

# GIGATOP 4-pole

Hydrogen and water-cooled  
turbogenerator

GIGATOP 4-pole is the most efficient 4-pole turbogenerator for the nuclear market, making it a solid long-term investment.

## Your nuclear solution

**In today's competitive power market, nuclear power plants need to operate with trustworthy components.** Alstom's GIGATOP 4-pole turbogenerator with its great reliability and efficiency is a solid investment for the future, providing the nuclear solution you need.

GIGATOP 4-pole, the turbogenerator behind Alstom's proprietary ARABELLE™ steam turbine, also sets the benchmark for performance. Based on the technology that Alstom has pioneered, the GIGATOP 4-pole is constantly improved with the application of the latest computing tools and modern manufacturing techniques.

The result is a high-tech turbogenerator with a proven track record. The GIGATOP 4-pole is thus robust in design, while meeting all requirements comprehensively.

## Customer benefits

### UNRIVALLED EFFICIENCY

Its optimised cooling system makes it the most efficient 4-pole turbogenerator for the nuclear market.

### A ROBUST PRODUCT

The unique feedback from nuclear plant operators enables us to continuously improve our design.

### EASE OF TRANSPORTATION

The stator is transported as a single unit, making the delivery smoother.

### EASY TO MAINTAIN

The inner parts of the machine are easily accessible, making maintenance much easier.



# GIGATOP 4-pole: Designed for the highest reliability

## HYDROGEN AND WATER-COOLING SYSTEM PROVIDING OUTSTANDING EFFICIENCY



The GIGATOP 4-pole is cooled with pressurised hydrogen gas in a closed circuit to remove heat from the rotor and stator. The stator casing is fully sealed to minimise hydrogen consumption.

De-ionised water flows through the stainless-steel cooling tubes to remove the heat dissipated by the stator winding.

This contributes to optimising efficiency and power output.

## STATOR CORE DESIGNED FOR LITTLE MAINTENANCE



The specific design of the core end plates enables the stator core to be maintained under a constant axial pressure.

As a result, there is no loosening of the laminations expected over the entire lifetime of the machine.

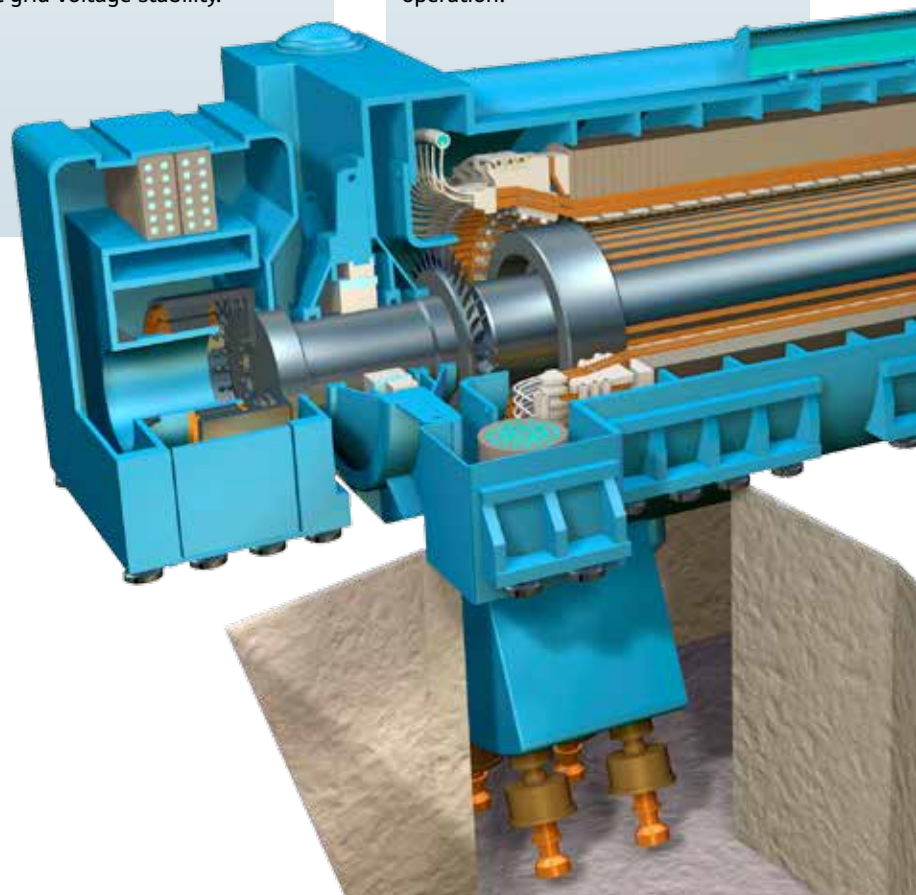
This enables reactive power to be increased and can be used to support grid voltage stability.

## STATOR WINDING AND SLOT WEDGING KEY TECHNOLOGIES FOR GREAT RESULTS



The use of Roebel bars for the dual-layer stator windings minimises the eddy-current losses and maximises efficiency.

The windings are held in the stator slots by double tapered, concave-convex wedges. This prevents the slot filling from loosening and compensates the initial settling and thermal expansion of the bars during operation.



**STATOR END-WINDING  
SUPPORT STRUCTURE**  
UNIQUE FEATURE FOR  
INCREASED AVAILABILITY



This structure is axially flexible to allow thermal expansion; it is also stiff in the radial and tangential directions to withstand high electromagnetic forces. The end-winding can easily be tightened during maintenance.

**MICADUR® INSULATION  
SYSTEM**  
BOOSTING GIGATOP 4-POLE  
RELIABILITY



The insulation consists of a glass-fibre tape incorporating mica flakes. The taped bars are vacuum impregnated, thermally cured and surface protected.

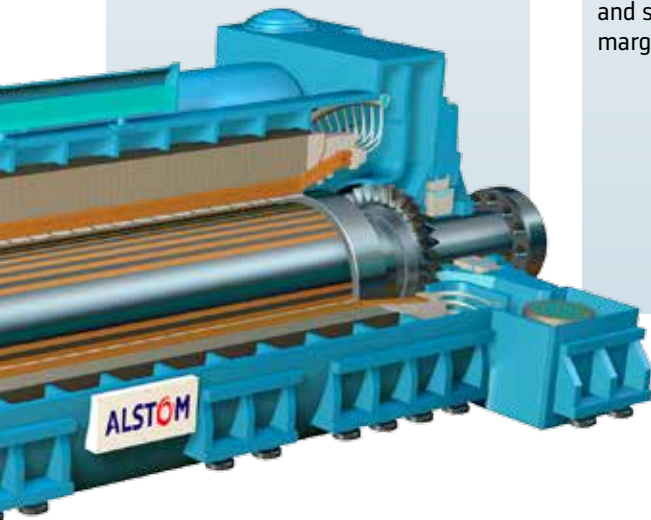
MICADUR® is the result of continuous development since the 1950s, meeting all requirements and showing an intrinsic safety margin for reliable operation.

**ROTOR**  
GOING THE EXTRA MILE



The rotor has been designed to withstand all of the forces it could be subjected to.

Mechanical integrity is proven by extensive material testing, the performance and durability are established with sensitivity tests.



Alstom has gone the extra mile with the safety of the GIGATOP 4-pole by designing a triple-circuit hydrogen sealing system.

All aspects of the design **meet, and often exceed, the relevant requirements** of the international standards.

## Leading experience for outstanding energy production

Alstom's 4-pole turbogenerator technology has accumulated **29 orders in the last 7 years**, demonstrating its many customer advantages and operating capabilities.



### GIGATOP 4-POLE – A SUCCESS STORY

#### Set for outstanding performance

Flamanville and Taishan power plants, equipped with EPR nuclear reactors also benefit from the Alstom GIGATOP 4-pole technology, enabling outputs reaching up to 1,750 MW.

#### Leading contribution in nuclear application

30% of all nuclear power plants world-wide run with Alstom turbine generator sets. This demonstrates over 55 years of experience with 112 GW in operation and more than 1.5 million hours of operation.

#### Optimised solution

The GIGATOP 4-Pole is designed for both rail and road transport. Only a small number of individual, separately packaged pieces are transported. This speeds up installation time, meaning that your power plant gets into operation faster.

#### Heavy duty

Alstom's GIGATOP 4-pole is an exceptional machine, with components reaching hundreds of tonnes. The stators manufactured for Flamanville, Oskarshamn and Forsmak weigh 450 tonnes each.

CLEAN POWER  
CLEAR SOLUTIONS™

REDUCING  
COST OF ELECTRICITY



99% efficiency

The GIGATOP 4-pole product family has demonstrated outstanding results. This means our customers get the best from our products, maximising power and revenue.

For more information, please contact your local Alstom Power representative.

Visit us online: [www.alstom.com](http://www.alstom.com)

