



CHETRA Mechanical Seals for Power Stations

Whether in power stations, in thermal power generation, in the production of energy from renewable raw materials and in ORC plants: The industry-specific requirements in power station operation call for a highly demanding technology in the mechanical seals used.

Independent of application – whether in fast-running turbo machines and feed pumps, boiler feed pumps, circulating and condensate pumps, hot water pumps, large tubular type and cooling water pumps, hydraulic turbines (Kaplan/Francis water turbines) or steam turbines-strict prerequisites for functional safety of these aggregates are valid.

The combination of high pressures and temperatures, running speeds of up to 50 m/s, different media and water conditions and additives require high-quality mechanical seal technology. Strict environmental protection requirements round out this product profile.



The results are innovative and often custom-made solutions for the special requirements of power stations, based on decades of experience in this area. Supported by sound application technology advice, CHETRA determines the optimum appropriate mechanical seal and the corresponding accessories.

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

- » robust construction with extensive safety reserves.
- » special seal face geometry.
- » protection of sensitive components.
- » solid seal rings and stationary seats in self-aligning arrangement.
- » stationary design, if applicable.
- » guided circulation flow for optimum heat dissipation.
- » split mechanical seal.

“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 in complex and demanding applications for renowned customers in the power station 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. Concerning nuclear power plants, corresponding regulations such as KTA 1401, OSP 4a are valid.

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



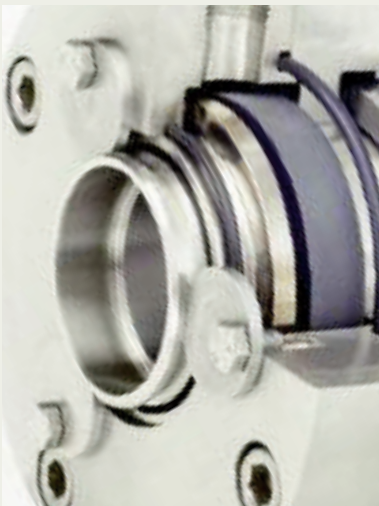
Example Seals



CHETRA style 208 N / 210 N

On the basis of design and materials used, these high-quality standard mechanical seals acc. to DIN EN 12756 (24960) meet the standard demands of power stations on a broad basis, such as in circulating pumps, condensate pumps, cooling pumps; or, with adequate accessories, as hot water pumps - mechanical seal style 208 S.

Style 208 N / 210 N are short design mechanical seals (L1k) in stationary arrangement, independent of direction of rotation, balanced (without stepped shaft, type kU) with protected multiple springs. The face materials mainly used are: A-carbon vs. silicon carbide (A/Q1; A/Q2) or silicon carbide vs. silicon carbide (Q1/Q2; Q2/Q2) – they are always designed as solid (non-shrunk) components.



CHETRA style 351 S

Specially for applications in so-called turbo machines, main boiler feed pumps and boiler feed pumps, the stationary single mechanical seal style 351 S was developed by CHETRA.

A rotating throttle protects the seal chamber against the hot medium. A pump ring provides internal mechanical seal cooling and the circulation guidance supplies the seal faces for optimum dissipation of heat. Further design features are overdimensional cross-sections and special relief of the seal rings.

Application data: number of revolutions (n) up to 6000 rpm, temperatures from 180° C to +200° C and pressures (p1) up to 35 bar.

The pre-assembled cartridge mechanical seal in stationary design achieves a service life of 3 to 4 years and offers a high degree of operational safety.



CHETRA style 770 CS

CHETRA series 770 CS are double-acting mechanical seals with two metal bellows seals in stationary arrangement, which are particularly recommended for applications in steam turbines of ORC plants. Especially against the background of a heightened environmental awareness combined with the more intensive use of regenerative energy sources, ORC plants for power generation and heat production become more significant than ever. In many cases, they are used at a regional level or by operating associations. An ORC plant centers around a steam turbine equipped with mechanical seals. Sealing occurs between process medium (e.g. silicon oil) and bearing.





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 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:** For optimum supply to the mechanical seal, with monitoring and signalling to a measuring station. Up to 50 loop systems with bladder accumulator can be supplied by **central refill systems** with an output rating of 100 bar. These innovative facilities offer the highest operational safety and are increasingly used for TA-Luft applications.

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 according to parts' unit.
- » **CHETRA CAS Computer Aided Seal Selection:** A CHETRA-developed design recommendation for 1000 media with reference to pressure, temperature and speed, incl. appropriate mechanical seal material, operation, type of seal and determination of friction power.



Solutions

Technology

The CHETRA mechanical seal was the only aggregate to survive an average

Retrofitting of all cooling water pumps in a Brazilian nuclear power station (cooling water circuit / safety level III) to split mechanical seals. Special requirements: resistance to sea water and shell limestone and adherence to all nuclear-relevant regulations, such as KTA 1401, QSP 4a and TÜV-approval. After one year and after an average, the CHETRA mechanical seal style 299 was the only component that had survived without damage.

Meanwhile, service lives have reached 5-6 years.

Safety reserves, built into CHETRA mechanical seals, have stood the test. The stationary design and the special design of the "split" of mechanical seal style 299 enable the operation of this "split" seal in a vacuum up to 0.5 bar abs. and up to pressures of a maximum of 25 bar – substantially above the conventional application area of split mechanical seals.

The CHETRA Solution for the Sealing of Hot Water

When sealing hot water (120° C – 200° C), it must be ensured that no mixed friction or evaporation resulting in dry-running occurs in the sealing gap. The bad lubricating properties of fully desalinated or demineralized water are also important. Rust, residues and water additives further contribute to the strain. Conventional applications use pumps with jacket cooling / auxiliary water cooling.

The CHETRA mechanical seal style 208 S – single-acting, stationary design with thermosyphon vessel as an accessory – meets these demands without use of auxiliary cooling; safe and cost-saving operation through elimination of uneconomical auxiliary cooling.

Service life: > 4 years.

Process Optimization for Multiple-stage Boiler Feed Pumps

Optimized operation with corresponding accessories and "heavy-duty" CHETRA mechanical seal extends service life when applied in boiler feed pumps.

Technical application data: multiple-stage boiler feed pump, n: 6000 rpm, p1: 16 bar, t: +180° C.

A stationary CHETRA mechanical seal with integrated rotating throttle bushing combined with a thermosyphon vessel replaced the previous seal concept. The solution ensures high cooling capacity and corresponding intensive dissipation of heat.

Service life is approx. > 4 years.

Power Stations

The mechanical seals listed here comprise some of the **standard seals (DIN EN 12756)** as well as **standard cartridge seals**, several **„customized“ cartridge mechanical seals** in adaptation to the resp. application and the aggregate. Further mechanical seal designs, cartridge and “non-cartridge”, are available.

Mechanical seal, style / Series:	Typical applications:	Technical Data (physical parameters):	
Single mechanical seals and standard cartridge			
208 N / 210 N	For universal applications: single mech. seal acc. to DIN EN 12756 (24960); e.g. condensate pumps (partly with quench), circulating pumps, cooling pumps a.o.	210 N p _{max} : 28 bar t: -80° – +220° C v _{max} : 25 m/s	208 N 50 bar -80° – +220° C 35 m/s
209 D	Standardized cartridge single mech. seal for universal applications; specially suited for retrofittings from packing to mechanical seal, e.g. in booster pumps and similar applications.	p _{max} : 25 bar t _{max} : 200° C v _{max} : 25 m/s	
207	Single cartridge mech. seal for universal applications; with higher pressure capabilities;	p _{max} : 50 bar t _{max} : 200° C	
207 S	suitable for DIN installation spaces.	v _{max} : 25 m/s	
809	Universal cartridge double mech. seal with reversible pressure balance, i.e. operation as tandem mechanical seal with fluid quench or as double mech. seal with higher barrier fluid pressure; applications e.g. in condensate pumps.	p _{max} : 30 bar t _{max} : 220° C v _{max} : 25 m/s	
“Customized” single and double cartridge mechanical seals			
208 S	Single mechanical seal (semi-cartridge), specifically for hot water applications > 120° C – 200° C; combined with quench vessel. Operation: without auxiliary cooling.	p _{max} : 20 bar t _{max} : 200° C v _{max} : 25 m/s	
299	Fully “split” single mech. seal for applications in cooling water pumps (tubular type propeller pumps) – in split design, owing to dimensions and (often) location – incl. nuclear power station applications with corresponding licencing acc. to KTA 1401; GSP 4a, TÜV Further applications: water turbines – Kaplan/Francis turbines.	P: vacuum 0.5 bar abs. up to max. 25 bar t _{max} : 120° C v _{max} : 10 m/s	
351 S	Single and double mechanical seal, cartridge – heavy duty design, stationary design, for applications in boiler feed pumps, main boiler feed pump, turbo machines and similar applications.	p _{max} : 150 bar t _{max} : 200° C v _{max} : 50 m/s	
770 CS	Double-acting mechanical seal with metal bellows in stationary arrangement – specially for applications in steam turbines	p _{max} : 28 bar t _{max} : 260° C	
870 F	in ORC plants.	v _{max} : 45 m/s	

All mechanical seals are available in compliance with **ATEX**. Dimensions: Dia: 20 mm to 600 mm, sizes in inches possible.

Safety instructions for application areas 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 type 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.