Synchronous Generators
2 and 4 poles

Altawest Group

JEUMONT Electric

Synchronous Generators

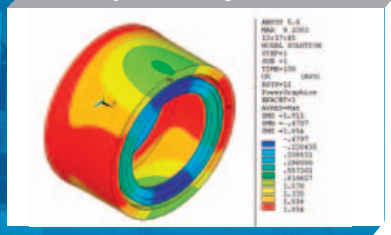
Generator and gear box on the same frame (Package)

4 pole generator with flange mounted gear box

Industrial power plant (Petrochemical site)

Engineering and development team

Stress analysis of a turbo generator end bell



Since the begining of the 20th century, JEUMONT Electric has been a world leader in designing and manufacturing large electrical generators and motors for a wide range of customers.

Markets and applications
Oil & Gas – Energy – Industry

Generators driven by steam or gas turbines:

- Waste incineration
- Co-generation
- Combined cycles
- Oil and Gas (Rigs, FPSO,..)
- Geothermal,
- Industrial sites (Pulp and paper, sugar, refineries,..)

JISALT: A Modular, Efficient and Competitive Range to meet your needs

- **Voltage** from 5.5 up to 20kV, 50 or 60 Hz, standard PF 0.8
- **Insulation**: F/H class
- **Heating:** B to F class
- **Protection:** IP 23, IP 42, IP 54, IP 55
- **Power ranges for:**

2 poles: from 30 to 82 MVA **4 poles: from 10 to 72 MVA**

Accessories - instrumentation

- 9 PT 100 temperature gauges (6 for stator winding and 3 for air flow)
- Heating resistors
- Bearing temperature control – 2 PT 100
- Oil flow control
- Optionally: vibration sensors, flow meters, pressure gauges, lube oil plant, etc…

JEUMONT Electric

2 and 4 pole design

Reliability, Robustness and High Performance

The fruit of a centennial experience allied to modern development and production tools.

Stator

CORE:

Magnetic low loss, pre-varnished laminations or optionally insulated by mineral coating applied after punching, providing

- Outstanding control of core losses
- Elimination of hot spots
- High stability and excellent behaviour at high temperatures

WINDING

In complete sections or in conductor bars with or without transposition (Roebel)

- Insulation in fibre glass and mica paper tapes
- Outer anti corona tape or conducting varnish
- Double impregnation in VPI cycle

Strong end winding bracing

- High cohesion and resistance to vibrations
- Outstanding capability to withstand operation incidents (Shorts, network incidents,..)

Rotor

Both types of rotors are cylindrical but different in construction:

2 pole generators

- Forged steel shaft with high mechanical and magnetic characteristics
- Silver copper conductors for better conductibility (Electrical and thermal together with a better yield strength)
- Retaining rings in high grade non magnetic steel (Cr Mn 18-18)
- Optimized end winding blocking to prevent conductor deformation

4 pole generator

- Body made of steel laminations heat mounted on forged steel shaft
- Winding from rectangular conductors with double glass-polyester wrapping
- Glass fibre and epoxy retaining ring
- Global VPI with rotating curing

Cooling

The generator cooling has been studied in depth using specialized softwares and validated by laboratory models to ensure

- Efficient end winding cooling
- Homogeneous temperature distribution in the whole winding, avoiding hot spots

The generators are air cooled, in one of the following configurations:

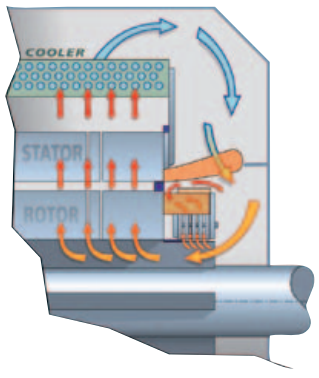
- Open circuit with filters (IC0A1)
- Air - Air exchanger (IC5A1A6 or IC6A1A6)
- Water – Air exchanger (IC8A1W7)

2 pole generator

- Fan with adjustable angle blades
- Axial and radial flow

4 pole generator

- Radial flow by centrifugal effect
- Auxiliary fan to cool down the end windings

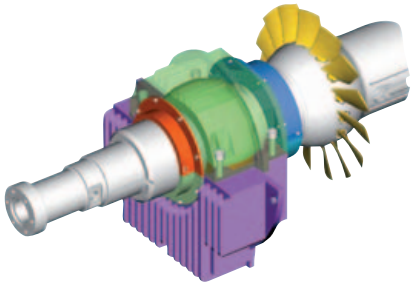


Modelling an end winding cooling

Mechanical stability

This is mainly the result of several factors such as:

- Control of vibrations of mechanical (natural frequencies) or electromechanical (harmonics) origins
- Shaft dimensions to withstand flexural or torsional stresses according to API 546 and 684
- Standard transient torques at 5x rated torque (Optionally up to 10x or even larger)
- Journal bearings flanged onto the frame, with selected stiffness as a standard – (Optionally pedestal bearings)
- Forced oil circulation with backup lubrication by floating ring



Modelling
the bearing - fan area
of a 2 pole generator

Test of AVR cubicles

Mineral insulation of laminations

4 poles rotor

2 poles rotor

Auxiliaries

Excitation and voltage regulation

Two possible systems

- Brushless
- Static

The excitation is controlled by the JEUMONT Electric digital AVR - JIREN - which provides :

- Great flexibility and ease of monitoring
- Outstanding dynamic properties
- Numerous functions

Protection and measurement

JEUMONT Electric can also supply the protection and phase/neutral cubicles.

Here below a number of possible protections/limitations

- Maxi current
- Mini/Maxi voltage
- Mini/maxi frequency
- Differential
- Stator currents unbalance
- Stator or rotor ground fault
- Mini/Maxi excitation
- Active or reactive reverse power

JEUMONT Electric

2 and 4 pole design

Rigorous quality follow up

Our product quality system is documented in a Quality Plan which accompanies the product throughout the manufacturing process.

Checks and measurements guarantee the product conformance and also provide the initial values of a number of relevant parameters which are useful in the assessment of the equipment condition during its life

In particular:

- Control of each winding section
- Dielectric test before and after VPI
- Measurement of capacity during VPI process (Option)
- Loop test (option)
- Measurement of resistances and impedances
- Measurement of insulation
- Measurement of the loss factor (Tan Delta) (Option)
- Balancing the rotor at rated speed and at 10 or 20 % overspeed
- Subsequently, global trial test is performed when the machine is totally finished, leading to a conformance certificate and to characteristics such as no load curve, short circuit curve, as well as the records of relevant readings.

Quality - Safety - Environment

JEUMONT Electric has adhered to the QSE scheme and has entrusted a team to manage the relevant system. ISO 9001, 14001 and OHSAS 18001 certifications have been obtained and are currently maintained.

Services

For the equipments of **all OEM's**, JEUMONT Electric offers a wide range of services for medium and high voltage generators in its power range and beyond, up to 1600MVA.

The company can mobilize more than 60 experienced engineers and technicians (R/D, design, assembly, winding, commissioning) either at the Jeumont factory or on site worldwide.

Their design and intervention capability, and the means of manufacturing and testing enable them to cover the full range of services dedicated to this type of machines:

- Tests and assessments
- Corrective or programmed maintenance
- Repair, retrofit, replacement, reverse engineering.
- Machine and network engineering (Stability, transients, protections, harmonics,...)

Commissioning a generator in a power plant

Rotor in spinning pit

Rewinding 2 poles 250 MW rotor in factory

Overhaul of generator in nuclear Power plant

Imagination & energy efficiency

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