



# CHETRA Mechanical Seals for the Chemical Industry

**The chemical industry is characterized by a multitude of processes, in which corrosive, toxic and explosive media are pumped, mixed, transported and stored.**

Very diverse types of substances, e.g. fertilizers, plastic materials, fibres, preservatives, foamed plastic, foils a.o. are manufactured from these preproducts. In all steps of the process, pumps and agitators, equipped with mechanical seals for the sealing of shafts, are employed to a great extent.

CHETRA takes these various application requirements into account beginning with the basic concept of a mechanical seal and the choice of suitable accessories.

A heightened environmental awareness and corresponding stipulations such as TA-Luft (Clean Air Act), ATEX (ex-protection), a.o., combined with economic efficiency, are the prerequisites for the planning, designing and manufacturing of every CHETRA mechanical seal.



**The results are innovative and often custom-made solutions, based on decades of experience in this area, with sound application technology advice for the optimum appropriate mechanical seal and the corresponding accessories.**

The CHETRA supply program covers special custom-made products and high-grade standard seals. Notable features and benefits:

- » robust construction with extensive safety reserves.
- » protection of sensitive components.
- » solid seal rings and stationary seats in self-aligning arrangement.
- » stationary design, if applicable.
- » special seal face geometry.
- » guided circulation flow for optimum heat dissipation.
- » optimization of material: employment of materials with high corrosion resistance, also specialty alloy; face materials with patented surface finish
- » application of "non-metal" mechanical seals.



## **"Made in Germany" and International Experience**

CHETRA is an international specialist for high-quality and high-performance mechanical seals. We offer quality "Made in Germany" with mechanical seals for complex and demanding applications, for renowned customers in the chemical industry.

Our mechanical seals are designed acc. to the relevant DIN and ISO standards (DIN EN 12756, 28136 ff., ISO 3069 a.o.), TÜV regulations, factory standards and local regulations. CHETRA mechanical seals are also available acc. to API 682/ISO 21047.

Our claim to high quality is reliably underpinned: We have been working in conformance to DIN EN ISO 9001: 2008 since 1996 and are certified by DQS/IQ NET.





## Example Seals



### CHETRA style 208 N / 210 N

These high-grade standard mechanical seals acc. to DIN EN 12756 (24960) perceptibly exceed the requirements of a conventional mechanical seal on the basis of their special design. They stand the test, even in a trying ambience, by means of their robust design.

CHETRA mechanical seal styles 208 N and 210 N are of short design (L1k), in stationary arrangement and utilizable independent of direction of rotation. They are balanced (without stepped shaft, type kU) and equipped with protected multiple springs. The components are exchangeable in every necessary combination of materials.

The sole use of solid seal rings and stationary seats and their self-aligning arrangement are further technical advantages and lead to higher service life.



### CHETRA style 881 / 881 D

A mechanical seal, designed for trying ambience, optimized for sealing of e.g. reactor circulation pumps in catalytic hydrogenation processes. Seal-technologically difficult media like nitriles, fatty acids and metallic catalyzers clogged during hydrogenation, put the highest demands on the mechanical seal used. The catalyzer tends to plate onto the seal faces, the medium is abrasive, and polymerization occurs in some cases. CHETRA mechanical seals style 881 and 881 D are designed for this demanding application area, with regard to design, choice of materials and material processing: in stationary design, use of solely solid, flexibly supported seal rings and stationary seats made of hard metal, of which the faces receive a special lap finish. Sensitive components of the mechanical seal are protected and an optimum heat dissipation is guaranteed by guided circulation flow.



### CHETRA style 770

This tandem safety mechanical seal was developed in close cooperation with Germany's largest pump factory to seal heat transfer oils up to 360° C (400° C) without auxiliary cooling. It is a double-acting mechanical seal with metal bellows in tandem arrangement and cartridge design.

The housing is equipped with cooling fins. To avoid cracking and the formation of oil carbon between the seal faces, the mechanical seal is supplied with cold heat transfer oil on the atmospheric side. It circulates between seal chamber and quench vessel (API plan 52) by thermosyphon action and is supported by feed screw on the atmospheric mechanical seal.

Optimized guidance of the quench medium enables flushing of stationary seat on the product side and ensures the dissipation of frictional heat between the seal faces.

These and other constructive as well as material technical measures enable the CHETRA style 770 mechanical seal with high service life (> 4 years) to seal synthetic and mineral-oil-based heat transfer oils up to 360° C (400° C) operationally safe and without auxiliary cooling of the pump.





# Experience

## Innovative Supply Systems and Accessories

- » **CHETRA individual supply systems and central installations:** An innovative and complete program for the supply of mechanical seals, consisting of **barrier fluid** and **quench fluid vessels**, acc. to EU guidelines and Regulation for Pressure Vessels (PED) incl. API vessels (acc. to ASME standard) and in connection with TA-Luft (= Clean Air Act).
- » **CHETRA sterile vessels and special vessels.**
- » **CHETRA vessel accessories:** p/t measuring systems, level switch, manual refill pump, cooling coil, pressure gauge and pressure switch.
- » **CHETRA heat exchanger,** water-cooled or air-cooled.
- » **CHETRA cyclone separator.**
- » **CHETRA pressure transmitter.**
- » **CHETRA loop systems.**
- » **CHETRA central refill systems.**

## CHETRA International Services

- » **CHETRA Service Centers** in Europe, in the Middle East and in Asia, as well as on-call service supervisors from the parent company ensure swift implementation of CHETRA mechanical seals, whether new or second-hand.
- » **CHETRA repair and maintenance service:** Analysis of damage, advice for improvement potential, expert and quick overhauling and optimizing of CHETRA seals and competitors' seals, worldwide logistics.
- » **CHETRA maintenance contracts:** Optimized fixed costs contracts and maintenance contracts.
- » **CHETRA spare parts service:** Large volume of spare parts on stock and perfected logistics for the worldwide supply of mechanical seals spare parts. Spare parts kits available for all cartridge mechanical seals (all dynamically used parts) as well as individual spare parts acc. to parts' unit.
- » **CHETRA CAS Computer Aided Seal Selection:** A CHETRA-developed design recommendation for 1000 media, as to the type and materials of the mechanical seal with reference to pressure, temperature and speed, incl. appropriate operation and determination of friction power.



# Solutions

## Technology

### **Improvement of Service Life – even in Connection with Curing Media and High Solids Content**

The impetus for this project was the stipulation to improve substantially the MTBF factor of 13 months in the operation of 360 pumps in a phenol distillation plant. The ten “bad actors” were refitted with CHETRA double mechanical seals style 821 with appropriate accessories (API plan 53).

Special requirements arose from the medium to be sealed, as it had a high solids content and a curing at  $< 260^{\circ}\text{C}$ . After the retrofit was accomplished, the total MTBF factor of all the pumps improved to  $> 30$  months.

### **Custom-made Solution for Worldwide Applications**

The mechanical seal has to fulfill special requirements when pumping MDI (diphenylmethane diisocyanate), an essential raw material for PUR applications resp. insulation plastic foams.

Due to massive problems with seals in the above-mentioned application, CHETRA developed a custom-made, multiple-stage shaft seal for one of the largest manufacturers in the chemical industry.

The successful application in the German plant prompted the manufacturer to employ this CHETRA seal design in all his MDI plants worldwide.

### **No Auxiliary Cooling – Sealing at $400^{\circ}\text{C}$**

Mineral oil-based and synthetic heat transfer oils are used in many HTF applications like plastic and synthetic material fibre production, with temperatures of up to  $+400^{\circ}\text{C}$  to be sealed.

Conventional pumps were operated by auxiliary cooling via cooling chambers – this is uneconomical and technically problematic at the same time (lime deposit / “insulation” of cooling chamber).

Using the CHETRA tandem safety seal style 770 it was possible, for the first time, to abandon the auxiliary cooling of the pump. More than 1000 applications all over the world are proof of CHETRA's successful seal system.

## Chemical Industry

The mechanical seals listed here comprise some of the **high-quality standard seals** (also DIN standard) as well as mainly cartridge mechanical seals, available acc. to **API 682, customer-specific standards** and **adapted** to the resp. aggregate. Further mechanical seal designs are available.

Mechanical seal, style / Series:	Typical applications:	Technical Data (physical parameters):	
<b>Single mechanical seals "non-cartridge"</b>			
201 S 202	In plastic centrifugal pumps; for acids and lyes; e.g. in acid recovery.	p <sub>max</sub> : 50 bar t: 280° C v <sub>max</sub> : 35 m/s	
208 N / 210 N	For universal applications: mechanical seal acc. to DIN EN 12756 (24960).	210 N p <sub>max</sub> : 28 bar t: -80° C to +220° C v <sub>max</sub> : 28 m/s	208 N 50 bar -80° C to +220° C 35 m/s
600	Outboard "non-metal" mechanical seal for corrosive media.	p <sub>max</sub> : 10 bar t: -80° C up to +220° C v <sub>max</sub> : 20 m/s	
600 MD	Dry-running single mech. seal outside the medium for mixers, agitators and reactors with top drive; e.g. in fine chemistry. Media: gas phase/gas cushion ; chemical substances, coloured paint pigments, additives, brightening agents a.o.	p: vacuum up to 10 bar (dep. on dia) t: -20° C up to +150° C dia: 60 – 180 mm v <sub>max</sub> : 3 m/s	
<b>Single and double mechanical seals cartridge</b>			
207 207 S 209 209 D/S	Universal cartridge single mechanical seal Lyes, acids, dyes, mash, oleum, synthetic resin, red mud, phosgene a.o. standardization.	207 p <sub>max</sub> : 50 bar t <sub>max</sub> : 220° C v <sub>max</sub> : 35 m/s	209 D/S 25 bar 200° C 25 m/s
517 / 557	Double-acting agitator mech. seal for top drive with even shaft; flange acc. to DIN 28138; mech. seal with and without integrated bearing available.	517 p: vacuum up to 16 resp. 50 bar t: -80° C to +200° C v: 10 m/s	557 +250° C
562	Double mech. seal for agitators/ mixers, bottom drive; e.g. for sealing of coating latex.	p: vacuum up to 16 bar t <sub>max</sub> : 200° C v <sub>max</sub> : 10 m/s	
577	Double-acting, short design mech. seal for agitators and bead mills; typical applications in the dyeing and varnish industry. Further applications: e.g. in rotating filters, aniline etc.	p <sub>max</sub> : 20 bar t <sub>max</sub> : 260° C v <sub>max</sub> : 25 m/s	
770	General for HTF applications like in plastic and fibre production – for heat transfer oils – synthetic or mineral-oil based – up to a max. of 400° C – tandem safety mech. seal for pumps.	p <sub>max</sub> : 28 bar t <sub>max</sub> : 360° C (400° C) v <sub>max</sub> : 25 m/s	
809 851 BT	Universal cartridge double mech. seal (API plan 52 or 53). Some typical applications: VCM pumps (vinyl chloride monomer), solvents, chemical mix products, intermediate products, ammonia mixture, cyclohexane a.o.	p <sub>max</sub> : vacuum up to 30 bar (851 BT: 50 bar) t <sub>max</sub> : 260° C v <sub>max</sub> : 25 m/s	
821	"Customized" double mech. seal (API plan 53) for demanding applications such as polyester melting, phenolic resin, phenol distillation, latex, liquid residues, sodium hydroxide solution, kaolin – in macerators (wet macerators) a.o.	p <sub>max</sub> : 12/16 bar t <sub>max</sub> : -120° C to +260° C v <sub>max</sub> : 25 m/s	
877 X 877 XC	Double mech. seal for chemical standard pumps; TA-Luft applications – for installation spaces acc. to DIN 24960 C.	p <sub>max</sub> : 20 bar t <sub>max</sub> : 220° C v <sub>max</sub> : 25 m/s	
881 881 D	Double mech. seal for technically maximum-demanding requirements, incl. frequently changing operating conditions: e.g. in fat chemistry – fatty acids, nitriles, hydrogenation, catalytic hydrogenating processes with metallic catalysts, chrome catalyst, acetone; in reactor circulation pumps a.o.	p: 50/150 bar t <sub>max</sub> : 260° C v <sub>max</sub> : 25 m/s	

All mechanical seals are available in compliance with **ATEX**. Dimensions: Dia: 15 mm to 450 mm, sizes in inches possible.

### Safety instructions for areas of applications and technical data:

The statements in this leaflet are based on the current state-of-the-art technology, including extensive testing and practical experience. Please note: The physical parameters (technical data) given here will interact with each other and cannot be fully utilized all at the same time. The listed temperature ranges are, among others, dependent on the kind of secondary seal used, the accessories for the seal and the other technical parameters. Due to the variety of uses and the individual technical arrangements only general pointers, which may not be applicable in every case, can be given for a successful application. No responsibilities can be accepted for statements made in this leaflet and therefore it is recommended to always undertake tests prior to application.