High impedance differential busbar protection REB650
Relion® 650 series
ABB introduces a new, unique and compact solution for high impedance differential protection. The numerical busbar protection REB650 IED (Intelligent Electronic Device) provides its users with a wide variety of application opportunities. Designed primarily for the protection of single busbars with or without sectionalizers in high impedance based applications, it also offers high impedance differential protection for generators, autotransformers, shunt reactors and capacitor banks. Its I/O capability allows you to protect up to three 3-phase high impedance differential protection zones with a single IED.

REB650 ensures fast fault clearance for all types of internal phase-to-phase and phase-to-earth faults in solidly earthed or low impedance earthed power systems. It can also handle all internal multi-phase faults in isolated or high impedance earthed power systems.

REB650 – ease of use from ready-to-use solutions
REB650 offers an optimum “off-the-shelf” ready-made solution for applications requiring high impedance differential protection. The type tested REB650 is delivered equipped and configured with complete protection functionality, and with default parameters for easy handling of products – from ordering, engineering and commissioning to reliable operation.
The 650 series IEDs introduce a number of innovations, such as a significantly reduced number of parameter settings and extended IED HMI functionality, including 15 dynamic three-color indication LEDs per page, on up to three pages, and configurable push-button shortcuts for different actions. In the 650 series IEDs, most basic parameters are set before delivery from the factory. You only need to set the parameters specific to your application. This allows you to quickly take your IEDs into operation. The application manual includes setting examples to support your protection engineers.

The REB650 IED continues ABB’s strong track record in high impedance differential busbar protection applications, starting from analog relay RADHA and other similar relays from previous generations. To date, these relays have been successfully serving utilities for over 50 years.

**Unique functional integration**

One REB650 is able to handle several high impedance differential protection zones. For instance, you can use it for one or up to three zones depending on your application. You can also utilize it to combine two main zones and a check zone in a single IED.

Among its top-notch features, REB650 incorporates complementary protection functionality consisting of versatile current and voltage protection functions. These functions can be used independent of the high impedance differential protection. Thus, one REB650 can integrate all protection functionality needed for a bus coupler. If required, the busbar protection operation can be released using the integrated phase undervoltage or residual overvoltage protection functions as an additional tripping criterion.

The users of REB650 will also benefit from the powerful integrated disturbance recorder that stores up to 100 disturbances. The pickup settings made directly in CT secondary volts reduce the need for re-calculting the current pickup and resistor values. This is another fact that contributes to taking the IED into operation faster than ever before.

**Designed to communicate**

REB650 features several communication protocols, such as IEC 61850-8-1. It utilizes ABB’s unique connectivity package concept, which simplifies the system engineering and reduces the risks of errors in system integration. A connectivity package contains a complete description of the specific IED, consisting of data signals, parameters, addresses and IED documentation. The signal data is configured automatically based on the information provided by the connectivity package to efficiently integrate the IEDs in ABB’s MicroSCADA Pro automation system.
Relion® – Complete confidence

High impedance differential busbar protection REB650 IEDs belong to the Relion® protection and control product family. The Relion product family offers the widest range of products for the protection, control, measurement and supervision of power systems. To ensure interoperable and future-proof solutions, Relion products have been designed to implement the core values of the IEC 61850 standard. With ABB’s leading-edge technology, global application knowledge and experienced support network, you can be completely confident that your system performs reliably – in any situation.
**Application examples**

H-type station. 1 1/2 breaker stations.

**REB650 Technology summary:**

<table>
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<tr>
<th>Features</th>
<th>Monitoring</th>
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<tbody>
<tr>
<td>• Fully IEC 61850 compliant</td>
<td>• Disturbance recorder</td>
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<tr>
<td>• Protection and monitoring integrated in one IED</td>
<td>- 100 disturbances</td>
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<td>• Extensive self-supervision including analog channels</td>
<td>- 40 analog channels (30 physical and 10 derived)</td>
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<td>• Four independent parameter setting groups</td>
<td>- 96 binary channels</td>
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<td>• Large HMI for visualization of single line diagrams and on-line measurements</td>
<td>- Event list for 1000 events</td>
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<td>• Integrated or detachable HMI with 1-5 m cable for flexible panel mounting</td>
<td>- Disturbance report</td>
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<td>• Accurate time synchronization via SNTP, DNP 3.0, IEC 60870-5-103 and IRIG-B serial interface</td>
<td>- Event and trip value recorders</td>
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<td>• Ethernet interface for fast and easy communication with PC</td>
<td>- Fault locator</td>
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<td>• Signal matrix for easy configuration of binary and analog signals</td>
<td>- Event counters</td>
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<td>• User management and authority handling</td>
<td>- Supervision of AC input quantities</td>
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**Configured solutions**

• Complete busbar protection for two busbar sections (zone 1 and 2), with the possibility for check zone. The same solution can also be used for other application areas, such as generator, reactor and transformer protection.

**Most important protection functions**

• Phase segregated 3-zone high impedance differential protection
  - Four step directional phase overcurrent protection with definite and inverse time characteristics
  - Four step residual non-directional/directional overcurrent protection with definite and inverse time characteristics and with voltage, current or dual polarization, based on zero sequence or negative sequence quantities
  - Thermal overload protection
  - Breaker failure protection
  - Pole discordance protection
  - Two step negative sequence directional overcurrent protection

• Voltage
  - Two step undervoltage protection
  - Two step overvoltage protection
  - Two step residual overvoltage protection

• Secondary system supervision
  - Fuse failure supervision
  - Breaker close/trip circuit monitoring

**Control functions**

• Selectable operator place allocation
• Versatile switch with two positions
• Selector switch with up to 32 positions

**Logic**

• Tripping logic
• Trip matrix logic
• Configurable logic blocks

**Technical details are available in the REB650 Product Guide.**