JENBACHER

ENHANCE POWER GRID STABILITY

Through the use of grid code-compliant Jenbacher gensets

Supporting the energy transition by enhancing power grid stability and enabling reliable power grids

The power generation landscape has been significantly transformed due to technological advancements, regulatory changes, and the growing integration of renewable energy. As the global focus shifts from fossil fuels to renewables, power grid connection has become more challenging, with complex requirements demanding extensive testing and compliance verification.

INNIO Group's Jenbacher gensets feature dispatchability, fuel flexibility, weather independence, and essential power grid support. Our reliable solution is backed by INNIO Group's ample experience in connection and compliance demonstration. The advanced technical capabilities[1] of Jenbacher gensets facilitate participation in energy markets and ancillary services, supporting the transition to a renewable-centric energy system while helping to maintain power grid stability.

By meeting the stringent requirements for both static and dynamic power grid stabilization, Jenbacher gensets enhance power grid connections for our customers and contribute to the stability of power grids worldwide.

In most countries, grid code compliance is essential for obtaining connection permission and enabling a reliable supply of electricity to the power grid. Compliance is verified through documentation based on testing and simulations that demonstrate correct static and dynamic performance. INNIO Group's Jenbacher generating sets meet these grid code requirements, offering significant competitive advantages:

- **Faster time to market**
- **Greater market access**
- **Risk mitigation**

These advantages favorably position INNIO Group's Jenbacher units in the rapidly evolving energy market landscape.



[1] The technical concepts related to fulfilling grid code requirements are investigated through the use of simulations for all of INNIO Group's Jenbacher genset combinations and validated by extensive tests on the test bench.

Grid code compliance with INNIO Group's Jenbacher gensets

For more than a decade, INNIO Group's Jenbacher brand has been developing solutions to meet the stringent static and dynamic requirements for gensets defined in various grid codes.

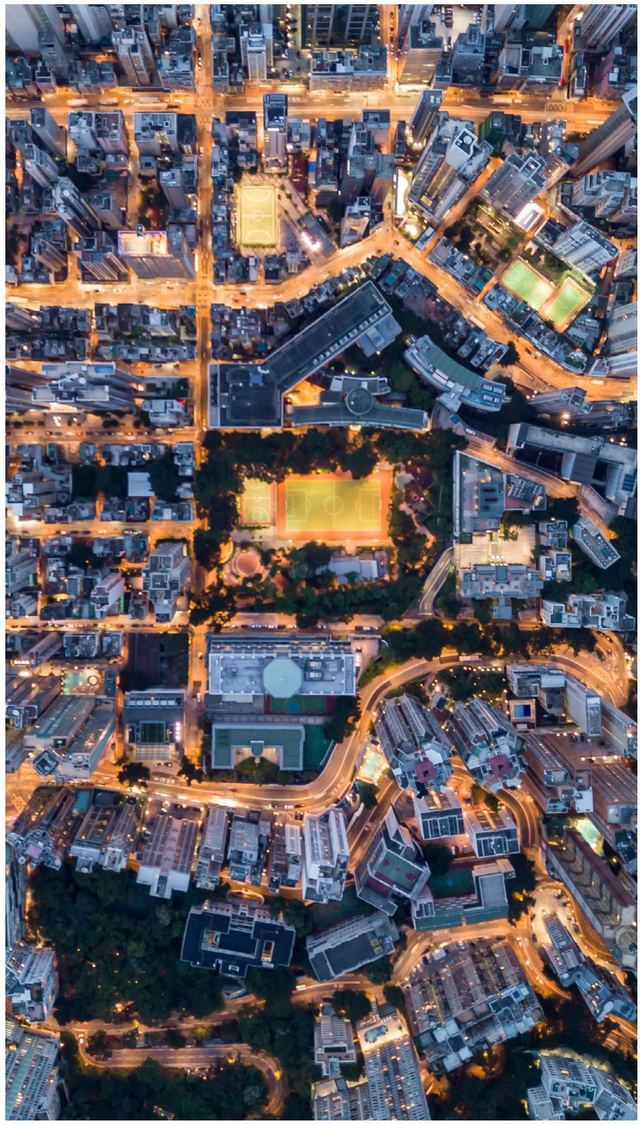
Extensive testing by independent, authorized institutes has validated the compliance of Jenbacher gensets with various grid codes and directives, including those from Germany, Poland, Italy, and Spain. These institutes also have confirmed the accuracy of the simulation model used for electrical studies. Multiple certifiers have issued unit certificates confirming that Jenbacher gensets meet the demands of these grid codes. This certification underscores the significant contribution of Jenbacher technology to power grid stability and security, thanks to its proven capabilities and functionalities.

INNIO Group's Jenbacher gensets are engineered to:

- Operate within a voltage range of +/-10% of the nominal voltage
- Function within a frequency range of +/-2% at full load and +4%/-6% with power reduction
- Withstand transient voltage dips down to 0% of nominal voltage for 0-250 ms
- Support frequency stability through frequency-sensitive functions (FSM, LFSM-O, and LFSM-U)
- Provide active and reactive power control
- Comply with local connection requirements through specific parametrization

INNIO Group's experienced Jenbacher engineering team offers comprehensive documentation support with in-house expertise and assists customers worldwide in discussions with system operators and on-site testing procedures. Choosing Jenbacher products helps ensure a smooth connection process for the power generation units.

Grid code capability compliance is not just a regulatory necessity but a strategic advantage for quick and effective power grid connection access.



ENERGIZING THE GRID—COMPLIANCE WITH GRID CODES

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Grid code certification

Jenbacher genset availability
INNIO Group holds many different grid code-related compliance certificates/homologation as of 2024, and among these are the following (non-exhaustive list):

Germany

- Einheitenzertifikat VDE-AR-N 4110 for Jenbacher Type 2, Type 3, Type 4, Type 6, and Type 9 engines
- Einheitenzertifikat VDE-AR-N 4120 for Jenbacher Type 6 and Type 9 engines
- Component certificate for GPC/EZA in accordance with VDE-AR-N 4110/4120

Italy

- Statement of compliance for Norma CEI 0-16; V2:2021-06 (Italy) for Jenbacher Type 2, Type 3, Type 4, Type 6, and Type 9 engines

Belgium & Netherlands

- Homologation for Synergrid via C 10/26—DECLARATION OF CONFORMITY for power-generating units GLV ed2.12 (12/2019) for Jenbacher Type 2, Type 3, Type 4, and Type 6 engines

Poland

- Equipment certificate according to PTPiREE, 2021-04: Conditions and procedures for using certificates in the process of connecting power generating modules to power networks and PSE, 2018-12: Requirements of general application resulting from Commission Regulation (EU) 2016/631 of 14 April 2016 for Jenbacher Type 2, Type 3, Type 4, Type 6, and Type 9 engines applicable to SPGMs Type B, C, D

Spain

- Unit certificate following the rules of "Technical standard of monitoring the compliance of power generating modules according to EU Regulation 2016/631" version 2.1 for Jenbacher Type 3, Type 4, and Type 6 engines

INNIO Group's Jenbacher experts can support the connection process by providing all necessary documentation required by the system operator for the power generation units.



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Customer benefits with INNIO Group's Jenbacher gensets:

Faster time to market:
INNIO Group's proven grid code compliance helps streamline the connection and ancillary service provision processes, reducing delays and getting units connected to the power grid more quickly. This capability means significantly shorter time to market, which is essential in today's fast-paced energy sector.

Greater market access:
Grid code compliance enables access to markets with stringent compliance requirements, such as those in the European Union. Specific certificates for grid code compliance often are mandatory for grid connection in various member states.

Risk mitigation:
Ensuring power grid code compliance with Jenbacher solutions helps reduce the risk of penalties and power grid disconnection. This proactive approach helps prevent costly disruptions and potential asset damage.

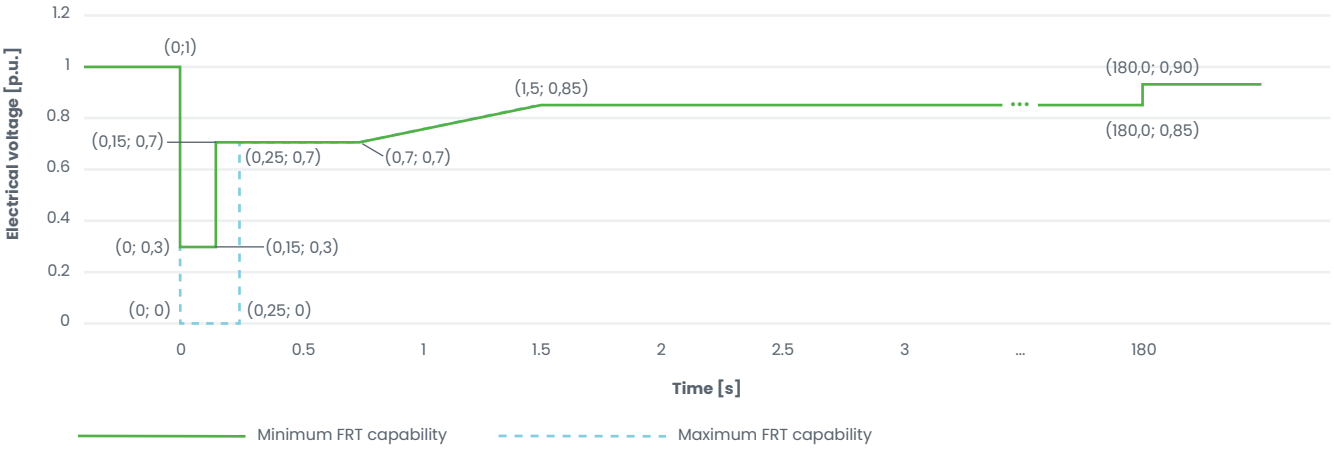
Additional advantages of static and dynamic power grid support:

Enhanced power grid stability:
Supports the integration of renewable energies, contributing to a more stable power grid.

Prevention of domino effects:
Mitigates the risk of cascading failures caused by power grid disturbances.

Reduced risk of power grid collapse:
Lowers the likelihood of power grid collapse and subsequent blackouts.

Stable decentralized energy supply:
Promotes a more reliable decentralized energy supply for the future.



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