



TRUST. WELL EARNED.

## Generator Services

Keeping the power on



[www.brush.eu](http://www.brush.eu)

# Generator Services

BRUSH Group is a premier OEM of generators, transformer, and switch gear with more than 100 years of industry leading design and innovation developments.

BRUSH has designed turbogenerators to be driven by every major gas turbine program, and steam turbine design across all energy sectors.

**Our designs are a reflection of extensive experience manufacturing generators to operate in a some of the most challenging applications and environmental conditions.**

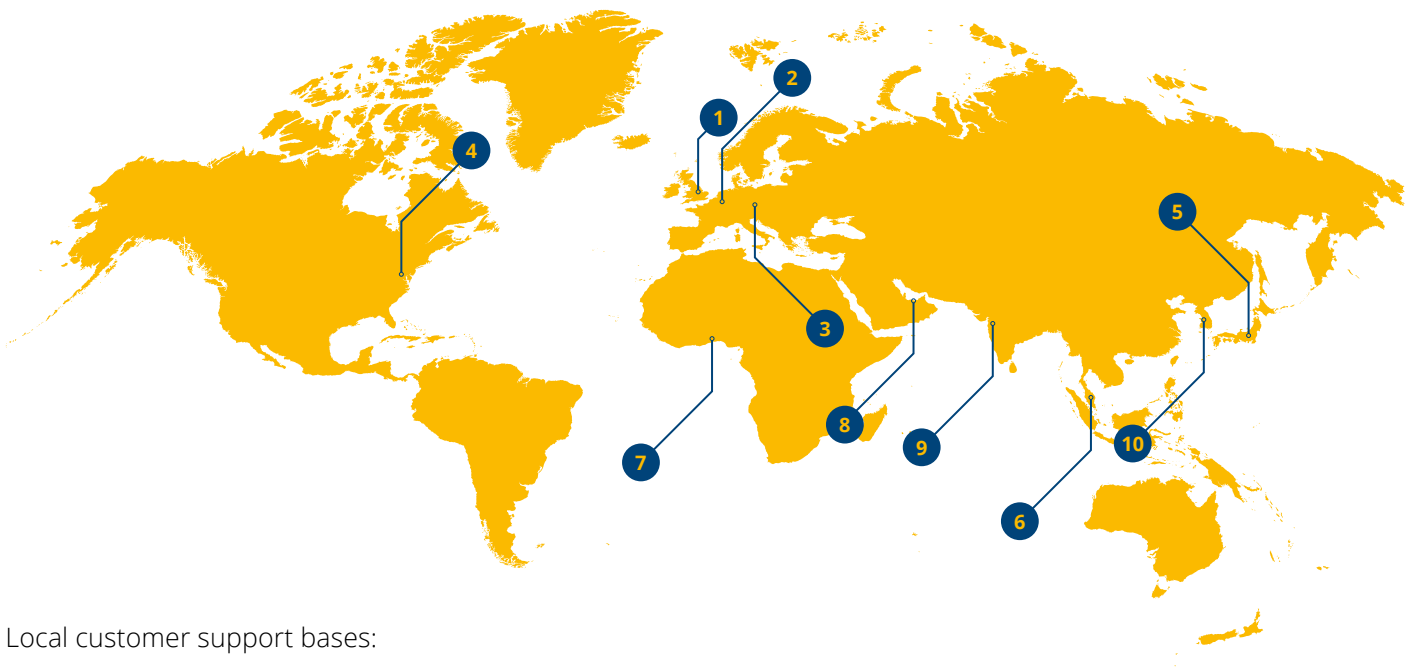
Servicing generators in these same challenging applications has allowed BRUSH to develop a team of internationally recognised power industry professionals, with deep expertise in service, and a reputation for quality.

## BRUSH's Approach to Service

The generator services team takes a consultative approach to service through a process of periodic inspections, engineering reports, recommendations for services, and upgrades.

We provide our findings and recommendations to the end-user to enable them to make informed decisions concerning the management of the life-cycle costs of their power generation assets.

**BRUSH Services are represented in the following locations:**



Local customer support bases:

- |                    |                          |
|--------------------|--------------------------|
| 1 Loughborough, UK | 6 Kuala Lumpur, Malaysia |
| 2 Ridderkerk, NL   | 7 Lagos, Nigeria         |
| 3 Plzeň, CZ        | 8 Abu Dhabi, UAE         |
| 4 Pittsburgh, USA  | 9 Mumbai, India          |
| 5 Tokyo, Japan     | 10 Seoul, Korea          |



# Industries We Serve

Broad knowledge base across multiple industries

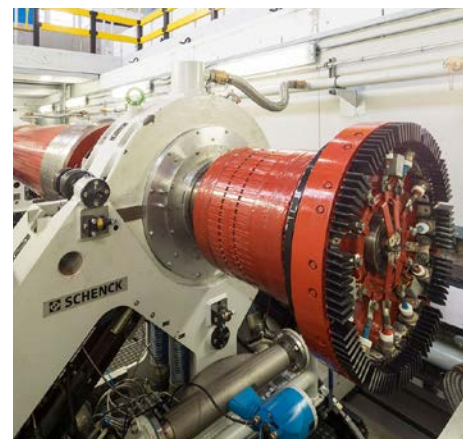
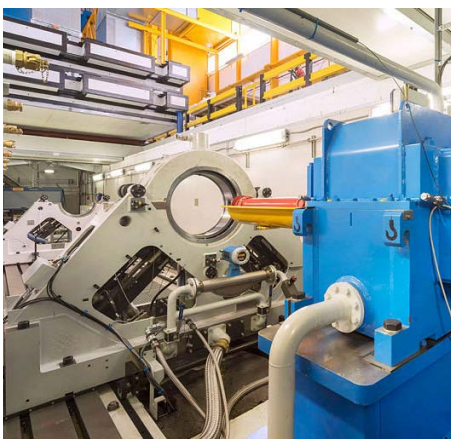
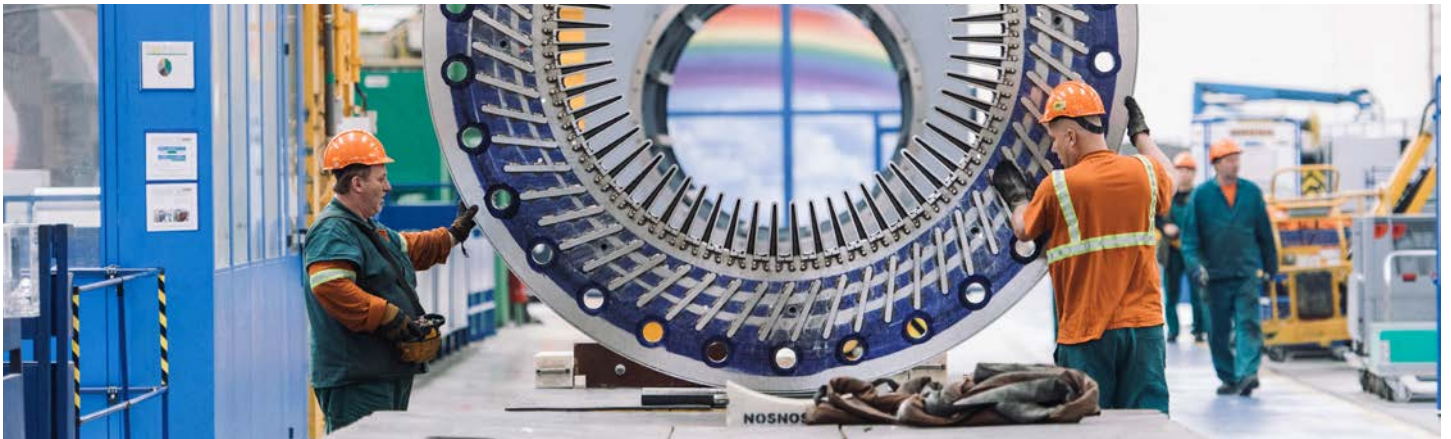
## Broad Knowledge Base Across Multiple Industries:

- Utility power production
- Refinery and petrochemical
- Offshore oil & gas
- Floating Production Storage & Offloading (FPSO)
- Fertilizer production
- Pulp & paper
- Sugar processing
- Other industries that produce their own power
- Independent power producers (for any use)

Over 4,000 BRUSH generators are in operations worldwide representing a significant segment of the total market, many of which have been in operation for multiple decades. The combined installed capacity of these generators is in excess of 200GW.

These long operating profiles are the results of BRUSH's robust design philosophy and manufacturing expertise, which allows for high reliability and availability of the generator even in the most extreme climatic conditions and hazardous atmospheres.

**BRUSH's engineering staff has access to decades-long operating profiles enabling us to provide timely engineering support that is relevant to each customer's application.**



## Field Services

From installation & commissioning, to onsite inspection, repair and rewinding.

**BRUSH Group has a global staff of field service professionals trained to service generators in both offshore, and onshore applications.**

Our project managers are experienced in working with end-users to plan outages, make risk assessments and mitigation plans to ensure a safe working environment.

### **Installation & Commissioning**

BRUSH deliver effective solutions to meet our clients' project management objectives at every stage - from engineered designs through installation & commissioning and first power.

Our field engineers have unrivalled experience, product knowledge and use the latest technologies in shaft alignment and bedplate levelling.

### **Outage Inspections**

BRUSH recommends inspections at 8K, 10K, 25K, 50K, and 100K equivalent operating hours (EOH). Operators of generators with high cycle frequency regimes, such as to support intermediate loads, and peak shaving, should consult with BRUSH to evaluate appropriate service intervals for their generators.

Should the need arise for fault finding services, BRUSH has resources to quickly mobilise a team to your site to identify the problem and present options for resolution.

### **Field Repairs**

During an inspection our team will identify and recommend repairs, if the repairs are minor, and time allows, these can be performed immediately.

If the repair requires more time, our team will work with you to schedule repairs to minimise outage and downtime.

### **Field Repair Services Offered:**

- Stator end winding refurbishment
- Stator overhaul
- Stator rewind
- Rotor-end cap/retaining rings inspections
- Bearing replacement
- Oil seal replacement
- Cooler repair
- AVR health checks.
- AVR Tuning







# OEM Repair and Overhaul Centers

BRUSH has two OEM Level Service Centers one in Europe (Plzeň, Czech Republic), and the other in the Americas (Pittsburgh, PA, USA).

**BRUSH Overhaul Centers provide full service repair and overhaul of rotors, stators, and exciters. This includes high-speed balancing.**

BRUSH has two OEM Level Service Centers one in Europe (Plzeň, Czech Republic), and the other in the Americas (Pittsburgh, PA, USA).

OEM Level service centers in North America and Europe: service hubs are staffed to offer the following services:

- Stator core replacement
- Stator rewind
- Bearing replacement and refurbishment
- Rotor overhaul and end-winding refurbishment
- Rotor-end cap/ retaining rings
- Rotor rewind
- Rotor high-speed balancing, including overspeed
- Exciter overhaul
- High-voltage test
- OEM Parts Controls: AVR's and Remote Monitoring
- Generator and controls upgrades
- Life-cycle Assessments
- Unsupported legacy OEM generators

## Modifications & Upgrades

During the life-cycle of a power plant the end-user will need to change the operating profile, or demand from the generator.

When the need arises BRUSH consults the original designs and makes recommendations for upgrades and modification of the existing generator, BRUSH services include:

- Power output increases
- Machine excitation systems
- Analogue to digital excitation controller
- Retrofit earth fault monitoring
- Cooling systems
- Generator auxiliary equipment
- Power management systems
- AVR's

## Other OEM

Our service facilities have developed BRUSH know-how into capabilities to repair other OEM generators.

**Examples include Westinghouse, Siemens, GE, EM/ WEG/ Alstom, ŠKODA, Elektrosila, Voith, Elin, ČKD, and ABB just to name a few.**



# Robotic Generator Inspection System (RoGIS)

## Benefits of a RoGIS Inspection

At BRUSH we understand that outages have many critical path drivers. This is why we developed the RoGIS system to inspect the generator without removal of the rotor.

The robot is guided in the gap between the rotor and the stator and includes cameras and the ability to check wedge tightness.

While not all generators provide enough clearance to use a robotic inspection system, our RoGIS has the slimmest profile in the industry allowing BRUSH to perform these inspections where others cannot.

**RoGIS is a robotic inspection system that carries out ELCID tests, stator wedge tightness assessment and a full visual inspection of the stator and rotor.**

### **RoGIS makes a fully automated inspection of the stator core**

Four high resolution onboard cameras provide the BRUSH service engineers with clear views of the stator core laminations, field and stator wedges, cooling slots and an onboard view of the retaining rings.

### **Benefits of a RoGIS Inspection**

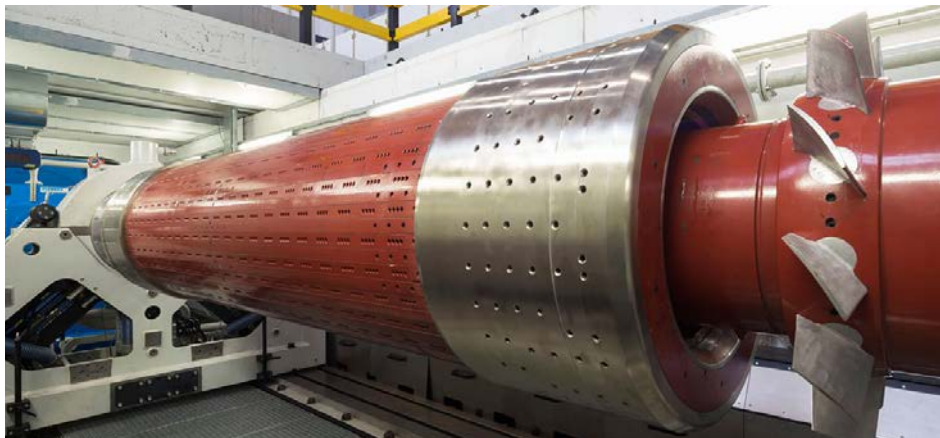
When comparing a RoGIS to a traditional inspection cost, reductions are achieved through:

- Reduced downtime – depending on the type of RoGIS inspection carried out the reduction to your outage period can be between 3 to 6 days.
- Eliminating consequential damage
- Reduced disassembly requirements



# High Speed Balance

Balance Capabilities	Europe	Americas
High Speed Balance	Quality of Balance grade 2.5 As defined by ISO 1940	< 2.00 mils pk-pk at operating speed < 3.00 mils pk-pk at critical speeds
Low Speed Balance	Quality of Balance grade 2.5 As defined by ISO 1940	Quality of Balance grade 2.5 As defined by ISO 1940
Weight Limit	Large balancing pit – 80 tons Small balancing pit – 20 tons	55 tons
Pedestals	2	2
Max. Coupling to Bearing Span	LBP -13,5 metres/SBP – 9 meters	470 Inches / 12 meters
Max. Journal Diameter	29.5 Inches/ 75 cm	18.7 Inches/ 47.5 cm
Max. Rotor Speed	4,500 RPM	4,500 RPM
Overspeed	max. 4500 RPM	110% of rotating speed



## Service 24

All End users and channel partners have access to our "Service 24" technical service program and its expert knowledge base.

**Service 24 can be reached via email or by phone. Simply provide the model and serial number of your equipment, plant name and a technical enquiry.**

End users will receive expert technical advice from BRUSH. For more information on this program visit the contact page at:  
**[www.BRUSH.eu/contact](http://www.BRUSH.eu/contact)**







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