ABB developed in 2009/2010 a compact Synchronous Generator for Diesel Electric Locomotive, the WGx560pb6. IEC Frame size is 560, rate power is 2.8 MW with efficiency over 96.9% @ 1800 rpm. ABB Traction Generators are IRIS certified.

### Main Specification:

<table>
<thead>
<tr>
<th>Certification:</th>
<th>IRIS (International Railway Industry Standard)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Standard compliance</td>
<td>IEC 60034 - IEC 61373</td>
</tr>
<tr>
<td>Power</td>
<td>2.8 MW</td>
</tr>
<tr>
<td>Nominal Output Voltage</td>
<td>1200 V</td>
</tr>
<tr>
<td>Operating Speed Range</td>
<td>600 – 1800 rpm</td>
</tr>
<tr>
<td>Mounting</td>
<td>Single / Double Bearing (IM 2405 / IM 2401)</td>
</tr>
<tr>
<td>Standard Ambient</td>
<td>-20 to +40 °C / 1000 mt amsl</td>
</tr>
<tr>
<td>Insulation/Temperature Class</td>
<td>H/H</td>
</tr>
</tbody>
</table>

### Design and Reliability

The ABB experience in electrical machines and interactions with principal European and Americans Diesel Engine Manufacturers are leading the design of ABB Traction Generators. ABB products are able to combine performances and reliability with the challenging requirements of weight and size demanded by new generation Locomotive designs.

The electrical dimensioning of the traction Generator is developed by ABB IT with dedicated calculation tools and FEM analysis verification.

The mechanical design is conducted performing FEM structural analyses in order to ensure the mechanical proprieties of the product. In order to reach the best integration and reliability on board with diesel engine, mechanical calculation was performed jointly with the customer. Stator, frame and shields group was analyzed considering static and fatigue loads. Endurance test was performed on the group completely assembled composed by diesel engine and generator, to verify the behaviour of shaft line components like generator rotor, flex plate, fly wheel and engine crankshaft (relevant bearing considered). Calculation were carried out on bearings, shaft line torsional and bending natural frequencies, shaft torque (stress analysis of shaft & welds) and resonant frequencies (displacements & stresses due to harmonic excitation).

Product and Process and FMEAs (Failure mode and effect analysis) were carried out in order to identify, quantify and mitigate possible risks, improving the Generator reliability. The evaluated Traction Generator MTBF (Mean Time Between Failure) fully satisfy the IRIS certification criteria. ABB Traction Generators also ensure good maintainability with easy access to components subjected to periodical checks.
ABB 2.8 MW Rail Traction Synchronous Generator WGx560pb6

Flexibility
ABB Traction Generator are designed to offer high performances, reliability and compactness. The standard cooling solution is force ventilation, in order to optimize the machine size; design variants are available for operation in extreme environmental conditions in terms of ambient temperature range and working altitude. Furthermore the machines can be customized in order to meet specific projects requirements: basing the design on the developed Generator core, ABB can offer customized solution for mounting configuration (Single/Double Bearing), shaft-end for Diesel motor interface, ambient condition worthiness, voltage output, thermal/insulation class and other features.

Quality
The quality assurance of the WGx560PB6 Traction Generator fulfills the requirements of IRIS certification and relevant standards. IRIS certification was obtained by ABB IT in 2011 and has to be renewed every year. The supply chain is audited and qualified; FAIs (First Article Inspections) for critical components are performed any time that design, the supplier or the manufacturing process change.

All the production phases are controlled and reported following the project Quality Control Plan, agreed with customers.

Sustainability
As per ISO 14001 guidelines the design and the manufacturing principles of the new WGX560pb6 generator is based on the environmental sustainability and waste reduction.

The high electrical efficiency allows to reduce energy consumption at any operative condition. Thanks to used materials for the equipment and the innovative design concept is moreover possible to maximize components recycling and reduction of raw material utilization.

[1] Rotor exciter with rectifier
[2] Rotor shaft
[3] Frame
[5] NDE Shield
[6] DE Shield

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