h

**3. Operating method:**

Exhaust frequency: continuous  / intermittent   
 Addition of washing liquid: continuous  / intermittent   
 Daily operating time: \_\_\_\_\_ hours

**4. Installation:**

indoor  / outdoor   
 available space (l. x b. x h.) \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_ m (drawing)  
 max. load per sq. metre \_\_\_\_\_ kg/m<sup>2</sup>

**5. Type / requirements / recommendations:**

material: app. / conduit / seals: \_\_\_\_\_  
 connection: (DIN / ASA.../ rated pressure): \_\_\_\_\_ / \_\_\_\_\_ bar

**6. Available energy:**

voltage / type of protection / Ex – class \_\_\_\_\_ V / \_\_\_\_\_ Hz / IP \_\_\_\_\_ / EEx \_\_\_\_\_  
 compressed air / vacuum \_\_\_\_\_ bar min / \_\_\_\_\_ mbar  
 cooling water; temp. / amount / pressure \_\_\_\_\_ / \_\_\_\_\_ °C max / min; \_\_\_\_\_ m<sup>3</sup>/h; \_\_\_\_\_ bar  
 other energy forms:  
 brine  / steam  / thermo oil  \_\_\_\_\_ / \_\_\_\_\_ °C max / min; ; \_\_\_\_\_ m<sup>3</sup>/h; \_\_\_\_\_ bar

Type  
**AWAB**

Group: 2.0  
Sheet: 2.0.8

Company / Address: \_\_\_\_\_

Name / Dept.: \_\_\_\_\_

Tel.: / Fax: \_\_\_\_\_ / \_\_\_\_\_

1. Operation requirements: \_\_\_\_\_

**2.1 Waste water analysis:**

pH – level: \_\_\_\_\_ , \_\_\_ mg/l  
CSB - level: \_\_\_\_\_ , \_\_\_ mg/l  
BSB– level: \_\_\_\_\_ , \_\_\_ mg/l  
sediment: \_\_\_\_\_ , \_\_\_ mg/l  
solid material concentration: \_\_\_\_\_ , \_\_\_ mg/l  
heavy metals: \_\_\_\_\_ , \_\_\_ mg/l

**2.2 Origin of waste water:**

pre treatment: sieve / sedimentation basin etc.: \_\_\_\_\_  
waste water qty.: \_\_\_\_\_ , \_\_\_\_\_ (ltr./h; m3/d; .....)

**2.3 Permitted residual levels according to local regulations:**

appropriate authorizing authority: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**3. Operating method:**

direct discharge  / indirect discharge   
continuous  / intermittent   
daily operating time: \_\_\_\_\_ hours

**4. Installation:**

indoor  / outdoor   
available space (l. x w. x h.): \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_ m (drawing)  
max. load per sq. metre \_\_\_\_\_ kg/m<sup>2</sup>

**5. Type / requirements / recommendations:**

material: app. / conduit / seals: \_\_\_\_\_  
connection: (DIN / ASA.../ rated pressure): \_\_\_\_\_ / \_\_\_\_\_ bar

**6. Available energy:**

voltage / type of protection / Ex – class \_\_\_\_\_ V / \_\_\_\_\_ Hz / IP \_\_\_\_\_ / EEx \_\_\_\_\_  
compressed air / vacuum \_\_\_\_\_ bar min / \_\_\_\_\_ mbar  
cooling water; temp. / amount / pressure \_\_\_\_\_ / \_\_\_\_\_ ° C max / min; \_\_\_\_\_ m<sup>3</sup>/h; \_\_\_\_\_ bar  
other energy forms:  
brine  / steam  / thermo oil  \_\_\_\_\_ / \_\_\_\_\_ ° C max / min; ; \_\_\_\_\_ m<sup>3</sup>/h; \_\_\_\_\_ bar

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Type  
RWAB

Group: 2.0  
Sheet: 2.0.9

Company / address: \_\_\_\_\_

Name / dept.: \_\_\_\_\_

Tel.: / Fax: \_\_\_\_\_ / \_\_\_\_\_

1. Operational requirements: \_\_\_\_\_

**2.0 Pure water - requirements:**

conductivity: max: \_\_\_\_\_ myS/cm  
water requirement: \_\_\_\_\_ l/min; \_\_\_\_\_ m<sup>3</sup>/h. ....../day  
withdrawal areas: \_\_\_\_\_ pieces/amount; requirement pressure \_\_\_\_\_ bar  
anorganically pure  / organically pure  / silicic acid free  / particle free  / germ free  / pyrogenic free

**2.1 Crude water - details:**

carbon hardness: \_\_\_\_\_ °dH; total hardness: \_\_\_\_\_ °dH;  
conductivity: \_\_\_\_\_ myS/cm; entry pressure: \_\_\_\_\_ bar;  
temperature: \_\_\_\_\_ °C; pH - level: \_\_\_\_\_

analysis enclosed  / 2 ltr. crude water will be supplied

**2.2 Crude water treatment:**

none  / filtration  / softener  / phosphatization  / chloration  / ozonisation  / other

**2.3 Available water treatment:**

none  / softener  / distillation   
full desalting  (make: \_\_\_\_\_ )  
reverse osmosis  (make: \_\_\_\_\_ )  
other  \_\_\_\_\_  
none

**3. Installation:**

indoor  / outdoor   
available space (l x w x h) \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_ m (drawing)  
max. load per sq. metre \_\_\_\_\_ kg/m<sup>2</sup>

**4. Type / requirement / recommendation:**

material: app. / conduit. / seal: \_\_\_\_\_  
connection: (DIN / ASA.../ rated pressure): \_\_\_\_\_ / \_\_\_\_\_ bar  
water – inlet: pipeline  / tank  / pump   
water – outlet: pipeline  / tank  / pump

**5. Available energy:**

voltage / type of protection / Ex – class \_\_\_\_\_ V / \_\_\_\_\_ Hz / IP \_\_\_\_\_ / EEx \_\_\_\_\_  
compressed air / vacuum \_\_\_\_\_ bar min / \_\_\_\_\_ mbar  
cooling water; temp. / amount / pressure \_\_\_\_\_ / \_\_\_\_\_ °C max / min; \_\_\_\_\_ m<sup>3</sup>/h; \_\_\_\_\_ bar  
other energy forms:  
brine  / steam  / thermo oil  \_\_\_\_\_ / \_\_\_\_\_ °C max / min; ; \_\_\_\_\_ m<sup>3</sup>/h; \_\_\_\_\_ bar

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# Questionnaire – for the Quotation of a production line or machinery

# CETEC

Which products is / are to be produced or processed:

Group: 2.0  
Sheet: 2.100.1

Customer / Name: \_\_\_\_\_

Address: \_\_\_\_\_

Tel.: / Fax: \_\_\_\_\_ / \_\_\_\_\_

**Please state which of the following services you require:**

planning  / production  / delivery  / assembly  / of a new plant  /

an existing plant  for the following capacity:

units \_\_\_\_\_ / kilos \_\_\_\_\_ / tons \_\_\_\_\_ (per hour / day / year)

name of product to be produced / processed (chemical formula) \_\_\_\_\_

requested delivery date: \_\_\_\_\_ starting / production date: \_\_\_\_\_

details of bank through which payment will be made: \_\_\_\_\_

name of bank account holder: \_\_\_\_\_

**1. Location of plant / machinery:**

daily temperature max. \_\_\_\_\_ °C / min \_\_\_\_\_ °C

average humidity \_\_\_\_\_ %; average yearly rainfall \_\_\_\_\_ l/m<sup>2</sup>

height above sea level \_\_\_\_\_ m

**2. Restrictions / regulations:**

permission for import (please attach); safety regulations; emissions; control according to specifications of customer / appropriate authority

**3. Technical details:**

technical process  / drawing  / assembly drawing  /

details of special characteristics and problem areas are attached

**3.1 Operating method:**

continuous  / intermittent

\_\_\_\_\_ hours / day; \_\_\_\_\_ days / year; other: \_\_\_\_\_

**3.2 Operation of the plant / machine:**

by hand (manually)  / semi-automatic  / fully automatic

**4. Available energy:**

none  / in building  / on tubular bridge / cabel line

electric: \_\_\_\_\_ / \_\_\_\_\_ V; \_\_\_\_\_ Hz; \_\_\_\_\_ kV

pneumatic: \_\_\_\_\_ bar (dry)

steam: \_\_\_\_\_ bar \_\_\_\_\_ m<sup>3</sup>/h

cooling water: \_\_\_\_\_ bar \_\_\_\_\_ m<sup>3</sup>/h \_\_\_\_\_ °C

brine: \_\_\_\_\_ bar \_\_\_\_\_ m<sup>3</sup>/h \_\_\_\_\_ °C

other: gas  / oil  (heating capacity) \_\_\_\_\_

**Questionnaire – for the Quotation  
of a production line or machinery**

**CETEC**

**Which products is / are to be produced or processed:**

**Group: 2.0  
Sheet: 2.100.1**

---

- 2 -

**4.1 Treatment of emissions:**

- extractor: \_\_\_\_\_ capacity: \_\_\_\_\_
- waste water: \_\_\_\_\_ capacity: \_\_\_\_\_
- other: \_\_\_\_\_
- none

**4.2 Quality control:**

- available  / none  / to be delivered
- laboratory equipment: sufficient
- to be extended: 1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. see special list

**5. Building:**

- already exists /  still to be built / decided upon
- new building  / old building  / stone building  / steel construction  /
- is the building in its present form suitable for the machinery / plant or does it need to be altered  /
- if alternations to the building are necessary please supply plans.  /
- plan attached with energy supply

**6. Language used in all correspondence:**

- german  / english

**7. Other bidders:**

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

---

name / signature

---

place / date

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# Glass Mixing Vessel with / without jacket (casing)

# CETEC

**Type GRB**  
**5 - 50 ltr.**

**Group: 2.1.1**  
**Sheet: 2.1.1.1**

## Glass Mixing Vessel (GRB)

The most outstanding feature of the **GRB** lies in its versatility.

It has proven application in the field of laboratories and training facilities either as a single unit or with distillation attachments. The **GRB** is highly suitable for test purposes or for producing small quantities.

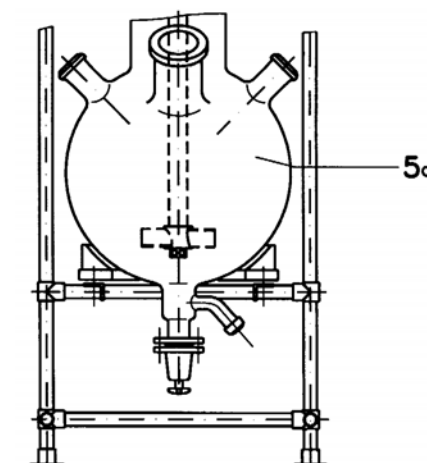
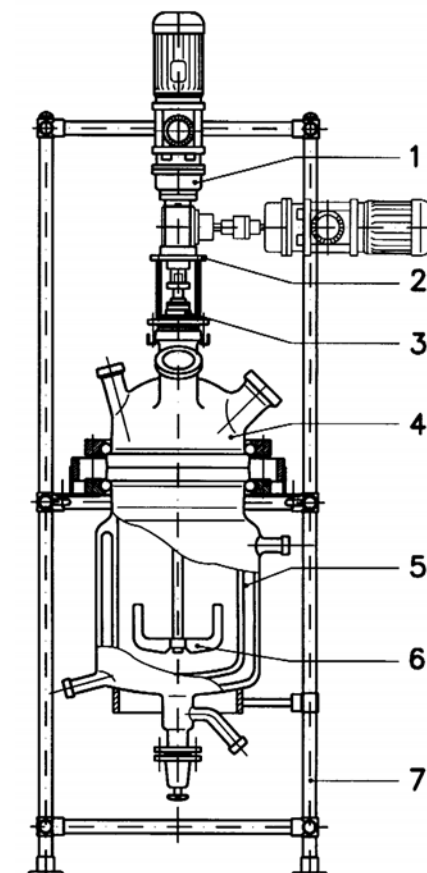
The value of the **GRB** is greatly increased through the unobstructed view into the reaction vessel to enable the observation of the reaction processes.

A max. temperature of 200°C is possible. The GRB can be employed for operating pressure from -1 to +0,5 bar.

Individual customer requirements can be taken into consideration (see questionnaire 2.0.1). The GRB can be supplied with accessories, distillation attachments (glass/SS), pumps, heating/cooling systems as well as measuring and controlling devices and computer controlled units.

### Assembly possibility:

- power**  
elect. / pneum. (expl. proof)  
speed control (0,18 - 1,1 kW)
- housing**  
for mechanical seal and coupling
- seal**  
lip seal/mechanical seal in PTFE or SS
- glass lid**  
DN 150/200/300 with various connections in BSG 3.3
- reaction vessel bottom part**  
beaker shape  
in borosilicate glass 3.3  
with/without bottom nozzle  
DN 40/25/15...with/without bottom outlet valve
- 5a. glass vessel – bottom part**  
in borosilicate glass 3.3  
with/without bottom nozzle  
DN 40/25/15...with/without bottom outlet valve
- mixer**  
shape anchor, propeller etc. in 1.4571 (coated) HC4, PTFE, enamelled steel
- rack / frame**  
steel pipe, zinc coated or SS pipe  
with GRV pipe connectors  
(see our sheet 10.1.1)



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# COMBI- Agitator vessel with glass hood for laboratory & pilot plant

# CETEC

Type **CRB**  
10 - 100 ltr.

Group : 2.1  
Sheet : 2.1.2

## COMBI – Agitator vessel (CRB)

**CRB** is characterised by its various application type. Within the range of laboratory and pilot plant as single device or cascade; for attempts or small production the **CRB** is very suitable.

The free view into the reactor area with high working reliability and the metallic under vessel construction give **CRB** a high value in use and flexibility.

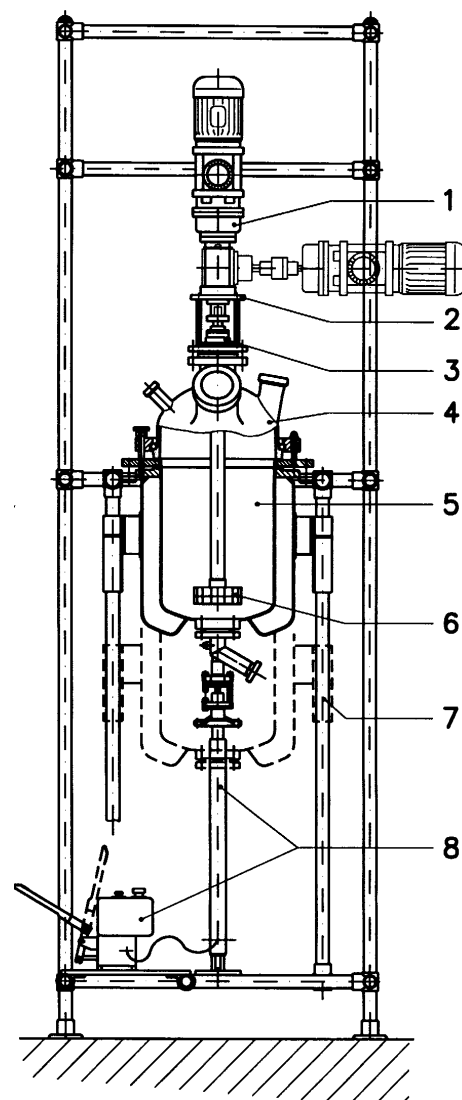
The temperature load is possible up to 200°C. The **CRB** can be used for a pressure load from -1 to + 0.5 bar. Customers desires can find consideration as far as possible (s. questionnaire, sheet 2.0.1+ 1).

The **CRB** could be delivered with accessories like pumps, heating/cooling system, distillation part made in (Glass/SS), as well as with measuring - and control components - up to the computer controlled unit.

Closed receivers up to  $p \times V < 200$  are also possible

The structure is possible as follows:

- 1. Driver**  
electrical /air (EEx) adjustable 0-700 1/min (0.18 - 1.1 kW)
- 2. Support**  
with clutch or hollow shaft
- 3. Seal**  
PTFE-lip seal or mechanical seal, materials PTFE or SS
- 4. Glass hood**  
with various connections from BSG 3,3, DN 200 to DN 400 intermediate flange, seals, PTFE-/SS - core
- 5. Reactor lower part**  
10/20/30/50 ltr.  
made in SS 1.4571 (coated), HC4, steel email with/without coat with/without soil connecting pieces (DN 40/25/15...) with/without soil valve to DN of 50/32
- 6. Agitators**  
anchors -, bars -, propellers -, turbine made in SS 1.4571 (coated), HC4, PTFE, CS or email
- 7. Rack**  
steel tube galvanized or SS-pipe with GRV- tub connections installed, stationary or moveable
- 8. Lifter**  
for reactor lower part, hydraulics (up and down)



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**CETEC Thin Film Evaporator**  
**(CDV 25)**

The **CDV 50** is distinguished by its compact design. (approx. 800 x 800 x 2800 mm).

Application: temperature-sensitive products which must be gently separated from the solvent. (I.e.: flavours, enzymes, vitamins, etc.)

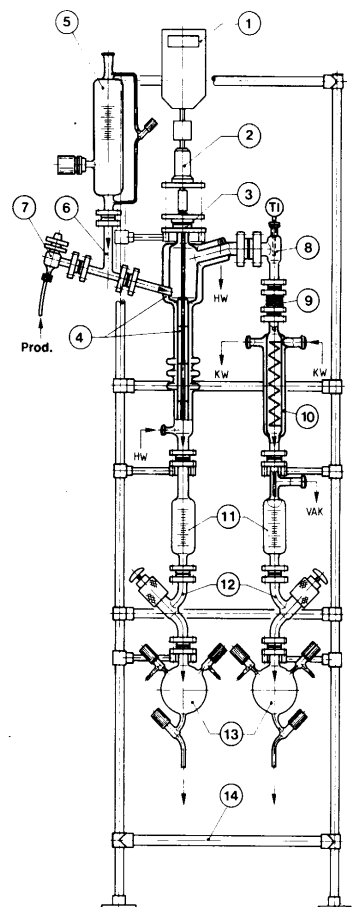
All parts which come into contact with the product are made of BSG. 3.3 or PTFE.

Variations on the separate parts: sizes (up to DN 100), materials (SS, HC...) and other construction are possible.

Accessories such as feeding/vacuum pumps, heating circuits, measuring and controlling devices are also available.

**Assembly Possibility:**

1. Power, adjustable elec./ pneum. expl.-proof motor
2. Shaft bearing with coupling
3. Mechanical seal, single-acting, PTFE Al<sub>2</sub>O<sub>3</sub>
4. Thin Film condenser BSG 3.3 with PTFE rotary-/glass-wiper
5. Dosage valve
6. Ventilation and vacuum valve
7. Thermometer (PT 100 with indicator)
8. Piece with PT 100
9. Bellow PTFE
10. Cooler BSG
11. Collecting vessels with graduated measures BSG 3.3 with/ without casing
12. Intermediate outlet valves
13. Interchangeable collecting vessels with various valves
14. Rack, galvanized steel or SS pipe



# CETEC Thin Film Evaporator

DN 50/475 cm<sup>2</sup>

Type CDV  
DN 50 - 100

# CETEC

Group: 2.2  
Sheet: 2.2.2

## CETEC Thin Film Evaporator (CDV 25)

The **CDV 50** is distinguished by its compact design. (approx. 800 x 800 x 2800).

Application: temperature-sensitive products which must be gently separated from the solvent. (i.e.: flavours, enzymes, vitamins, etc.)

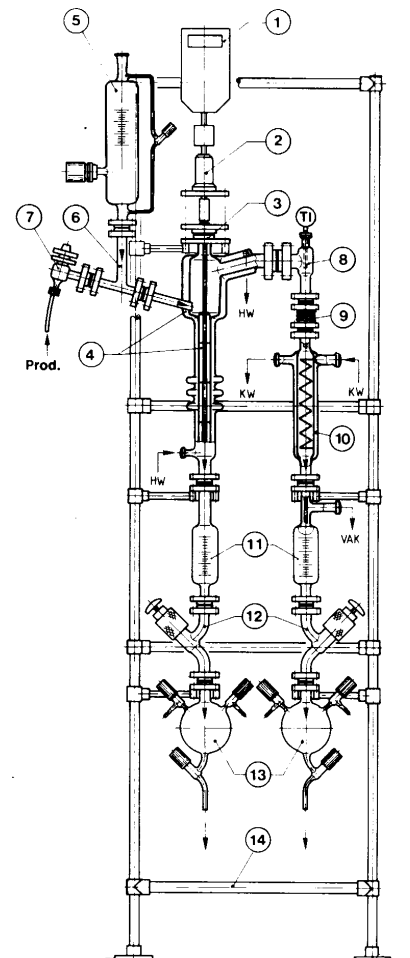
All parts which come into contact with the product are made of BSG. 3.3 or PTFE.

Variations on the separate parts: sizes (up to DN 100), materials (SS, HC...) and construction are possible.

Accessories such as feeding/vacuum pumps, heating circuits, measuring and controlling devices are also available.

### Assembly Possibility:

1. Power, adjustable elec./pneum. expl.-proof motor
2. Shaft bearing with coupling
3. Mechanical seal, single-acting, PTFE Al<sub>2</sub>O<sub>3</sub>
4. Thin Film condenser BSG 3.3 with PTFE rotary-/glass-wiper Dosage valve
5. Ventilation and vacuum valve
6. Thermometer (PT 100 with indicator)
7. Piece with PT 100
8. Bellow PTFE
9. Cooler BSG
10. Collecting vessels with graduated measures BSG 3.3 with/ without casing
11. Intermediate outlet valves
12. Interchangeable collecting vessels with various valves
13. Rack, galvanized steel or SS pipe



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# Exhaust Gas Washer

## Borsilicate glass 3.3

# CETEC

Type ALW  
5- 50 ltr.

Group: 2.4  
Sheet: 2.4.1

### Exhaust Gas Washer (ALW)

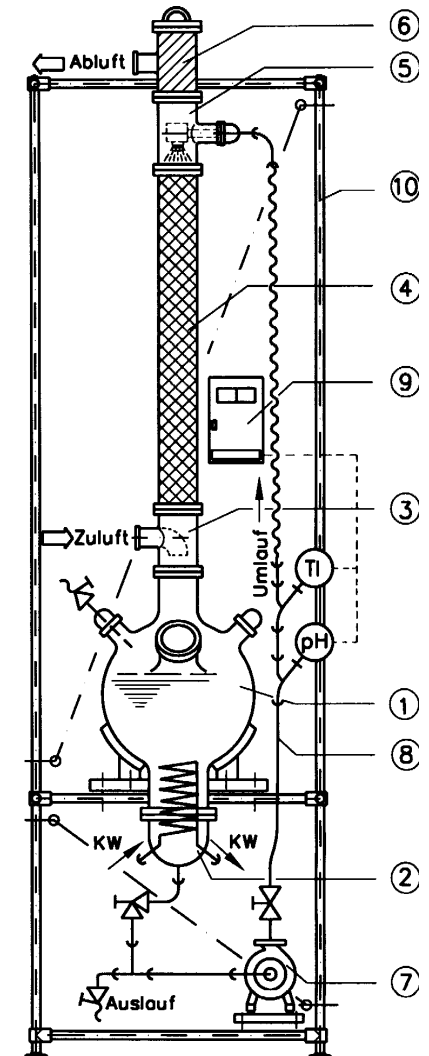
The environmental damaging substances in exhaust gases (e.g. HCL) released during many chemical processes should be eliminated and neutralised at source to prevent pollution of the atmosphere.

The **ALW** can be operated either in uni-flow or counter-flow.

Extras, such as devices for measuring temperature and pH level as well as the dimensions of the packed column / reservoir / magnetic pump etc., can be supplied according to customer specifications.

#### Standard type washer consists of:

1. spherical reservoir  
20 ltr. / BSG 3.3  
with various nozzles
2. coil cooler  
0,5 m<sup>2</sup> in BSG 3.3
3. connecting piece with air inlet nozzle
4. packed column  
(DN 100x1000) in BSG 3.3  
tube with spray nozzle in  
PTFE/BSG 3.3 (DN 100/50/15-25)
5. demister with outlet nozzle
6. magnetic pump  
(15/70) in PP, PVDF oder PTFE
8. circulating tube DN 15 in BSG 3.3
9. pH- and temperature control with  
digital display (optional)
10. frame in zinc-plated steel (1") with  
pipe connectors



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# Glass Filter Strainer with PTFE – or PP filter bottom

# CETEC

**Type GFN**  
**10 - 60 ltr.**

**Group: 2.5**  
**Sheet: 2.5.1**

## Glass Filter Strainer (GFN)

The **GFN** is highly resistant to chemicals due to the combination of materials such as glass/PTFE/PP or PVD its simple design enables easy operation.

The model **GFN** is particularly popular in laboratories or small batch production. It is moveable, can be easily assembled or dismantled and allows for visual observation of the process.

The closed model meets with today's environmental protection regulations.

The top part (1) of the **GFN** can be dismantled together with the filter bottom (3); (2) remains in the frame.

The PTFE filter bottom allows for an operating temperature of about 150 °C, PVDF about 100 °C and PP max. 50 °C. The pressure capacity of the **GFN** is full vacuum. The Excess load pressure limit is max. 0,5 bar.

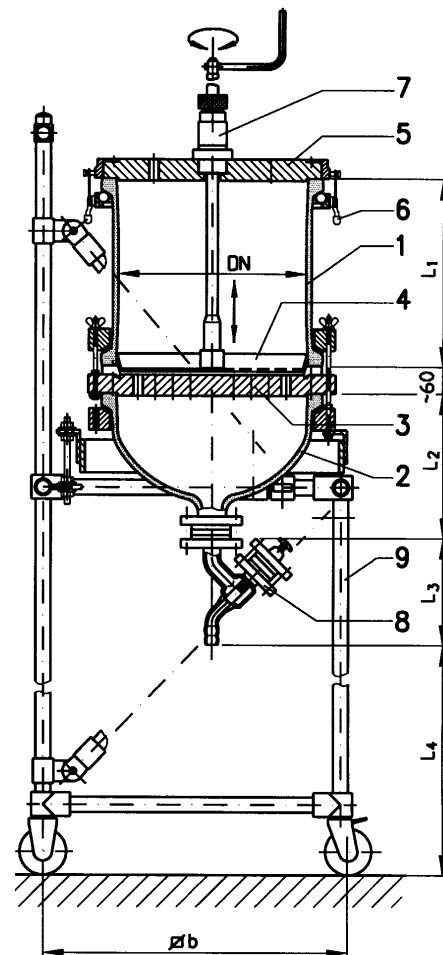
Other models and material combinations available on request.

### Construction of Glass-Filter-Strainer

1. glass column (DN 200-400)
2. glass vessel with outlet
3. filter bottom with fibrous filter and tension ring
4. spatula, stirrable, raisable and lowerable
5. cover, flat, with various connections and quick-lock device
6. quick action clamps
7. stuffing box to allow for movement of mixing spatula
8. filtrate outlet valve (vacuum)
9. framework, steel galvanized, with castors; two of them can be locked

### Dimensions

contents [ltr.]	DN	L1 [mm]	L2 [mm]
10	200	300	200
20	300	300	200
25	300	400	300
35	300	500	300
50	400	400	400
60	400	500	400



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# Vertical Peeling Centrifuge

## Type V 50 U and V 63 U

# CETEC

Type VZU  
500/630

Group: 2.6  
Sheet: 2.6.1

### Vertical Peeling Centrifuge (VZU)

Vertical Peeling Centrifuges are batch filter centrifuges for the processing of small quantities/batches (50 – 300 kg/h) in the chemical, pharmaceutical and related industries.

#### Particular advantages of these centrifuges are:

- non-manual emptying
- gentle emptying at peeling speeds of 50 rpm, no crystal damage
- acceptable ejection height for the peeled product
- compact space-saving design
- vibration adsorbing design in base of centrifuge
- low noise operation 75 dB (A)

#### General design:

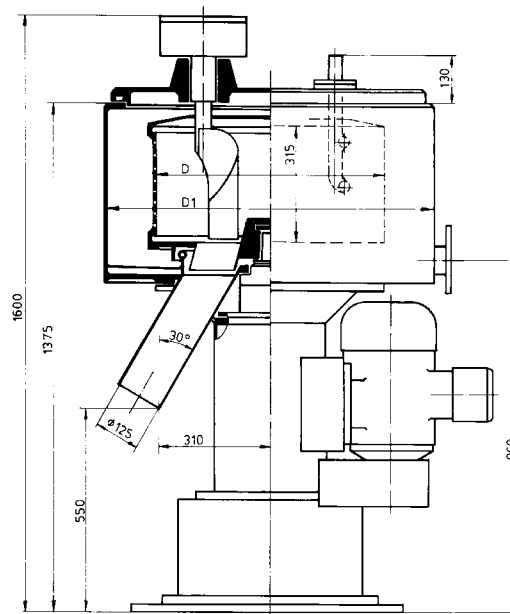
- frequency modulated drive
- complete control system also in ex-proof model
- balance control
- wide peeling knife
- removal system for any product left in basket
- available in all corrosion resistant materials
- rubber or HALAR lining

#### Options:

- inert gas blanketing
- centrifuge and control mounted on a common base, movable by means of hydraulic lift with cart

#### Basket data:

inside diameter:	500	630 mm
sieve height:	315	316 mm
filterarea:	0,5	0,63 m <sup>2</sup>
nominal volume:	31,5	50 ltr.
load:	40	63 kg
speed		
adjustable to:	1700	1500 <sup>1</sup> / <sub>min</sub>
centrifugal force:	800	800



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# OZON-Generators for Laboratory and Industry

# CETEC

Type OZE  
5 – 1000 g/h

Group: 2.7  
Sheet: 2.7.1

## Laboratory Ozonizer

- Production Range: 0,6 to 30 g/h
- Ozone production from Air or Oxygen

### Technical Characteristics:

- Table Model complete with all necessary fittings and Screw-Joint for gas inlet and outlet in front panel
- High Voltage Transformer 6 to 7 KV
- Air cooling

## OZON Generators for Industry

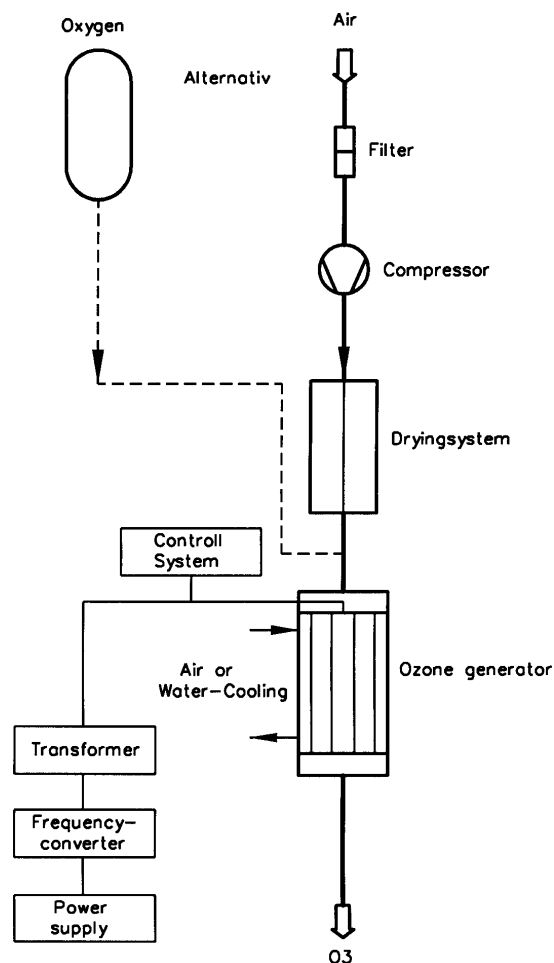
- **Typ M** : Prod. Range 5 - 500g/h  
Ozone production from Air or Oxygen  
Air Cooling System  
Ambient Temperature up to 35 °C
- **Typ U** : Prod. Range 40 - 600g/h  
Ozone production from Air  
Water Cooling System  
Ambient Temperature up to 45 °C
- **Typ US** : Prod Range 20 -1000g/h  
Ozone production from Oxygen  
Water Cooling System  
Ambient Temperature up to 45 °C

## OZONE Generator fully automatic

Are in a compact cabinet design and ready to use.  
The construction is according DIN 19627 with TÜV-approval and GS Sign.

**Ozone generator operating to the principle of silent electrical discharge under vacuum or alternatively light overpressure (max. 0,8 bar)**

Other capacity upon request



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**Type RWA**  
**0,18 - 1,1 KW**

**Group: 2.10**  
**Sheet: 2.10.1**

**Agitators – Actuators (RWA)**

The **RWA** is made to fit the CETEC stirring vessels, type **GRB** made of BSG 3.3 and the combined stirring vessel, type **CRB**, made of BSG 3.3 with SS (VA) or enamelled steel components.

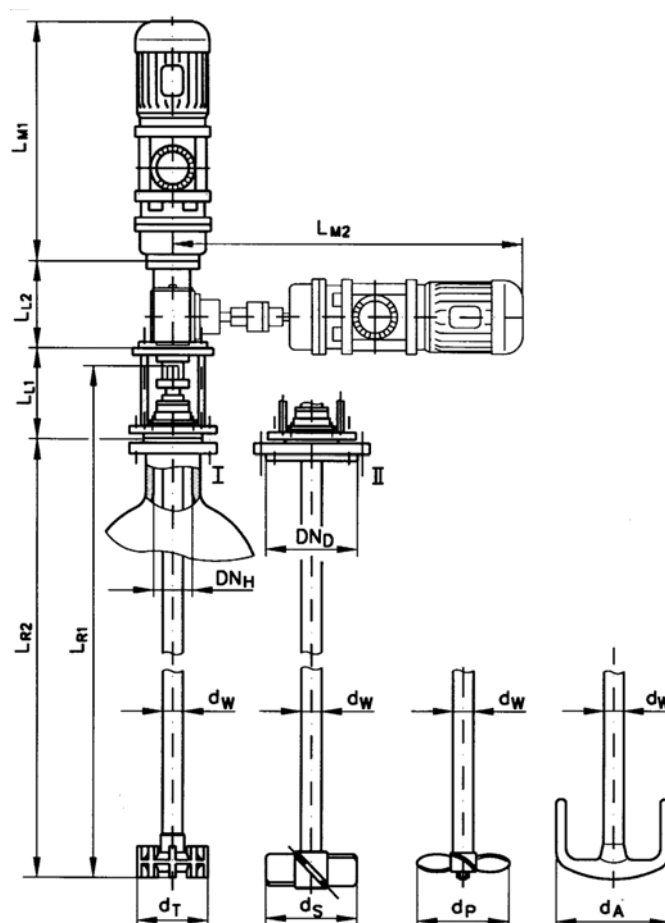
Continuously controlled operating speed by variable speed gear motor; i. e.: 52-520 RPM, or 9-90 RPM as to customer's request, resp. Definition of function.

Generally, the rotary current motors have a capacity of 220/380V-50 Hz-IP54 and can be supplied (expl. proof) EEXe II T3 or acc. to requirement. Actuation capacity ranging from 0,18-1,1 KW in compliance with motor performance. The actuator can be vertically or horizontally mounted depending on space available; bearing will be adjusted accordingly.

For the mechanical shaft seal – type **CGD** – please see catalogue item 2.12, page 2.12.1. It is a single-acting device with PTFE expansion bellow and aluminium oxide stationary ring. Other types and material compounds on request.

Agitators are available in the following shapes: propeller, turbo anchor, blade, impeller, etc. and can be supplied acc. to order. Materials should be in compliance with the process product, i. e. 1.4577.HC4, SS-PTFE, SS-PFA, Halar-coated, steel-enamelled, etc. agitators.

Specific customer requirements for different types of agitators can be given special attention. Please send your detailed inquiry.



**Dimensions**

vessel capacity	-10 ltr.	-20 ltr.	-50 ltr.
motor power [KW]	0,18/0,25	0,25/0,55	0,55/1,1
DN <sub>D</sub> [mm]	150/200	200/300	300/400
DN <sub>H</sub> [mm]	50	50/80	80/100
d <sub>A</sub> [mm]	140/190	190/280	280/380
d <sub>P</sub> [mm]	80/100	120	160
d <sub>T</sub> /d <sub>S</sub> [mm]	90	100	120
d <sub>W</sub> [mm]	25	33	43
L <sub>M</sub> /L <sub>R</sub>	depend of vessel measurement or customs		

technical alterations possible 11/2003

# Stainless Steel Stirring Propeller three blade steel casting unit

# CETEC

**Type ERP**  
**40 - 400**

**Group: 2.11**  
**Sheet: 2.11.1**

## SS Stirring Propeller (ERP)

three blades, models N and Z

Both types are made of stainless and acid resisting special steel (1.4581).

Model "Z" allows for a more effective stirring as by its special shape an additional flow turn of the mixture is produced.

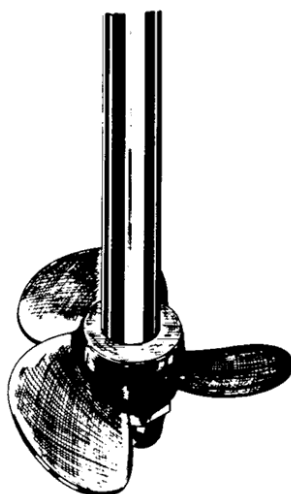
The ERP is ready for use, already balanced and provided with threaded or smooth bore holes acc. to requirements.

Electrolytically polished, surface or coated on request.

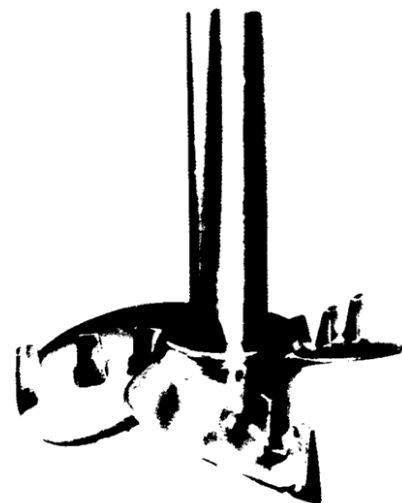
How to order:

ERP – 160 / N - M16 (or 16 H7)...

Other materials (HC, GG, Rg), types and sizes on request.



type N



type Z

propeller diameter [mm]	circulation [m³/min]		power consumption (KW)	
	type N	type Z	type N	type Z
			1450 / min	1450 / min
80	0,3	0,39	0,016	0,02
90	0,49	0,65	0,035	0,045
105	0,86	1,2	0,076	0,097
125	1,32	1,84	0,19	0,23
150	1,9		0,4	
160	2,7	3,6	0,63	0,8
190	4,6	6,1	1,45	1,9
220	7,2	9,5	3,01	3,9
			970 / min	970 / min
105	0,52	0,7	0,023	0,029
125	0,89	1,1	0,056	0,071
160	1,83	2,4	0,19	0,25
190	3,08	4	0,45	0,57
220	4,7	6	0,91	1,17
250	7	9,01	1,74	2,24
300	12	15,6	4,33	5,57
			730 / min	730 / min
190	2,6	3,2	0,22	0,29
220	3,6	4,5	0,4	0,51
250	5,3	6,7	0,75	0,96
300	9,2	11,9	1,85	2,38
350	14,5	18,8	4,01	5,15
400	21,7		7,79	

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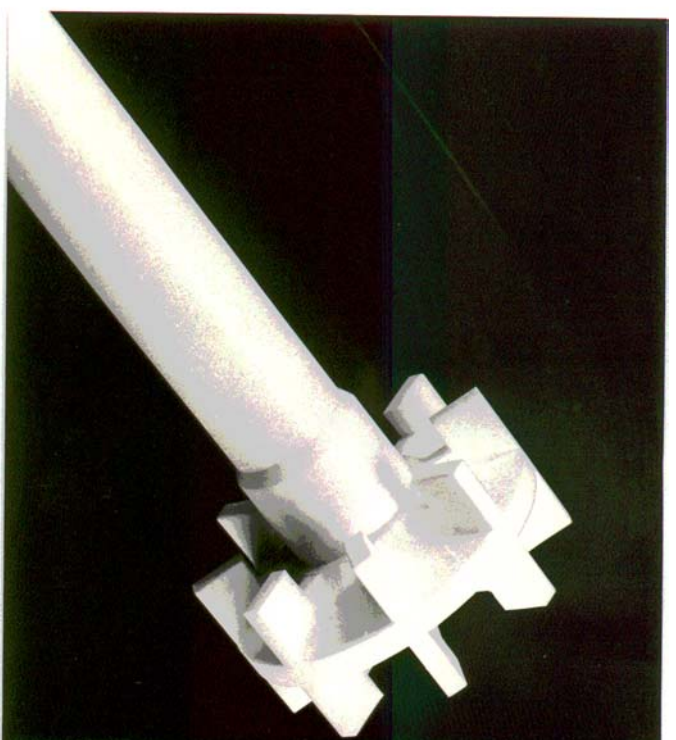
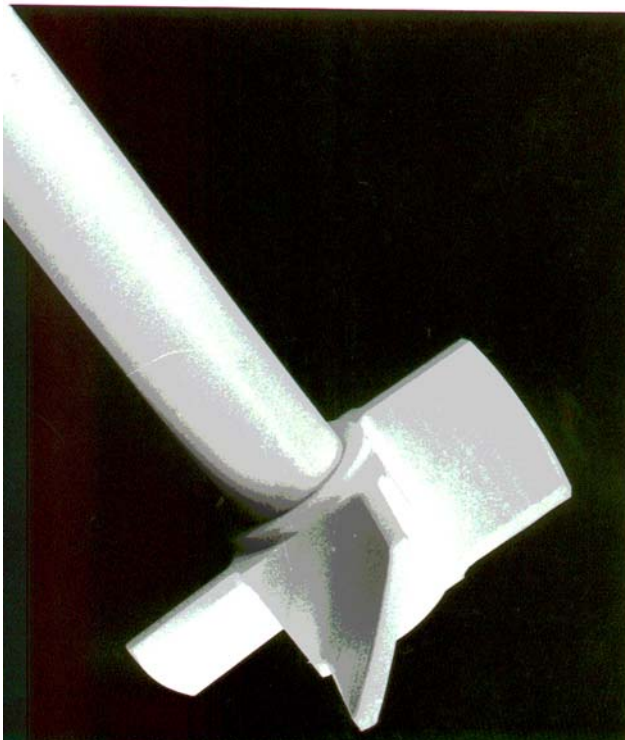
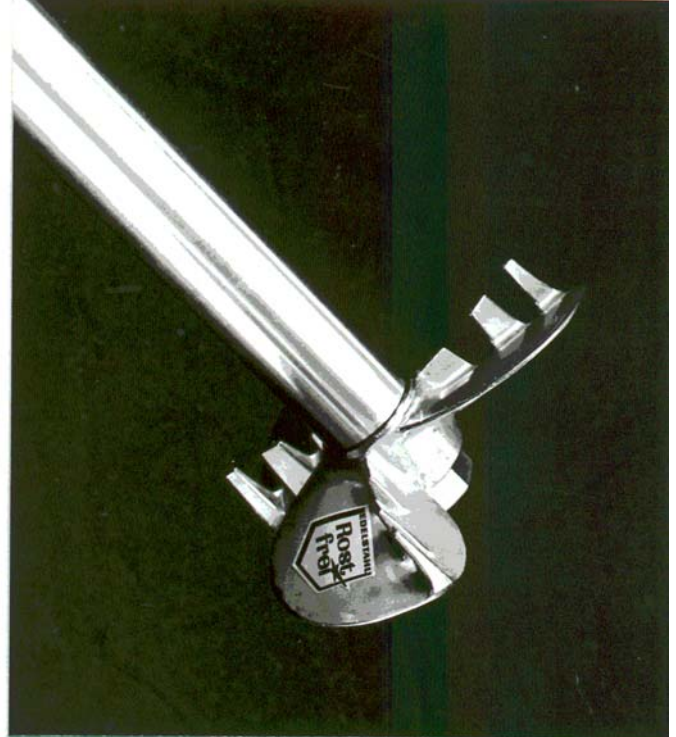
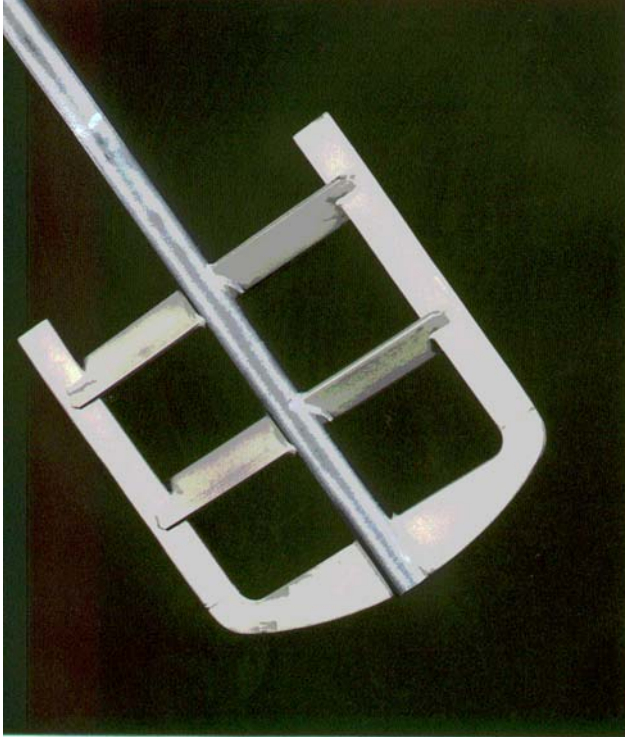
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High-grade steel anchor - propeller agitator  
and PTFE diagonal sheet-/ turbine agitator

**CETEC**

Group : 2.11  
Sheet : 2.11.1.1



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# Mechanical Seal with PTFE-bellow and Al<sub>2</sub>O<sub>3</sub>-counter

# CETEC

Type CGD  
25 - 65

Group: 2.12  
Sheet: 2.12.1

## Chemical Resistant Mechanical Seal (CGD)

CGD is single acting and rotates freely in both directions.

The material components -YVTMT-DR; which stand for expansion bellow (PTFE) with fibreglass reinforced sealing face and clamping fixture and counter ring in (Al. oxide) so that the highest corrosion resistant quality is guaranteed.

All organic compounds and salts as well as all kind of products which are exposed to strong oxidation or oxidation reduction – except for molten alkali metals and fluric gas, present no problem.

### Construction features:

1. **mechanical seal – expansion bellow**  
PTFE glass (T)-(Y)
2. **counter ring**  
al-oxide (V)- (DR)
3. **pressure ring**  
duroplast
4. **clamp collar with screw**  
SS
5. **compression springs**  
Hostelloy – C (M)
6. **intermediate ring**  
PTFE
7. **mounting collar**  
SS
8. **securing ring**  
SS

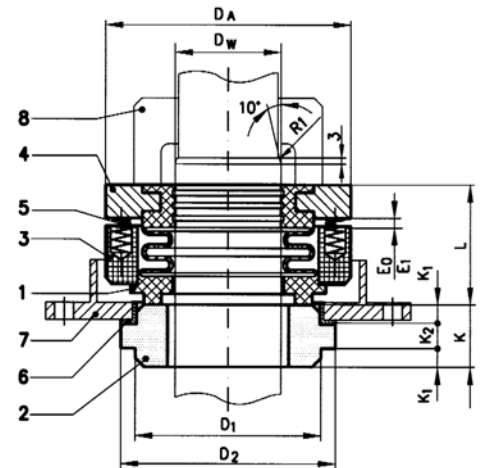
### Range of application:

Basically in combination with high quality components like glass, ceramic, titanium etc. for shaft insertions in stirring vessels and pumps.

### How to order:

Shaft diameter 33 mm  
CGD – 033 / YVTMT - DR

Other types, nominal widths, materials on request.



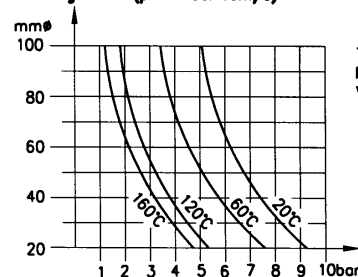
### Dimensions

Dw/h6	D A	D1/f7	D2/h1	E 0	E 1	K	K 1	K 2	L
25 / S	60	42	52	2	4	18	5	8	40
33 / S	75	54	67	2	4	26	7,5	11	42
35 / S	75	54	67	2	4	26	7,5	11	42
43 / S	85	67	80	2	4	26	7,5	11	42
53 / S	95	80	96	2	4	34	10	14	45
65 / S	105	90	106	2	4	34	10	14	45

.../S = standard, E<sub>0</sub> = setting dimension, E<sub>1</sub> = abrasion factor

### Application limits (p x v at 10 m/s)

#### Einsatzgrenzen (p x v bei 10m/s)



T<sub>max</sub> = 160 °C  
P<sub>max</sub> = 9 bar  
V<sub>max</sub> = 10 m/s

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# Glass covers (hoods)

# CETEC

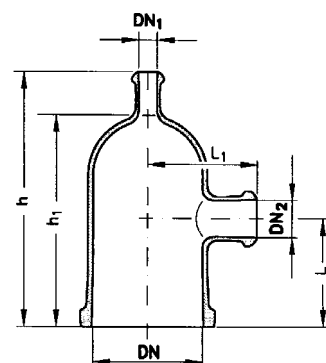
## Type HAU

**Group:** 2.15  
**Sheet:** 2.15.1

- Material:** borosilicate-glass 3.3
- Flange:** b = collar flange
- Facing:** according to DIN / ISO 3587  
either glass ground or fire polished  
(high breaking resistance)

### Dimensions

DN	DN <sub>1</sub>	DN <sub>2</sub>	h [mm]	h <sub>1</sub> [mm]	L [mm]	L <sub>1</sub> [mm]	
80	25	25	300	240	100	100	
		50			125		
100	25	25	300	240	150	125	
		50					
150	25	50	350	290	150	150	
		80					
200	50	50	400	340	150	175	
		80	400	340	150		
		100	450	390	200		
300	50	50	500	440	200	225	
		80	500	440	200	225	
		100	500	440	200	225	
		150	550	490	250	275	

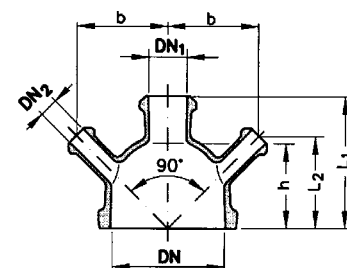


How to order:  
GAH – 300 / 50 - 80

Other nominal widths and types on request.

### Dimensions

DN	DN <sub>1</sub>	DN <sub>2</sub>	L <sub>1</sub> [mm]	L <sub>2</sub> [mm]	b [mm]	h [mm]
100	50	2 x 25	150	121	97	90
150	50	2 x 25	175	122	122	111
200	50	2 x 25	175	122	122	119
300	50	2 x 25	225	172	172	168



How to order:  
GZH – 200 / 50 - 25

Other nominal widths and types on request.

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# Cylindrical Vessel

# CETEC

Type ZYG

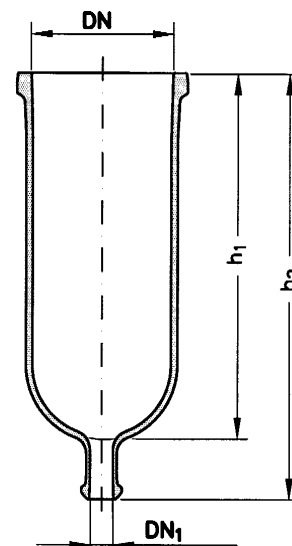
Group: 2.15  
Sheet: 2.15.2

**Material:** borosilicate-glass 3.3  
**Flange:** b = collar flange  
**Facing:** according to DIN / ISO 3587  
either glass ground or fire polished  
(high breaking resistance)

## Dimensions

DN	Volume [ltr.]	DN <sub>1</sub>	h <sub>1</sub> [mm]	h <sub>2</sub> [mm]
150	5	25	400	460
	10	25	660	720
200	5	25	290	350
	10	25	490	550
300	30	25/40	590	650
300	50	25/40	840	900

Other nominal widths and types on request.



How to order:  
ZG – 10 / 200 - 490

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**Material:** borosilicate-glass 3.3  
**Flange:** b = collar flange  
**Facing:** according to DIN / ISO 3587  
either glass ground or fire polished  
(high breaking resistance)

### Dimensions

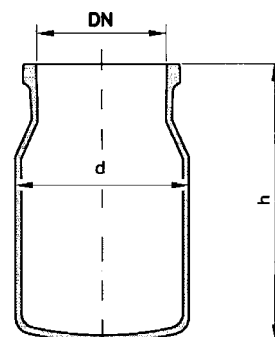
DN	150				200			
Volume [ltr.]	2	4	6	10	15	20	25	30
d [mm]	180	200	215	240	250	315	315	315
h [mm]	160	240	270	360	410	460	530	700
DN <sub>1</sub>	25							
L <sub>1</sub> [mm]	40							
L <sub>2</sub> [mm]	220							

Alternative: with nozzle (S) or valve (V)

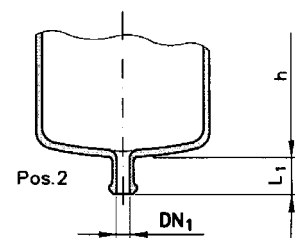
Other nominal widths and types on request.

### How to order:

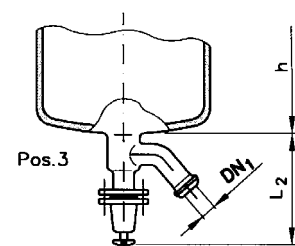
Pos.1: without nozzle - O  
for example: RG - 15 / 200 - 3b - O  
Pos.2.: with nozzle - S  
Pos.3.: with valves - V



Pos.1



Pos.2



Pos.3

technical alterations possible 11/2003



# Reaction Vessel with jacket – beaker shape

# CETEC

Group: 2.15  
Sheet: 2.15.3.1

**Material:** borosilicate-glass 3.3  
**Flange:** b = collar flange  
**Facing:** according to DIN / ISO 3587  
either glass ground or fire polished  
(high breaking resistance)

## Dimensions

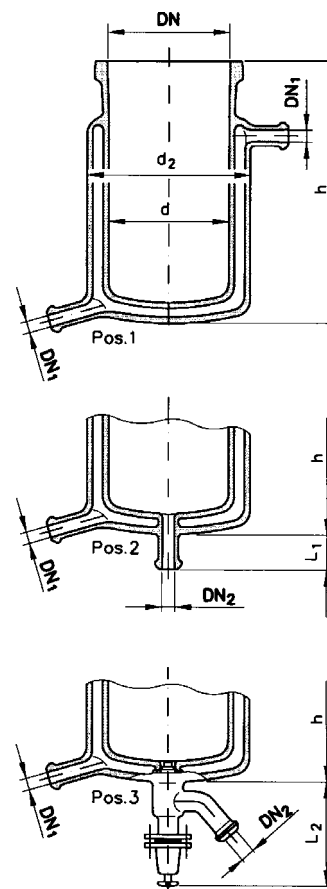
DN	150		200			300		
Volume [ltr.]	4	6	10	15	20	25	30	50
$d_{(i)}$ [mm]	150		200			290		
h [mm]	330	440	450	630	780	530	600	900
DN <sub>1</sub>	15		25					
DN <sub>2</sub>			25					
L <sub>1</sub> [mm]			40			50		
L <sub>2</sub> [mm]			220					
d <sub>2</sub> [mm]	200		270			370		

Alternative: collar (b/k) – or laboratory flange (L)  
with nozzle (S) or valve (V)

Other nominal widths and types on request.

## How to order:

Pos.1: ...without nozzle – O  
RGM – 25 / 300 - 3b - O  
Pos.2: ...with nozzle – S  
Pos.3: ...with valves – V



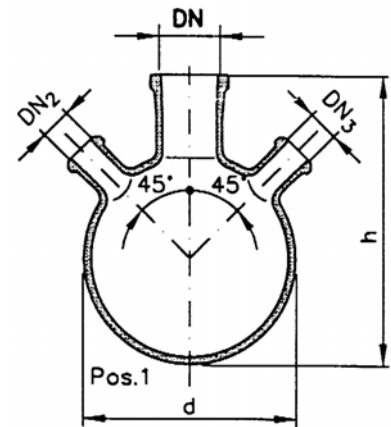
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**Material:** borosilicate-glass 3.3  
**Flange:** b = collar flange  
**Facing:** according to DIN / ISO 3587  
either glass ground or fire polished  
(high breaking resistance)



### Dimensions

Volume [ltr]	10	20	50	100
DN [mm]	100		200	
DN <sub>1</sub> [mm]	25 - 300			
DN <sub>2</sub> [mm]	25	25	25	25
DN <sub>3</sub> [mm]	25	50	50	50
d [mm]	280	350	510	610
h [mm]	450	550	700	825
L <sub>1</sub> [mm]	50			
L <sub>2</sub> [mm]	220			

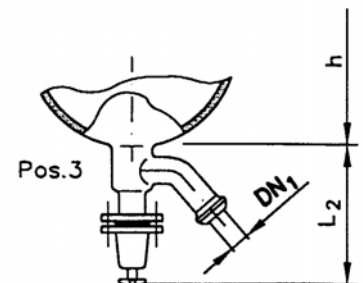
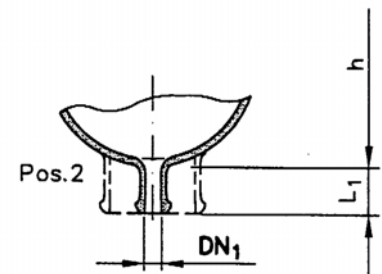
Other nominal widths and types on request.

### How to order:

Pos.1 : ... without nozzle - O  
KG - 20 / 100 - O

Pos.2: ... with nozzle - S  
KG - 10 / 100 - S / 25 - 1 - B

Pos.3: ... with valves -V  
KG - 50 / 200 - V / 25 - 1 - B



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# Column with metering nozzle

# CETEC

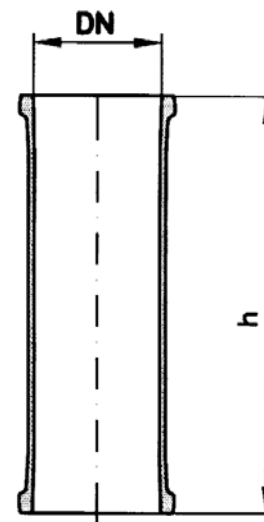
Group: 2.15  
Sheet: 2.15.6

- Material:** borosilicate-glass 3.3
- Flange:** b = collar flange
- Facing:** according to DIN / ISO 3587  
either glass ground or fire polished  
(high breaking resistance)

### Dimensions

DN	80	100	150	200/225*	300
DN <sub>1</sub>	25				
h [mm]	1000				
h <sub>1</sub> [mm]	40		60		30
L [mm]	75		100		125
L <sub>1</sub> [mm]	100	125	150	175/200	225
d [mm]	45	65	105	150	200

Other nominal widths and types on request.

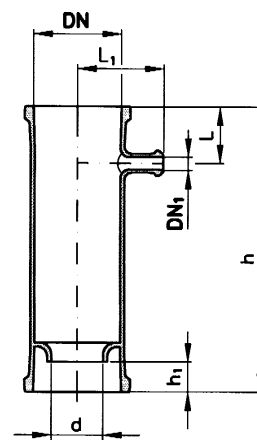


How to order:  
KS – 200 / 1000 – 3b

### Dimensions

DN	80	100	150	200/225*	300
h [mm]	500/1000/1500				

Other nominal widths and types on request.



How to order:  
KR – 200 / 1000 – 3b

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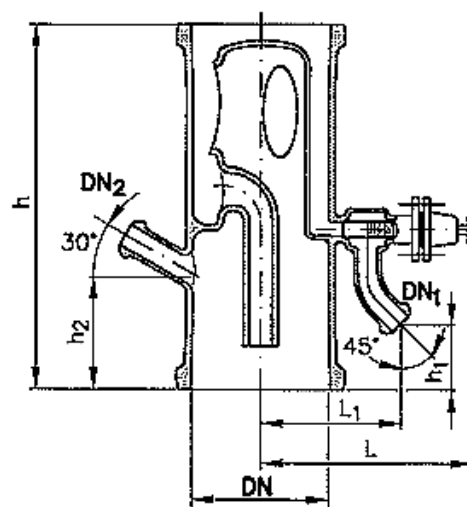
# Reflux divider DN 80 - 100 - 150

## Manual control

# CETEC

Group: 2.15  
Sheet: 2.15.7

- Material:** borosilicate-glass 3.3
- Flange:** b = collar flange
- Facing:** according to DIN / ISO 3587  
either glass ground or fire polished  
(high breaking resistance)



How to order:  
RLT – 080 / 275 - HV

### Dimensions

DN	H [mm]	L [mm]	DN <sub>1</sub>	h <sub>1</sub> [mm]	L <sub>1</sub> [mm]	DN <sub>2</sub> *	h <sub>2</sub> [mm]
85	275	250	15	60	120	25	120
100	300	260	25	70	150	25	120
150	300	280	25	60	170	25	130

\*Nozzle DN<sub>2</sub> is tangentially placed.  
Other nominal widths and types with pneumatical power on request.









HV= manual - valves  
PV= pneum. valves

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column packing		sizes [mm]	surface [m <sup>2</sup> / ltr]
cylindrical rings, ceramic*		5, 6, 8, 10, 12, 15	4,8 / d
saddle, ceramic*		4, 6, 8, 10, 15	7,3 / d
cylindrical rings, glass		2, 3, 4, 5, 6, 8, 9, 10, 12, 15	4,8 / d
wire coils, tightly winded		2, 3, 4, 5, 6, 8, 10, 12	7,2 / d
wire coils, stretched		2, 3, 4, 5, 6, 8, 10, 12	6,9 / d
wire mesh rings, SS		3, 4	6,5 / d
wire mesh rings, SS		3, 4, 6, 8, 10, 15	8,4 / d
Wilson- coils, glass		3, 4, 7	4 / d

d = nominal size or outer diameter (mm)

\* = ACIDUR- specialty ceramics and DURANIT- porcelain

Quantity of cycl. rings resp. coils ca.:  $0,768 \times 10^6 / d^3$  (pro ltr.)

Other material (plastic) on request

technical alterations possible 11/2003

# Column Packing

## Made in ceramic

# CETEC

**KPK**

**Group:** 2  
**Sheet:** 2.16.7

### Column Packing KPK

Ceramic Column Packing is since approx... 20 years with success in use.

The structure packing is used for the high performance of mass- and heat transfer in distillation rectification -, absorption and extraction columns.

The **KPK** Packing is made from thin-walled ceramic and is used mainly for corrosive distillation products.

#### **MATERIAL:**

Silicium and alumina oxide with small content of alkalis and alkaline-earths for high chemical resistance  
Improved catalytic indifferent by withdrawal of ferrous magnet. Ferric oxide (Fe3O4)

#### **APPLICATION:**

Rectification of halogenated and organic compounds e.g. Naphthene -, Carbon -, mineral -, mono -, dichlor -, acetic -, formic acid etc..

#### **CHARACTERISTICS:**

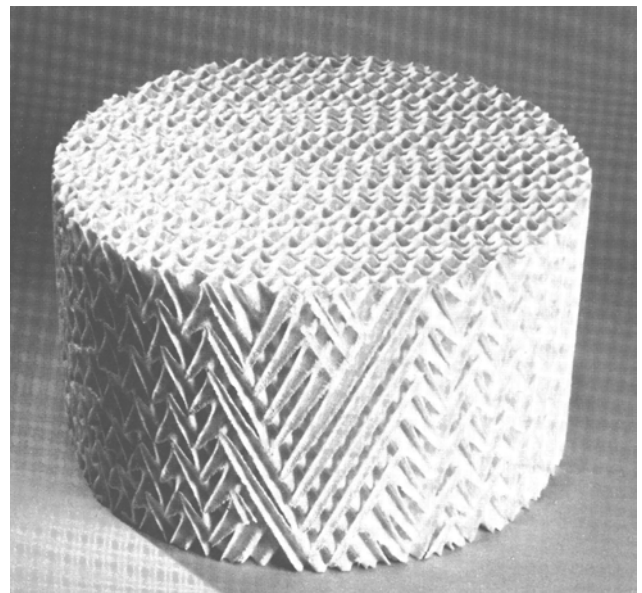
High separation efficiency with very low pressure drop  
Minimum liquid hold up and economic operating range

#### **AREA OF APPLICATION:**

Refinery, fine chemicals, flavours, laboratory and pilot – columns  
Suitable for vacuum or atm operation for different column material e.g. glass -, enamelled or other lined columns

The indicated values are based partially on estimations and serve only as reference

For corrosion tests, we can deliver samples.



- CERADUR® -

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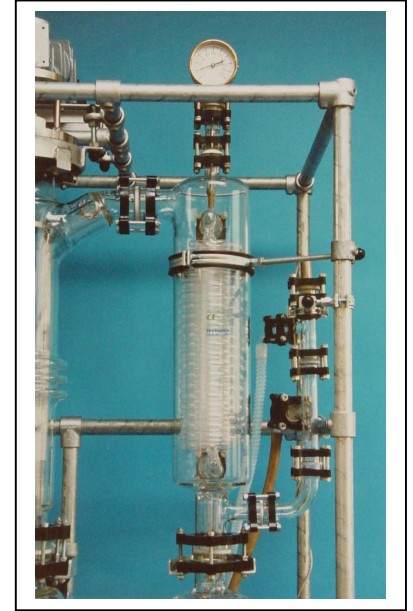
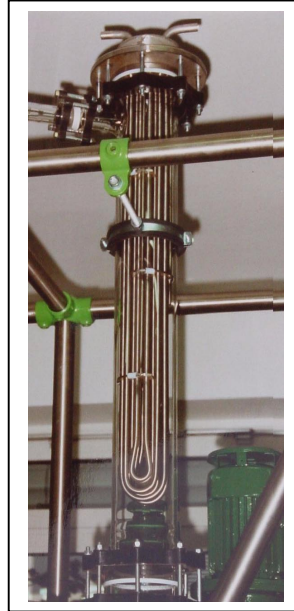
## WÄRMETAUSCHER+HEIZ-/KÜHLGERÄTE Heat-Exchanger + Heating-/Cooling-Units

Gruppe / Item 3.1-1

U-Rohr-WT, DN 150 / 1 m<sup>2</sup> 1.4571

Kondensor: BSG 3.3/HC22

Glas-Kondensor 0,7 m<sup>2</sup> (BSG 3.3)

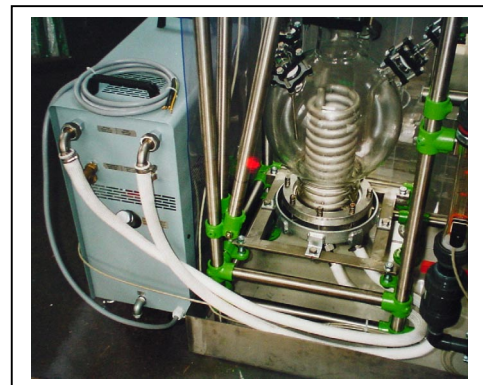


Thermoöl-Heiz-/Kühl-Gerät 3/6/9KW; 20-150°C

Glas-Metall-Kondensor DN 200 / 2 m<sup>2</sup> (HC22)



Rückseite: Thermoöl-Heizgerät





Type  
WT

Group: 3.0  
Sheet: 3.0.1

Company / address: \_\_\_\_\_

Name / Dept.: \_\_\_\_\_

Tel.: / Fax: \_\_\_\_\_ / \_\_\_\_\_

**1. Operational Requirements:**

heating  / cooling  / evaporation  / condensation  / reduction  / dilution   
 other  \_\_\_\_\_

**2. Evaluation:**

product side                      service side

medium		_____	_____
composition / concentration	weight-%	_____	_____
solid matter	%	_____	_____
other elements	%	_____	_____
pH - level		_____	_____
specific weight	kg/m <sup>3</sup>	_____	_____
specific heat	kJ/kg K	_____	_____
heat conductivity	W/m K	_____	_____
viscosity with temperature	m Pas at °C	_____	_____
“ (secondary) “	m Pas at °C	_____	_____
evaporation / condensation heat	kJ/kg	_____	_____
amount	kg/h	_____	_____
deposit factor	m <sup>2</sup> K/W	_____	_____
entry / exit temperature	°C	_____	_____
exchangeable heat amount	kW	_____	_____
pressure (vacuum)	bar/mbar	_____	_____
permitted pressure loss	bar	_____	_____
suggested material (graphite, SS, PTFE...)		_____	_____
other		_____	_____

drawing (please sketch on reverse side of this sheet)  (type / installation area / connections)

technical alterations possible 11/2003

# Heat Exchanger

## Coil condenser with / without jacket

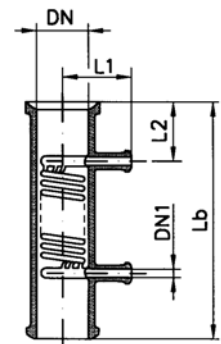
# CETEC

Group: 3.1  
Sheet: 3.1.1

- Material:** borosilicate-glass 3.3
- Flange:** b = collar flange  
tog.\* with 1, 2 or 3 complete
- Facing:** according to DIN / ISO 3587  
either glass ground or fire polished  
(high breaking resistance)

### Dimensions

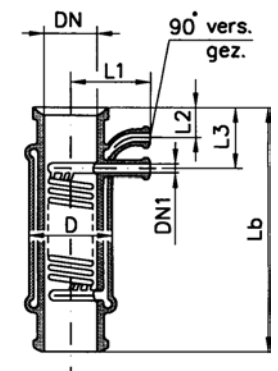
DN	50		80		100		150		200/225*	
Fb [m <sup>2</sup> ]	0,15	0,2	0,3	0,5	0,3	0,6	0,6	1	1	1,8
Lb [mm]	500	800	500	800	450	750	525	750	500	750
Fk [m <sup>2</sup> ]	0,3		0,4		0,5		1	1,5	2,5*	
Lk [mm]	610		610		610		610	840	790*	
DN <sub>1</sub>	15		15		15		25		25	
L1 - b/k	75		100		100		200/150		225/180*	
L2 - b/k	75		75		75		85/100		85/125*	



How to order:  
WTS – 50 / 800 b\*

### Dimensions

DN	50		80		100		150		200/225*	
Fb [m <sup>2</sup> ]	0,25	0,3	0,4	0,65	0,4	0,8	0,8	1,25	1,25	1,25
Lb [mm]	500	800	500	800	450	750	525	750	500	750
Fk [m <sup>2</sup> ]	0,45		0,55		0,65		1,2	1,8	3,0*	
Lk [mm]	610		610		610		610	840	790*	
DN <sub>1</sub>	15		15		15		25		25	
D [mm]	90		120		150		200		300	
L <sub>1</sub> [mm]	100		125		125		150		200	
L <sub>2</sub> [mm]	75		75		100		100		125	
L <sub>3</sub> [mm]	100		100		125		125		150	



How to order:  
WTSM – 50 / 500 b\*

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**Bayonet Heater in SS**  
**Single tube for glass equipment DN 80**

**CETEC**

**Type HKE**  
**DN 80**

**Group: 3.2**  
**Sheet: 3.2.3**

**Bayonet heater, single tube (HKE)**

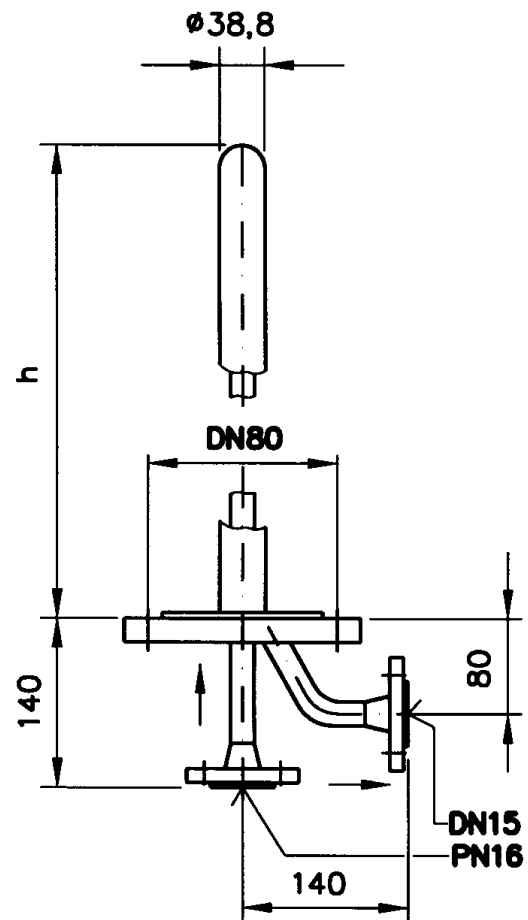
Bayonet heaters are used for small circuit evaporators and preheaters of stripping columns and are fixed in a glass tube, NW 80, of corresponding length.

Steam and condensate connect by means of steam hoses with flanges according to DIN 2633 / PN 16.

Material: SS 1.4571/Tantal\*/Titan\*  
 \* for components in contact with product

**How to order:**  
 for HKE 0,150 m<sup>2</sup>, DN 80 in 1.4571:  
**HKE – 80/15 – 1.4571**

Other sizes, materials and types on request.



**Dimensions**

DN	Heat transfer surface [m <sup>2</sup> ]	h [mm]
80	0,050	400
	0,100	800
	0,125	1000
	0,150	1200
	0,175	1400
	0,200	1600

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# Bayonet Heater

for glass apparatus DN 150 - DN 300

# CETEC

Type KWT  
0,1- 2,0 m<sup>2</sup>

Group: 3.2  
Sheet: 3.2.3.1

## Bayonet heater (KWT)

With metal heat exchangers of larger sizes (more transfer surface) a higher heat exchange capacity can be obtained with multiple tube bayonet heaters.

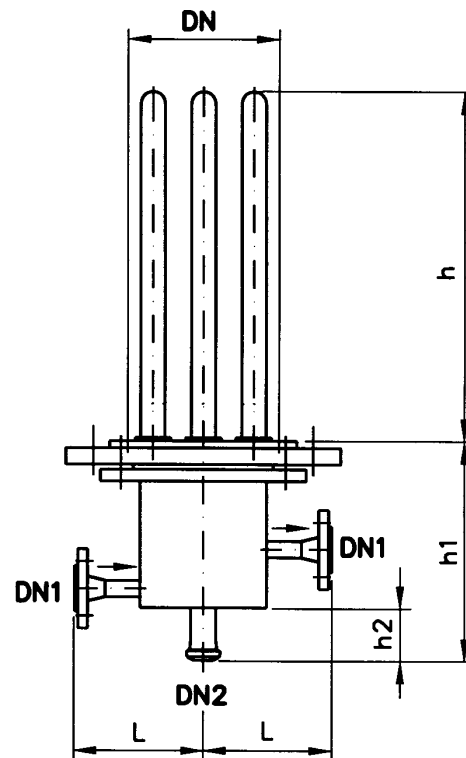
Proven application in circuit evaporators and columns up to DN 300. The heating tubes are welded onto a bottom plate, which has bore holes to fit those of DIN flange connection of the glass component. The outlet nozzle (DN 1) is suitable for glass tubing connection.

Standard type is tested for heating steam excess pressure of 6 bar. Steam and condensate connect by means of steam hoses with flanges according to DIN 2633 / PN 16.

Material: SS 1.4571/Tantal\*/Titan\*  
\* for components in contact with product

**How to order:**  
for KWT 0,20 m<sup>2</sup>, DN 150 in 1.4571:  
**KWT – 150/20 – 1.4571**

Other sizes, materials and types on request.



## Dimensions

DN	Heat transfer surface [m <sup>2</sup> ]	DN <sub>1</sub>	DN <sub>2</sub>	h	h <sub>1</sub>	h <sub>2</sub>	L	b tubes
150	0,1	25	25	175	250	200	180	7
	0,2			335				
	0,3			495				
200	0,3	25	25	495	250	200	200	7
	0,5			825				
	0,7			1155				
300	1	50	50/25	580	350	300	300	20
	1,5			870				
	2			1160				

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# Coil Heat Exchanger for glass apparatus DN 150 - DN 300

# CETEC

**Type SWT**  
**0,1- 1,0 m<sup>2</sup>**

**Group: 3.2**  
**Sheet: 3.2.4**

## Coil Heat Exchanger (SWT)

Heating coils as a metal heat exchanger to heat liquids in glass vessels and columns. The heating coil is welded onto a bottom plate which has been bored to fit the DIN flange connection of the glass parts. The outlet nozzle (DN 1) is suitable for glass tube connections.

Steam and condensate tubing should be connected by steam hoses ( steel convoluted hoses). Operating pressure of heating coils:

13 bar excess pressure.

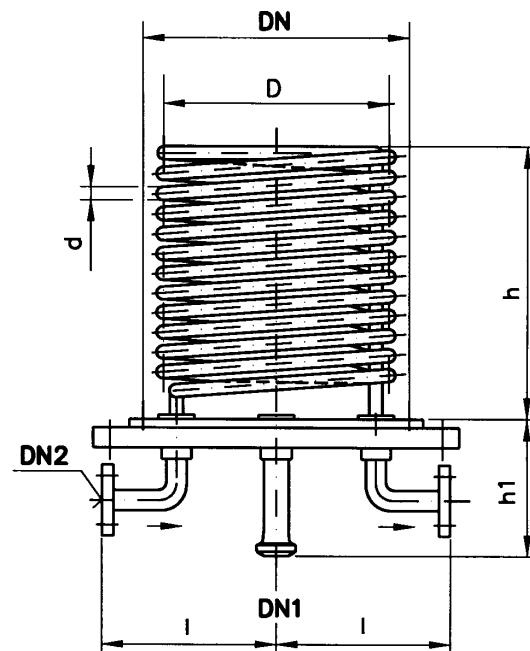
Material: 1.4571/Tantal\*/Titan\*

\* for components in contact with product

### How to order:

for SWT 0,20 m<sup>2</sup>, DN 150, in 1.4571:  
**SWT – 150/20 – 1.4571**

Other sizes, materials and types on request.



### Dimensions

DN	Heat transfer surface [m <sup>2</sup> ]	DN <sub>1</sub>	DN <sub>2</sub>	D [mm]	D hose [mm]	h [mm]	h <sub>1</sub> [mm]	l [mm]
150	0,1	25	15	115	15	180	125	115
	0,2		15			300		
200	0,15	25	15	165	15	180	75	150
	0,3		15	165		300		
	0,45		25	165/125*		300		
	0,6		25	165/125*		300		
300	0,25	50	15	260	20	200	75	200
	0,5		15	260		325		
	0,75		25	260/210*		300		
	1		25	260/210*		350		

\*dual heating coil

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Type  
CNDGroup: 4.0  
Sheet: 4.0.1

Company / address: \_\_\_\_\_

Name / dept.: \_\_\_\_\_

Tel.: / fax: \_\_\_\_\_ / \_\_\_\_\_

1. **Operational Requirements:** \_\_\_\_\_2. **Flow – Through Fluid:**

name of liquid: \_\_\_\_\_ formula: \_\_\_\_\_  
 concentration: \_\_\_\_\_ %  
 temperature: \_\_\_\_\_ / \_\_\_\_\_ °C min / max  
 viscosity or similarity with other fluid: \_\_\_\_\_ °E / \_\_\_\_\_  
 specific weight: \_\_\_\_\_ kg/m<sup>3</sup>  
 solids content: \_\_\_\_\_ %  
 grain content: \_\_\_\_\_ mm (soft  / hard )

3. **Specific Requirements:**

capacity: \_\_\_\_\_ Q min.; \_\_\_\_\_ ltr./min/Q max.; \_\_\_\_\_ ltr./min  
 hydrostatic pressure: \_\_\_\_\_ m WS (bar)  
 suction height: \_\_\_\_\_ m WS (bar)  
 static suction head: \_\_\_\_\_  
 self suction required: yes  / no  ; amount: \_\_\_\_\_ pieces  
 installation: outdoors  / at room temperature  ; (sketch / plan)

4. **Pump Type / Connection:**

centrifugal pump  / piston – dosage pump  / diaphragm - dosage pump  / peristaltic pump   
 screw pump  / submersible pump  / barrel pump  / other: \_\_\_\_\_  
 dia. Of pipes: DN \_\_\_\_\_ ; conn. pipes available: yes  / no   
 connection type (DIN): \_\_\_\_\_  
 material: app. / conduit / seals: \_\_\_\_\_

4.1 **Power:**

pump with flanged motor (available compl. only)   
 pump without motor   
 pump on base plate with coupling with / without motor   
 current: alternating current  / rotary current  / direct current   
 voltage: \_\_\_\_\_ V; \_\_\_\_\_ Hz / IP \_\_\_\_\_ / EEx \_\_\_\_\_

4.2 **Seals:**

stuffing box  / mechanical rotating seal: single face  / double face  / with static sealing press. syst.  /  
 magnetic coupling  / other: \_\_\_\_\_

4.3 **Extras:**

frequency regulation  / variable speed gear  / overheat cut-out  / flow control  /  
 bogie  / current overload cut-out  / other: \_\_\_\_\_

technical alterations possible 11/2003



## Type VPS II

**B 335 x H 880 x T 530 mm**

**Group: 4.3**

**Sheet: 4.3.3**

The vacuum pump unit **VPS II** is completely equipped with a PTFE membranes vacuum pump – **VP** – (2,1 m<sup>3</sup>/h <= 15 mbar), a condenser - **KA** – (-20 / - 30 °C, 450 W), which is connected to an insulated high capacity cooling trap – **KF** – made of BSG 3.3 glass (ca. 0,5 m<sup>2</sup>) and to a vacuum stabilizing unit – **VR** – by means of a control valve - **RV** – a permanent vacuum is guaranteed. A level indicator which is situated on the front side of the control panel of the cooling trap, shows the quantity of the condensate collected. The condensate interruption of the distilling process.

The aeration valve – **BV** – is switched from – **KF/RE** – to - **KF/B** – in order to keep – **RE** – vacuum controlled. – **KF** – is aerated to drain the condensate.

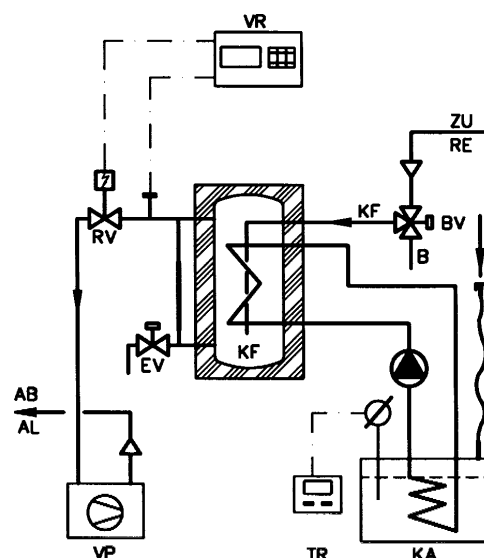
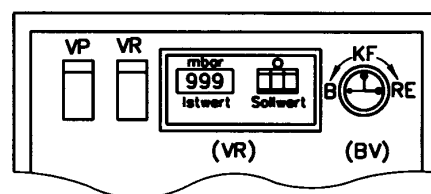
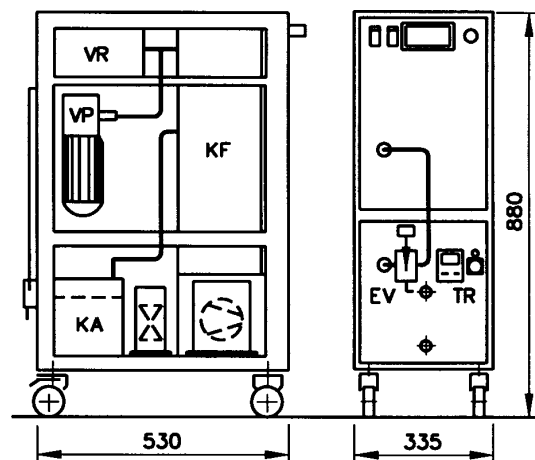
The compact unit has very small dimensions: W x H x D = 335 x 880 x 530 mm and is stand on four castors, two of which can be locked.

Application of the VPS II – e. g.: in laboratories – is versatile as a result of its high chemical resistant material. Operating fields are: vacuum dryer cabinets, reactors and various distillations processes; as a vacuum source or as a complete "unit" consisting of a vacuum controller, glass condenser and glass cooling trap.

To operate the unit a single power source is needed. Neither water nor dry ice has to be used. The excellent combination of vacuum pump in conjunction with high capacity cooling and easy handling.

The unit also contributes to environment al conservation. Since neither water nor oil are used contamination does not take place. Most of the steam is condensed in the cooling trap – **KF** – and can be disposed of either at a waste separating plant or waste disposal facility.

- AL** = exhaust
- BV** = aeration valve
- EV** = drain outlet valve
- KA** = condenser
- KF** = cooling trap (glass)
- RV** = control valve
- RE** = receptor (closed)
- TR** = temp. controller
- VP** = vacuum pump
- VR** = vacuum controller



technical alterations possible 11/2003



## GLASTEILE -1-

### Glassparts

## Guppe /Item 5.1-2

### Glasventile – Schrägsitz- + Eckventile



### Glasrohrleitungsteile ( BSG 3.3)



### Kolonnenteile, beschichtet



### Kondensator, schrägliegend, beschichtet



**Material:** borosilicate-glass 3.3

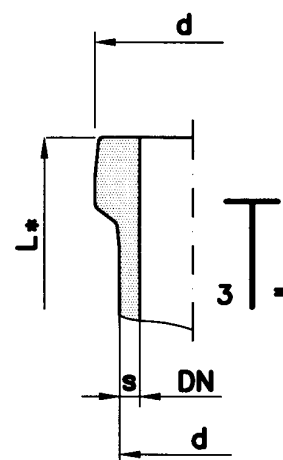
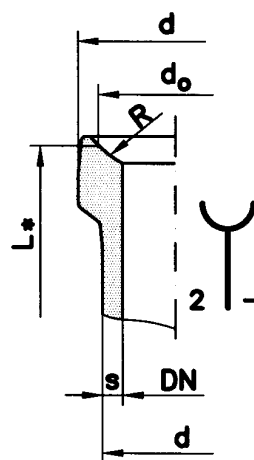
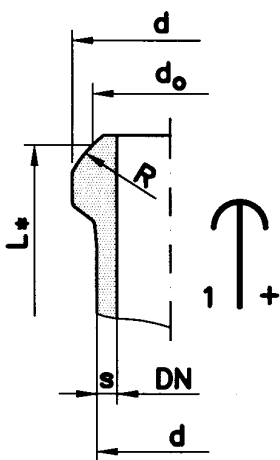
**Flange:** b = collar flange  
 tog.\* with 1, 2 or 3 complete

**Facing:** according to DIN / ISO 3587  
 either glass ground or fire polished  
 (high breaking resistance)

**Type:** ball  
**Ref.number:** 1  
**Ref. Mark:** +

**Type:** saucer  
**Ref.number:** 2  
**Ref. mark:** -

**Type:** flat  
**Ref.number:** 3  
**Ref. mark:** =



DN	15	25	40	50	80	100	150	200	300
max	23	35	51	62	92	120	170	215	315
S min	2,5	4,0	5,0	5,0	5,0	5,0	7,0	7,0	7,0
d	30	44	62	76	110	131	185	233	338
d <sub>o</sub>	21	34	50	62	90	118	170	224	325
R	18	25	40	50	80	100	170	200	300
P 1*	4	4	4	4	3	2	2	1	1
P 2*	3	3	3	2	1,5	1	0,5	-	-

P 1\* = max. operating pressure (bar) without glass adaptors

P 2\* = max. operating pressure (bar) with glass adaptors

L\* = acc. to DIN/ISO 3587 Rate

Other flange connections possible

**Type GLR1**

**Group:** 5.1  
**Sheet:** 5.1.2

- Material:** borosilicate-glass 3.3
- Flange:** b = collar flange  
tog.\* with 1, 2 or 3 complete
- Facing:** according to DIN / ISO 3587  
either glass ground or fire polished  
(high breaking resistance)

**Tube – straight**

DN	15	25	40	50	80	100	150	200	300
L-min	100	100	100	100	125	125	150	150	150
L-max	3000	3000	3000	3000	3000	3000	3000	3000	2000

Other nominal widths and lengths on request

**Tube - bend 30°**

DN	15	25	40	50	80	100	150
L	50	75	100	100	125	175	200

from NW 80 upwards; bend with angle

**Tube – bend 45°**

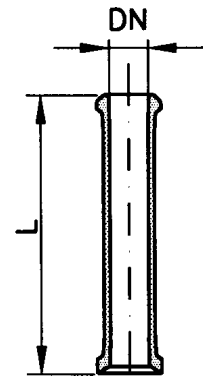
DN	15	25	40	50	80
L	50	75	100	100	125

Other nominal widths and lengths on request

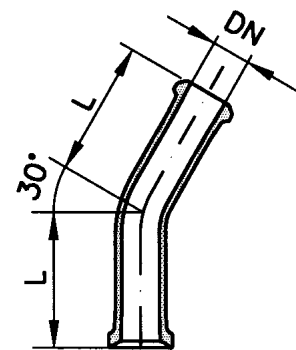
**Tube – bend 90°**

DN	15	25	40	50	80	100	150
L	75	100	150	150	200	200	250

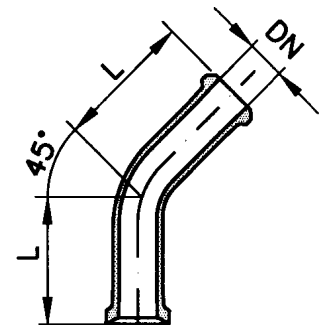
from NW 80 upwards; bend with angle



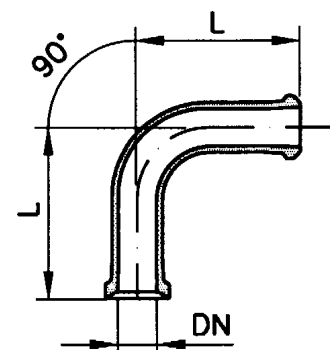
How to order: RG-50/1000/b\*



How to order: RB-50/30°/b\*



How to order: RB-50/45°/b\*



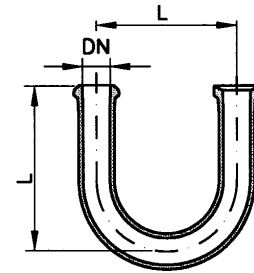
How to order: RB-50/90°/b\*

technical alterations possible 11/2003

## Type GRL

Group: 5.1  
Sheet: 5.1.3

- Material:** borosilicate-glass 3.3
- Flange:** b = collar flange  
tog.\* with 1, 2 or 3 complete
- Facing:** according to DIN / ISO 3587  
either glass ground or fire polished  
(high breaking resistance)

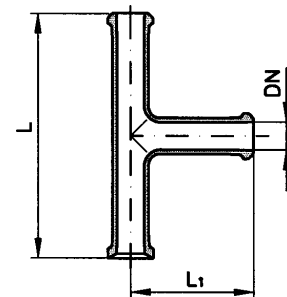


How to order:  
RU – 50 / b\*

### Tube - U- Bend

DN	15	25	40	50
L <sub>k</sub> [mm]	75	140	180	180
L <sub>b</sub> [mm]	100	150	150	150

Other types on request.



How to order:  
RT – 50 / b\*

### Tube - T- Piece

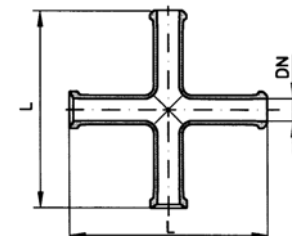
DN	15	25	40	50	80	100	150	200
L [mm]	100	200	300	300	400	500	500	600
L <sub>1</sub> [mm]	75	100	150	150	200	250	250	300

Other types on request.

### Tube – Cross - Piece

DN	15	25	40	50	80	100	150
L [mm]	100	200	300	300	400	500	500

Other types on request.

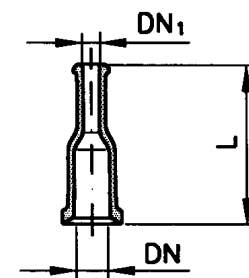


How to order:  
RK - 50 / b\*

### Tube – Reducing Adapter

DN <sub>1</sub>	15	25	40	50	80	100	150	200
DN	L [mm]							
25	100							
40	100	100						
50	100	100	100					
80		125	125	125				
100		150	150	150	150			
150		200	200	200	200	200		
200		200	200	200	200	200	225	
300		275	275	275	275	300	300	300

Other types on request.



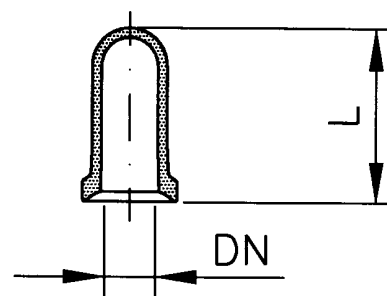
How to order:  
RR – 50 / 25 – 12 / b\*

technical alterations possible 11/2003

## Type GRL

Group: 5.1  
Sheet: 5.1.4

- Material:** borosilicate-glass 3.3
- Flange:** b = collar flange  
tog.\* with 1, 2 or 3 complete
- Facing:** according to DIN / ISO 3587  
either glass ground or fire polished  
(high breaking resistance)



How to order:  
REK – 50 / b\*

### Tube - Endcap

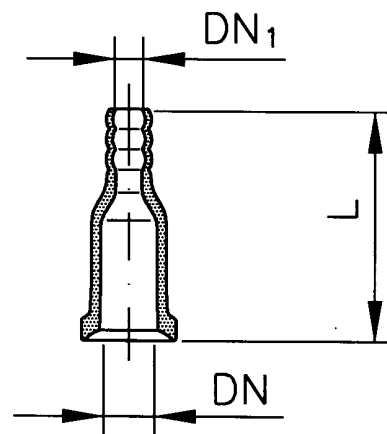
DN	15	25	40	50	80	100	150	200	300
L [mm]	50	75	75	100	100	150	150	150	175

Other types on request.

### Tube – Hose adapter - straight

DN <sub>1</sub>	9	22	33	50	60
DN					
15	100	100			
25	125	125	125		
40				150	
50					150

Other types on request.

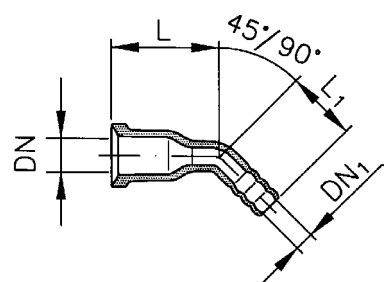


How to order:  
RSO – 25 – 22 / b\*

### Tube – Hose adapter – 45° /90°C

DN <sub>1</sub>	9	22	33
DN	L / L <sub>1</sub> [mm]		
15	50 / 70		
25	100 / 100		

Other types on request.



How to order:  
RSO – 25 – 22 / 45° / b\*  
RSO – 25 – 33 / 90° / b\*

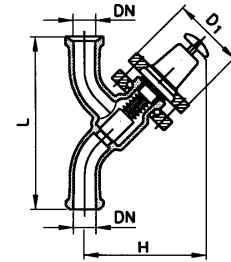
technical alterations possible 11/2003



## Type VB

Group: 5.2  
Sheet: 5.2.1

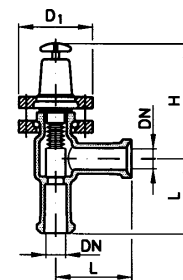
- Material:** borosilicate-glass 3.3
- Flange:** b = collar flange  
tog.\* with 1, 2 or 3 complete
- Facing:** according to DIN / ISO 3587  
either glass ground or fire polished  
(high breaking resistance)



### straight through valves (VS...)

How to order: VS – 25 / 12 / b\*

DN	15	25	40	50
L [mm]	150	200	300	300
H [mm]	140	165	200	225
D <sub>1</sub> [mm]	102	102	130	145

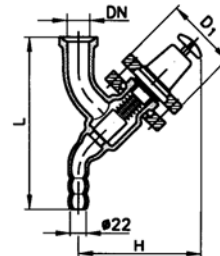


### angle valves (VE...)

How to order: VE – 25 / 12 / b\*

DN	15	25	40	50
L [mm]	50	100	150	150
H [mm]	140	140	170	185
D <sub>1</sub> [mm]	102	102	130	145

### aeration valves (VB...)



DN	15	25	40	50
L [mm]	150	200	300	300
H [mm]	140	165	200	225
D <sub>1</sub> [mm]	102	102	130	145

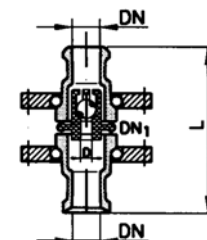
Other hose-adapter possible

How to order: VB – 25 / 22 / b\*

### Ball check valves with/without PTFE-solid or hollow (VR...)

DN	15	25	40	50	80	100
L [mm]	225	225	325	325	275	275
DN <sub>1</sub> [mm]	25	40	50	80	100	100
D [mm]	13	23	28	50	50	50

Solid ball: ...../.....-V ; Hollow ball: ...../.....-H



How to order: VR – 25 / 40 / b\* - H

Other flange connections possible.

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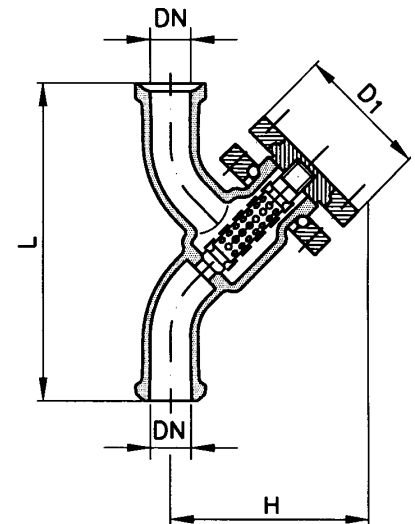
# Pipeline Filter in BSG 3.3 with PTFE filter (fibrous)

# CETEC

Group: 5.2.2  
Sheet: 5.2.2.5

- Material:** borosilicate-glass 3.3
- Flange:** b = collar flange  
tog.\* with 1, 2 or 3 complete
- Facing:** according to DIN / ISO 3587  
either glass ground or fire polished  
(high breaking resistance)

DN	25	40	50	80
L	200	300	300	400
H	165	200	225	265
D <sub>1</sub>	102	130	145	180



Other flange connections possible.

How to order: RF – 25/M1\*/b\*\*

- \* Mesh size code number  
M1 = 100 my  
M2 = 300 my  
M3 = 500 my

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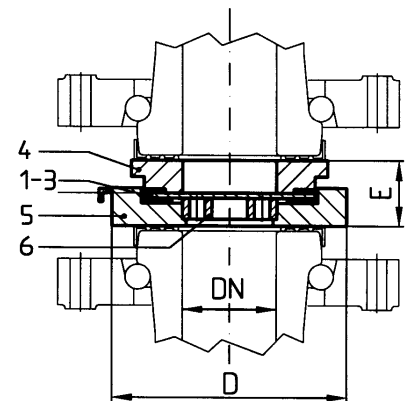
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### Bursting Discs

Bursting Discs protect lines and pressure vessels and receivers against inadmissible loads (vacuum and pressure). Such apparatuses or apparatus-parts without appropriate precaution represent a very high risk with unpredictable consequences for the operator. Graphite Bursting Discs count among other safety devices generally to the best substantial safety devices for apparatus and equipment construction. In chemistry plants, Bursting Discs from graphite are preferentially used because of their corrosion resistance.

For the installation of Bursting Discs plants with glass apparatuses and pipe lines we designed a complete Bursting Discs Unit as standard - see accompanying picture "structure".



### Structure

1. Diaphragm
2. cork seal
3. graphite seal
4. guard ring
5. vacuum support

### Substantial characteristics:

1. Continuous responding mode over the whole temperature range from -50°C up to +180°C
2. High sensitive contact also with load change up to 80% of the nominal pressure
3. Suitable for gases and liquids, in vacuum and pressures up to 0.5 bars – in vacuum is a vacuum support necessary.
4. High-quality graphite, which is provided with a furan resin impregnation and ensure the perfect tightness as well as a very good corrosion resistance.
5. The construction is simple and saving costs, installation and maintenance is easy without problem. In case of responding the pressure security only the diaphragm (part of 1) is to be renewed. The holder remains in to the function.
6. The security Bursting Discs from graphite are manufacturing according to the AD specification A1, certified and design-examined by TÜV GERMANY.

### Dimensions

DN	D [mm]	E <sub>min.</sub> [mm]	E <sub>max.</sub> [mm]
40	82	27	32
50	100	29	33
	120	32	37
80	130	37	42
100	160	43	49

The standard program covers the Bursting Discs for the glass apparatus and glass devices with a bursting pressure of 0.5 bar +/- 10% - with vacuum support - and is suitable for the PLAN/PLAN glass flanges (DN 40/50/80 and 100).

Beside above mentioned specifications for response pressure, the Bursting Discs are also available for other pressure ranges, nominal sizes and from other materials (combinations e.g. high-grade steel/PTFE).

technical alterations possible 11/2003

## SCHLÄUCHE – PTFE ... PTFE- /FEP convoluted hose

## Gruppe / Item 6.1-1

PTFE-Wellschläuche -PWS / FCS ...-

PTFE- Wellschlauch ohne Armierung -FCS-



PTFE-Schlauch (Typ FCS-EL) m. Glasanschlüssen

PTFE-Schlauch (Typ FCS ... / EL → elektr. leitf.)



FEP-Wellschlauch m. konzent. Welle -FWS-

ARMATUREN -Schlauchenden



Type  
SCHL

Group: 6.0  
Sheet: 6.0.1

Company / Address: \_\_\_\_\_

\_\_\_\_\_

Name / Dept.: \_\_\_\_\_

Tel.: / Fax: \_\_\_\_\_ / \_\_\_\_\_

1. Operational Re-  
quirements: \_\_\_\_\_

2. Technical Data:

Nominal width x overall length: \_\_\_\_\_ x \_\_\_\_\_ mm

Bending radius: \_\_\_\_\_ mm

fittings: one end: \_\_\_\_\_ DIN \_\_\_\_\_

other end: \_\_\_\_\_ DIN \_\_\_\_\_

material – pipe: \_\_\_\_\_

material – reinforcement: \_\_\_\_\_

material – fittings: \_\_\_\_\_

working pressure: \_\_\_\_\_ bar contin.  / intermittent

vacuum: \_\_\_\_\_ m bar contin.  / intermittent

working temperature: \_\_\_\_\_ / \_\_\_\_\_ °C min / max

no. of pieces:: \_\_\_\_\_

3. Other information:

what movements occurs? \_\_\_\_\_

frequency? \_\_\_\_\_ x / (min / hour / day / .....)

the hose will be used for  
following machine / equipment: \_\_\_\_\_

electrical conducting capacity  
R<sub>e</sub> < = 10<sup>8</sup> Ohm is required: yes  / no

which pipe of hosepipe is  
already in use? \_\_\_\_\_

workshop / model / co.: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

installation drawing: (please sketch on reserve side of this sheet)

technical alterations possible 11/2003



# PTFE- Convuluted Hose highly flexible

# CETEC

**Type PWS**  
**NW 15 - 100**

**Group: 6.1**  
**Sheet: 6.1.1**

## PTFE Convuluted Hose (PWS)

The PTFE convuluted hose (PWS) is internationally recognised as the optimum choice for highest standards of operating and constructing technology. PWS hoses have been found to offer particular advantages in applications requiring the flexible transfer of corrosive chemicals, foodstuffs and steam versus other hose types.

### Flexibility

Extremely flexible, yet crush resistant and fully kink resistant.

### Chemical resistance

Virtually resistant against all chemicals and solvents except for molten alkali metals like sodium, fluoride C<sub>3</sub> fluoride and H<sub>2</sub> fluoride.

### Self-cleaning property

Due to the convuluted shape and helical track internal bacteria traps can be avoided.

### Integral PTFE-lined end-fittings

An integral PTFE-lined end-fitting is available for most types of end-fittings see catalogue page 6.1.1/1

### Temperature and pressure range

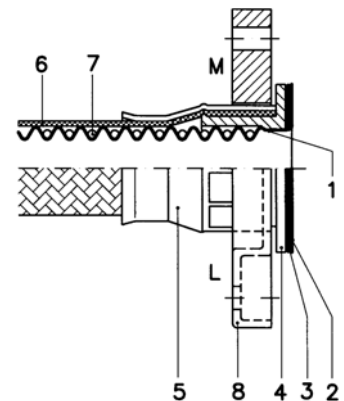
Application from -70°C to 230°C, depending on type and operating pressure. Similar to other hose types, an increased operating temperature requires a decrease in max. permissible operating pressure. As a rule of thumb it must be considered that for each 1 °C exceeding 130 °C the operating pressure must be reduced by 1%. Exceptions are: extreme bending radius or rapid fluctuations of temperature and pressure.

In such cases a further decrease in operating pressure should be carried out. All finished PWS hose assemblies are hydrostatically pressure tested to 1.5 x the max. working pressure. If required, pressure test certificates can be issued.

### Hose lengths

PWS can be supplied up to length of 10m (NW 100 = max. 5m). More lengths can be achieved when PTFE-lined joint fittings are used. If not agreed otherwise, tolerance of length is: + 10% - 0%.

1. PTFE convuluted helical hose extended at the end fitting
2. then flared out to the form the sealing face
3. sealing insert
4. collar
5. ferrule, compressed
6. S/S wire braid
7. S/S spiral
8. Swivel flange M / L / DIN / PN 10 - 16



### Dimensions:

<b>DN mm</b>	12,7	19	25,4	31,7	38,1	50,8	63,5	76,2	101,6
<b>DN inch</b>	½	¾	1	1 ¼	1 ½	2	2 ½	3	4
<b>Insider diameter mm</b>	9,5	14,3	20,6	25,4	31,7	44,4	50,8	63,5	89
<b>Wallthickness mm</b>	1	1,25	1,25	1,5	1,5	1,5	1,5	1,5	2
<b>Outside Ø mm</b>	19	25	32	38	48	60	73	89	114
<b>Min. bending radius mm</b>	25	38	50	63	76	100	127	152	203
<b>Max. working pressure max. bar</b>	35	28	24	21	17	14	10	8	7
<b>Weight [kg / m]</b>	0,3	0,45	0,7	0,82	1,5	2,1	2,58	3,29	5,33

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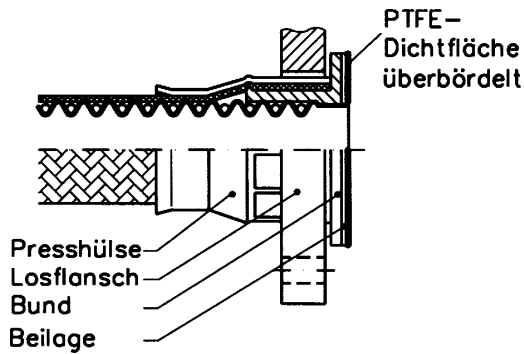


# Fittings for PTFE convoluted hose

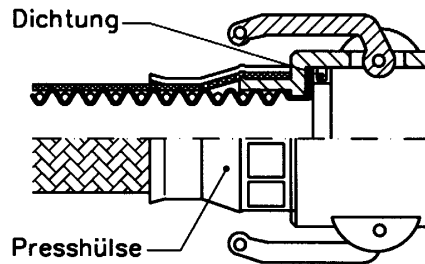
# CETEC

**Type PWS**  
**DN 15 - 100**

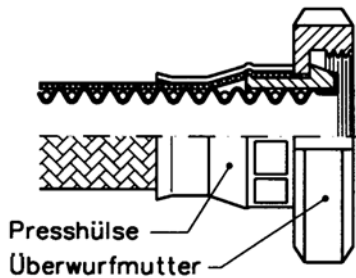
**Group: 6.1**  
**Sheet: 6.1.1.1**



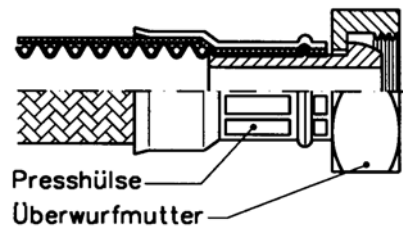
**Fig.1 Flange:**  
PTFE-flared / DIN-PN 16; ASA 150;  
DN 15-100 / MS-galv./SS



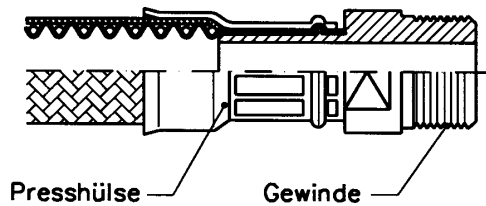
**Fig.2 Cam Action:**  
PTFE-lined (non-lined)  
DN 25-100 / PP; Al; SS



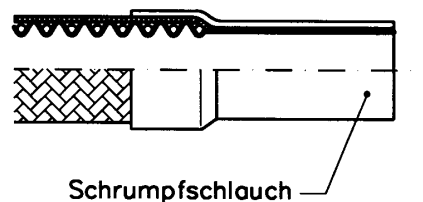
**Fig. 3 Hygienic-Fitting:**  
PTFE – lined (non-lined) DN 11851  
DN 20 – 100 / only stainless steel (SS) 1.4541



**Fig.4 Female Union:**  
60 ° con seat / ISO 1179  
BS 5200 / MS-galv./ SS



**Fig. 5 Fixed Male:**  
DN 15-100 (1/2" –4")  
(PP/MS/SS...)



**Fig.6 Smooth End:**  
with shrinking hose  
DN 15 - 25 =3 bar, DN 100 =1 bar

Liner-material: the standard liner is Virgin-PTFE or antistatic on request. PWS-hoses can be supplied in any length and other flange-specification; to individual requirement.

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# PTFE Chemical Convoluted Hose

## high flexible/without braiding

# CETEC

Type FCS  
DN 1/2" – 4"

Group: 6.1  
Sheet: 6.1.2

### Flexitef Chemical Hose (FCS)

The FCS hose offers significant advantages in conveying hot, gaseous, liquid or acid chemicals by virtue of its many positive features.

#### Chemical resistance

The PTFE hose material is resistant against virtually all chemicals and solvents except for molten alkali metals such as sodium, fluoride, C<sub>3</sub> fluoride, etc.

#### Flexibility

Extremely flexible, outstanding kink resistance.

#### Self-cleaning property

By its smooth non-adhesive and inert surface (helical of the PTFE liner) shape.

#### Temperature and pressure

Suitable for application ranging from -70 °C to +200 °C depending on nominal width and operating pressure (see table); vacuum stable up to 30 Torr at 25°C.

#### Antistatic property

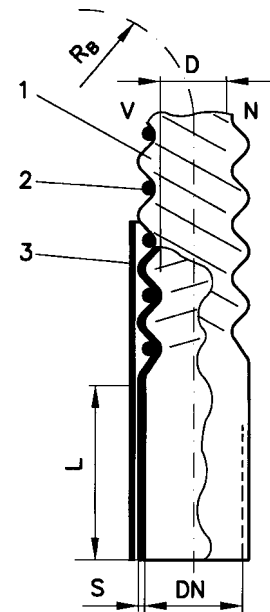
If requested the hose can be supplied in antistatic quality ( $R_o = \text{ca } 10^6 \text{ Ohm}$ ). No electrostatic charge build up.

#### Fittings

Swive flange, cam action flange joints in aluminium oxide, SS, PP; various glass fittings and special designs see catalogue page 6.1.2/1.

#### Hose length

Some diameters of FCS hose can be supplied in lengths up to 10m. (DN 100 - max. 5m).



### Dimensions

Nom. Widths		Inside-diam. D	Wallthickn. S	Straight ends ca. L	Bending rad. R	Working pressure	
DN						20 °C	100 °C
mm	inch	Mm	mm	mm	mm		
12,7	1/2	8	1,0	15	25	6,0	2,0
16,0	5/8	10	1,0	20	35	6,0	2,0
20,0	3/4	12	1,0	30	40	5,5	2,0
25,0	1	18	1,0	40	50	5,5	2,0
32,0	5/4	22	1,0	40	60	4,0	1,8
40,0	6/4	28	1,5	50	80	3,5	1,8
50,0	2	36	1,5	70	100	2,5	1,5
65,0	5/2	50	1,5	70	120	2,5	1,5
80,0	3	60	1,5	100	150	2,0	1,2
100,0	4	80	2,0	120	200	1,5	1,0

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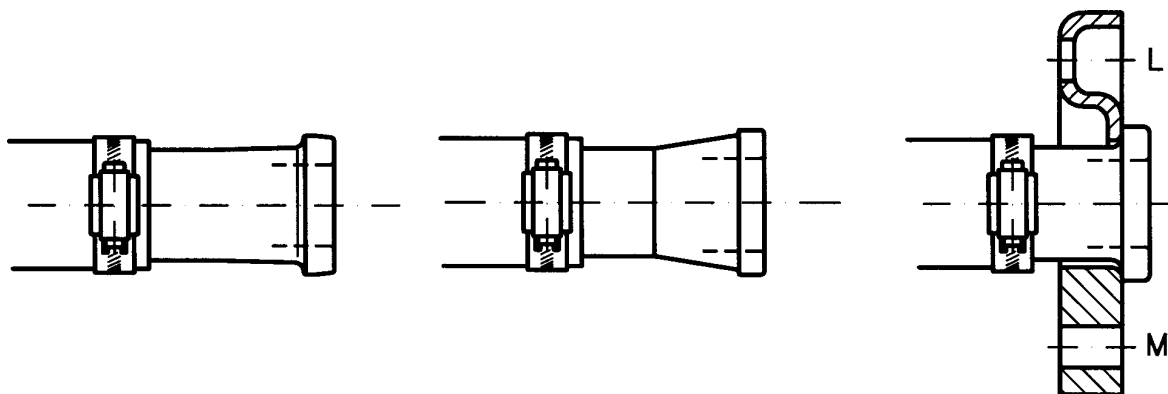
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**Fittings**  
for FEP convoluted hose

**CETEC**

Type FCS  
DN 1/2"-4"

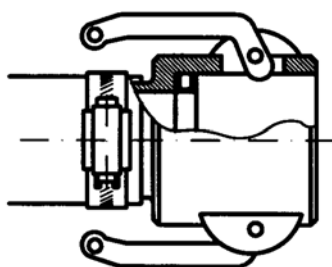
Group: 6.1  
Sheet: 6.1.2.1



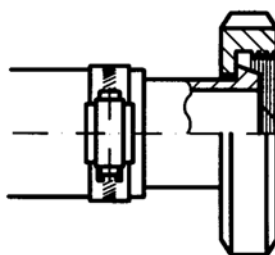
1. Collar flange NW.../1 - 3b  
Material: glass 3.3, 1.4571 etc.

2. Conical flange NW .../1 3k  
Material: glass 3.3, 1.4571 etc.

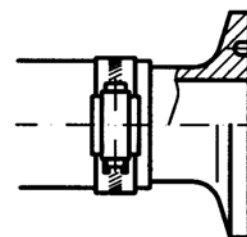
3. Lap joint flange NW.../l or M  
Material: glass 3.3, 1.4571 etc.



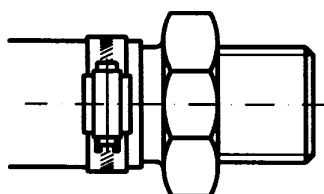
4. Quick Coupler (Cam Action)  
Material: PP; AL; 1.4571



5. Milchröhrverschraubung (DIN)  
Material: 1.4301



6. TRI-Clamp-Flange-Fitting  
Material: 1.4301



7. Male/female Threaded Fittings acc to DIN  
Material: 1.4301; 1.4571 etc.

Other joints, fittings and materials on special request

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# FEP Convoluted Hose

highly flexible / transparent / without braiding

# CETEC

Type FWS  
DN 6-50

Group: 6.1  
Sheet: 6.1.3

## FEP Convoluted Hose (FWS)

Most conventional industry and insulating hoses as well as braided pressure hoses in PTFE are very often not flexible enough for application areas. The well-tried FWS hose is all over convoluted (ends excluded) and features a minimum bending radius = 1/2 of the inside diameter. For inside diameter ranging between 6,4 and 50,8 mm the working pressure is between 7 and 1,4 bar.

The FEP (Teflon) hose material with excellent resistance against almost all corrosive chemicals, is suitable for all-purpose application between -50 °C and +130 °C. It is physiologically harmless, has an anti-adhesive surface and has outstanding dielectric properties.

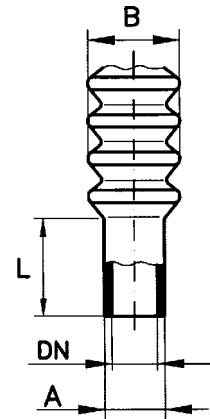
### Main application areas:

- As hose lines for corrosive chemicals or solvents in laboratories and chemical plants, electro plating fields etc.
- As gas and air hoses in hospitals and laboratories (physiologically safe).

- As a protective hose for electrical lines in instrument and aircraft construction.

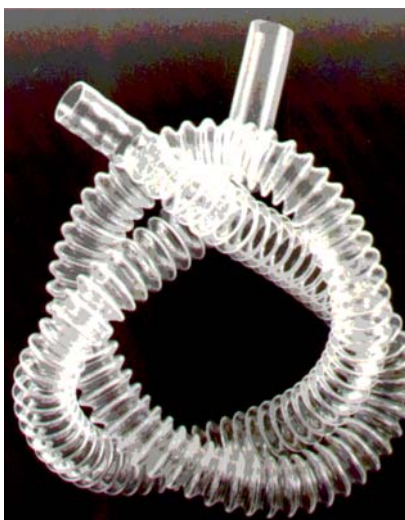
### Technical features

- resistant to almost all chemicals
- temperature resistance from -50 °C up to +130 °C
- suitable for vacuum applications up to 760 mm HG (at 20 °C)
- excellent hose transparency
- outstanding dielectric properties
- physiologically safe
- minimum bending radius = 1/2 of inside diameter
- ratio of extended / contracted length 2,3:1
- non-adhesive surface – easy to clean



Available in standard lengths from 1,2 and 2,4 m with smooth ends. For example of fittings see item 6.1, page 6.13/1.

Other lengths on request.



### Dimensions

DN		A	B	L	work. pressure
mm	inch	mm	mm	mm	bar (max)
6,4	1/4	7,1	11,0	20	7,0
9,5	3/8	10,6	16,0	25	5,6
12,7	1/2	14,0	19,0	25	4,6
15,9	5/8	17,2	24,0	25	4,2
19,1	3/4	20,6	27,0	40	3,5
22,2	7/8	26,9	32,0	40	2,8
25,4	1	27,2	36,0	50	2,4
31,8	1 1/4	33,5	41,0	50	2,1
38,1	1 1/2	39,9	46,0	50	1,7
50,8	2	52,8	72,0	50	...

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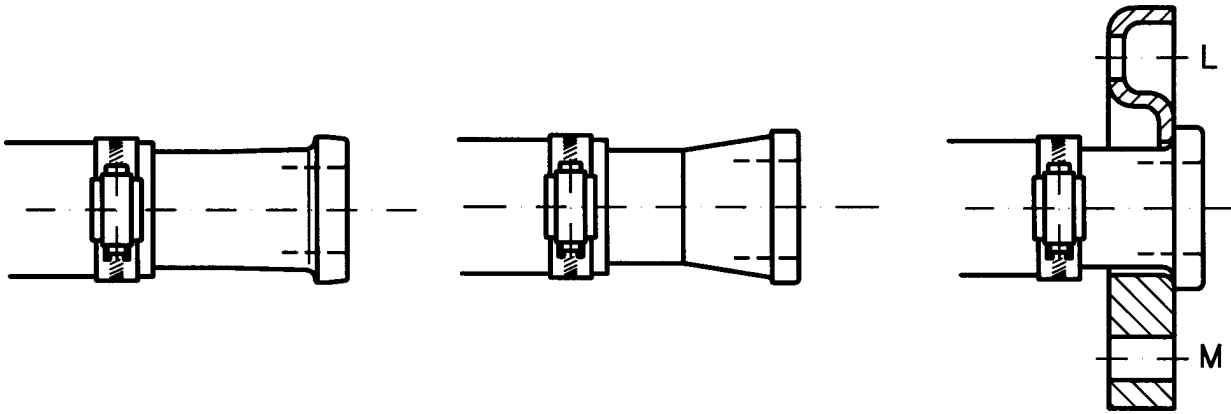
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**Fittings**  
for FEP convoluted hose

**CETEC**

Type FWS  
DN 6-50

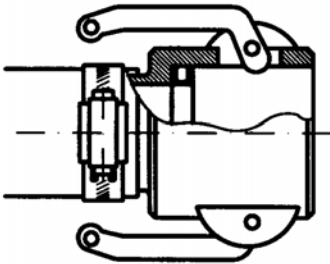
Group: 6.1  
Sheet: 6.1.3/1



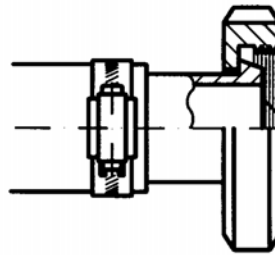
1. Collar flange NW.../1 - 3b  
Material: glass 3.3, 1.4571 etc.

2. Conical flange NW .../1 3k  
Material: glass 3.3, 1.4571 etc.

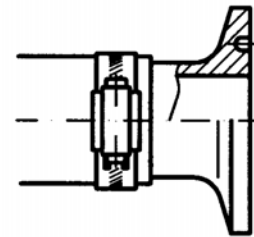
3. Lap joint flange NW.../l or M  
Material: glass 3.3, 1.4571 etc.



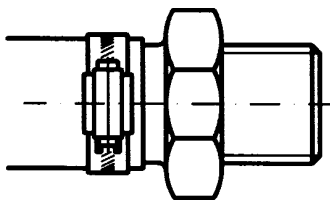
4. Quick Coupler (Cam Action)  
Material: PP; AL; 1.4571



5. Milchrohrverschraubung (DIN)  
Material: 1.4301



6. TRI-Clamp-Flange-Fitting  
Material: 1.4301



7. Male/female Threaded Fittings acc to DIN  
Material: 1.4301; 1.4571 etc.

Other joints, fittings and materials on special request

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**Type PKS**  
**DN 4 -...**

**Group: 6.1**  
**Sheet: 6.1.4**

**Hoses/tubes in PE**

Dimensions

(DN = inner / outer diameter) mm pressure (bar / 20°C\*)

4 / 6	10
6 / 8	8
8 / 10	6
10 / 12	5
12 / 14	4
14 / 16	4
16 / 18	4

Other dimensions available on request, tolerance +/- 0,10 mm, colour - natural (transparent). PE coloured hoses can also be supplied.

\* the permitted operational pressure drops with increased temperature.



**Hoses/tubes in PA 12 W**

Dimensions

(DN = inner / outer dia.) mm pressure (bar / 20°C\*)

4 / 6	27
6 / 8	19
8 / 10	15
10 / 12	12
12 / 14	10
14 / 16	9
16 / 18	8

Other dimensions available on request, tolerance +/- 0,10 mm, colour - natural (milky white).

**Hoses/tubes in PVDF**

Dimensions (DN = inner / outer dia.) mm

4/6 6/8 8/10 10/12 10/14 12/14 14/16

Other dimensions available on request, tubes in length of 3 m or rolls of 50 m, colour natural (opaque)

**Hoses/tubes in PFA**

Dimensions (DN = inner / outer dia.) mm

2/4 4/6 6/8 8/10 10/12 10/14 12/14 14/16

**Hoses/tubes in PTFE**

Dimensions (DN = inner / outer dia.) mm

2/4 4/6 6/8 6/10 8/10 8/12 10/12 10/14 12/14 14/16

Other dimensions available on request, colour natural (milky white). Tubes in PTFE can also be supplied coloured, enabling easy recognition or marking for popular uses.

technical alterations possible 11/2003

# PTFE High Pressure And high temperature hoses

# CETEC

**Type PHS**  
**DN 1/8" – 1"**

**Group: 6.2**  
**Sheet: 6.2.1**

## PTFE high pressure/high temperature hoses (PHS)

Smooth PHS-PTFE hoses are fabricated of sintered pure PTFE with SS braiding. They can be supplied are short notice with all standard assemblies and fittings; pressure tested. Standard is "R" thread of cadmium plated steel (alternative SS).

**Outstanding chemical resistance**  
PHS-PTFE features high resistance against virtually all chemicals – properties similar to ceramic – Hoses of PTFE are resistant against at liquid, gas and corrosive media, including acids, lyes, solvents, oils and petrol. Excluded are molten metals and fluorides.

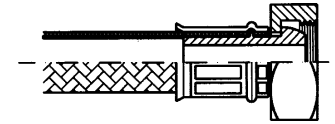
**Wide range of temperatures**  
PHS-PTFE hoses can be used at working temperatures ranging from - 75°C up + 260°C. They are superior to all conventional rubber hoses and other synthetics.

**Flexibility**  
PHS-PTFE hoses are highly flexible, especially in the low and medium diameter sizes. This flexibility meets with most application requirements. For higher flexibility demands (e.g. machines with high vibration areas) our hose type PWS, item 6.1, page 6.1.1) is recommended.

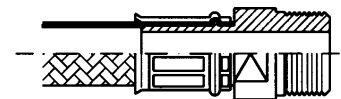
### Long life service

The excellent chemical and physical properties of PHS-PTFE hoses remain stable even when used for longer periods at high working temperatures. The length of service is greater than with conventional rubber or plastic hoses. The PHS\_PTFE hose is more reliable and requires less maintenance.

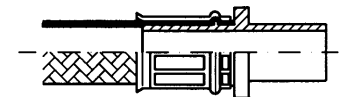
Hose fittings are available in steel, SS or other material, other types on request.



1. union nut for R-screw thread connection for 60° DIN 7608



2. strong connection with conical threaded pipe



3. with pipe socket for clamping ring or cutting ring connection

### Dimensions

nominal width DN		wall thickness mm	outside diameter with braid mm	min. bend. radius mm	max. poper. pressure bar	burst. pressure bar	max. fabricated length m
inch	mm						
1/8	3,17	1,00	6,47	19	210	840	60
3/16	4,75	1,00	8,05	25	185	770	60
1/4	6,34	1,00	9,62	38	175	700	37
5/16	8,00	1,00	11,00	45	165	600	30
3/8	9,52	1,00	12,79	50	148	595	30
13/32	10,90	1,00	13,00	50	148	595	30
1/2	12,70	1,27	15,86	1,27	122	490	21
5/8			19,67	101	96	385	16
3/4	19,04	1,27	22,84	152	78	315	14
1	25,28	1,27	29,19	203	61	245	10

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### Silicone hoses (SHS)

Silicone hoses have excellent physical and chemical properties which are superior to all conventional rubber and elastomere hose types. In contrast to these hoses, SILICONE hoses do not alter their positive features at working temperatures ranging from -60°C till +200°C. Short periods of heating up to +300°C do not harm the material.

SILICONE hoses are extruded from high quality elastomere and are vulcanized. The material does not have any leaching properties, is fully neutral in taste and outdoor, is inert and physiologically harmless.

### Features

SILICONE hoses show excellent resistance against weak acids and alkalines, also against ionic solvents and corrosive lyes, against most alcohols, carboric acids and some mineral oils as well as against high molecular chlorinated carbon hydride, ozone and oxygen. SILICONE hoses are weather-proof, nonwearing, stable to light and highly suitable for foodstuffs. SILICONE hoses are light, extremely flexible and can be easily handled.

### Special designs

SILICONE hoses can also supplied in transparent and knick-free quality. Shore hardness in rang from 30°C to 80°C. Our special "Ivory Compound" quality allows for a working temperature +300°C.

SILICONE elastomere can be coloured acc. to RAL by blending with colour pigments.

SILICONE hoses are available in antistatic and self extinguishing quality as well as circular shaped.

SILICONE hose lengths are available with different cut edges suchas parallel cut, chop cut etc.

### SILICONE hoses with fabric liner

Have been developed in recent years and have highly suitable for use in critical areas where high working pressure and temperatures are required.

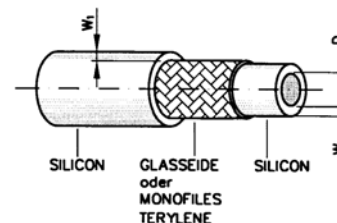
A strong glass-silk or monofil Terylene braiding provides the hose with high resistant property against high working pressure and hose kinking. Due to its braid pattern excellent bonding properties and guaranteed between the SILICONE liner and SILICONE cover hose, furthermore, the braiding is also protected by its cover hose against contamination and damage.

### Special designs

The wall thickness of the liner as well as of the silicone cover hose can be varied according to requirements. Transparent silicone outer (cover) hoses can be supplied to allow observation of the medium being transported.

The silicone cover hose can be provided in every RAL colour.

Special tools enable the manufacture of complicated hoses, even with integrated control lines eq. Silicone hose with 4 bore holes + fabric lining.



### Technical design:

Inner hose transparent sillicone elastomere  
Fibrous liner (standard):  
Glass-silk (till +200 °C) or monofil  
Terylene (till +170 °C)  
Silicone outer hose fused together with inner hose  
Colour: red (standard)

### Technical data:

Breaking elongation: up to 300% without rupture  
Resilience: almost complete  
Heat conductivity:  $0,6 \times 10^{-3} \text{ cal/cm}^2\text{/}^\circ\text{C/sec.}$   
Temperature proof: grade H and above up to +200°C, short periods to +300°C, does not become brittle at low temp. -60°C  
Dielectric constant: 3,2/20°C/800Hz  
2,9/180°C/800Hz  
Dielectric loss factor: 0,004/20°C/800 Hz  
0,050/180°C/800 Hz  
Shore hardness: ca. 60° ± 5°(standard)  
Colour: transparent / opaque

### Nominal diameter ranging from 2,0 –40 mm Tolerances: acc. to DIN 7715

D x W mm	W 1 mm	D x W mm	W 1 mm
2,0 x 1,5	1,0	12,5 x 2,5	1,5
3,0 x 1,5	1,0	14,0 x 3,0	1,5
4,0 x 1,5	1,0	15,0 x 3,0	1,5
5,0 x 1,5	1,0	16,0 x 3,0	1,8
6,0 x 1,5	1,2	18,0 x 4,0	1,8
6,0 x 1,75	1,2	19,0 x 4,0	1,8
6,0 x 2,0	1,2	20,0 x 4,0	1,8
7,0 x 1,75	1,2	22,0 x 4,0	1,8
8,0 x 2,0	1,2	24,0 x 4,0	1,8
8,5 x 2,5	1,2	25,0 x 4,0	2,0
9,5 x 2,0	1,2	29,0 x 5,0	2,0
9,5 x 2,5	1,2	32,0 x 5,0	2,0
10,0 x 2,5	1,5	35,0 x 5,0	2,0
12,0 x 2,0	1,5	38,0 x 5,0	2,0
12,0 x 2,5	1,5	40,0 x 5,0	2,0

technical alterations possible 11/2003

## PTFE Heavy Duty Expansion Bellow (PHK)

PHK expansion bellows are produced by special technique whereby wrapped >PTFE tubes are moulded by pressure and temperature.

The resultant high crystalline and diffusion resistant material retains its excellent flexibility and allows for a wide variety of use. The uniform wall thickness guarantees long service and excellent safety (factor 3-4).

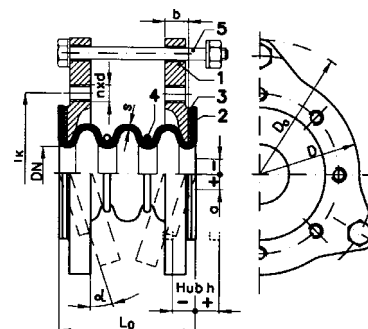
### Uses

PTFE Heavy Duty Expansion Bellows are used in chemical pilot plants to absorb expansion, vibrations and tolerance allowances in apparatus and glass tubing at high working temperatures, raised pressure and vacuum.

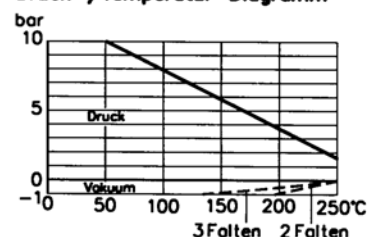
### Advantages:

- corrosion resistance
- withstand extreme temperature
- high flexibility
- pressure & vacuum proof
- vibration & shock absorbing

- 1 Flange:  
Cast iron 40.2, coated
- 2 PTFE-expansion bellow:  
virginal PTFE, wrapped
- 3 Insert:  
IT-replacement
- 4 Supporting ring:  
stainless steel
- 5 Insulating sleeve limit bolt:  
steel / PE



Druck-/Temperatur-Diagramm



### Dimensions

DN	Flange dimension PN 10					Mounting dimension & lat. movement								wall-thickness s
	D	Tk	n x d	Da	b	2 conv.				3 conv.				
						Lo	h±	a±	α°	Lo	h±	a±	α°	
25	115	85	4 x M 12	155	14	45	7	4	8	55	12	6	10	2,2
40	150	110	4 x M 16	190	16	55	8	4	8	70	12	6	9	2,3
50	165	125	4 x M 16	205	16	55	11	6	6	70	19	9	8	2,3
65	185	145	4 x M 16	225	16	60	11	6	6	80	19	9	8	2,5
80	200	160	8 x M 16	240	16	60	13	7	6	85	25	12	8	2,8
100	220	180	8 x M 16	260	16	65	15	8	5	90	25	12	7	3,0
125	250	210	8 x M 16	290	16	70	15	8	5	95	25	12	6	3,2
150	285	240	8 x M 20	345	18	75	16	8	4	100	28	14	6	3,2
200	340	295	8 x M 20	400	18	75	17	8	4	105	28	14	5	3,6
250	395	350	12 x M 20	455	18	80	19	9	3	110	30	15	5	4,0
300	445	400	12 x M 20	540	18	85	19	9	3	115	30	15	5	4,5

Other pressures or sizes to DN 1200 as well as mores with up to 10 convolutions on request.

technical alterations possible 11/2003

# PTFE-Flange Expansion Joint acc. to DIN/PN 10

# CETEC

Type PFF  
DN 25-300

Group: 6.5  
Sheet: 6.5.2

## PTFE Flange Expansion Joint (PFF)

PTFE expansion joints are made of sintered virginal PTFE powder.

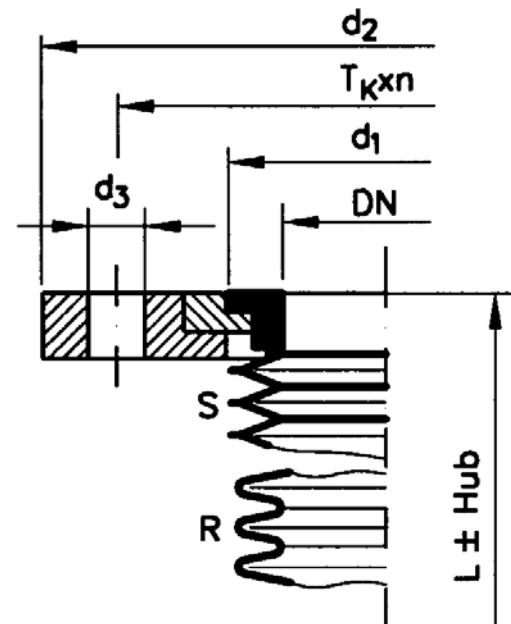
PTFE expansion joints are:

- corrosion proof
- withstand extreme temperature
- vibration and shock absorbing
- compensate expansion and shifting

Form **S** is pointed. Highest flexibility at shortest overall length.

Form **R** material is of higher consistency. Application for operating pressure of max. 2 bar (not suitable for vacuum), depending on temperature up to 200°C.

Flanges are bored according to DIN and are available in aluminium oxide, steel or SS (VA)



### How to order:

f. PFF DN 50 with S-Expans. e. St.-Flange  
PFF – 050 / S – St. 35

f. PFF DN 100 with R-Expans. e. SS-Flange  
PFF – 100 / R – 1.4541

Other types (nominal widths and expansion lengths) on request.

DN	d1	d2	d3	T <sub>k</sub> xn	L <sub>s</sub>	Hub <sub>s</sub> <sup>+</sup>	L <sub>R</sub>
25	44	115	14	85x 4	50	± 19	69
40	61	150	18	110x 4	52	± 21	71
50	74	165	18	125x 4	57	± 24	76
80	106	200	18	160x 4	59	± 26	78
100	125	220	18	180x 8	65	± 25	84
125	149	250	18	210x 8	66	± 24	85
150	175	285	23	240x 8	67	± 25	86
200	232	340	23	295x 8	82	± 32	102
250	285	395	23	350x12	87	± 35	107
300	335	505	23	400x12	89	± 35	109

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**PTFE Bellows (PFB)**  
made of pure PTFE.

**Application:**

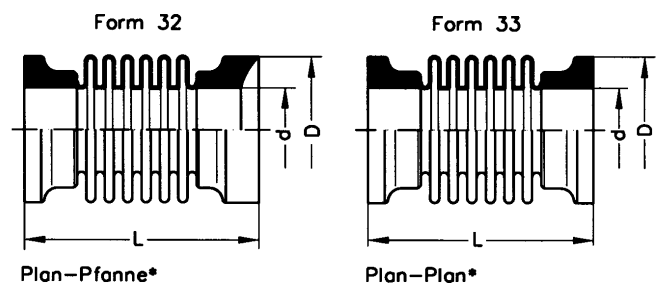
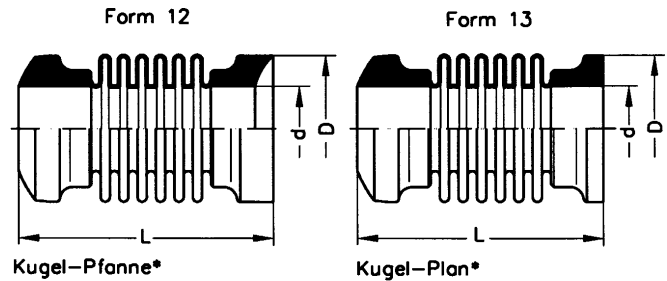
To compensate for tube shifting (laterally) as well as to absorb axial expansion and vibrations.

- \* Flange and sealing face connection for glass tubing with collar ends acc. to Din/ISO 3587  
ball (1), socket (2), or flat (3).

**How to order:**

PTFE-expansion joint DN 50/ shape 12

**PFB - 050 / 12**



**Dimensions**

DN	d	D	F12 L	F13 L	F32 L	F33 L
15	16	30	62	60	60	58
25	26	44	81	75	75	69
40	41	62	99	90	90	81
50	52	76	107	95	95	83
80	81	110	111	100	100	89
100	100	131	126	110	110	94
150	153	185	140	125	125	110
200	203	234	152	140	140	130
300	203	339	168	156	156	145

Other types (eg. Fibreglass reinforced ends) on request.

technical alterations possible 11/2003

**PTFE Bellows - DUO**  
for facing acc. to DIN/ISO 3587

**CETEC**

**Type PFD**  
**DN 15-300**

**Group: 6.5**  
**Sheet: 6.5.4**

**PTFE Bellows – DUO (PFD)**

**Application:**

For collar flange/glass tube units in the chemical industry. To absorb expansion, shifting, vibrations and tolerances allowances in units and tubings.

**Advantages:**

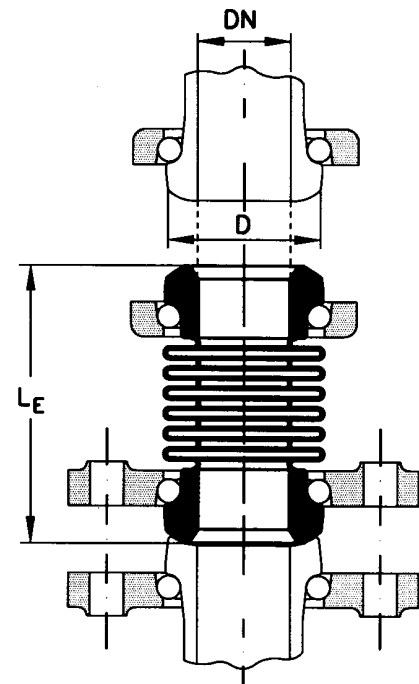
Virginal PTFE: corrosion resistant, temperature-proof, vibration and shockabsorbing. Can be mounted all collar flanges with standard couplings and inserts. (Item 7.1, page 7.1.5)

**Special design:**

For high vacuum; available with vacuum support  
Connecting ends: reinforced with fibreglass or similar material.

**How to order:**

PTFE-expansion joint DUO DN 50  
**PFD - 050**



**Dimensions**

DN	D	LE	Article-No.
15	30	75	PFD-015
25	44	75	PFD-025
40	62	100	PFD-040
50	76	125	PFD-050
80	110	125	PFD-080
100	131	150	PFD-100
150	185	150	PFD-150
200	234	175	PFD-200
300	339	175	PFD-300

Larger dimensions or other types DN on request.

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## FLANSCH-VERBINDER + -KUPPLUNGEN

Pipe + Hose - Connection

## Gruppe / Item 7.1-1

Schellenringe DIN/DN 15-300 f. Glasrohre -SRD-



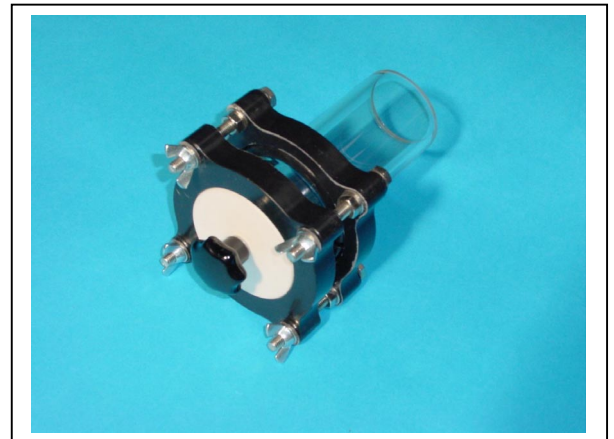
Schnellverschluss-Kupplungen -SSK-



Edelstahladapter / Schlauchanschlüsse -MRV-



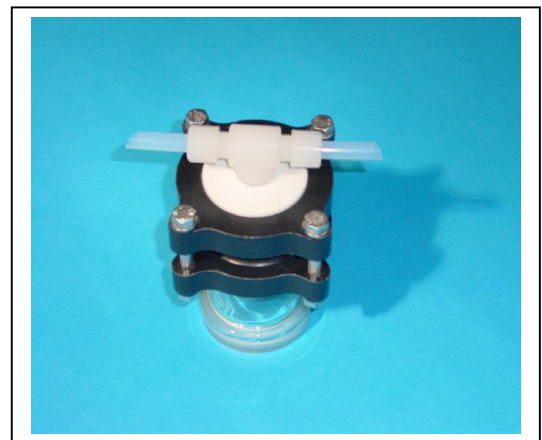
PTFE- Blinddeckel m. Flügelmuttern -PBD-



Edelstahladapter m. Schweißanschluss -MAG-



PTFE-Gewindeadapter -PGA-





# Backing flange DIN/ISO (PN 10) for Glass tubing with Collar Flange

# CETEC

Type **SRD**  
DN 15-300

Group: 7.1  
Sheet: 7.1.5

## Backing flange DIN (SRD)

a complete coupling for glass flange connection (1) consists of two **SRD** (3), insert (4), bolt with nut and washer (2) but without a PTFE seal (5), (please see Item, 8.1, Page: 8.1.3/ 8.1.4) .

The backing flange is designed to interconnect glass tubing DIN/PN 10 flanges, or is used for direct mounting to enamel stainless steel flanges without the help of an intermediate flange.

For reducing bushings for DIN steel flange bolts (please see Item, 7.8, Page: 7.8.4.)

### Design:

one-piece backing flange (DIN 2641) for installation in glass tubings with collar flange.

### Material:

Phenolic resin, reinforced with glass-fibre.

### Operating temperature:

Up to 200 °C.

### Accessories:

insert, bolt with nut and washers.

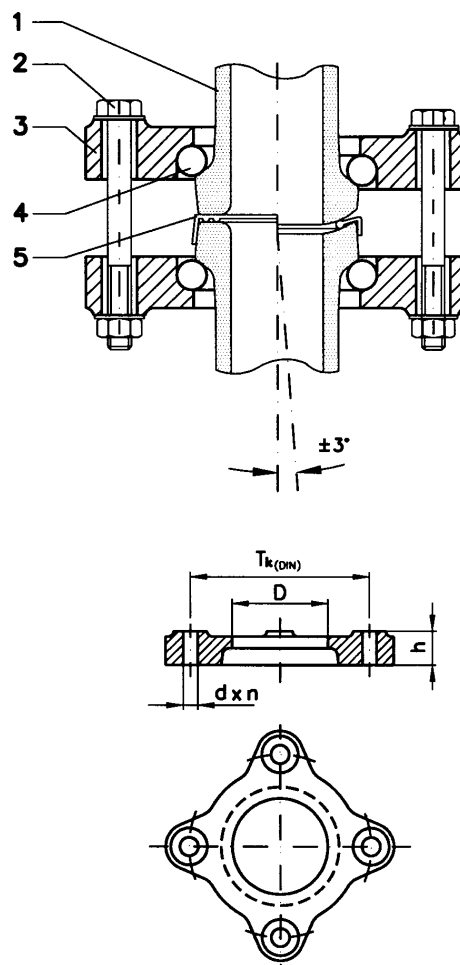
### How to order:

Backing flange NW 50 f. DIN/PN 10  
Flange connection (without insert):  
**SRD -50**

### Coupling, complete:

Pos. 2-4 (without 5) for ON 50:  
**SVK -50**

Other dimensions and types on request.



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# CAM ACTION Couplings for Hoses with varied connection possibilities

# CETEC

Type SSK  
DN 1/2" – 8"

Group: 7.4  
Sheet: 7.4.1

## CAM Action Couplings (SSK)

All adapters of the same size are interchangeable.

### Dimension details:

See Group 7.4 / sheet 7.4.1/2

### Materials:

SS, brass, Al. Oxide and PP.

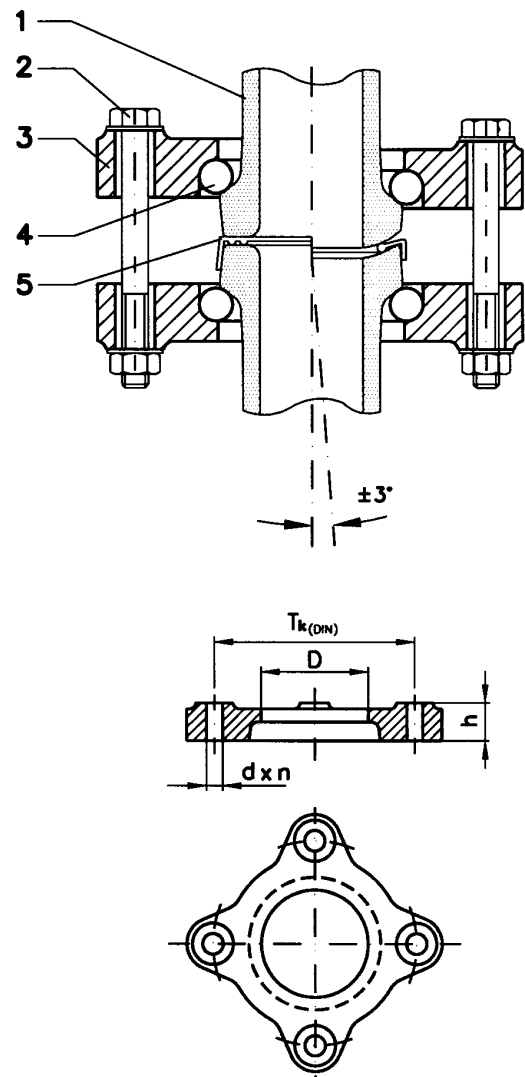
### How to order:

1" male coupler thread in PP

**SSK – 1"/F-PP**

### The most important features are:

1. precision machined - housing
2. uniform wall thickness; no weak spots
3. reinforced rim
4. large cam ears for longer service
5. forged lever – long lasting
6. SS-pins. Greater safety and longer service.
7. uniform heavy wall thickness; no weak spots
8. recess retains gasket in coupler and assures proper placement
9. precision machined – accurate tolerances



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# CAM ACTION Couplings for Hoses

## Dimensions for all Parts

# CETEC

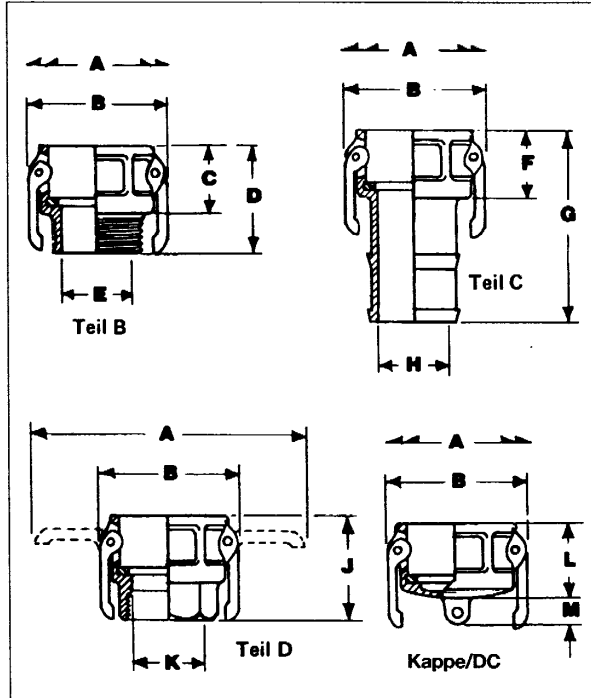
Typ SSK  
DN 1/2" – 8"

Group: 7.4  
Sheet: 7.4.1.2

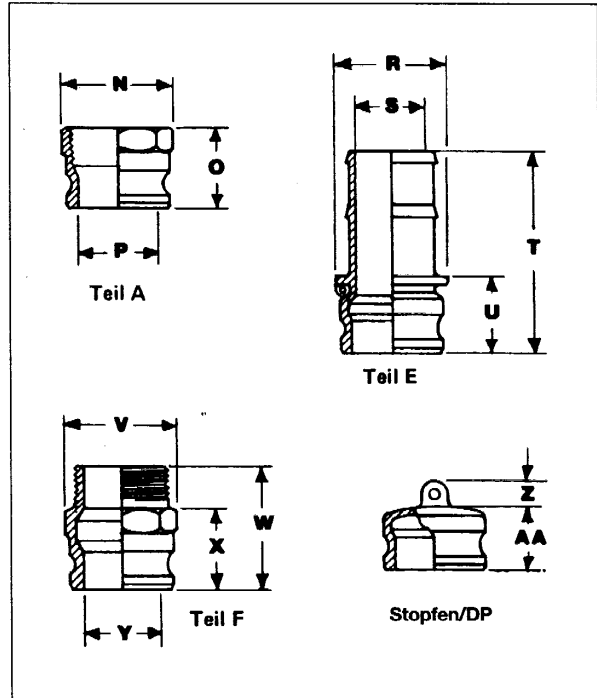
### Female

### Male

#### Mutterteil



#### Vaterteil



Zoll	A	B	C	D	E	F	G	H	J	K	L	M
1/2	68	41	29	46	14	30	67	11	48	14	30	13
3/4	113	56	33	52	19	33	84	13	52	22	32	13
1	140	62	40	62	25	40	97	19	64	30	41	16
1¼	181	81	49	79	32	49	103	25	73	35	51	17
1½	189	87	48	70	40	46	106	32	70	41	51	19
2	200	97	57	79	51	56	127	43	86	51	57	17
2½	208	113	57	89	60	57	137	56	86	60	44	19
3	251	140	60	90	73	59	160	68	89	73	64	19
4	279	168	62	102	100	62	170	92	100	95	49	19
5	302	192	62	102	121	160	184	117	103	124	68	22
6	416	244	68	111	151	67	213	143	111	151	73	29
8	508	319	98	146	197	98	287	197	152	203	108	32

N	O	P	R	S	T	U	V	W	X	Y	Z	AA
30	40	14	25	11	62	27	27	48	33	14	13	25
38	41	19	38	13	92	41	38	56	38	19	13	29
44	49	24	43	19	105	48	40	65	43	25	13	35
54	54	29	51	25	113	56	57	76	54	29	16	38
64	56	35	57	32	117	57	62	79	56	35	17	44
71	62	46	67	43	130	60	75	86	62	46	16	48
94	70	71	84	71	146	67	84	97	67	57	17	48
108	70	73	102	67	168	67	108	100	70	73	19	51
138	78	98	132	92	178	70	135	114	78	98	22	54
165	84	124	152	117	189	64	165	116	76	121	25	54
197	84	151	183	141	224	76	194	121	76	151	32	65
257	140	197	229	184	289	81	257	159	114	197	32	100

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# Metal Adapter for transition onto glass tubing

# CETEC

**Type MAG**  
**DN 15-100**

**Group: 7.8**  
**Sheet: 7.8.1**

## Metal Adapter (MAG)

For transition onto glass tubing

**MAGs** are designed in collar or conical shape with facings as to DIN/ISO 3587 and are welded to match the glass counter part. Assembling of both parts by one coupling system only.

### Possible user:

Glass drain columns, cooling/heating system of heat exchangers; feed product tubing etc. of glass apparatus.

In combination with the PTFE-adapter, type PAR, (item 8.2, page 8.2.1) or Grooved-Seal, type PKD, (item 8.1, page 8.1.4) the flat-flat sealing (3/=) is the best over-all solution.

### How to order:

DN 50 ball / thread collar flange and SW

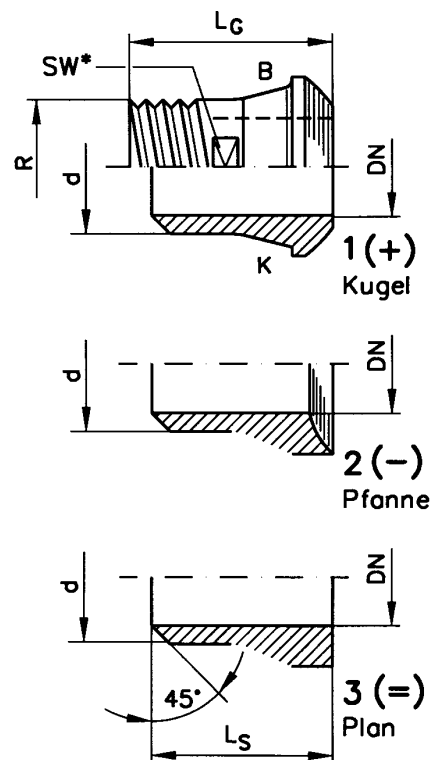
**MAG-050/B-1-G**

DN 50 flat / conical flange with 45° welding end

**MAG-050/K-3-S**

**Material: 1.4571**

Other types, dimensions and material on request



### Dimensions

DN	d	$L_S$	$L_G$	R	$SW^*$
15	22	30	50	1/2"	19
25	33	40	60	1"	30
40	50	50	75	1 1/2"	-
50	60	60	85	2"	-
80	90	90	130	3"	-
100	115	100	150	4"	-

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# Reducing Bush for DIN-Flange Glass- SS Tubing – PN 10 -

# CETEC

**Type RBF  
DN 15-300**

**Group: 7.8  
Sheet: 7.8.4**

## Reducing Bush (RBF)

By means of the reducing bush (**RBF**) the problem of different bore hole (3) between the DIN steel flange (2) on the steel tube side and the plastic / aluminium oxide flange (4) on the glass tube side (5) is easily solved.

The **RBF** is made according to DIN steel flange bores. It acts both as a disc and a centring device and in this way it supports the accurate mounting of the combined flange connection.

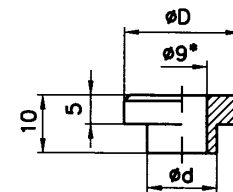
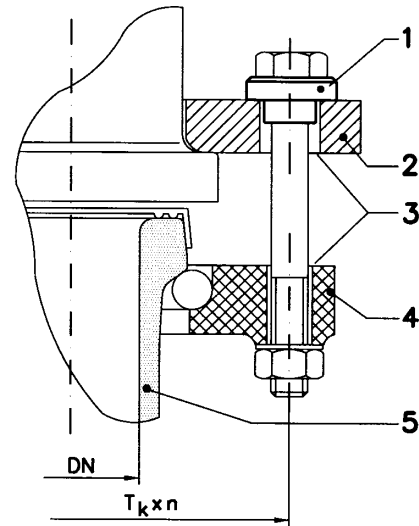
Material: SS (V2A) or galvanized steel

### How to order:

f. DN 50/PN 10 in SS (VA)  
**RBF – 16/VA**

f. DN 200/PN 10 in galvanized steel  
**RBF – 20/SV**

Other types and materials on request.



## Dimensions

### Dimensions

DN	D	D	T <sub>k</sub> x n
15	12	20	65 x 4
25			85 x 4
40	16	24	110 x 4
50			125 x 8
80			160 x 8
100			180 x 8
150	20	30	240 x 8
200			294 x 8
300	24	36	400 x 12

\* for DN 15=diameter 6,5 mm

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# Compression Springs for glass couplings

# CETEC

Type DFG  
DN 15-300

Group: 7.8  
Sheet: 7.8.5

## Compression spring (DFG)

Compression springs (DFG) for glass couplings (2-4) are especially recommended for glass pipes which are subject to high temperatures. The plastic flow of the PTFE glass flange seal is compensated which leads to a better sealing of the connection.

The DFG (1) is made of SS 1.4301. It is essential that the maximum bolt tightening torques for glass couplings are not exceeded during assembly.

Longer bolts are required if the DFG compression springs are fitted to connections or couplings of DN 15 to DN 300.

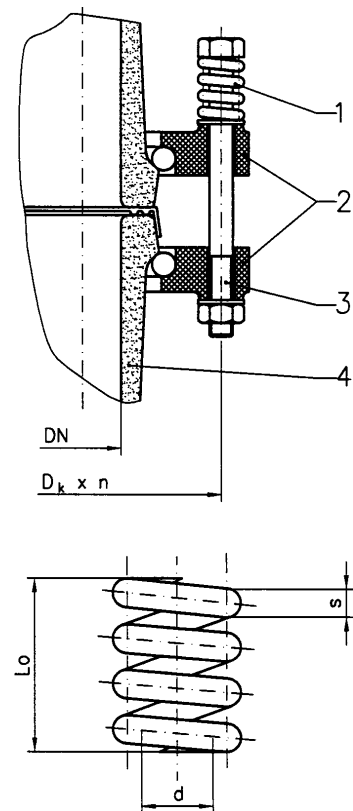
Bolt lengths for:

DN 15 - 80 =  $L_s + 20$  mm

DN 100 - 300 =  $L_s + 30$  mm

( $L_s$  = bolt length)

( $L_o$  = unstressed spring length)



### Dimension

DN	D x L <sub>o</sub> x s
15 - 80	9 x 20 x 3,6
100 - 300	10 x 30 x 5,0

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## DICHTUNGEN -1-

## Gruppe / Item 8.1-1

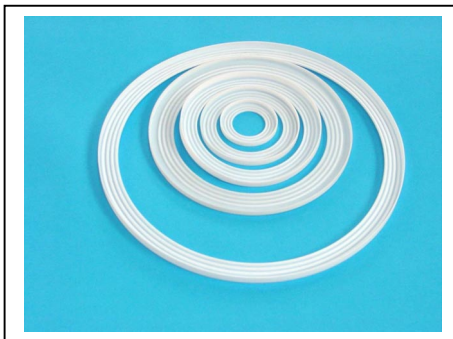
PTFE-Kragendichtungen für Glasflansche -PGD-



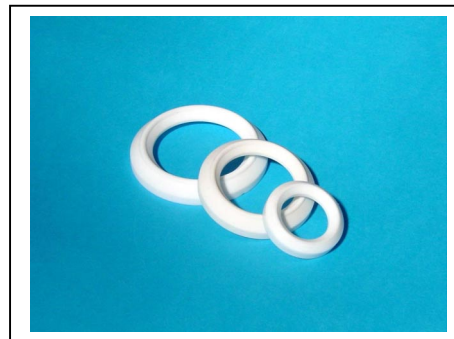
PTFE-Hülldichtungen m. Einlagen (leitf.) -PHD-(EL)



PTFE-Kammdichtungen für Glasflansche -PKD-



PTFE-Adapterringe für Glasflansche -PAR-



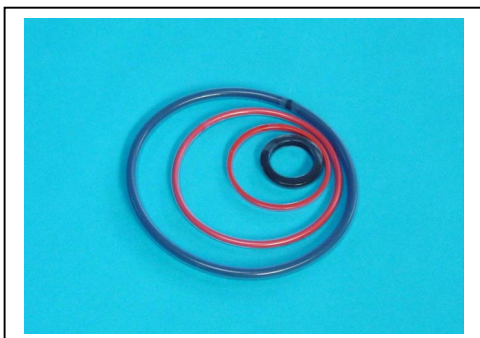
PTFE-Flachdichtungen m. Stahlkern -PFS-



Dichtringe nach DIN 11851 aus EPDM/VITON/PTFE ...



FEP / PFA- nahtlos umhüllte O-Ringe -FPO-



FEP-umhüllte QUAD-Ringe für SSK -FQR-





Type  
DICH

Group: 8.0  
Sheet: 8.0.1

Company / address: \_\_\_\_\_

\_\_\_\_\_

Name / dept.: \_\_\_\_\_

Tel.: / fax: \_\_\_\_\_ / \_\_\_\_\_

1. Operational Requirements: \_\_\_\_\_

\_\_\_\_\_

2. Seals for:

- equipment – Flange \*
- pipes – Flange \*
- fitting – spindle \*
- stirrer – spindle \*
- pump – spindle \*
- other \*

shape (cross section):

- flat
- round
- profile
- measurement D \_\_\_\_\_ / \_\_\_\_\_ x \_\_\_\_\_
- DIN \_\_\_\_\_

\* material: \_\_\_\_\_

3. Working conditions:

Product: \_\_\_\_\_

temperature: \_\_\_\_\_ / \_\_\_\_\_ °C min / max

pressure: \_\_\_\_\_ / \_\_\_\_\_ bar min / max

pH – level: \_\_\_\_\_ / \_\_\_\_\_

static:  yes  no

dynamic: \_\_\_\_\_ mtr./sec., \_\_\_\_\_ 1/min

4. At present in use:

material: \_\_\_\_\_ (sketch on reverse side)

name / type: \_\_\_\_\_

supplier: \_\_\_\_\_

5. Last order – no.: \_\_\_\_\_ from: \_\_\_\_\_

No. of pieces: \_\_\_\_\_

del. - date: \_\_\_\_\_

other: \_\_\_\_\_

CETEC-cat.-nor.: \_\_\_\_\_

Type: \_\_\_\_\_ (requirements / recommendation)

technical alterations possible 11/2003

**Flat Seals / Gaskets**  
According to DIN 26690 /..91 /..92 /...

**CETEC**

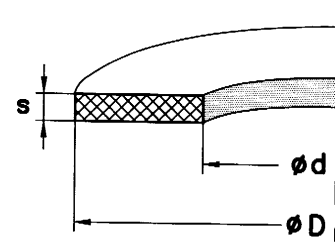
**Type FDD**  
**DN 10-500**

**Group: 8.1**  
**Sheet: 8.1.1.2**

**Flat seals - DIN -**

**Application:**

The **FDD** seals are mostly used in pipe-work construction in the chemical or related industries.



**Possible materials are:**

Gasket sheets:  
(asbestos-free)  
IT replacement (natural)  
Klinger  
Frenzelit  
Reinz  
PDT  
Graphite...etc.

Elastomere

EPDM  
Perbunan  
natural rubber  
silicone  
viton

Plastic

polyurethane  
vulkollan  
PVC  
TFM  
PTFE (-compound)

Dimensions (DIN 2690/PN 10)

Nominal width	d x D x s *
DN 10	18 x 45 x ...
DN 15	22 x 50 x ...
DN 20	28 x 60 x ...
DN 25	35 x 70 x ...
DN 32	45 x 82 x ...
DN 40	49 x 92 x ...
DN 50	61 x 107 x ...
DN 65	77 x 127 x ...
DN 80	90 x 142 x ...
DN 100	115 x 162 x ...
DN 125	141 x 192 x ...
DN 150	169 x 218 x ...
DN 200	220 x 273 x ...
DN 250	274 x 328 x ...
DN 300	325 x 378 x ...
DN 400	420 x 490 x ...
DN 500	520 x 595 x ...

s\*= 1,0; 2,0; 3,0 state on order  
other thickness on request

Other dimensions / norms and materials or according to drawing – on request.

Material	Temperature Range	Application / characteristics
Elastomere Nitril NBR Viton FPM Silicone	- 30 + 120 °C - 50 + 180 °C - 70 + 220 °C	Soft seals for low pressure areas, PTFE-constructions, valves, etc., glass parts
IT-replacement PTFE Graphite	- 80 + 250 °C to + 500 °C	hard seals for smooth surfaces, steel flange lids, flanged wheels etc.

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# PTFE Flat Seals / Gaskets DIN 2690 with perforated stainless steel inlays

# CETEC

Type PFS  
DN 15-500

Group: 8.1  
Sheet: 8.1.1.3

## PTFE-Flat Seals (PFS)

### Application:

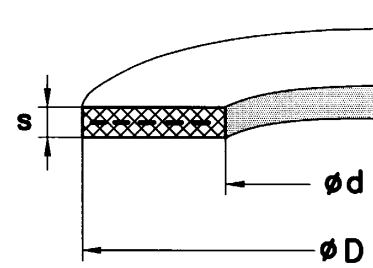
The PFS (with perforated stainless steel inlays) are mainly used in pipe constructions. (flanged joints, screw connections etc.)

In the construction of Chemical Plants very high demands are made on seals and gaskets in respect of resistance to chemicals and extremes of temperature. Seals made of 100% PTFE are seldom used as the cold flow can only be prevented by enclosing such as tongue and groove.

The PFS with a 0,5 mm perforated SS inlay is a new seal. The previously mentioned drawbacks with cold flow eliminated by the perforated SS inlay. The PFS can therefore be used without problem.

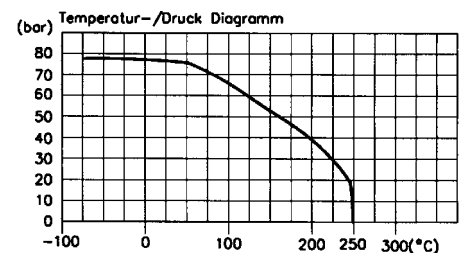
### Advantages:

- resistant against almost all chemicals
- no cold flow thanks to the perforated SS inlay
- no porosity problems therefore gas-tight
- easy installation, eliminates possibility of wrong mounting
- no deformation of the seal through raised pressure or surges of pressure because of 0,5 mm metal inlay
- able to withstand temperatures ranging from -60 to +200°C
- DIN sizes available from stock, other sizes available on request



Dimensions (DIN 2690/PN 10)

nominal width	d x D x s *
DN 10	18 x 45 x 3
DN 15	22 x 50 x 3
DN 20	28 x 60 x 3
DN 25	35 x 70 x 3
DN 32	45 x 82 x 3
DN 40	49 x 92 x 3
DN 50	61 x 107 x 3
DN 65	77 x 127 x 3
DN 80	90 x 142 x 3
DN 100	115 x 162 x 3
DN 125	141 x 192 x 3
DN 150	169 x 218 x 3
DN 200	220 x 273 x 3
DN 250	274 x 328 x 3
DN 300	325 x 378 x 3
DN 400	420 x 490 x 3
DN 500	520 x 595 x 3



### Recommended torque (NM)

DN	Nm	DN	Nm
25	20	200	68
40	20	250	75
50	27	300	82
65	34	350	95
80	41	400	102
100	47	450	108
125	54	500	115
150	60	600	122

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## PTFE Envelope Gaskets (PHD)

### Application:

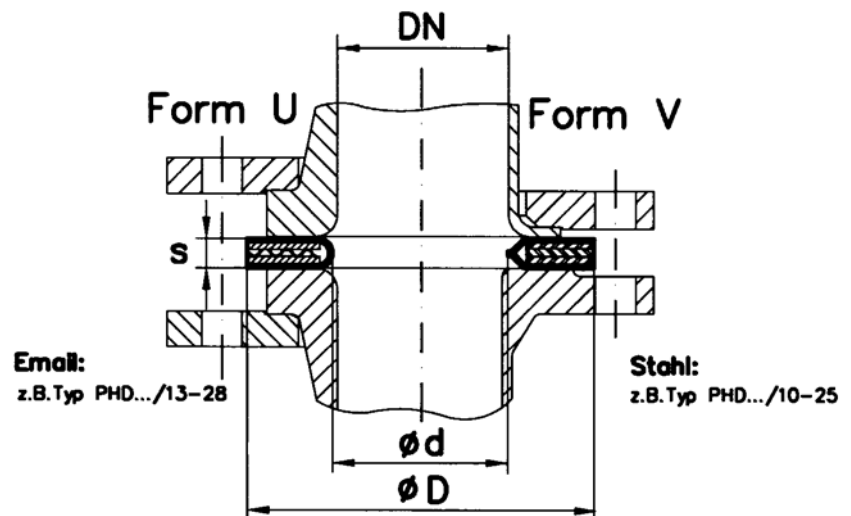
Gaskets (with / without PTFE-envelope) are mainly used in pipe construction (flange connections, threaded joints, etc.). In general, gaskets are either pressed from rubber or high pressure sealing sheets (asbestos-free).

In chemical pilot engineering gaskets are exposed aggressive media and must satisfy high demands for corrosion-proof and temperature-proof. Gaskets made of pure PTF are rarely used since the cold flow of the material can only be stopped by precise fixing (e.g. tongue and groove).

The combination of PTFE-envelope with insert has covering proved itself over several years. The insert is selected acc. to sealing surface and operating conditions. The envelope is dependent on diameter size and also on operating conditions.

### Advantages:

- corrosion and chemical resistance
- temperature-proof
- insert (contact force) to be selected
- available in all sizes



### Technical information:

PTFE-envelopes up to a diameter of 700 (approx.) are mechanically made.

Larger diameter are seamwelded of PTFE-sheets. PTFE-envelopes for DIN flanges can be supplied in standard sizes. Generally, the envelopes thickness is 0,5 mm.





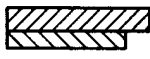


### Type:

Envelopes-shapes and inserts can be found on cat page 8.1.2/1. Further details as to diameters and types i.e. for sight glasses or acc. to specific request can be provided.

### Dimension:

1. for enamelled steel of stirrer nozzle shape E acc. to **DIN 28148 A**
2. for enamelled steel nozzle with swivel flange acc. to **DIN 28148 B**
3. for enamelled steel main flanges with manholes acc. to **DIN 28148 C**
4. for enamelled steel nozzle with swivel flange acc. to **DIN 28148 D**
5. for enamelled steel hand and manhole nozzle acc. to **DIN 28148 E**
6. for steel apparatus flanges acc. to **DIN 280031/32/34**
7. for steel SS nozzle with fixed flange acc. to **DIN 2690**

**Ausführungen**

1. PTFE-Hüllen	Formart	Durchmesser Bereich (mm)	Anwendung/Merkmale	
Pos. 10 	spitz gestochen	10...700	Standard-Ausführung preisgünstig	
Pos. 11 	spitz gekehrt	40...700	Spezialausführung	
Pos. 12 	eckig gedreht	10...700	für dicke Einlagen glatter Übergang	
Pos. 13 	rund eingestochen	10...700	für dicke, weiche Einlagen flexibel, hohe Festigkeit	
	rund eingeschweißt	300...2000	flexibel, für große Durchm. ovale Mannlochdichtung	
Einlagen für alle Hüllenformen	<b>Werkstoff</b>	<b>Temperatur Bereich</b>	<b>Anwendung / Merkmale</b>	
	21	Elastomer	weiche Dichtung für geringe Anpresskräfte, PTFE-Konstruktionen, Kunststoff-Apparatebau, Armaturen, etc., Glasteile	
	22	Nitril NBR	-30 + 120°C	Kunststoff-Apparatebau, Armaturen, etc., Glasteile
	23	Viton FPM	-50 + 180°C	
	24	Silikon	-70 + 220 °C	
25	IT-Ersatz	-80 + 250 °C	harte Dichtung für glatte Oberflächen, Stahlflansche, Deckel, Bordscheiben, etc.	
Pos. 26 	IT-Ersatz mit Auflagen lt. Pos. 20	-80 + 250 °C	anpassungsfähig für höhere Temperaturen, Glasteile, emaillierte Teile etc.	
Pos. 27 	Stahl rostfrei mit Auflagen lt. Pos. 20	-80 + 280 °C	für ausgekleidete Armaturen, Pumpen, Rohre, Glas-Apparate	
Pos. 28 	Stahlwellring (VA) mit Auflagen lt. Pos. 20	-80 + 250 °C	Standard-Dichtung für emaillierte Flansche und Apparate	

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**PTFE Glass Flange Seal**  
for facing acc. to DIN/ISO 3587

**CETEC**

**Type PGD**  
**DN 15-500**

**Group: 8.1**  
**Sheet: 8.1.3**

**PTFE Glass flange seals (PGD)**

PTFE is the multiple purpose sealing material for glass tubing with collar/conical flanges. The PGD seal is originally designed for ball (1) and socket (2) connections can also be effectively used for flat (3) connections.

For larger flat flanges conn., however, e.g. columns, cylindrical vessels, etc., PTFE grooved seals type PKD (cat.-page 8.1.4) have proved more suitable.

For use between two different flanges especially flat on ball or socket please see the PTFE-adapter ring (Type PAR, cat.-page 8.2.1). The PAR combines the function of adapter ring and seal.

The seal is of high quality PTFE and made to meet high standards.

**How to order:**

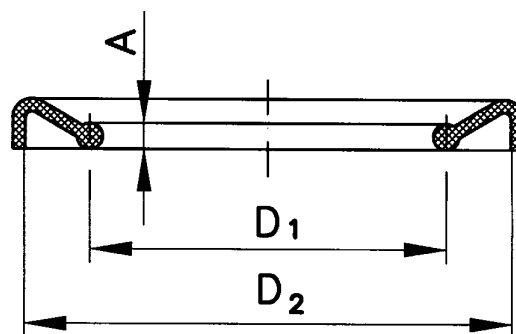
for collar flange connection DN 25

**PGD – 025/B**

for conical flange connection DN 50

**PGD – 050/K**

Other types and dimensions on request.



**Dimension for collar flange**

DN	D1	D2	A
15	23	29±0,5	2,0
25	34	43±0,5	2,0
40	51	60±0,5	2,5
50	63	74±0,5	2,5
80	96	108±0,5	3,0
100	116	128±0,5	3,0
150	169	184±0,5	4,0
200	220	231±0,5	4,0
300	321	337±0,5	4,0

**Dimension for conical flange**

DN	D1	D2	A
15	23	28±0,5	2,0
25	32	41±0,5	2,0
40	48	56±0,5	2,0
50	61	69±0,5	2,0
80	89	98±0,5	3,0
100	123	132±0,5	3,5
150	172	184±0,5	4,0
200	242	258±0,5	4,0
300	322	340±0,5	4,0

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# PTFE Grooved Seal for facing according to DIN/ISO 3587

# CETEC

**Type PKD  
DN 15-300**

**Group: 8.1  
Sheet: 8.1.4**

## PTFE Grooved Seal (PKD)

with centring collar for glass tubing.

The PKD seal has been designed for collar/conical glass flange connections. Here the PKD perform a double function as a seal and slide bearing.

A modified type „L“ is suitable for laboratory glass flange connections.

For standard connections according to DIN/ISO 3587 the PKD seal offers the following advantages:

1. Made of pure PTFE, no problems for chemical application
2. Compared to the collar o-ring seal the PKD has a reduced flow property thus enabling quick sealing / tightening. However, adjusting is recommended for high temperature fluctuations (200°C)
3. Step and groove sealing (Labyrinth effect) which is highly suitable for pressure and vacuum application
4. Slightly damaged glass facing ends can usually be sealed again by means of the PKD seal

5. The PKD seal can be eased slightly thus compensating for possible size deviations between ball and socket facing
6. The PKD seal is flush on the inside. It eliminates the usual contaminant grooves and makes cleaning and sterilization easier (foodstuff- and pharmaceutical industries)
7. The PKD seal is especially suitable for columns and drains of larger diameters
8. The PKD seal is tried and proven from -80°C to +250°C.

### How to order:

for collar flange connection DN 25:

**PKD – 025/B**

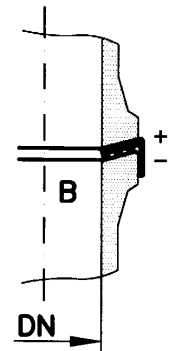
for conical flange connection DN 25:

**PKD – 025/K**

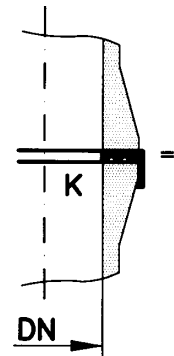
for laboratory flange DN 100:

**PKD – 100/L**

Other nominal widths (suitable for laboratory flanges) and types on request.



PKD seals are adapt accurately to ball/socket shape (tubing)



PKD seals fit perfectly on onto to flat sealing facings (columns) not slot

DN	D
15	PKD-015/...
25	PKD-025/...
40	PKD-040/...
50/60L	PKD-050(060L)/...
80	PKD-080/...
100	PKD-100/...
120	PKD-120/L...
150	PKD-150/...
200/225K	PKD-200(225K)/L...
300	PKD-300/...

Item reference:

B = collar flange

K = conical flange

L = laboratory flange only available

DN 60/100/120/150/200

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# PTFE Adapter Ring for facing according to DIN/ISO 3587

# CETEC

**Type PAR**  
**DN 15-100**

**Group: 8.2**  
**Sheet: 8.2.1**

## PTFE Adapter Ring (PAR)

The PAR seal was specially made for glass flanges according to DIN/ISO 3587. The seal is provided with a centring collar and serves as adapter, seal and sliding bearing in connections between different facing like flat (3), ball (1) and socket (2) facings.

For standard connections according to DIN/ISO the PAR seal offers the following advantages:

1. Made of pure PTFE, thus no problem in chem. operation
2. Since cross section of the PAR-adapter is lower versus solid PTFE intermediate rings, flow property is minimized. Once equally tightened, the sealing is effected. For high fluctuations of temperature (i. e. 200 °C and more) retightening of the seal is recommended.
3. The PAR seal allows for easy handling and convenient operation when facings have to be changed from flat to socket or ball and vice versa.

### How to order:

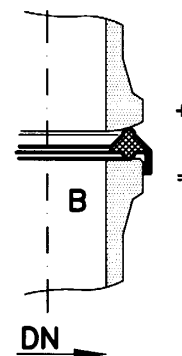
for collar flange DN 50:

**PAR – 050/B**

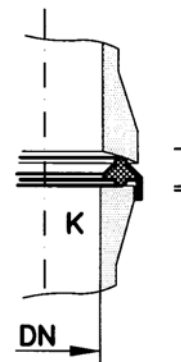
for conical flange DN 50:

**PAR – 050/K**

Other dimensions (up to DN 300) and types (fibreglass reinforced) on request.



collar flange connection:  
ball-flat



conical flange connection:  
socket-flat

DN	for collar flange	for conical flange
15	PAR – 015B	PAR – 015K
25	PAR – 025B	PAR – 025K
40	PAR – 040B	PAR – 040K
50	PAR – 050B	PAR – 050K
80	PAR – 080B	PAR – 080K
100	PAR – 100B	PAR – 100K

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# Moulded Seal for rapid action hose coupling (SSK)

# CETEC

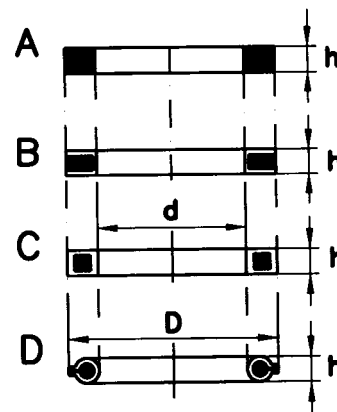
**Type FDS**  
**DN 1/2" - 8"**

**Group: 8.2**  
**Sheet: 8.2.2**

## Moulded Seals (FDS)

These seals are for use with EVERTITE / KAMLOK / RITE quick couplings or similar. They are available in different forms, materials and combinations.

<b>A</b>	1. Perbunan – NBR 2. Viton – FBM
<b>B</b>	1. PTFE with NBR core 2. PTFE with FPM core 3-sided covered cone
<b>C*</b>	FEP with silicon-viton-core 4-sided tightly covered
<b>D</b>	PTFE with FPM core Allround tightly covered



\*permitted and checked to L-P-389A, ASTM-D-2116 and FDA

Other material combination on request.

### Order example:

Mould seal for 2"-SSK, type B with FPM core:

**FDS-2"/B2**

### Dimensions

Nominal size inch	d mm	D mm	H mm
1/2 - 3/4	20	35	5
1	25	40	6
1 1/4	32	49	6
1 1/2	40	55	6
2	50	67	6
2 1/2	60	80	6
3	76	95	6
4	102	124	6
5	127	149	6
6	152	179	6

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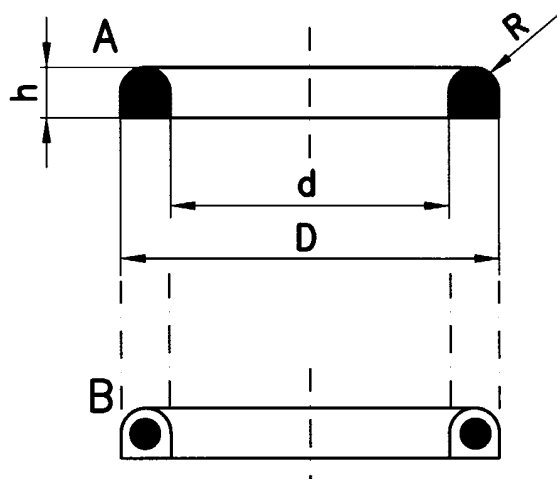
**Form Seal**

**Material:**

Standard type is perbunan (NBR-Acrylnitril-Butadien-Kautschuk). We can deliver on request (additional price) the following seal rings.

**Type A**

- Silicon** (VMQ-Vynil-Methyl-Polysiloxan)
- EPDM** (Äthylen-Propylen-Dien-Kautschuk)
- Viton** (FKM-Fluor-Kautschuk)
- PTFE** (Polytetrafluor-äthylen)



**Type B**

PTFE with viton core, seamless encapsulated.

All seal qualities (except viton) meet with the food and drink regulations.

The standard seal has a small opening at the i.d. For stricter hygiene requirements we can deliver a seal with collar which covers this gap.

**Dimensions**

DN	D	d	h	R
10	20	12	4,5	2,3
15	26	18	4,5	2,3
20	33	23	4,5	2,8
25	40	30	5,0	2,8
32	46	36	5,0	2,8
40	52	42	5,0	2,8
50	64	54	5,0	2,8
65	81	71	5,0	2,8
80	95	85	5,0	2,8
100	114	104	6,0	2,8

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**FEP/PFA-seamless-encapsulated-O-Ring (FPO)**

With silicone or viton full – or hollow core. Diameter acc. to DIN/SMS/AS or BS standard.

**Construction:**

The FPO o-ring consists of a rubber elastic core and a FEP (PFA) encapsulation which encases the o-ring without seams. Silicone (VMQ) or viton (FKM approx. 70° shore A) are used as core materials.

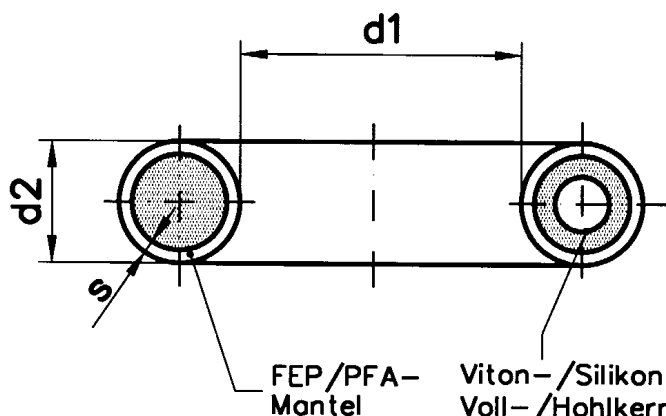
**Function:**

The FPO rings are self-acting, double acting sealing elements. The sealing property is achieved by the FEP (PFA) encapsulation where as the o-ring serves as an elastic element exerting a permanent and uniform pressure against the contact surface. The radial or axial contact force is equal to the force of the working pressure. The total compression will increase according to the increase of the working pressure.

**Advantages in application**

- resilience property (70° shore A)
- resistant to almost all chemicals and liquids
- no contamination when used for foodstuff, pharmaceutical and medical products
- can be sterilized acc. to FDA requirements
- applicable temp. range approx. -60 °C to +200 °C
- low friction, no stick-slip effect, no adhesion tendency
- low steam permeability

Due to the FEP or PFA encapsulation the application performance of o-rings has been extended considerably.



**Operating ranges**

FPO-rings are primarily used as static seals (axial and radial), e.g. for lids and covers, flanges, etc. When subjected to low levels of strain and stress (speed and pressure), the seal can also be used for dynamic sealing, i.e. for pistons, rods, spindles, etc.

FPO-rings are used wherever conventional elastomere o-rings cannot be used due to their low chemical resistance, Typical application in the chemical, petrochemical, food industry, medicine, water + waste water technology etc. For fittings, tubes, pipes, filters, pumps, apparatus, etc.

**Cross sections d<sub>2</sub>:**

- metric sizes** (DIN 2514\*...) 2,0/2,5/3,0/4,0/5,0\*/6,0\*/7,0\*/8,0\*mm
- swedish standard** (SMS 1586) 2,4/3,0/5,7/8,4 mm
- american standard** (AS 568 A, DIN/ISO 3601) and
- british standard** (BS 188806) 1,78/2,62/3,53/7,00 mm

**Strength of FEP-encapsulation**

D<sub>2</sub>/s(mm): 1,78/0,20 – 2,62/0,25 – 3,53/0,30 – 5,33/0,40 – 7,00/0,50

**Tolerances**

In general, fabrication tolerances of FPO-rings are greater than those of elastomere o-rings. Therefore the largest possible cross section should be selected, since the tolerances are relatively lower compared to smaller sizes.

**Surface quality**

In general, the surface quality of both contacting faces should be RA 0,4/0,8 mym, Rt 3/6,3mym, N5/6, in vacuum RA 0,1mym, Rt 0,83 mym, N3.

Groove can be machined with RA 1,6 mym, Rt 11/16mym, N7.

**Groove dimensions**

When the FPO-ring is installed its cross section must be deformed in order to achieve highest sealing efficiency. Virtually all groove dimensions can be found on page 8.3.3/1. They are similar to those of pure elastomere o-rings.

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**1. Rectangular groove – axial contact force**

When used for sealing of flanges and lids, the o-ring normally anticipates axial contact force. To calculate the most suitable ring and groove dimensions the radial or axial contact force must be taken into consideration. If the ring is subjected to external excess pressure the outside diameter of the o-ring must be equal or larger than outside diameter of the groove. By considering this it can be avoided that the o-ring is exposed to more distortion and increased attrition since the ring will not move under high pressure.

**2. Rectangular groove – radial contact force**

Sealing of radial (static) parts. For groove in bores, shafts or rods.

**3. Rectangular groove – radial contact force**

O-rings are also used to seal dynamic machine parts. The seal is installed in a rectangular groove. The o-ring must be compressed radially. With regard to friction the compression must be less than compression for static installation. More service life is guaranteed when lubricated efficiently. Groove dimensions – as mentioned in the table – undergo an average compression of 10 to 20% according to their cross section.

**4. Trapezium groove – axial contact force**

Sealing of axial static parts, in particular lids, etc. The sealing does not fall out of the groove when lid is opened.

**5. Installation and construction advice**

In general, the same rules apply to installation of encapsulated o-rings and conventional elastomere o-rings. However, please note that due to the FEP or PFA encapsulation these o-rings cannot be squeezed, i.e. they don't contract as readily as elastomere o-rings do, once stretched. The sealing ring should never be forced into the groove (i.e. by buckling) since this can spoil the sealing function. In such cases a split groove must be used.

When used for external sealing application (e.g. pistons), the FEP/PFA encapsulated o-rings must be stretched out and then put back in shape. The stretching should be carried out on top of a tapered tool, whereas a calibration collar is recommended to reshape the o-ring. To facilitate and save time

the o-rings can be heated up to 100 °C in oil or water. For operating pressure higher than approx. 50 bar it is advantageous to also fit in concave back-up rings. We cannot be held liable for damage incurred on the basis of the information provided on these pages.

d2	T	B <sup>+0,2</sup>	d2	T	B <sup>+0,2</sup>
1,78	1,3	2,4	5,34	4,40	7,0
2,00	1,5	2,6	5,70	4,65	7,5
2,40	1,8	3,1	6,00	5,20	8,0
2,62	2,1	3,6	6,99	5,85	9,4
3,00	2,3	3,9	8,00	6,80	11,4
3,53	2,8	4,8	8,40	7,25	11,6
4,00	3,2	5,4	9,00	7,70	12,7
5,00	4,1	6,5	10,00	8,65	13,8

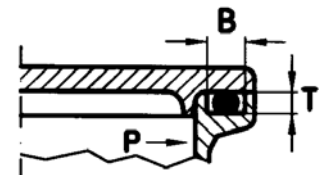


Fig.1

d2	T	B <sup>+0,2</sup>	d2	T	B <sup>+0,2</sup>
1,78	1,3	2,4	5,34	4,40	7,0
2,00	1,5	2,6	5,70	4,65	7,5
2,40	1,8	3,1	6,99	5,85	9,4
2,62	2,1	3,6	8,00	6,80	11,4
3,00	2,3	3,9	8,40	7,25	11,6
3,53	2,8	4,8	9,00	7,70	12,7
4,00	3,2	5,4	10,00	8,65	13,8

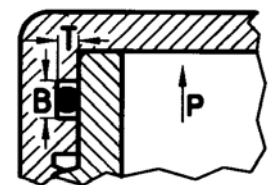


Fig.2

d2	T	B <sup>+0,2</sup>	d2	T	B <sup>+0,2</sup>
1,78	1,5	2,3	5,34	4,70	7,1
2,00	1,7	2,6	5,70	5,10	7,7
2,40	2,1	3,0	6,99	6,30	9,4
2,62	2,3	3,4	8,00	7,20	9,6
3,00	2,6	3,6	8,40	7,50	11,5
3,53	3,1	4,6	9,00	8,20	10,8
4,00	3,5	5,4	10,00	9,10	12,0

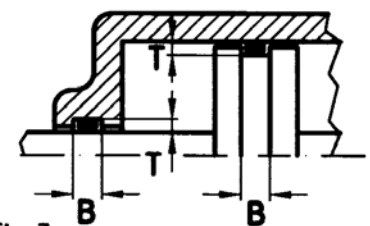


Fig.3

d2	B <sub>-0,05</sub>	R1	R2	T <sub>-0,05</sub>
3,53	2,80	0,8	0,25	3,05
5,00	4,15	0,8	0,25	4,10
5,34	4,40	0,8	0,25	4,35
5,70	4,80	0,8	0,40	4,75
6,99	5,95	1,5	0,40	5,65
8,00	6,85	1,5	0,50	6,50
8,40	7,25	1,5	0,50	6,80
9,00	7,80	1,5	0,50	7,25
10,00	8,70	1,5	0,50	7,95

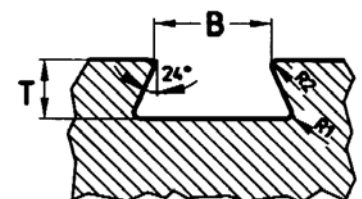


Fig.4

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# Levlon-Soft-Seal Flat Sealing Tape of expanded PTFE

# CETEC

**Type LSS  
DN 50-1800**

**Group: 8.4  
Sheet: 8.4.1**

## Levlon-Soft-Seal

The LSS tape (1) is 100% expanded PTFE. It has a self-adhesive strip (2) and is rolled onto reels (3).

High chemical resistance against aggressive gases, corrosive acids, lyes, solvents and alkaline chemicals, except for elemental fluor, fluorine and molten alkali metals, thus providing a high application variety in the range of chemical industry. Temperature range is stable from -240 °C up to +250 °C; for a short time +300 °C. The material is not subject to ageing and is non-combustible. Pressure load up to 200 bar depending on the surface of the sealing areas and operational requirements. LSS sealing tape is physiologically safe and neutral in taste and outdoor.

The important characteristics of LSS sealing tape are the following:

- high chemical and temperature resistance
- soft and flexible
- long service, no deterioration with age, no cold flow
- economically for warehousing, less shelfspace needed since a small number of sizes can satisfy all requirements
- easy handling, cuts down labour time

Typical application range:

- tubing - lids
- pumps - compressors
- stirring vessels - apparatus
- heat exchangers columns, etc.
- columns, etc.

### Instructions for use:

After removing the backing paper (1) gently press the adhesive face of the sealant (2) into contact with the cleaned sealing surface. It easily follows rounded or regular flanges, with or without groove; the LSS goes through thick and thin! The sealant should be within the bore circle. Cross over when finished.

For glass, enamel or ceramic faces it is recommended to cut the ends to form a carved or lap joint. Flanges will part easily for maintenance and require minimal cleaning before resealing.

## Tests and Approvals

### TÜV Test No. MP 373 712

Sealing parameters are for working pressures of 6/16 and 40 bar.

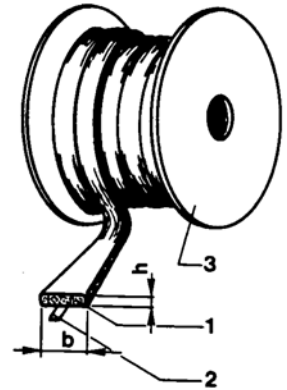
### BAM Tgb.-No. 8677/854-2988

Based on test evaluation in steel/copper and copper/alloy flanges; either with smooth sealing face or groove, up to oxygen pressures of 100 bar and at temperatures of 90 °C.

### DVBW Reg.-No. G85e037

Approved for gas supply at working pressures up to 16 bar and temperatures ranging from -10 °C up to +50 °C.

All technical information and advice has been provided on the grounds of our gained experience and to our best knowledge and belief. However, we cannot be held liable for any damage incurred. Information and estimates always require examination by the customer who only can judge whether it is the right sealing or not, since he has all details available on premises.



**LSS tape dimensions and lengths p/ reel:**

b	h	L (m)/reel	
3	1,5	25	50
5	2,0	25	50
7	2,5	25	50
10	3,0	10	50
12	4,0	10	50
14	5,0	10	50
17	6,0	8	25
20	7,0	5	25

Other sizes can be fabricated if quantity of order allows.

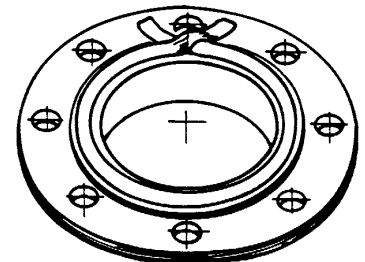
### Recommended tape widths (b):

DN (flange)	b
to 50	3
to 200	5
to 500	7
to 1000	10
to 1500	14
over 1800	17/20

### How to order:

for 1 reel of LSS sealing tape  
7 x 2,5 x 25 m:

**LSS-7/2,5 x25**



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# PTFE Threaded Sealing Tape of pure expanded PTFE

# CETEC

Type PGB

Group: 8.4  
Sheet: 8.4.2

## PTFE Threaded Sealing Tape

**Tested for all gas**  
**DIN – DVGW – test number**  
**85.01 e 133**

Excellent chemical resistance against aggressive media. Does not become brittle, weather, deteriorate or become sticky.

Application ranging from -200°C up to +260°C.

Safe sealing and low friction coefficient.

### **Does not contain oil or fat.**

Prevents pitting of flanges and deterioration; (convenient resealing, even after years – also steel bolts in aluminium oxide!)

Quick and clean handling of the sealing procedure.

Is not combustible. Please make flame test!  
Caution: do not breathe in resultant fumes!

**Tested for oxygen**  
**BAM 4985/1984**

For steel lines up to: 40 bar  
For copper lines up to: 40 bar  
Max. permissible  
Working temperature 60 °C

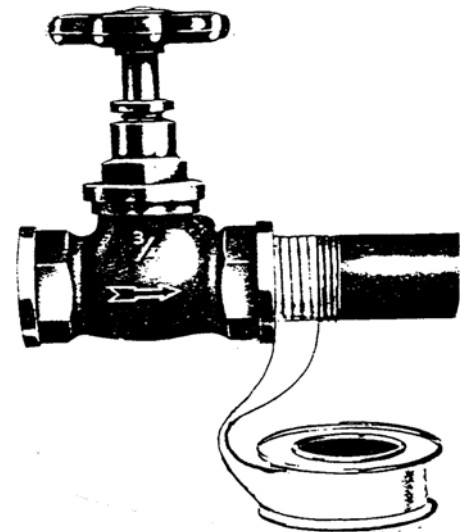
### **Wz Du Pont®**

#### **Suitable for:**

gas – oxygen – chemicals – lyes - oil –  
water – petrol, etc.

#### **Available in widths:**

6 – 19 – 12 – 20 and 25 mm



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# PTFE Glass Enamel Gasket for DIN connection

# CETEC

Type PGE  
DN 15-300

Group: 8.5  
Sheet: 8.5.1

## Design:

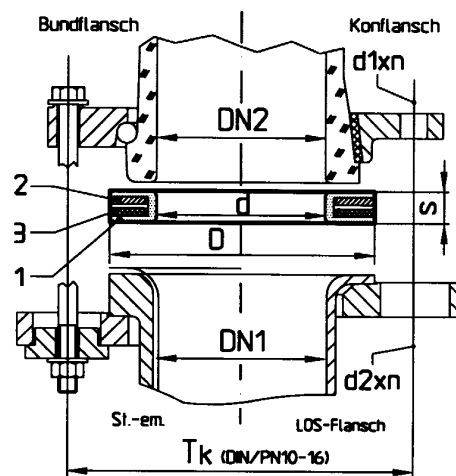
PTFE glass enamel gasket for connecting glass to enamel tubes welding border acc. to DIN 2646.

PTFE envelope 0,8 mm thick, U-shape, rounded, seamless, outside open.

Inserts to glass tubing side 1 mm thick.

IT-replacement inserts, (soft material, asbestos free).

Support ring of Cr-Ni-steel mat No. 1.4571, (HC4), 2-6 mm thick.



1. PTFE-cover
2. 1.45571 (HC 4)
3. IT-free insert

DN1 Glass/Enamel tubing flared flange	DN2 Glass tubing	D	D	s	T <sub>k</sub>	n x d1	n x d2
15	15	45	12	6	65	4 x 7	4 x 14
20	25	58	22	6	75	metallflange	4 x 14
25	25	65	20	8	85	4 x 9,5	4 x 14
32	40	75	36	8	100	metallflange	4 x 18
40	40	85	36	8	110	4 x 9,5	4 x 18
50	50	100	46	8	125	4 x 9,5	4 x 18
65	80	120	75	8	145	metallflange	4 x 18
80	80	135	75	8	160	8 x 9,5	4 x 18
100	100	160	95	8	180	8 x 9,5	4 x 18
150	150	210	147	8	240	8 x 10,5	4 x 22
200	200	268	197	8	295	8 x 11	4 x 22
300	300	365	294	11	400	12 x 11	12 x 22

d 1 couplings (backing flanges) acc. to ISO 2084. Diameters of bore holes and bolts acc. to flange standards DIN 2501 PN 10

d 2 bolt diameter for both DIN flange and coupling must be same size.

Headed bushing of Cr-Ni-steel are used to reduce bore holes in DIN flange.

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# Protecting Collar for filter flaks

# CETEC

Type SFS  
Size 1-5

Group: 8.5  
Sheet: 8.5.2

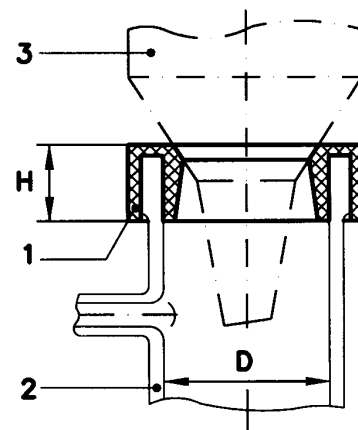
## Protecting Collar for filter flaks (SFS)

The SFS (pos. 1) for glass filter flaks (pos. 2) provides by its specially designed shape a centering and stable support for filters, funnels and strainers (pos. 3). Moreover, a clean sealing effect is achieved between glass flange and the mounted device. By means of vacuum the sealing effect is continuously supported.

A further important feature of the SFS is the all-over protection of the glass flange which means that damages incurred by knocks are reduced leading to longer service.

The material of SFS is EPDM which has proved to be highly suitable for laboratory equipment. SFS is available in five different sizes in compliance with sizes of filter flasks and nozzles. (See table)

Other material and types on request.



### Dimensions

D mm	H mm	flasks size (ml)	article- N°
23	11	100	SFS-1
33	15	250 ÷ 500	SFS-2
44	25	1000	SFS-3
58	25	2000 ÷ 3000	SFS-4
68	25	5000 ÷ 10000	SFS-5

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**MSR-SENSOREN - ZUBEHÖR**  
**Measuring-Accessories**

**Gruppe / Item 9.1**

**PT 100 - verschmolzen -PGT-**



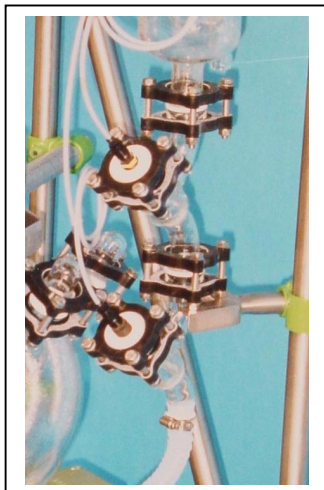
**PT 100 - VA m. Hüllrohr -PHW-**



**Plattenfedermanometer -PFM-**



**pH- u. Temp.-Inline-Messg.**



**Durchflussmessung (EX) -DFM-**



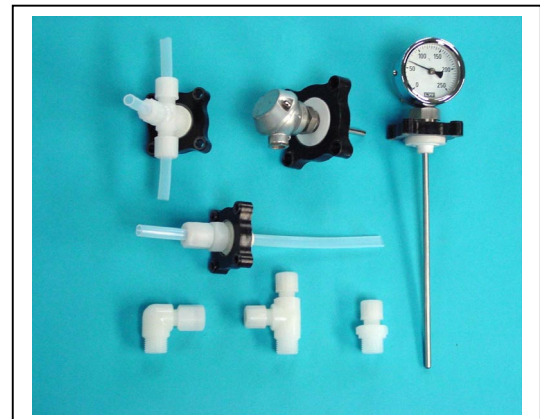
**PFM m. dig. Anzeige (4-20 mA)**



**pH- u. Temp.-Anzeige (EEX)**



**PTFE-Gewinde-Adapter (-PGA-) mit div. Anschl.**



# Resistance Thermometer with safety glass tube (BSG 3.3)

# CETEC

Type WTS  
DN 25

Group: 9.1  
Sheet: 9.1.1

## Resistance Thermometer (WTS) with safety glass tube (BSG 3.3)

The resistance thermometer with safety glass tube (WTS) is used for measuring temperature of gases and liquids by means of a remote indicator.

The transducer, a glass sealed PT 100, is protected safety tube against mechanical impact.

The construction features have the following advantages:

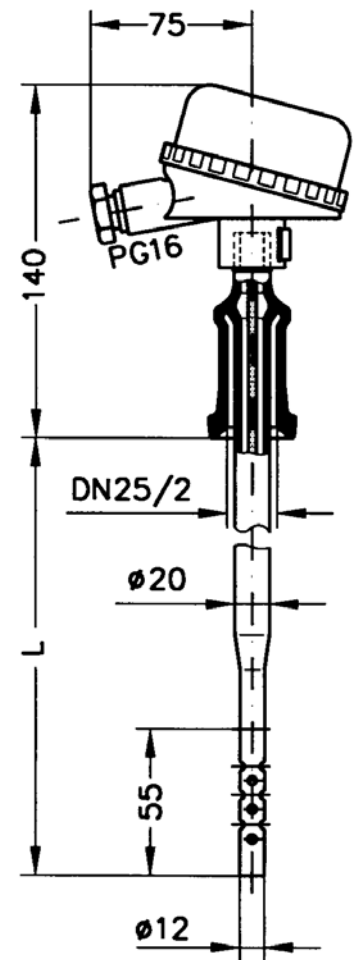
1. rapid and sensitive temp. Measuring of gas and liquids product range
2. Borosilicate glass stands for high corrosive and thermal resistance, so that almost all purpose application is guaranteed
3. standard type with a 2-phase wiring, can be supplied with a 3-/4-phase wiring if desired

Ex – proof types are also available on request.

Temperature indicators, temperature recorders (analogue or digital) can be supplied on request.

**How to order:**  
with DN 25/2-connection and L = 200 mm  
**WTS-025/2-200**

Other types (nom. widths, lengths) on request.



### Dimensions / Article-No.

D	H	Article-No.
25	100	WTS-025/2-100
25	150	WTS-025/2-150
25	200	WTS-025/2-200
25	300	WTS-025/2-300

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# Resistance Thermometer with casing tube (BSG 3.3)

# CETEC

Type WTH  
DN 25/50

Group: 9.1  
Sheet: 9.1.2

## Resistance Thermometer (WTH) with casing tube

The resistance thermometer with casing tube (WTH) is used for measuring temps. Of gases and liquids by means of remote indicator.

The transducer, a PT 100, is operating by indirect thermometry. This means that a contact liquid e.g. oil or conductive paste is filled between jacket tube and transducer.

The construction features have the following advantages:

1. the thread adapter can be moved and replaced whenever needed without the unit being opened
2. through the casing tube (BSG 3.3) inexpensive VA transducer can be inserted without any corrosion problem occurring.
3. Thermometry capacity is ranging from -50 °C up to +200 °C

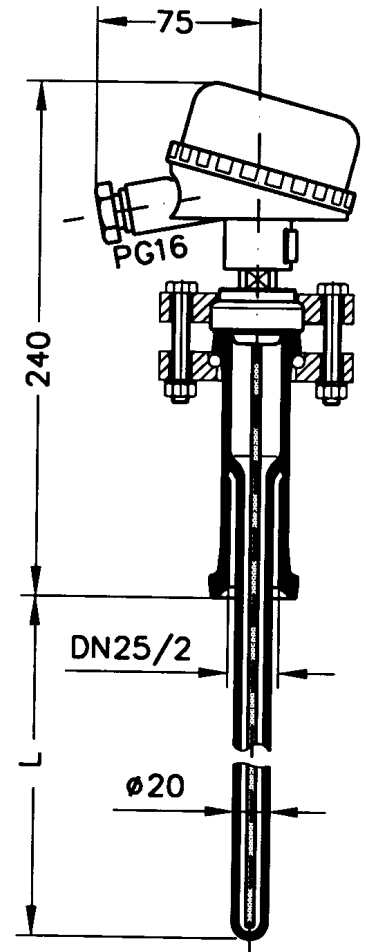
Standard type with a 2-phase wiring can be supplied with a 3-phase wiring if desired.

Ex – proof types are also available on request.

Temperature indicators, temperature recorders (analogue or digital) can be supplied on request.

**How to order:**  
with DN 25/2-connection and  
L = 200 mm  
**WTH-025/2-200**

Other types (nominal widths, lengths) on request.



### Dimensions / Article-No.

D	H	Artikel-No.
25	100	WTS-025/2-100
25	150	WTS-025/2-150
25	200	WTS-025/2-200
25	300	WTS-025/2-300
50	200	WTH-050/2-200
50	300	WTH-050/2-300
50	400	WTH-050/2-400

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# Read thermometer with casing tube

# CETEC

**Type ZTH**  
**DN 25/50**

**Group: 9.1**  
**Sheet: 9.1.2.1**

Read thermometer (ZTH)  
with casing tube

The read thermometers with casing tube (ZTH) is used for the temperature measurement by gases and liquids with/without remote indication.

The assigned feeler works by indirect temperature measurement; i.e.: between the tube made in Borosilikat glass. For the feeler contact is necessary to fill liquid (e.g. oil) or a conductive paste into the tube.

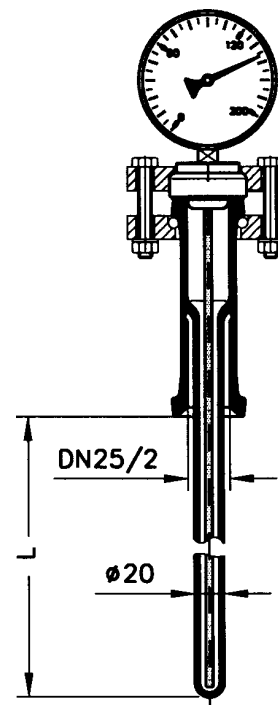
Temperature indication devices (analogue or digital) or temperature printer are available of request.

Order example:  
with DN 25/2 - Connection and L = 200 mm ZTH-O25/2-200  
Other variations types (nominal sizes, lengths, curved) on request.

1. The advantages of this structure are the following:
  1. it is possible to change the measuring part without opening the equipment any time

2. Into the casing tube from Borosilicate glass 3.3 could be used low coast stainless steel contactor - without problems with corrosions
2. The temperature measuring range is from + - 0°C up to +200 °C

The standard is implemented with a 2- phase wiring when desired can be supplied with a 3- phase wiring



**Dimensions / Article-No.**

D	H	Article-No.
25	100	ZTS-025/2-100
25	150	ZTS-025/2-150
25	200	ZTS-025/2-200
25	300	ZTS-025/2-300
50	200	ZTH-050/2-200
50	300	ZTH-050/2-300
50	400	ZTH-050/2-400

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# Glass Flow Meter with floater

# CETEC

**Type GDM  
DN 15-80**

**Group: 9.1  
Sheet: 9.1.3**

## Glass Flow Meter (GDM)

The GDM with floater is used to obtain exact throughput data of gases and liquids. The floater is raised by the throughput of the product. The upper edge of the floater indicates the flow rate on a laterally fixed scale. Measuring accuracy:  $\pm 2\%$

The flow meter is BSG 3.3 whereas the floater is corundum or made of PTFE coated cores. As a result, The GDM is fully corrosion proof against most chemical processing products.

The scale is calibrated for water at 20 °C and can be graduated for different throughputs, however, the following product details are needed:

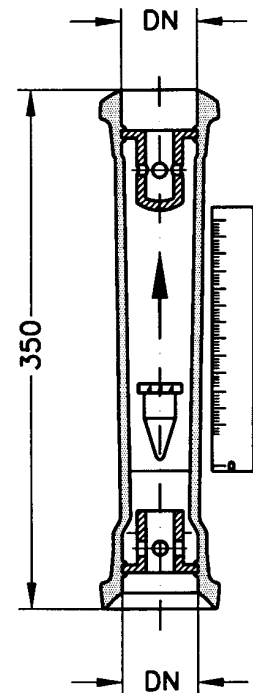
1. measuring product
2. rate of measuring i.e.: 1/min, 1/h etc.
3. density of product in kg/l or kg/m<sup>3</sup>
4. dyn. Viscosity in Pa's
5. operating temp. of prod. in °C
6. operating pressure in bar
7. standard operating conditions of gases

The GDM can be supplied on request with pneumatically measuring transformers.

### How to order:

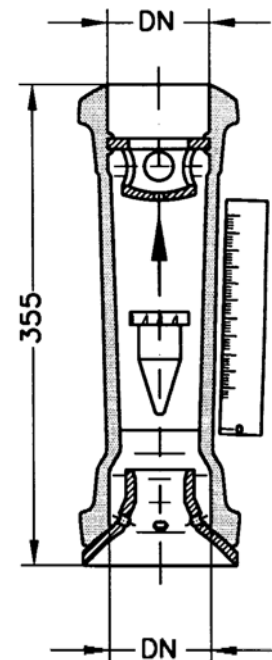
DN 25 for 40-400 l/h water at 20 °C

**GDM-025/BW-8**



### Measuring range /article-no.

DN mm	measuring range water (l/h)	measuring range air (l/h)	article-no. X für W od. L
15	0,025-0,25	1-13	GDM-015/AX-1
15	0,063-0,63	3-30	-2
15	0,40-4,00	17-170	-3
15	1,00-10,00	38-380	-4
15	4,00-40,00	140-1.400	-5
15	6,30-63,00	220-2.200	-6
25	16,00-160,00	600-6.000	GDM-025/AX-7
25	40,00-400,00	1.500-15.000	-8
40	63,00-630,00	2.400-24.000	GDM-040/AX-9
40	100,00-1.000,00	4.000-40.000	-10
80	160,00-1.600,00	6.000-60.000	GDM-080/BX-11
80	250,00-2.500,00	10.000-100.000	-12
80	400,00-4.000,00	15.000-150.000	-13



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# Diaphragm Pressure Gauge 0 - 1,5 bar with PTFE – lining/coating

# CETEC

Type PFM  
DN 25

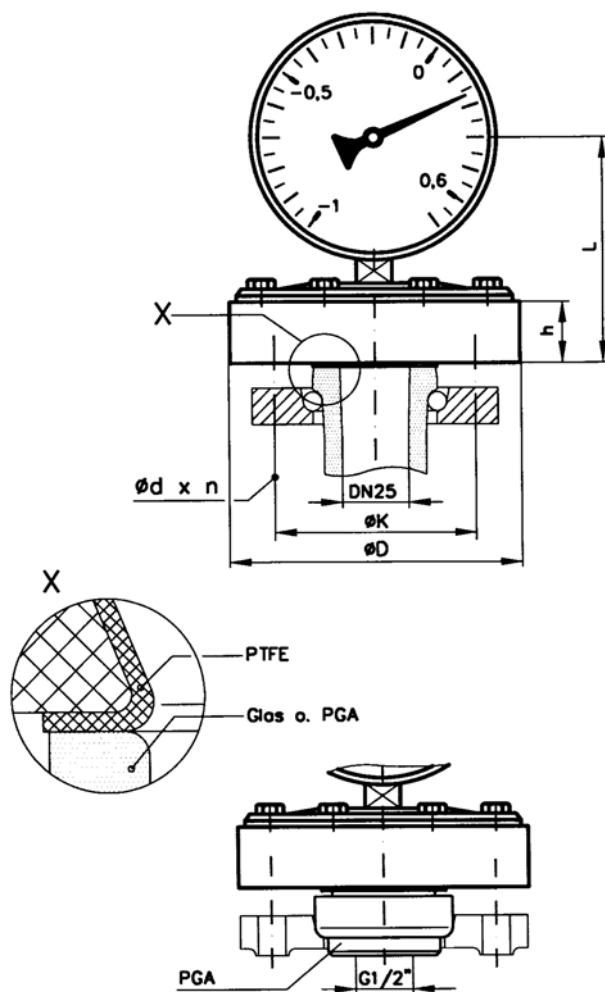
Group: 9.1  
Sheet: 9.1.5

## Diaphragm Pressure Gauge (PFM)

The diaphragm pressure gauge (PFM) available in 2 sizes, NG 10 or NG 160. The base flange is available in either SS 1.4571 or coated in cast iron and can be directly mounted to a flat glass flange as the contact surface is bordered with PTFE (see detail X).

A modified version of the gauge is available with pre-installed PTFE thread adapter (see sheet 9.6.1) and a PTFE tube which screwed into the reaction vessel. By means of this screen connection the pressure gauge can be installed at any chosen spot near the measurement point.

Models with electrical max./min. contacts can also supplied.



### Dimensions

Connec-ting flange	Pressure measu- rer NG	Indicator area bar/abs.	ØD	ØK	Ød x n	L	h
DIN ND 25	100 160	0 – 1,5	115	85	M8 x 4	111 141	25

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# Level Gauge in Stainless Steel with transparent FEP-/ PFA-lining

# CETEC

Type HMR  
DN 25-80

Group: 9.4  
Sheet: 9.4.1

## Level Gauge (HMR)

With transparent lining available in nominal widths of DN 25/50 and 80.

### Construction:

1. flange DIN/PN 16, flared
2. float catcher (on request)
3. float level indicator (on request)
4. safety shield (Polycarbonate)
5. FEP-/PFA-lining, highly transparent
6. Angled slots for max. visibility
7. Sliding cup for ease of shield removal

L = max.: 6.000 mm

T = max.: 180 °C

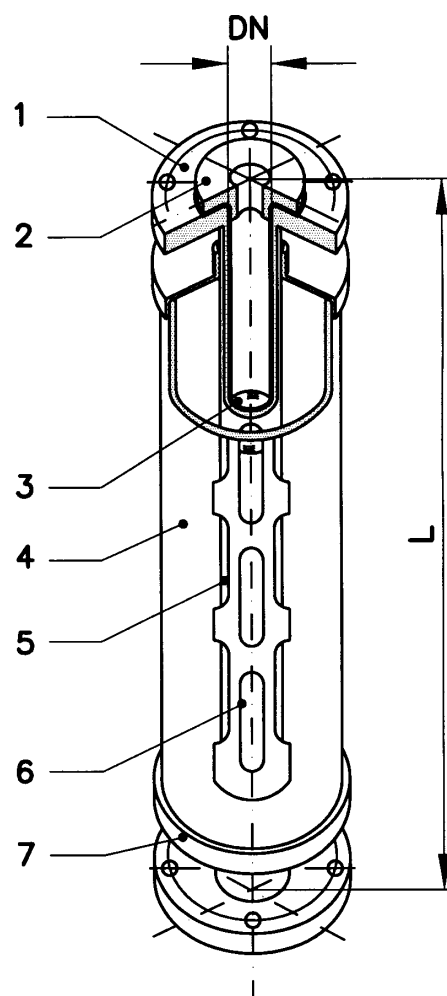
P = max.: 10 bar

\* dependent on working pressure

All steel parts of 1.4301 or similar quality.

### Please indicate with your enquiry:

Nominal width (DN)  
length  
working pressure  
working temperature  
product  
to be used



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**Level Control**

The inductive Level Control with magnet contact switch for fluid level monitoring is installed in combination with a by-pass pipe. The combination of magnet switch and float produces a contact free switch. The switching process is magnetically induced.

The example opposite shows a Level Control with two switching points as is most commonly installed. Models with one or more switches are possible.

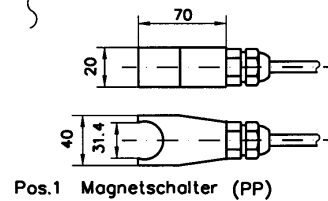
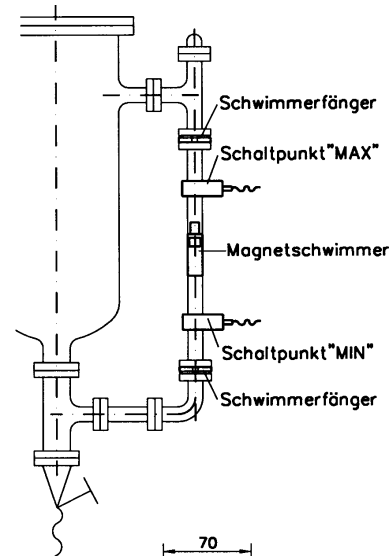
**Magnetic Level Control**

The switch is suitable for attachment to a glass pipe DN 25, in which a float with in-built magnet can move up and down. The switch stores the current set switching point i.e. It remains closed if the switching point is passed until the float returns to the set point. This model is suitable for use in EEX areas.

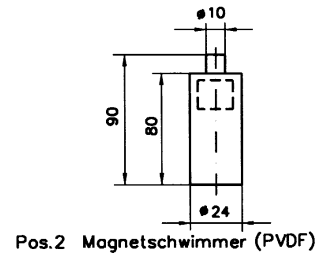
**Magnet Float for Electrical Level Control**

This magnet float is suitable for fluids with a density > 0,8 g/cm<sup>3</sup>. Floats for other densities can be supplied on request.

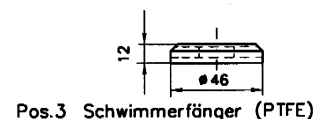
The standard model includes two PTFE float catchers for DN 25.



Pos.1 Magnetschalter (PP)



Pos.2 Magnetschwimmer (PVDF)



Pos.3 Schwimmerfänger (PTFE)

technical alterations possible 11/2003

# PTFE Thread Adapter for glass tubing with collar flange

# CETEC

Type PGA  
DN 15/25

Group: 9.6  
Sheet: 9.6.1

## PTFE Thread Adapter (PGA)

For assembling in units and glass tubing with collar flange, for easy installation of measuring and feeding devices with threaded connection – according to table – Please see catalogue page 9.6.1/1 to find some assembling examples.

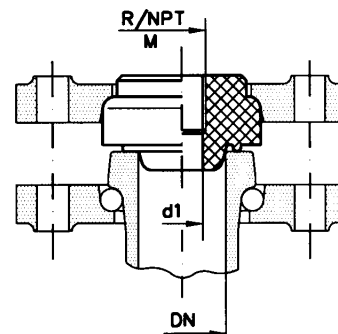
Easy to mount without any additional parts. Can be fixed with standard backing flange.

The adapter is virgin PTFE thus highly suitable for chemical application. Operating temperature for fibreglass reinforced quality ranging to 200 °C and higher.

**How to order:**  
**PGA – 025/R 1/2"**

Different types, nominal widths, threads and material on request.

**DBGM: 8716334.9**  
**GDM – 025/BW-8**



Dimension/article-no.

DN	R/NPT	M	D1
15	1/4"	10 x 1,5	4,5
	1/2"	10 x 1,5	6,5
25	1/4"	10 x 1,5	6,5
	3/8"	10 x 1,5	8,5
	1/2"	16 x 1,5	10,5
	3/4"	16 x 1,5	12,5

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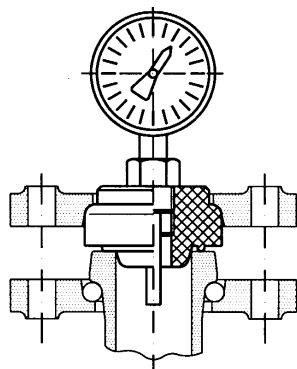
# PTFE Thread Adapter

## Installation details

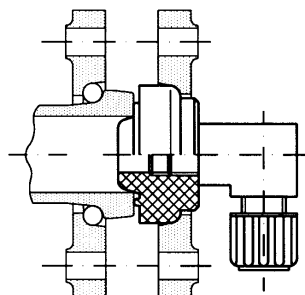
# CETEC

Type PGA  
DN 15/25

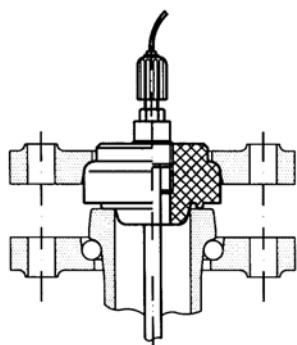
Group: 9.6  
Sheet: 9.6.1.1



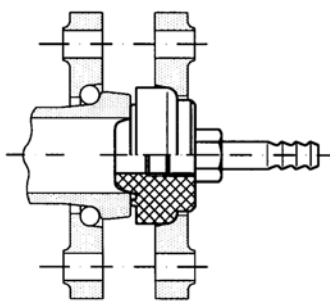
PGA with manometer



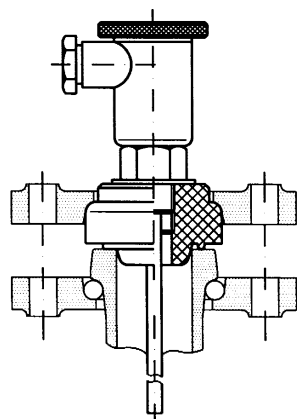
PGA with corner screw connection



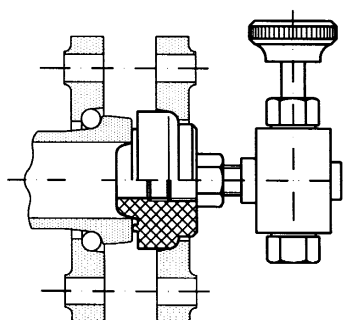
PGA with electrode



PGA with tube - olive



PGA with thermometer



PGA with valve

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# Ex-Proof Lamp

## Series USL-06/75 Ex

# CETEC

**Type USL**  
**EEx d II C T 3, T 4**

**Group: 9.7**  
**Sheet: 9.7.1**

**Application:** This compact, powerful lamp can be used for combined light/sight port (single flange version) or separate light and sight ports (dual flange version) to illuminate the interiors of tanks, bunkers, silos, through-flow indicators, pipelines, mixers and other vessels and reactors which are normally closed. This model is intended for use in all EX-Hazardous Area. The unit is suitable for use in the food industry.

**Sightglass Styles:** This powerful, compact size lamp is designed to give glare free illumination in combination with sightglass styles as follows:

- bolted circular flanges acc. to DIN 28 120/DIN 28 121 or similar styles
- circular screwed flanges acc. to DIN 11 851
- through-flow indicators

**Size:** Depending on fitting, this lamp fits sightglasses DN 50 and larger.

**Protection:** Dust / waterjet tight to IP 65 and EN 60598, certificate available.

**Ambient Condition Operating Range:** Depending on its power intake, this unit is approved for operating at ambient temperatures up to 60 °C. Conformity certificate: PTB no. Ex-91.C.1078. The unit is dependent of internal vessel pressure or vacuum.

**Ignition protection glass:**

- EEx d "flameproof enclosure" acc. to DIN EN 50 018/VDE 0170/0171, version 1 with "resin cast cable tail"
- EEx de "flameproof enclosure" and "increased safety" acc. to DIN EN 50 019/VDE 0171/0171, version 2 with "terminal box".

**Temperature class:** up to T4 (depending on power intake)

**Explosion class:** IIC (all explosion classes)

**Electric data, lamp sockets and lamps:**

According to PTB conformity certificate; supply voltage AC or DC depending on lamp type.

**Power supply:** The unit can be fitted with various halogen lamps, and thus suits AC or DC.

- without built-in transformer  
supply 12 V; halogen lamp 20W, 35W or 50W  
supply 24 V; halogen lamp 20W or 50W  
supply 230 V; halogen lamp 50W
- with built-in transformer  
supply 230 V; halogen lamp 12V/20W  
supply 240 V; halogen lamp 12V/20W

**Lamp sockets:** These vary according to voltage.

**Power cable (version 1 only):** Pressure-proof, resin cast flared cable entry, cable length can be selected between 2 m (standard), 5 m, 10 m, or 20 m. Cable-gland unit can be replaced on site, e.g. to install a longer cable.

**Terminal box (version 2 only):** Cables of any selected length can be installed (see overleaf).

**Addition:**

- installation set: stainless steel hinged bracket, or (for use with screwed sightglass MV 65) adapter flange
- special claw spanner: for opening / tightening the lens ring
- power cable, automatic delay switch Ex-Proof Lamp Timer



Ex-Proof Lamp USL-06 / 75-Ex d with hinged fastening, type 1 with power cable included



Ex-Proof Lamp USL-06 / 75-Ex de installed on a hinged bracket, type 2 with terminal box

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## GESTELLBAU m. ZUBEHÖR Framework + Accessories

## Gruppe / Item 10.1

Gestellrohrverbinder – GGG-verz. / lack. -GRV-



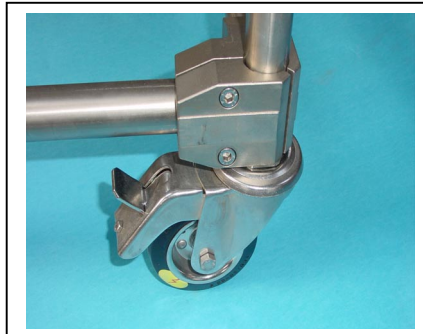
Rohrschellen (st.-verz./ VA mit Gi / Si) -RSG-



Lenkrolle m. Stopper (verz.)



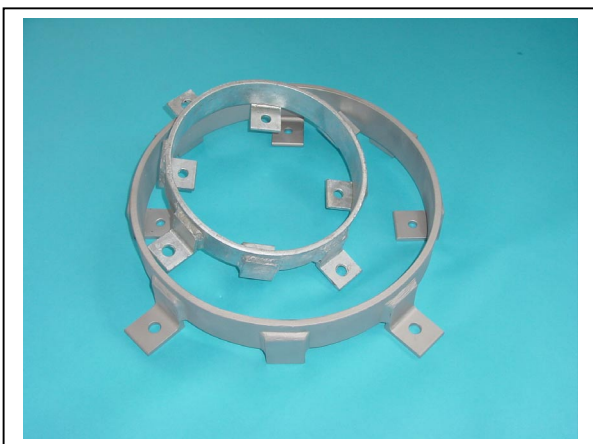
Lenkrolle m. Stopper (VA)



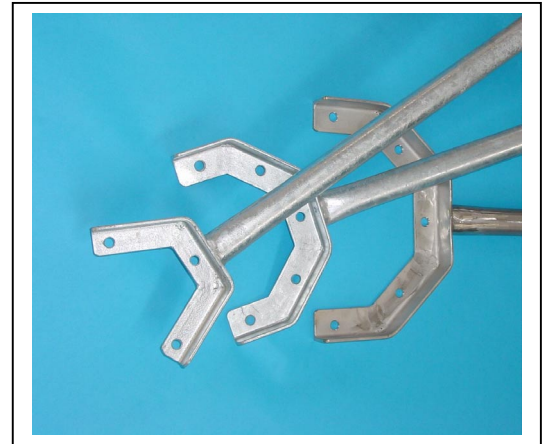
Gestellrohrverbindung (verzinkt)



Tragringe → st.-verzinkt / VA - (DIN) -TRD-



Taggabeln → st.-verzinkt / VA - (DIN) -TRG-





# Rack Pipe Connectors for Rack / Storage / Railing Construction

# CETEC

Type GRV  
DN 1/2"-2"

Group: 10.1  
Sheet: 10.1.1

## Rack Pipe Connectors (GRV)

The GRV is galvanized malleable iron casting which is standard quality. It is streamlined in shape to enhance the clear lines of the tubing. It has no rough edges. In combination with galvanized steel tubing or with SS tubing acc. to DIN 2440, the GRV provides a comprehensive and versatile construction.

## Shape - Sizes

GRV 10-6 is a connector with both sockets type A to tube size 6 which has an outside diameter of 33,7 mm.


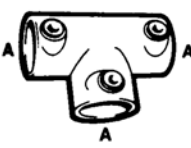

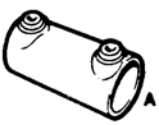











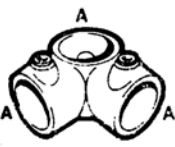

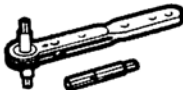

GRV 45-98 is a connector size 45 with one socket type A = to take a tube size 9 (60,3 mm) and B socket to take a tube size 8 (48,3 mm outside diameter).

## Special finishes

Besides the standard galvanized GRV the pipe connector can be

supplied is chromium plated; finished to order in a standard range of RAL colours or polyester. Tube diameter and GRV socket size references are given in the following table.

Tube diameter	size:
21,3 mm=1"	4
26,9 mm=3/4" (QVF)	5
33,7 mm=1" (Schott)	6
42,2 mm=1 1/4" (QVF)	7
48,3 mm=1 1/2" (Schott)	8
60,3 mm=2" (Schott/QVF)	9

Art.-Nr.	Art.-Nr.	Art.-Nr.
 10-2 10-65 10-8 10-3 10-67 10-87 10-4 10-7 10-9 10-5 10-75 10-6 10-76	 25-4 25-9. 25-5 25-6 25-7 25-8	 M50-4 M50-9 M50-5 M50-6 M50-7 M50-8
 14-4 14-9 14-5 14-6 14-7 14-8	 26-4 26-87 26-5 26-9 26-6 26-7 26-8	 61-3 61-8 61-4 61-9 61-5 61-6 61-7
 16-5 16-6 16-7 16-8 16-9	 35-4 35-9 35-5 35-6 35-7 35-8	 62-2 62-9 62-5 62-6 62-7 62-8
 17-5 17-6 17-7 17-8 17-9	 40-5 40-6 40-7 40-8	 77-4 77-9 77-5 77-6 77-7 77-8
 20-4 20-5 20-6 20-7 20-8	 45-2 45-65 45-87 45-3 45-7 45-9 45-4 45-76 45-98 45-5 45-8 45-6 45-86	 97-23 97-4 97-5-8 97-7-8-9
 21-4 21-9 21-5 21-6 21-7 21-8	 C50-44 C50-55 C50-66 C50-77 C50-88 C50-99	 98-46 98-6-9
		 99-2-3 99-4 99-5-6 99-7-8-9

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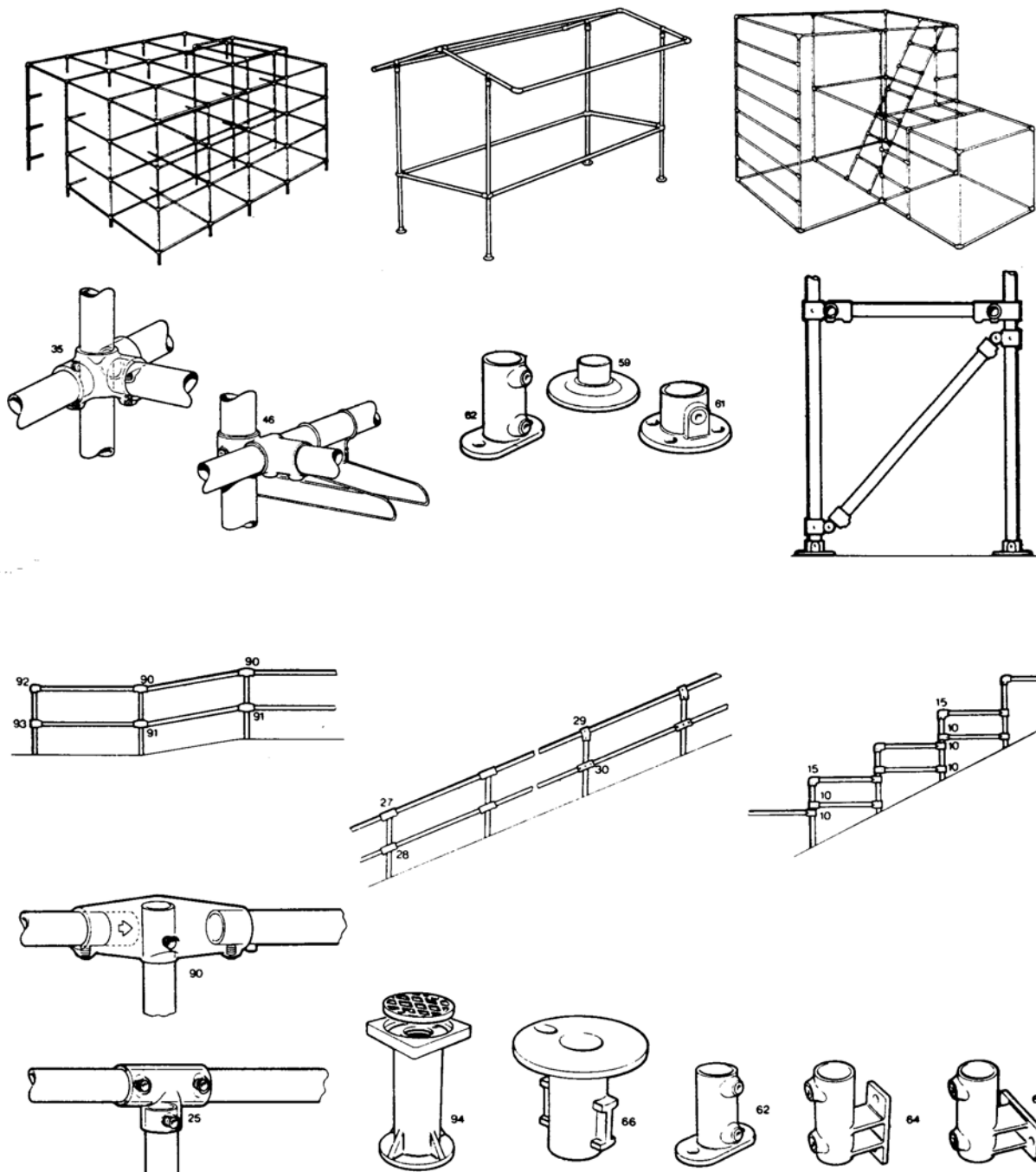
# Rack Pipe Connectors

## Application and Construction Examples

# CETEC

Type GRV  
DN 1/2"-2"

Group: 10.1  
Sheet: 10.1.1.1



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**Rack-Pipe-Connectors**  
**For Rack-/Shelf-/Storage-/Platform-/Railing-/Construction**

**CETEC**

**Type GRV**  
**DN 1/2"-2"**

**Group: 10.1**  
**Sheet: 10.1.1.2**

10	12	14	15	16	17	18	19
20	21	25	26	27	28	29	30
31	35	40	45	46	49	F50	C50
M50	M51	C51	C52	M52	C58	M58	59
60	61	62	63	64	65	66	68
70	71	72	75	76	77 Plastic	78	79
81	82	83	84	90	91	92	93
95	97	98	99	105	114	121	145

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# Rack Pipe Connectors for Rack / Storage / Railing Construction

# CETEC

Type GRV  
Examples

Group: 10.1  
Sheet: 10.1.1.3

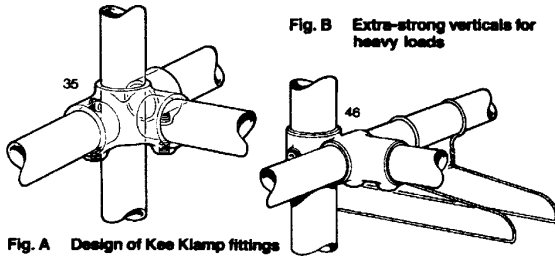


Fig. A Design of Kee Klamp fittings

Fig. B Extra-strong verticals for heavy loads

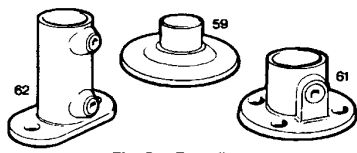
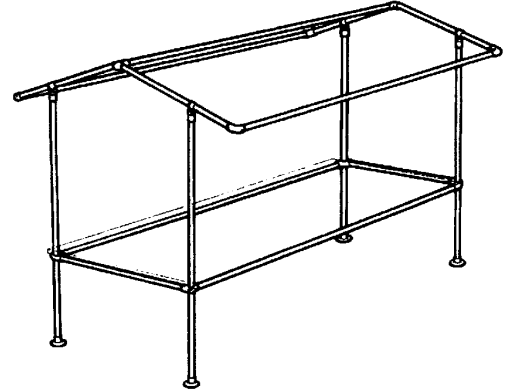


Fig. C Base flanges

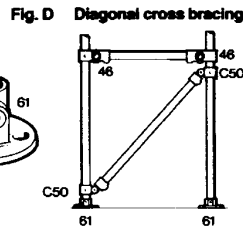
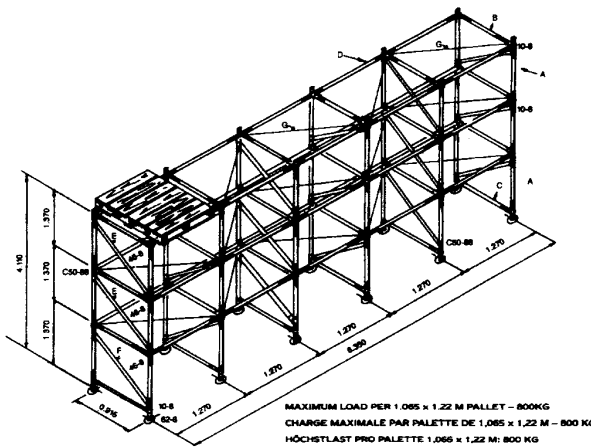
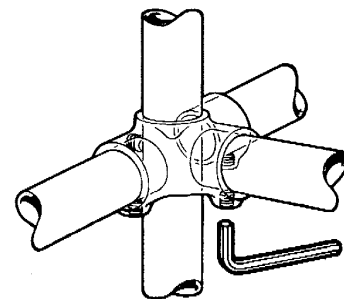
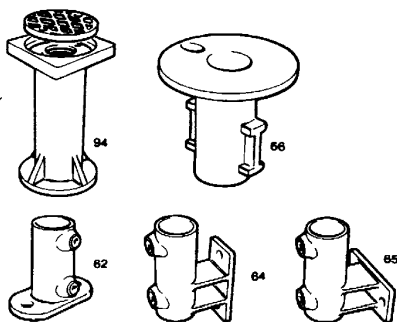
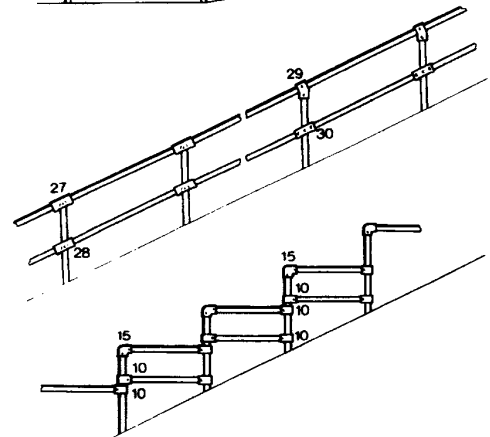
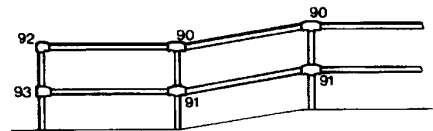


Fig. D Diagonal cross bracing



MAXIMUM LOAD PER 1,065 x 1,22 M PALLET - 800KG  
CHARGE MAXIMALE PAR PALETTE DE 1,065 x 1,22 M - 800 KG  
HÖCHSTLAST PRO PALETTE 1,065 x 1,22 M: 800 KG



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# Supporting Ring for Glass tubing – flange couplings

# CETEC

Type TRD  
DN 80-300

Group: 10.1  
Sheet: 10.1.5

## Supporting Ring - DIN (TRD)

Application range for TRD are vertically mounted tubings, columns, glass vessels with couplings (backing flanges acc. to DIN / PN 10. / Catalogue item 7.1 / page 7.1.5)

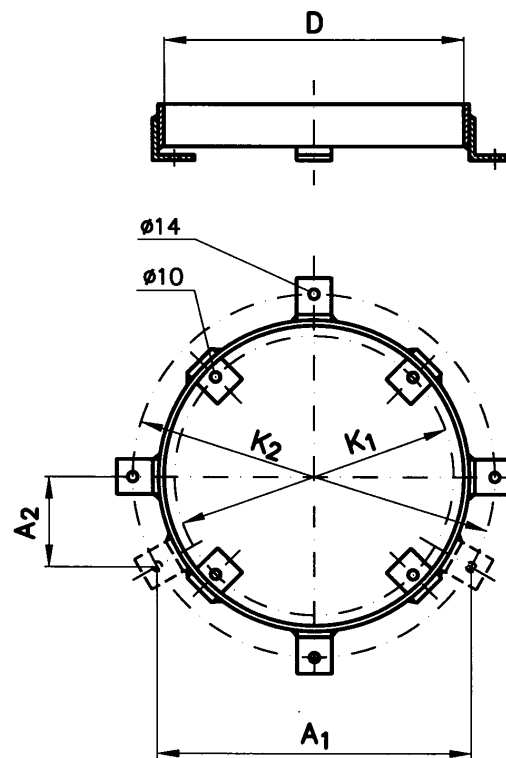
**Material:** galvanized steel

### How to order:

for column with DN 150  
Flange couplings (DIN / PN 10)  
supplement.../3 (with 3 claws)  
supplement.../4 (with 4 claws)

**TRD – 150/...**

Other nominal sizes and types on request.



### Dimensions

DN	D	K <sub>1</sub> *	K <sub>2</sub>	A <sub>1</sub> /A <sub>2</sub> **
80	190	160	200	234/ 68
100	210	180	270	234/ 68
150	270	240	335	290/ 84
200	320	295	390	338/ 98
300	430	400	520	450/130

\*K<sub>1</sub> = acc. to DIN/PN 10 \*\*A<sub>1</sub>/A<sub>2</sub> = alternatively with 3 claws

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# Trifurcate Support

## For Glass tubing – flange couplings

# CETEC

Type TGD  
DN 25-200

Group: 10.1  
Sheet: 10.1.6

### Trifurcate Support

For mountings of vertically installed glass tubing with flange couplings according to DIN/PN 10, small heat exchangers, vessels, etc. The TGD is double-acting as a support and lateral guidance device.

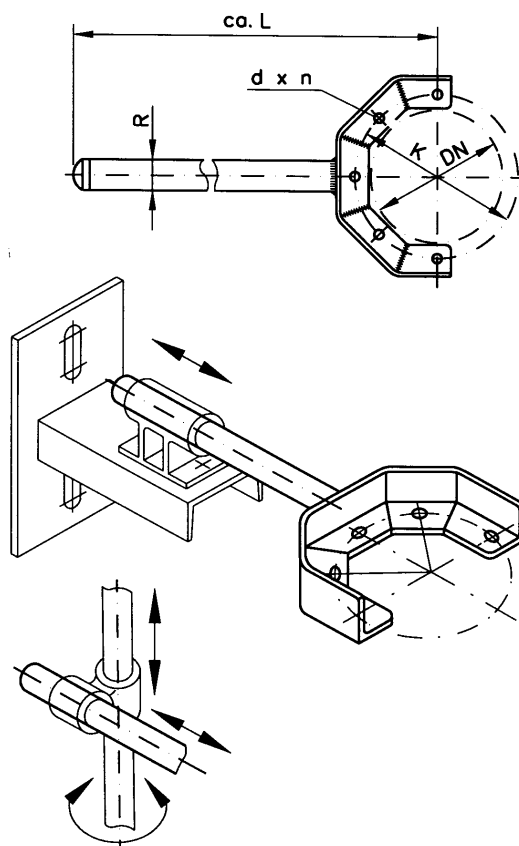
Horizontal mountings is also possible. In combination with pipe connectors (type GRV-Item 10.1, Page 10.1.1) is possible a great variety of application.

The pipe diameter „R“ according to DIN 2440 complies with the GRV connectors mentioned above.

**Material:** galvanized steel

**How to order:**  
for DN 50 flange connection  
**TRD – 50/500**

Other types, lengths and material on request.



### Dimensions

DN	K*	d x n	R	L
25	85	9 x 3	3/4"	500
40	110	9 x 3	3/4"	500
50	125	9 x 3	3/4"	500
80	160	9 x 3	1"	500
100	180	9 x 5	1"	500
150	240	9 x 5	1"	600
200	295	9 x 5	1"	600

K\* = acc. to DIN/PN 10

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# Supporting Ring for Glass Cylinder e. Spherical Vessel

# CETEC

Type STR  
DN 80-200

Group: 10.1  
Sheet: 10.1.7

## Supporting Ring (STR)

To support glass spherical vessels and unit components which are unsuitable to mount (flange) in the upper part of the unit.

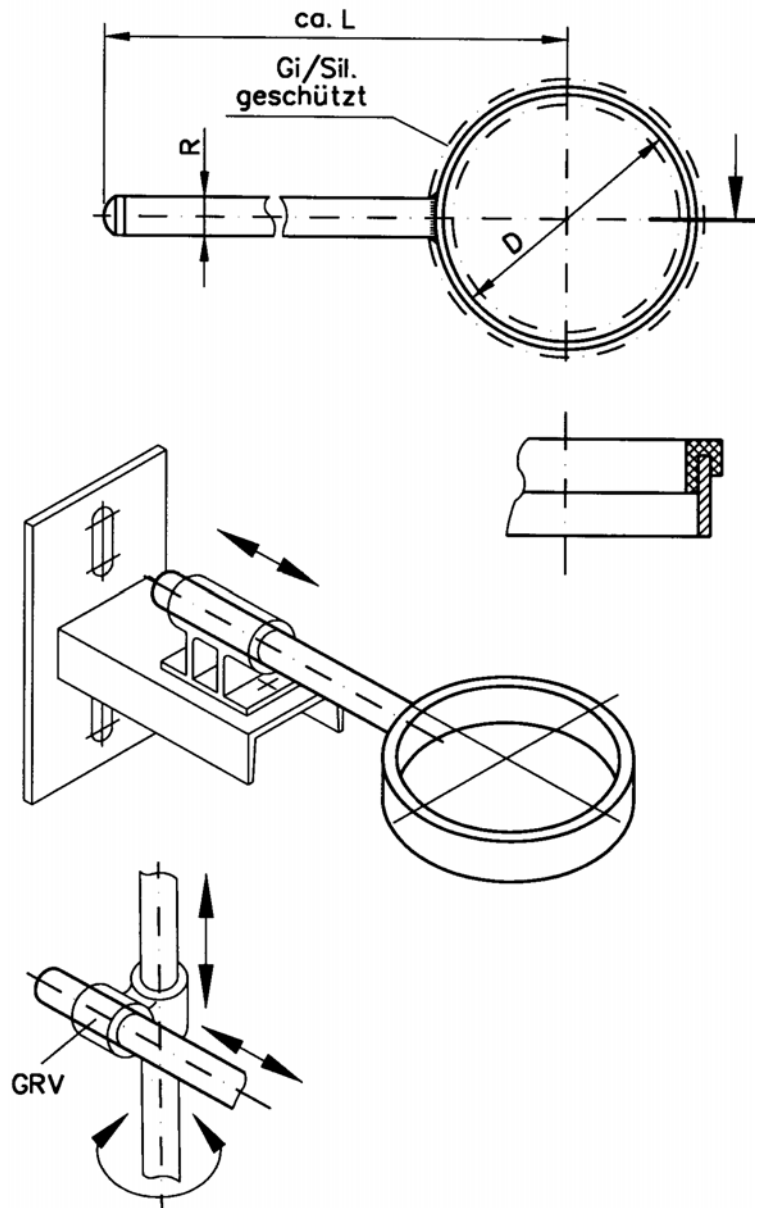
There is a great variety of application when mounted horizontally in the combination with GRV pipe connectors (Type GRV, Item 10.1, page 10.1.1)

The pipe diameter "R" according to DIN 2440 complies with the GRV pipe connectors mentioned above.

**Material:** galvanized steel

**How to order:**  
for D = 80 with L = 550  
**STR - 80/500**

Other types, lengths and material on request.



**Dimensions**

D(ca)	R	L
80	3/4"	550
100	1"	550
150	1"	600
200	1 1/4"	650
250	1 1/4"	650

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# Pipe clamps für glas pipes with Gi- or Si- insert

# CETEC

Type RSG  
DN 15-300

Group: 10.2  
Sheet: 10.2.1

## Pipe clamps (RSG)

for glass pipes are a secure and rational possibility for pipe-fixing. The fastening is done by threaded rods and plugs on a rack pipe or a structured shape.

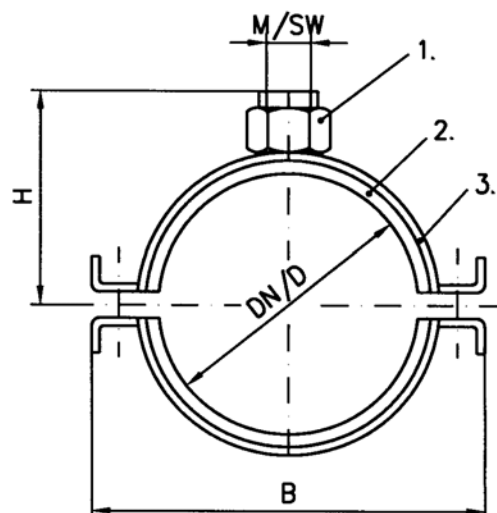
The **RSG** is galvanized as standard quality, but there are stainless steel (VaA) clamps available as well.

All **RSGs** are delivered with a rubber (Gi-) or silicone (Si-) insert. The two-parts-clamp guarantees a tight and equal pressure around the insert.



### Advantages:

- M 8-screws, secured against loss, screws with combi-cross recessed head
- terminal (1.) with stepped thread M 10/M 12 up to D 6". D 6" and on: M 16
- structured rubber / silicone insert, secured against movement (2.)
- sound insulation according to DIN 4102
- building material class B2 according to DIN 4102
- clamp with bead to reinforce clamp (3.)



### Dimensions

DN	D	M / SW	B	H	Artikel-Nr.
15	20 - 25	M10/M12-SW17	69	36	RSG-015/12-X*
25	32 - 38	M10/M12-SW17	83	42	RSG-025/12-X*
40	48 - 54	M10/M12-SW17	101	50	RSG-040/12-X*
50	57 - 64	M10/M12-SW17	111	55	RSG-050/12-X*
80	82 - 90	M10/M12-SW17	144	71	RSG-080/12-X*
100	108 - 114	M10/M12-SW17	174	84	RSG-100/12-X*
150	146 - 162	M10/M12-SW17	223	107	RSG-150/12-X*
200	210 - 219	M16-SW21	183	136	RSG-200/16-X*

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## TERMS AND CONDITIONS OF SALE

### 1. Offer and conclusion of contract

All our offers and sales shall be subject to the following terms and conditions. After receipt of our order confirmation, orders can be regarded as having been accepted. Any agreements made verbally must be confirmed in writing to become binding. Counter-confirmations from the buyer referring to their terms and conditions of sale will not be accepted.

### 2. Offers Documents / Drawings and Technique

Prices, drawings and plans relating to offers may not be made available to a third party by the buyer. Violations will be subjected to damages. All rights reserved on copyrights. Drawings and other documentation supplied with an offer remain our property and are to be returned immediately, if an order is not effected.

Production will be carried out according to DIN-EN tolerances, as far as this is possible, otherwise production will be carried out according to the tolerances common to that particular line of production.

### 3. Prices

All prices are to be understood ex works, excluding the relevant VAT packing freight customs dues, insurance, assembly, and other fees, etc. Packing will be charged at self cost rate and is non-returnable.

All prices are based on the costs for wages and material valid at the time the offer is made. We reserve the right to amend the prices should any alterations in these costs occur.

### 4. Ownership

The goods will remain our property until all obligations resulting from the transaction have been settled.

If the goods supplied or parts thereof are built into another object, then the ownership will be maintained in that we shall share the property rights for this new object in proportion to the original invoiced value of the part incorporated therein

The buyer is entitled to include such goods with co-property rights in normal business and also to sell them, however he is neither entitled to pawn such goods nor use them as pledges.

Should the goods be processed further or re-sold, then all the buyer's claims and rights from the sale are automatically resigned to an amount equivalent to that of the invoice, to the seller. Should the buyer have collected the resigned claims, this is carried out in our name and the amount due us will be relinquished without delay. On our demand the seller is obliged to inform the intermediate buyer about the waiver.

The buyer must inform us immediately about any pledges resp. other interferences with our rights by a third party. Should the second buyer not pay his commitments immediately, then the buyer has to cede our extended property rights. If the buyer does not fulfil his commitments after receipt of reminders, then the seller has the right to regain possession of his goods, and the buyer is obliged to return the goods.

### 5. Payment

Payment made within 30 days, net. The invoiced price will become payable immediately, if the buyer has other outstanding financial commitments with us, or if his financial situation should become instable due to insolvency or bankruptcy or protest against bills resp. cheques, or compulsory execution or loss of a guarantor, or any other incident liable to § 321 BGB.

Payments made within 10 days after the date of invoice are entitled to 2% discount. 30 days after due date, bills still unpaid will be declared as in arrears even without a reminder.

Such bills will be subject to interest amounting to 2% over the current discount rate of the Deutsche Bundesbank, and at least 10%.

The customer is neither entitled to withhold payment nor offset them, provided this has not been legally determined.

Services such as research, engineering, assembly, putting into operation and repairs are to be paid immediately, net.

### 6. Delivery/Risks

All deliveries are despatched at the account and risk of the buyer. Part-shipments are permissible and transport insurance optional.

### 7. Taking over

The delivery shall be approved immediately after it has been inspections through the buyer. Approval of the delivery shall be confirmed in writing.

### 8. Complaints

Disapproval of quantity, weight, quality or equipping of the goods as far as this cannot be excluded by our conditions of sale, can only be considered, if we are informed of this fact in writing immediately after recognition of the fault or at least within 8 days after receipt of the goods at the point of destination. We are also to be informed in writing about any concealed faults as soon as they are discovered.

### 9. Guarantee

Our goods are guaranteed for 12 months after they have been taken into operation against fabrication and material faults, maximum for 18 months after date of delivery.

Should there be a case for the guarantee, it will be at our discretion to decide whether the faulty item/part is to be repaired or exchanged for a suitable item/part.. The transport costs for returning an objected item/part are to be born by the buyer. The buyer is not entitled to claim expenses for eliminating faults himself.

There is no guarantee on wearing parts or for parts, which due to their construction are subject to premature wear during use or corrosion.

Further claims from the buyer, in particular claims for damages, which are not directly connected with the delivered object are excluded (secondary-damage).

### 10. Additional Terms and Conditions

No modification of these terms and conditions shall be binding unless in writing and signed by authorised representatives of both parties.

### 11. Place of performance and jurisdiction

place of performance for delivery and payment is LEVERKUSEN. The TERM AND CONDITIONS OF SALE shall be interpreted according to German law. If the purchaser is a legal person in the sense of section § 24 BGB of the German Law Relating to Standard Terms and Conditions, jurisdiction – for action and on cheques and bills also – is LEVERKUSEN. German law applies to all contracts unless otherwise expressly agreed.

Germany - 51377 LEVERKUSEN, July 2003 / 1