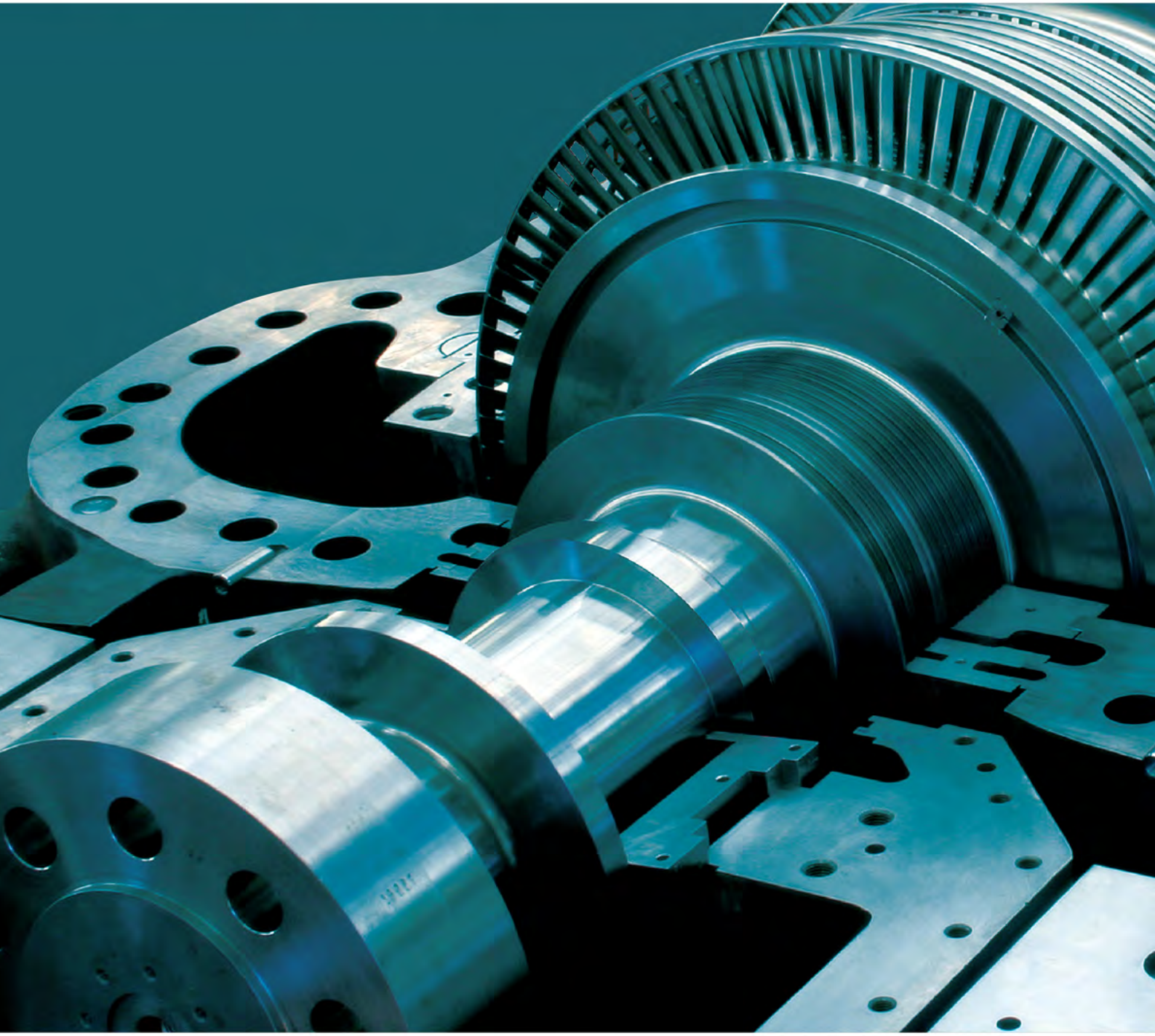
GLORINDA
Ideas Beyond Imagination

Glorinda Company
Steam Turbines



Power Generation, Energy Recovery Systems

www.glorinda.com

About Us

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About Glorinda

Turbines

Glorinda Turbines is driven by a team of experienced techno-entrepreneurs with decades of expertise in the design, manufacturing, and support of steam turbines and related systems. Our capabilities also include after-sales service, refurbishment, and support for critical components.

We are committed to creating unique and advanced solutions in the field of steam turbines and turbomachinery. This passion has guided us in developing products and services that not only meet the highest standards but are also precisely tailored to customer needs.

Our work combines proven design principles, advanced engineering tools, and deep industry knowledge to create flexible and efficient turbines. Manufactured with high-quality materials and precise craftsmanship under strict quality standards, these turbines deliver reliable performance and long service life.

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What We Offer

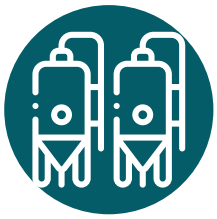
- Steam turbine generator sets
- Energy recovery systems
- Modernization, refurbishment, and upgrading of existing steam turbines to improve efficiency, increase output, and extend service life

Why Choose Glorinda Turbines?

- We offer a complete range of turbines, from small to large capacities, with full focus on customer requirements.
- Each turbine is built with unique designs and proven features to deliver high performance and reliable operation.
- Our wide range of products is designed to support various industrial applications.

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Applications


Distilleries


Paper Plants


Rice Mill


Sugar Plant


Iron & Steel


Solvent-extraction Plants


Chemical & Pharma Plants


Textile/ Textile Processing Units


Dairies


Food Processing Unit


Solar Thermal


Geo-thermal


Biomass


Oil & Gas

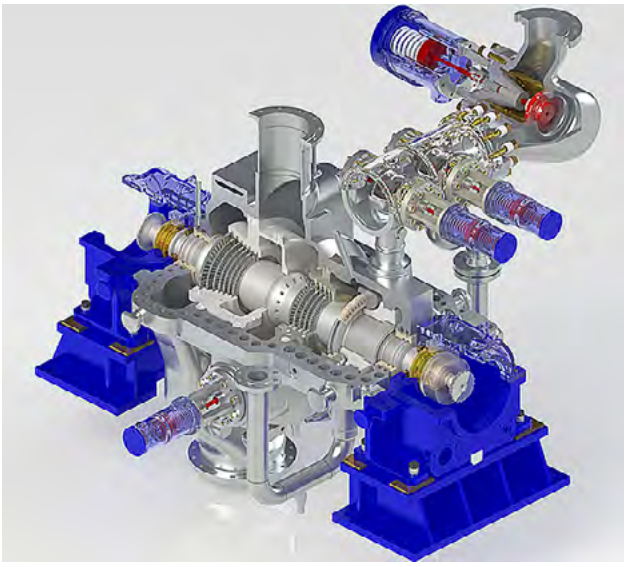

Waste to Energy

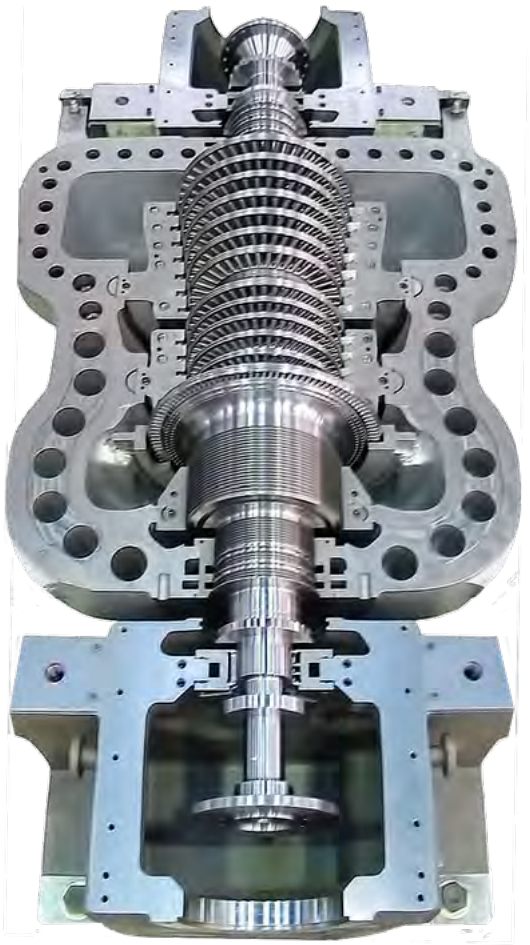
Our Products

Steam Turbines

Glorinda offers a wide range of impulse and reaction steam turbines from 50 kW to 180 MW. These turbines are designed for industrial co-generation, power generation, and energy recovery.

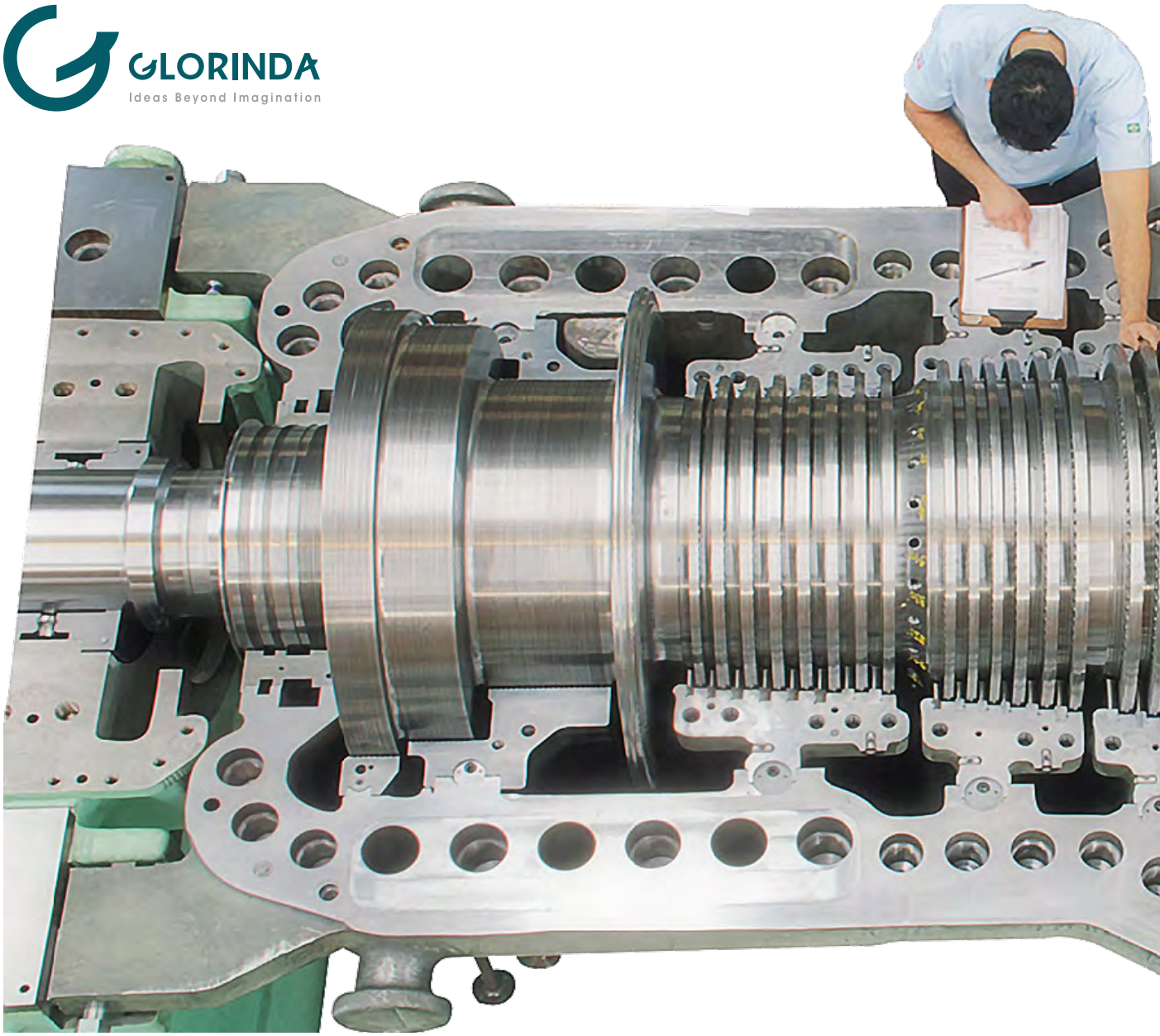
- Back-pressure
- Extraction (or Induction) with back-pressure
- Condensing
- Extraction (or Induction) with condensing





Typical back-pressure reaction steam turbine design:
Control can be achieved through throttling control with downstream over-pressure blading or through nozzle group control.

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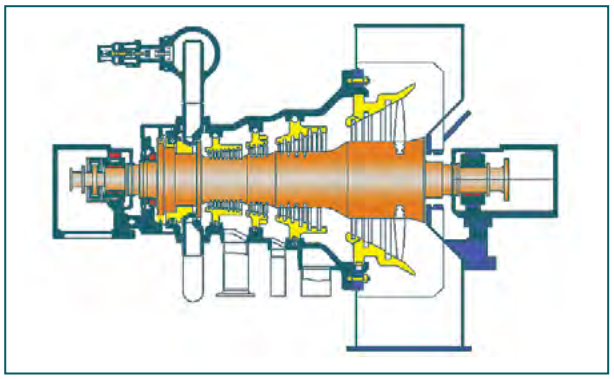


Our turbosets can be supplied as complete package designs or as individual installations on a concrete foundation. Key components include:

- Multi-stage steam turbine
- Gearbox (If required the turbine can be delivered as a direct-driving unit)
- Generator (with 2 poles or 4 poles)
- Lube and control oil system installed separately, or integrated into the package unit
- Electrical engineering and control system
- Auxiliary plants such as condensers, condensate preheating systems, elevation units, secondary cooling systems

We also provide retrofits and custom-made steam turbosets tailored to specific customer requirements.

Typical condensing steam
turbine as reaction design



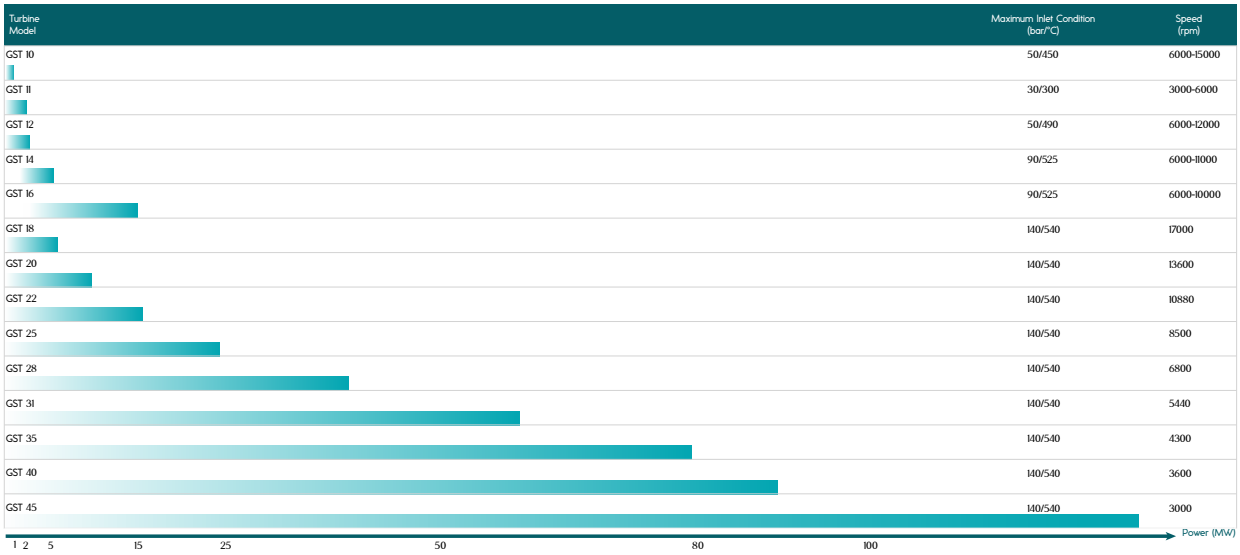


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Model and Rating:

Type	• Reaction • Impulse	
Configuration	• Back-pressure • Condensing	
Steam Inlet Pressure	Up to 140 bar	
Steam Inlet Temperature	From saturated steam up to 540 °C	
Exhaust / Back Pressure	Up to 20 bar	
Extraction	•Without extraction	
	•With extraction	•Extraction Count: Single or multiple •Extraction Pressure: Up to 70 bar(a)
Bleeds	Uncontrolled single or multiple bleeds	
Enthalpy Drop	From 100 to 1,400 kJ/kg	
Speed (RPM)	Up to 16,000 r/min	
Power Range	50 kW to 180 MW	

Turbine Models and Specifications



Core Turbine Components

Steam Inlet Section

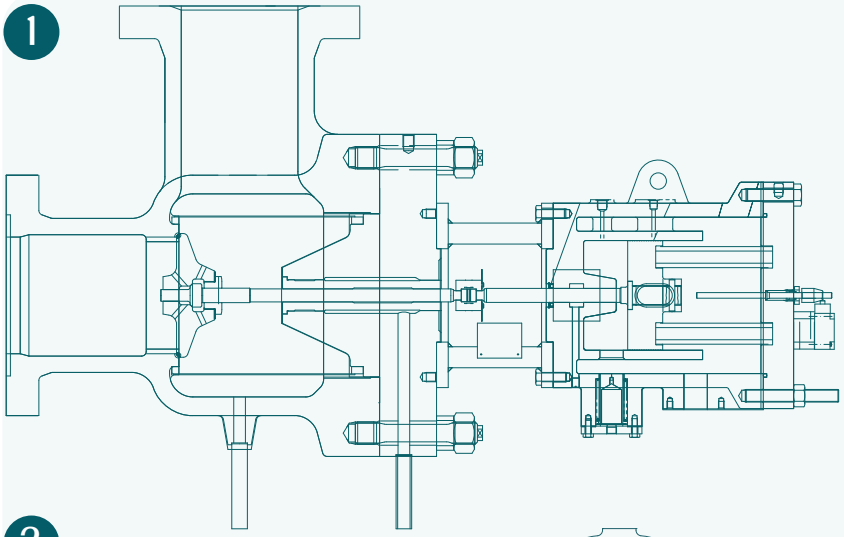
Steam enters through the flanged emergency stop valve [Fig. 1] and flows into the tube-shaped valve casing.

Up to four double-seated valves, each operated individually, are installed side by side in this casing to control the live steam flow safely and precisely [Fig. 2].

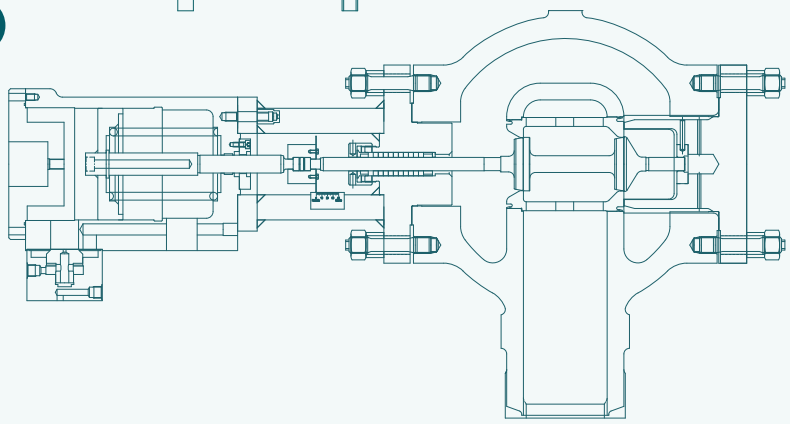
The valve casing is welded or cast to the high-pressure (HP) casing.

Inside the HP casing, the cast nozzle chest houses individually designed nozzle segments for optimal steam distribution.

1



2



1. Hydraulically operated emergency stop valve with low pressure servo motor

2. Hydraulically operated double seated control valve with low pressure servo motor

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Turbine Casing

The turbine casing features a symmetrical design to minimize thermal stresses. It is horizontally split and secured with pretensioned flange bolts [Fig. below]. The upper and lower flange surfaces are steam-tight without the need for additional sealing elements.

For extraction turbines, the modular casing includes an extraction module. Extraction flanges can be configured upwards or downwards.

The casing is made of alloyed cast steel to withstand high steam pressures and temperatures. It also includes sufficient openings for borescope inspections. Its compact design ensures short start-up times.



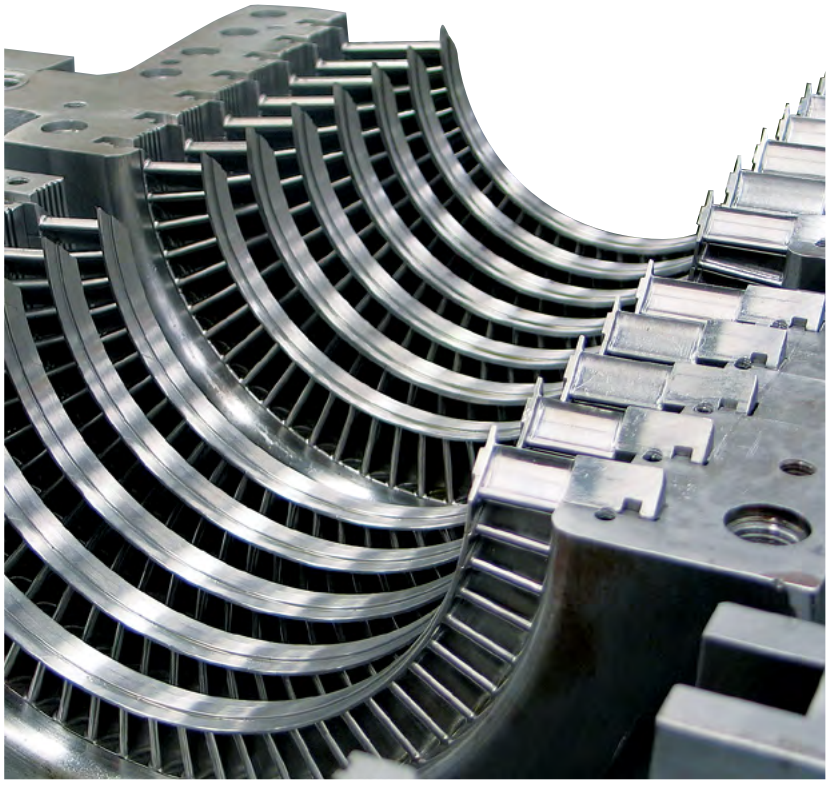
Typical horizontally split high pressure casing

Exhaust Steam Casing Guide Blade Carrier

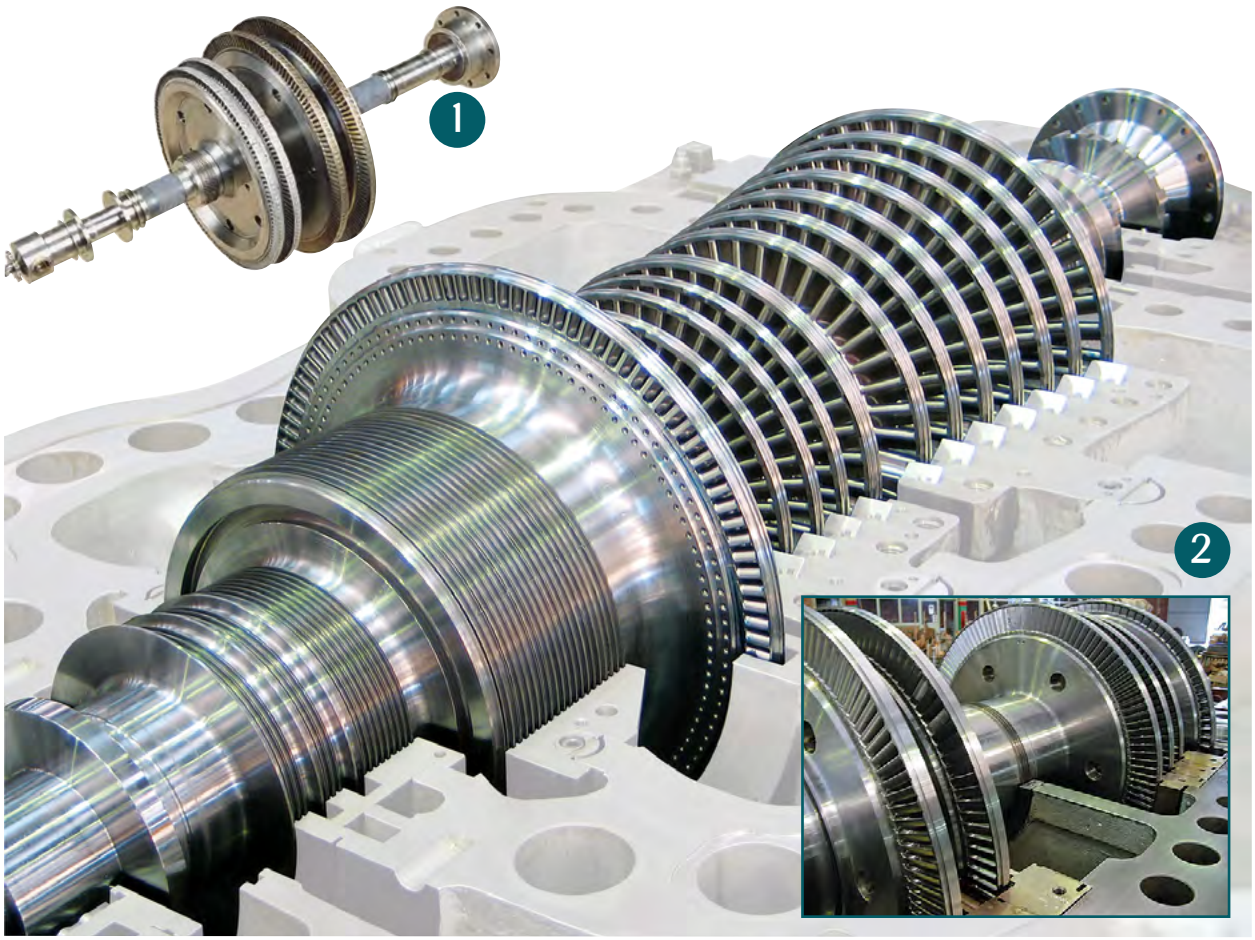
The exhaust steam casing is selected from a modular system and can be either welded or cast, depending on the turbine size and type. Both casing halves are connected using pre-tensioned bolts at the horizontal flange.

The vertical cross-split flange is positioned in the exhaust steam area, behind the support of the last guide blade carrier. This design ensures favorable start-up and loading times.

Installed guide blade carrier
after internal alignment



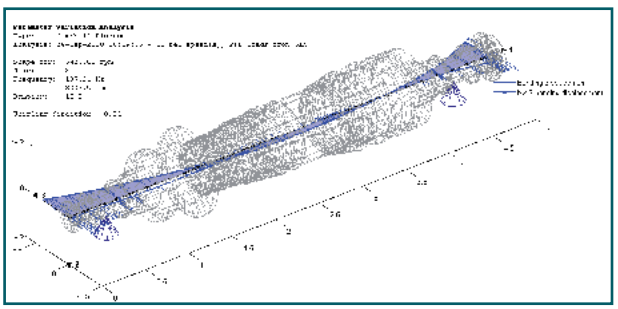
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1. Typical impulse type disc rotor
2. Overpressure barrel type rotor

Turbine Rotor

The turbine rotor is manufactured from a solid forging and undergoes strict quality checks, including tensile, ultrasonic, and crack tests. Modern computational programs are used to determine critical bending and torsional speeds [see plots to the right]. Calibrated software ensures optimized blade channel design and the best blade profiles for the specific operational requirements.



Bearings and bearing pedestals

Bearing pedestals are standardized in four scaled sizes. The front pedestal is designed as a standing pedestal. For back-pressure turbines, the rear pedestal has the same design, while for condensing turbines, it is fixed to the exhaust casing.

The bearings are engineered for long service life with simple maintenance. As a standard feature, they are equipped with bearing metal temperature sensors.



1. Axial bearing
2. Journal bearing
3. Combined axial-journal bearing
4. Oil sealing ring
5. Rotor labyrinth bush

Blading

The control wheel is positioned behind the nozzle groups in the nozzle chest. Rotor blades, including root and shroud band, are precisely milled from solid material.

Control wheel blades are highly loaded dynamically, especially during partial admission. A rolled-in wire acts as a damping element to reduce potential vibrations. Over-pressure rotor blades feature an integrated shroud band for stability.

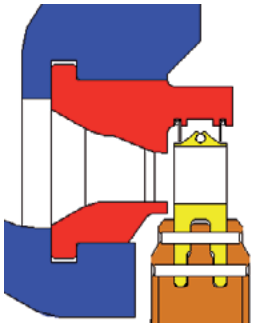
The last stages of condensing turbines use free-standing twisted blades without shroud bands, connected by a damping wire. Blade roots are designed according to load requirements and can have finger, hammer, or fir-tree shapes. All blades are manufactured from 13% chromium steel.

Guide blades are installed in the guide blade carrier, with each row equipped with either an integral or riveted shroud band.

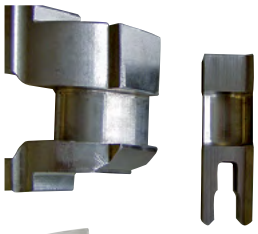
Sealing Systems

Shaft sealing is achieved using non-contact metallic seals, commonly known as labyrinth or brush seals. The design uses a series of annular gaps and chambers, where steam pressure is converted into velocity energy to ensure efficient sealing.

Milled nozzle, respectively, control wheel blade before being finally assembled











Standardized last stage blades with damping wire drilling

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Minimum scope of supply for the turbine control system

- Electronic overspeed protection
- Turbine protection
- Turbine controller
- Turbine control with start-up automatic



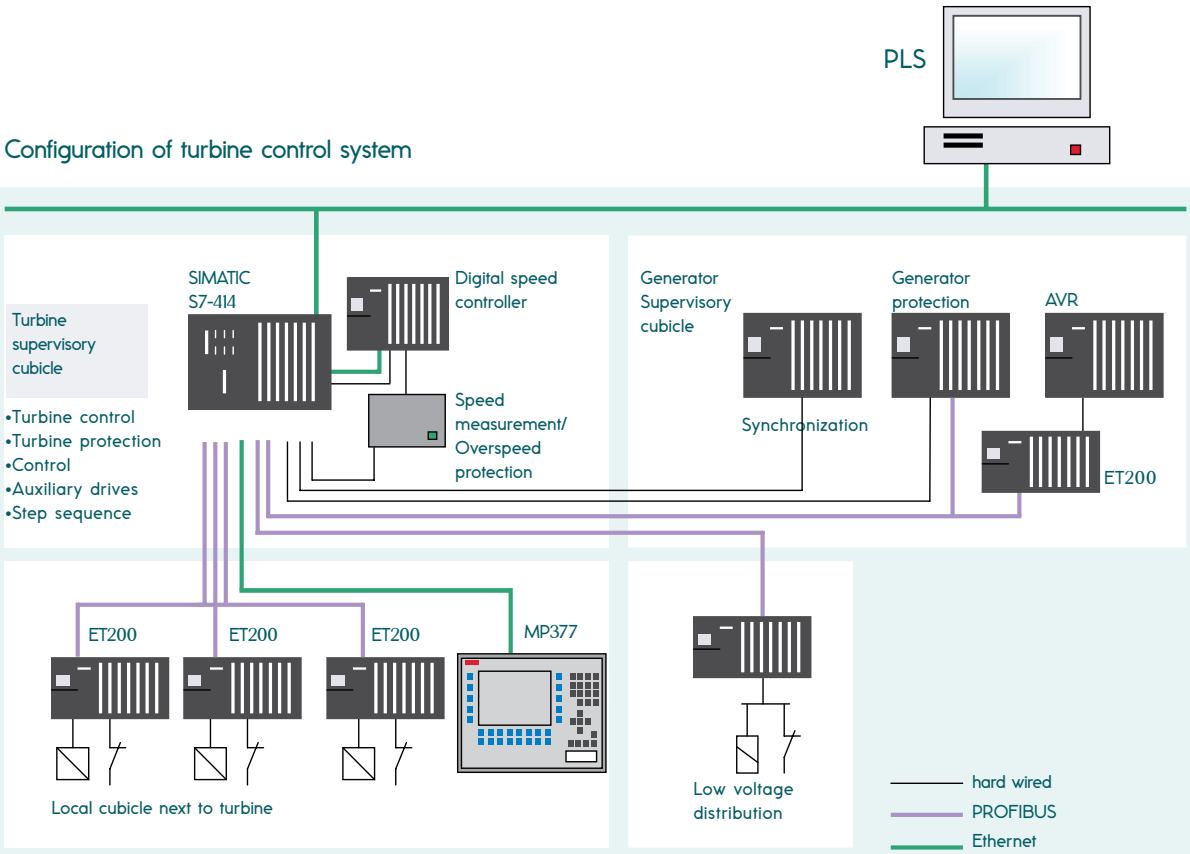


Electrical Engineering & Control System

The turbine control system monitors process and machine parameters, evaluates data, and manages the operation of drives and units, including signaling and alarms.

The main control system concept is illustrated in the "Turbine Control System Configuration." Measured values are monitored in the local cubicle and transmitted via three independent PROFIBUS connections to the Turbine Supervisory Cubicle (TÜS).
Generator control components, including generator protection, voltage control, and synchronization, are installed in the Generator Supervisory Cubicle (GÜS).

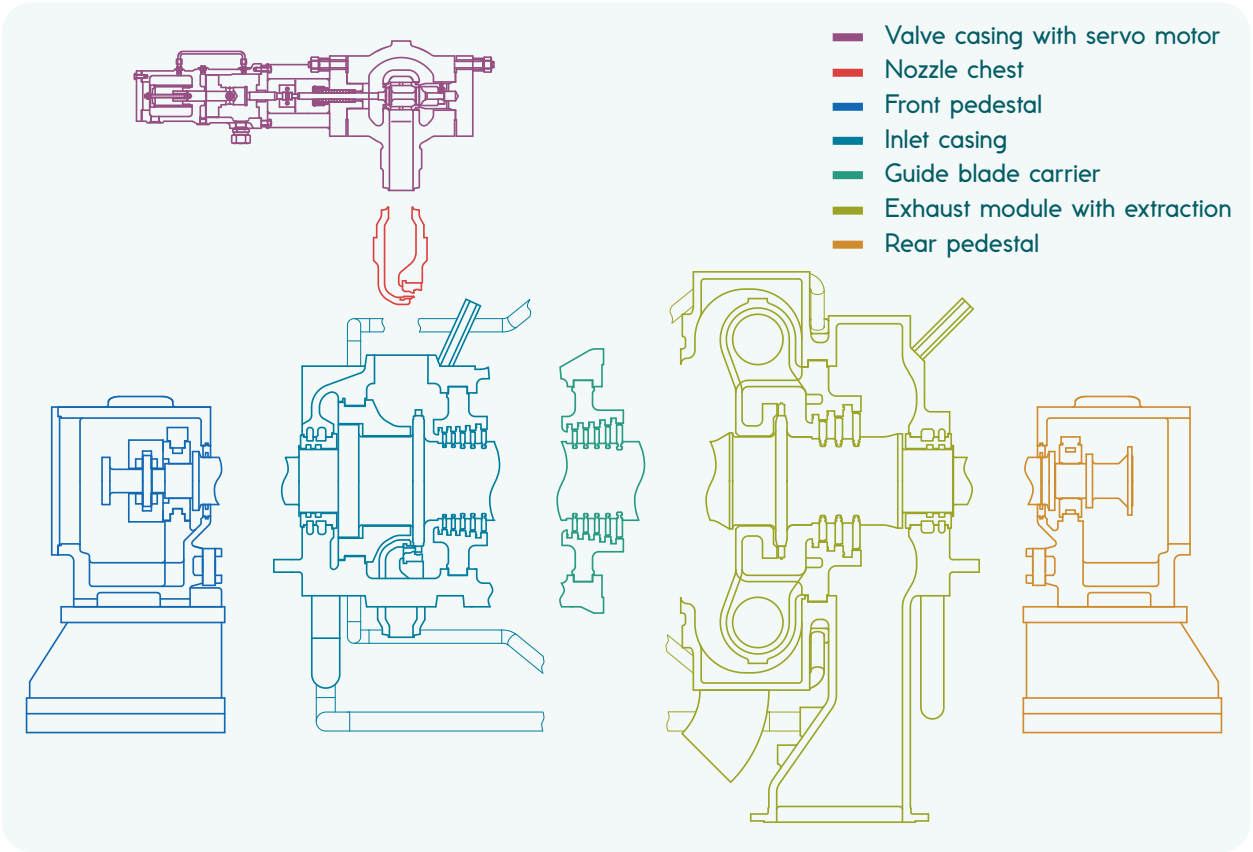
Configuration of turbine control system



Glorinda's control and safety philosophy complies with the VGB standard VGB-R 103 M for steam turbine monitoring, limitation, and protection devices, as well as IEC standard IEC 45-1. Overspeed protection, the critical turbine safety element (failure level 1), operates on dedicated hardware with three independent channels. Each channel can be tested during turbine operation, from the speed monitor to the trip solenoid valve in the safety block.

Turbine shutdown is executed by the protection PLC (closing the emergency stop valve) and the turbine controller (closing control valves). The turbine controller is programmed in the Siemens S7 CPU. Turbine start-up is fully automatic, initiating individual function groups. Speed is increased to nominal and then loaded to a pre-selected target using an optional free load controller. This controller calculates the free margin based on turbine casing temperature differences and material parameters. This method minimizes start-up time while keeping temperature differences and stresses within safe limits.

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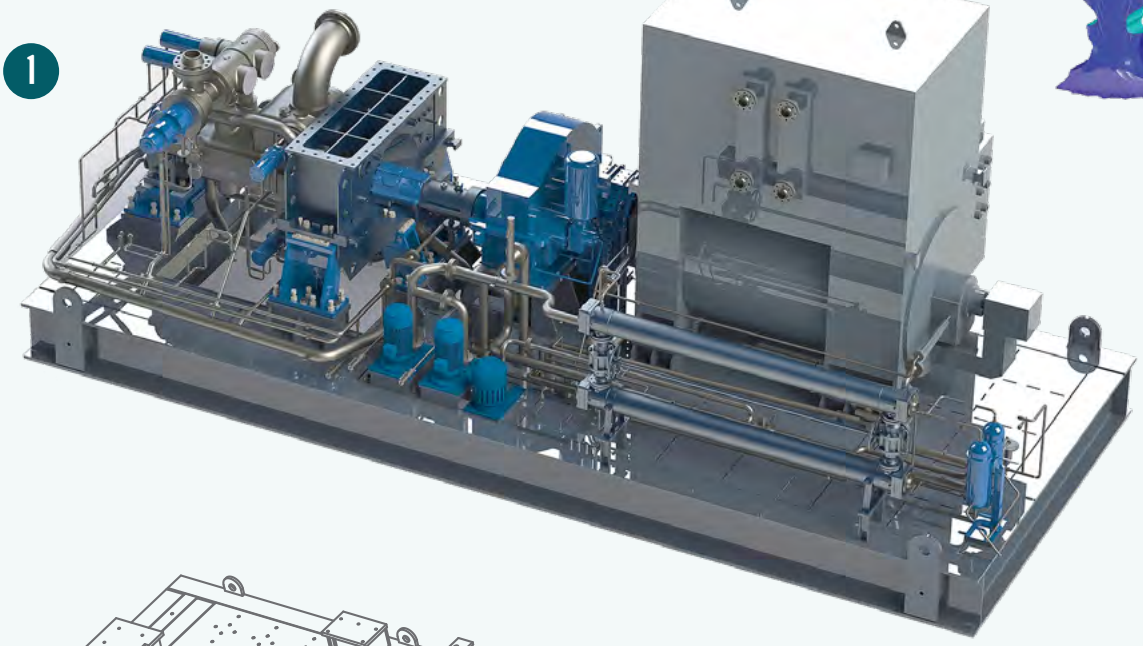
Design and Layout Planning

- Turbine layout based on load point tables or complete water/steam cycle calculations
- Draft and planning according to foundation type (concrete table or steel frame) with integrated oil plant in 3D-CAD
- New turbine design or retrofit, including full calculation of rotating equipment
- Complete pipework planning with 3D drawings, isometrics, and material take-off (MTO)
- Process design with P&IDs and related lists
- Control diagrams, function planning, and configuration of operating screens

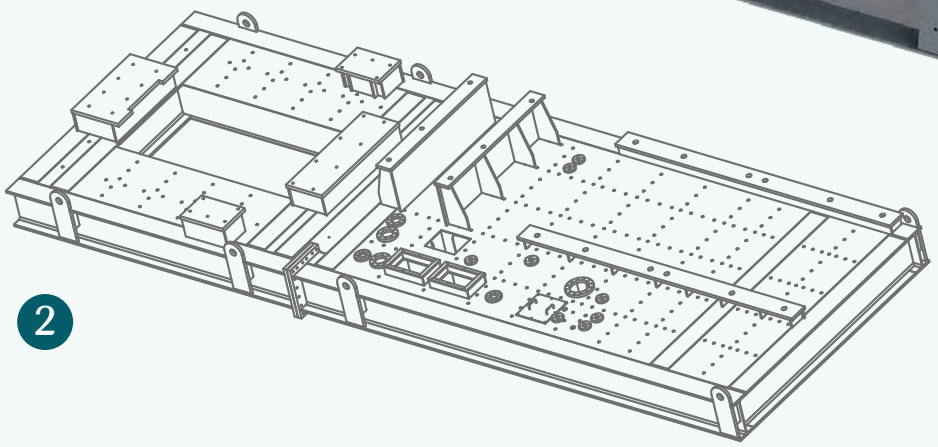
1. Layout planning for a condensing steam turboset using 3D-CAD
2. Detailed design for a base frame
3. 3D pattern for a rotor blade



3



1



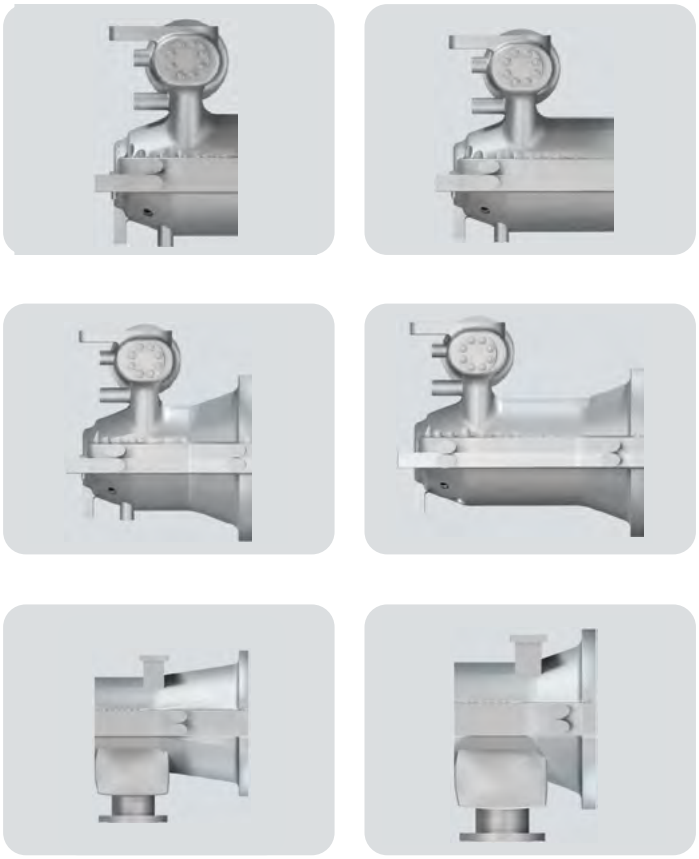
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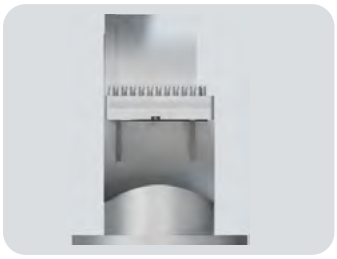
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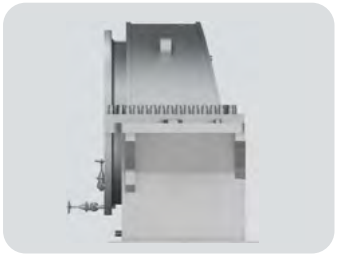
Design & Development

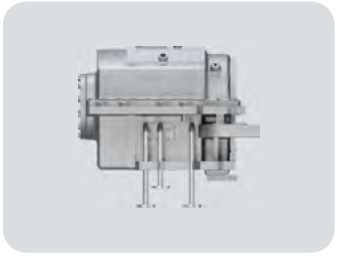
Glorinda applies the concept of Optimized Flow Path with Modular System in its steam turbine design. Standardized modules are arranged according to application needs, creating compact, efficient, and durable turbine packages.

This approach ensures high reliability in industrial operations with heavy load variations while maintaining excellent internal efficiency.










Advantages of the Modular System

Glorinda's modular design reduces development cost and time, simplifies manufacturing, and speeds up spare part availability. It also allows flexible production of different turbine types from the same standard base. The modules improve quality, reliability, and service efficiency while ensuring an economical and customized design for industrial use.

Key modules include:

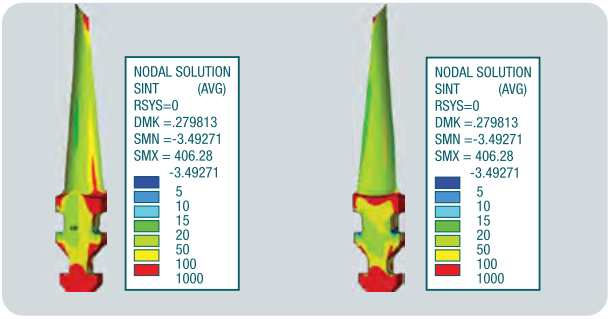
- Emergency stop valve
- Control valve casing
- Casing sections, pedestals, labyrinths
- Bearings
- Standardized blade profiles
- Guide blade carriers

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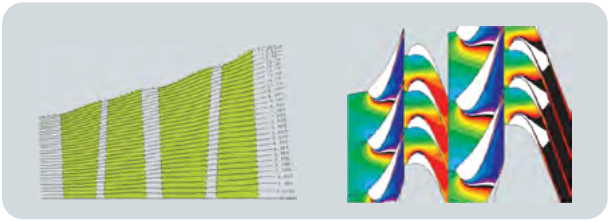
In-House Expertise

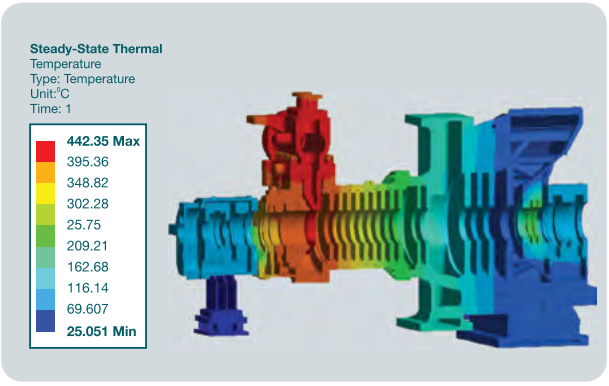
The following design and engineering activities are carried out in-house:

- Thermodynamic design of steam flow paths, nozzles, blade and valve profiles, and steam leakage optimization
- Mechanical design of rotors, diaphragms, blades, casings, supports, valves, servos, gears, couplings, bearings, and sealing systems
- Integration of mechanical and electrical systems such as condensing units, AC generators, control systems, and lubrication systems









Continuous Development

All designs are constantly monitored and optimized to improve efficiency, reliability, availability, and service intervals. This approach shortens the time needed for new development programs.

Engineering Tools

Glorinda uses advanced software for:

- Thermodynamic design
- Computational Fluid Dynamics (CFD)
- Rotor dynamics (lateral and torsional)
- Casing and blade mechanics
- Stability and heat transfer analysis
- 3D modeling and 2D design

Steam Turbine Design Features

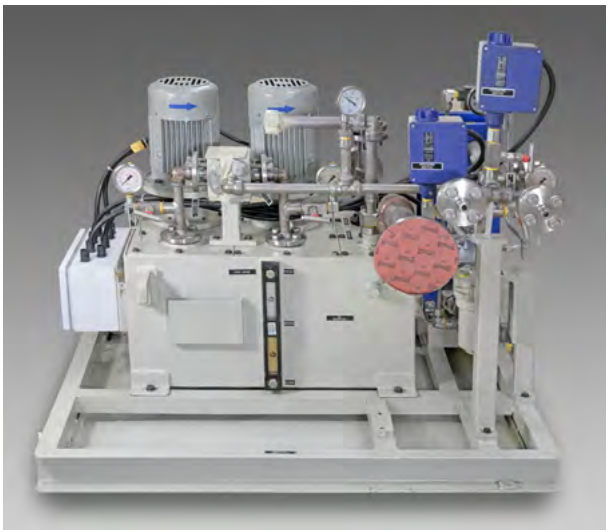
- High thermal elasticity with guide blade carrier design
- Symmetrical casing construction
- Separation of hot inlet areas from high-pressure casing
- Strong and stiff rotor design to minimize leakage and vibration across all operating conditions
- High safety margin in blade strength design
- Components engineered for minimal maintenance and wear

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Energy Recovery
Systems



Glorinda Energy Recovery Systems (ERS) set the benchmark for efficiency, reliability, and simplicity. These turbines are designed using advanced thermodynamic principles and proven simulation tools, minimizing the number of components. The result is a machine without a gearbox and with a simple lubricating oil system, delivering high efficiency, easy operation, and low maintenance.



Model and Rating:

Type	• Impulse
Configuration	• Back-pressure • Condensing
Steam Inlet Pressure	Up to 30 bar
Steam Inlet Temperature	Up to 300 °C
Exhaust / Back Pressure	Up to 15 bar
Extraction	• Without extraction • With extraction
Speed (RPM)	Up to 6000 r/min
Power Range	3 to 10 MW

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Unique Features of Glorinda ERS/ Micro Turbines

1. Double Pedestal Construction

ERS turbines feature bearing support at both ends, ensuring extended reliability and availability, especially for dry and saturated steam applications. Unlike conventional overhung designs with rotor discs on the generator or gearbox shaft, this approach reduces frequent shutdowns and maintenance caused by steam gland or bearing failures.



2. Direct Drive – No Gearbox

Turbine and generator are directly integrated, creating a compact footprint and simplified low-speed rotating train. This eliminates the need for a complex forced-feed lubrication system, reduces maintenance, and avoids costly gearbox components such as bearings, oil pumps, and baffles.

3. Tailored Multi-Stage Design for High Efficiency

Multistage turbines are customized for specific steam conditions, achieving superior efficiency compared to single-stage designs. Combined with double-bearing construction, the heavier rotor manages frequency fluctuations from variable steam demand, providing a faster payback period.



4. Rivet-less Bladed Design

Rotor blades are machined with integral shrouds for a seamless surface, offering:

- Longer blade life due to reduced stress compared to riveted designs
- Lower disc clearances for improved efficiency



5. Multi-Control Valve Option for Efficient Part-Load Operation

Inlet steam flow is managed with 2 or 3 sequentially operated control valves, ensuring high efficiency even during part-load operation, common in industrial processes.



6. Common Base Frame

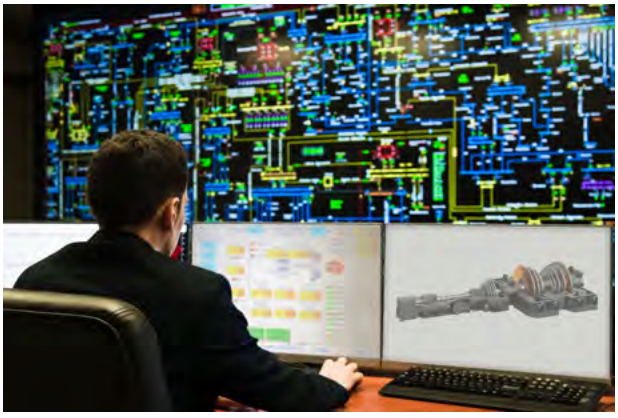
Turbine and generator are factory-fitted on a single base frame, providing a compact, simple package that is easy to install without extensive foundations.



7. Fully Automatic Control System

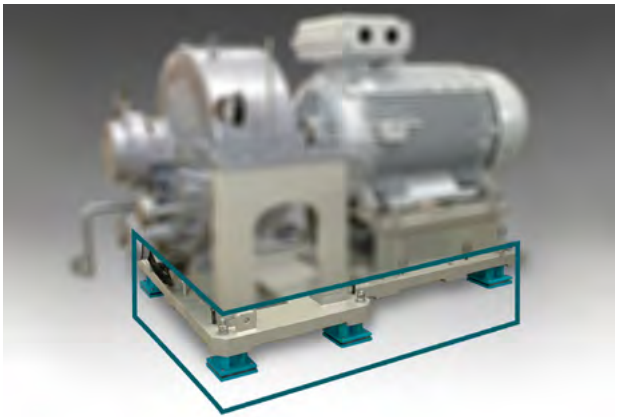
PLC-based control system enables:

- Push-button automatic start
- Push-button or automated shutdown
- Monitoring of key parameters and fault detection



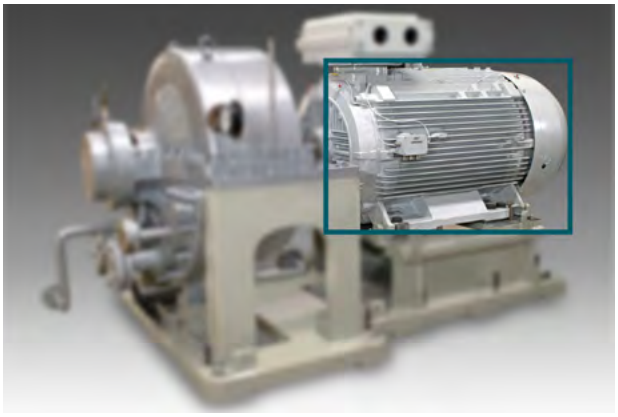
8. Anti-Vibration Mounts – No Special Civil Foundation Required

ERS packages can include anti-vibration mounts, reducing installation time and cost. These mounts also enable installation on upper floors without extensive civil work.



9. Induction Generator for Simplified Grid Connection

The induction generator allows easy parallel operation with the grid and automatic power import reduction based on package output. Grid synchronization is handled via pre-programmed start and process control functions.



10. Remote Monitoring via IoT App

Package parameters can be monitored remotely using Glorinda's IoT mobile app, providing real-time data on turbine speed, vibration, bearing temperatures, steam parameters, power generation, and generator winding conditions.



Our Services

Glorinda provides a wide range of services through its expert team to ensure turbine quality and customer support throughout the entire lifecycle.

Our services include:

- **Manufacturing** with precise production and high-quality standards
- **Quality Assurance** with strict control at every stage
- **After-Sales Care** with reliable support and maintenance
- **Modernization** upgrades to improve efficiency and extend service life
- **Training & Knowledge Transfer** to share expertise with customer teams

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Manufacturing

Our manufacturing approach combines in-house expertise with carefully selected outsourcing of machining operations.

Partner facilities are thoroughly evaluated, and every stage of outsourced work is subject to strict quality controls and close supervision. This ensures reliability, precision, and consistency in all components.

From raw material procurement to component machining, assembly, and final testing, every step follows a proven in-house process.

This structured approach guarantees the delivery of customized products with exceptional quality, durability, and performance.







Quality Assurance

Glorinda is committed to maintaining the highest standards in both production and service support. Our quality approach is based on the following principles:

- **Strict process control** across all in-house and outsourced production stages.
- **Close cooperation with vendors** to improve outsourced operations and component supply.
- **Continuous improvement** through structured feedback from product users and our customer care team.
- **Acceptance testing** with detailed reports according to DIN 1943 standards.

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After Sales Care

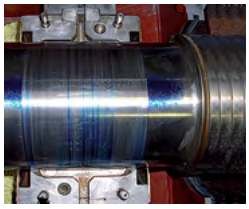
Glorinda is committed to providing reliable after-sales care that ensures optimum equipment performance with minimum downtime. Our dedicated service support is available 24/7, supported by an adequate stock of spare parts to respond quickly to customer needs.



Scope of Services:

- **Installation & Commissioning:** Workshop and site assembly, installation of turbine units (including through-roof solutions or lifting devices), commissioning, trial runs, acceptance tests (DIN 1943), and complete documentation.
- **OEM Service Expertise:** As an original equipment manufacturer, Glorinda provides complete service solutions for steam turbosets and auxiliary plants (oil, cooling, and condensing systems).
- **Service Contracts:** Modular service agreements for up to 10 years, including:
- Basic maintenance (inspections, overhauls, borescope checks)
- 24/7 telephone support, 365 days a year
- Guaranteed spare part availability within 24 hours
- Customized spare part packages and wear components

Check of bearing contact area for a radial bearing



Blade during manufacturing on a multiple axis milling machine



On-Demand Services

- Planning and execution of inspections and overhauls
- Non-destructive testing of rotors, casings, and valves (ultrasonic, crack, X-ray, replica methods)
- Repair and refurbishment of components (sealing strips, weld repairs with stress relief, blade row replacement)
- Supply of critical spare parts (valve spindles, bearings, bushings, sealing strips, etc.)

Modernization & Engineering

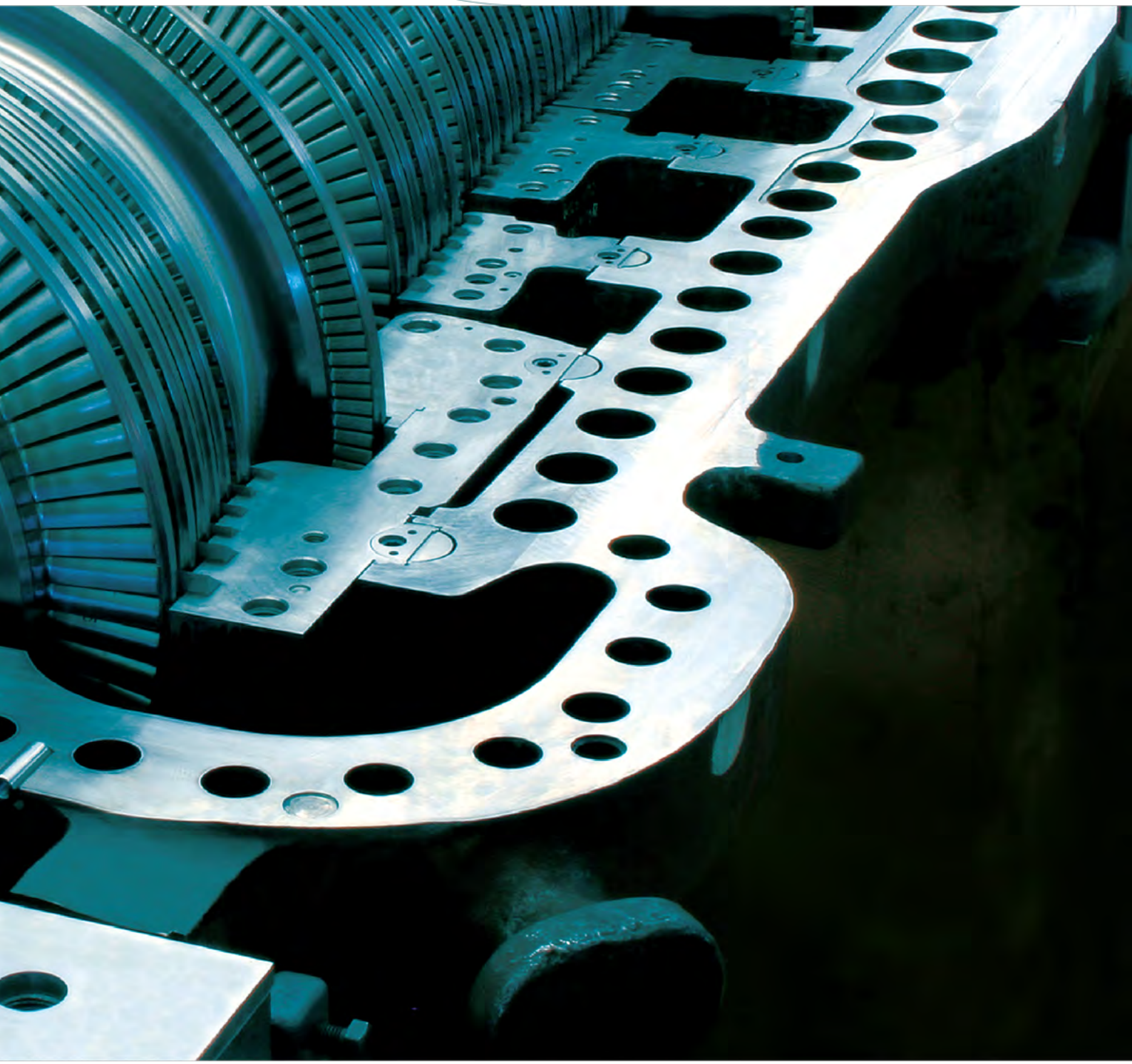
- Retrofit and rerate solutions to extend lifetime and increase efficiency
- Steam path redesign, rotor-dynamic analysis, and updated blading layouts
- Engineering studies, feasibility and profitability analysis, modernization concepts, and scheduling support

Training & Knowledge Transfer

- Performance monitoring and maintenance services for Glorinda equipment and other manufacturers' turbines
- On-site and in-house training programs tailored to customer requirements

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Ideas Beyond Imagination



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