

Fault management for grid automation

Advanced fault location solution



Power distribution systems are undergoing a major evolution with distributed generation from renewables gaining ground as part of the energy mix. Energy demand is continually rising and so is the demand for higher reliability and availability of energy supply. This change calls for increasing the level and degree of automation in today's distribution networks. ABB's future-proof, advanced fault location solution meets these requirements and offers fault management with unequalled accuracy.

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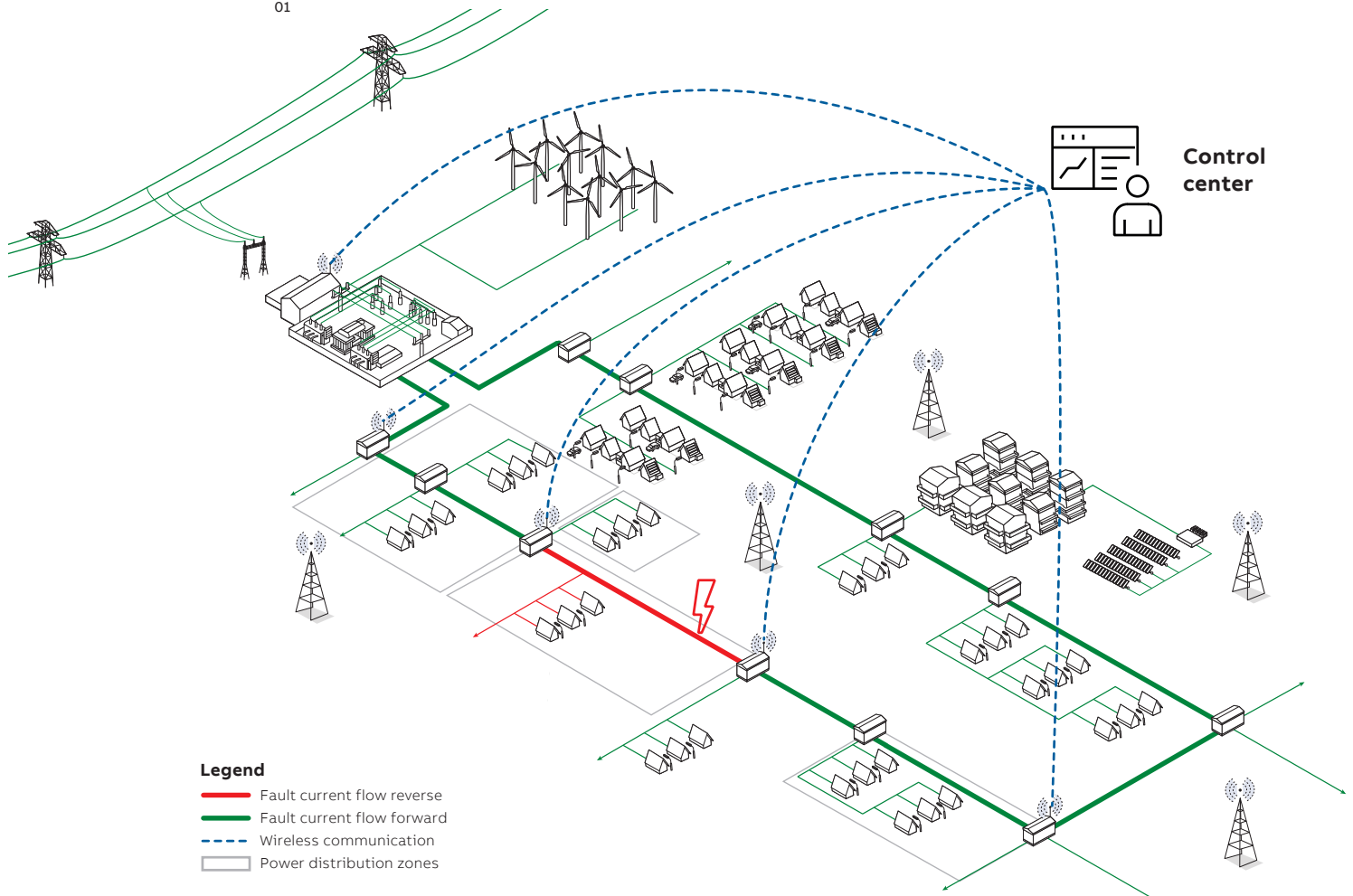
Advanced fault location solution

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01 Automation, communication and especially accurate fault location significantly contribute to accelerating the fault isolation process.

To meet the changing requirements of today's distribution networks, ABB offers a ready-made, easy-to-install, advanced fault location solution with power flow management, equally suitable for new installations as well as for retrofitting secondary distribution air and gas-insulated switchgear. This optimized solution combines

ABB's technologically advanced sensors with the remote I/O unit RIO600 and its unrivaled fault passage indication (FPI), which is based on ABB's unique earth-fault detection algorithm. Accurate fault passage indication significantly contributes to accelerating the fault location process.

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Extended automation with power flow management

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01 The compact secondary substation (CSS) with ABB's advanced fault location solution is ready-made for fast deployment.

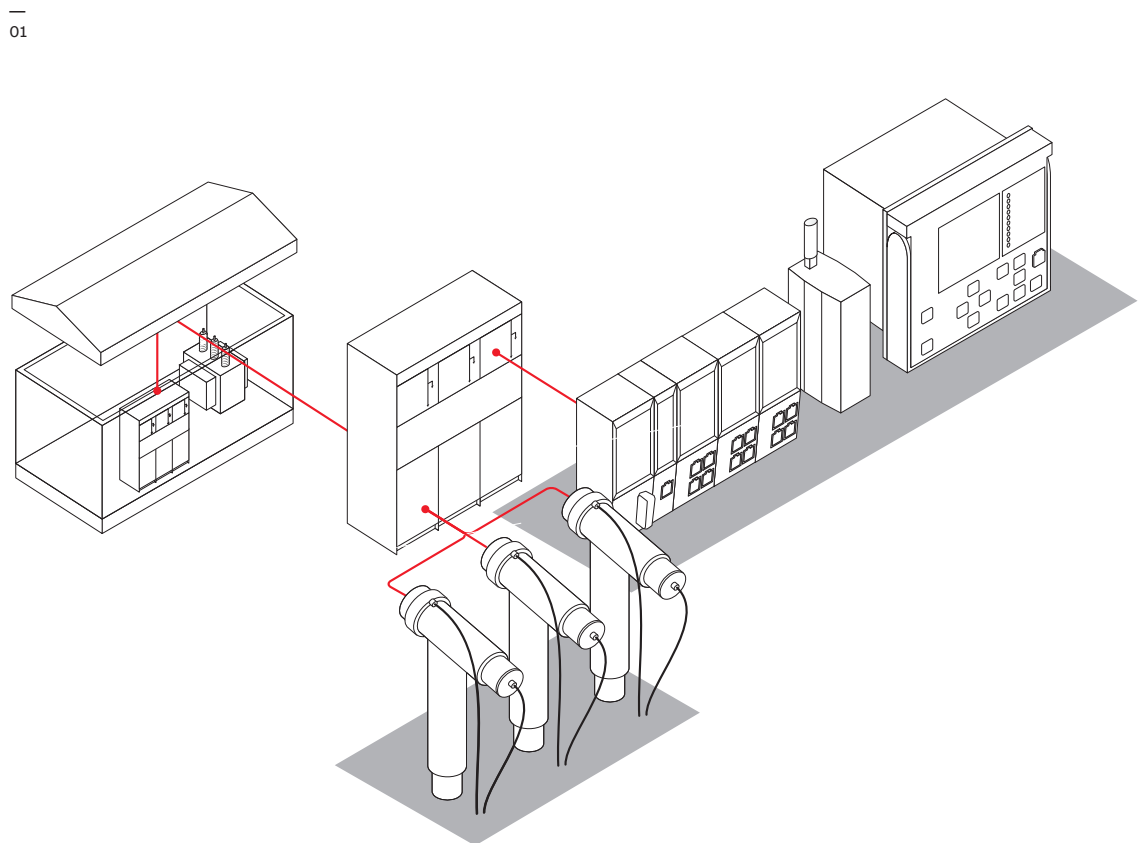
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02 A typical automated CSS with ABB's advanced fault location solution is being deployed.

The level of automation in distribution network varies from one section to another, depending on supply criticality, the likelihood of faults and the need for remote control. A distinction can be made between situational awareness, fault isolation and power restoration, power flow management and protection selectivity.

Locating the fault quickly and accurately, as well as applying selective fault isolation and quick restoration of power, are of crucial importance to lower the frequency and shorten the duration of faults. Adding power flow management ensures that overloads and subsequent interruptions in power supply are reduced to an absolute minimum.

The remote I/O unit RIO600 and the sensors installed in a medium-voltage RMU (ring main unit), or alternatively on the separate cable connectors, enable high-accuracy current and voltage measurements. As a result, the power flow can be actively monitored and managed. Sensors also ensure perfect linearity throughout the whole measurement range, which in turn extends the lifetime of the entire fault location solution.

Power flow management is especially important in networks with distributed generation from renewable energy sources, and in networks with energy storages and ad hoc charging of electrical vehicles. Power flow management enables optimizing the dimensioning of the network by allowing access to information that facilitates network maintenance. This, in turn, ensures maximum return on network investments.



Advanced fault passage indication with the remote I/O unit RIO600

RIO600 expands the number of digital and analog inputs and outputs of Relion® relays as well as the substation management unit COM600, in both primary and secondary substations. In grid automation applications, RIO600 can be used for advanced fault passage indication, reporting the information further to the upper-level system for faster fault restoration.

By applying ABB's unique, multifrequency admittance-based earth-fault detection algorithm to fault passage indication (FPI), RIO600 is now able to detect all types of earth faults with unequaled accuracy, irrespective of the type of distribution network. In symmetrical

networks, ABB's advanced fault location solution allows a sensitivity as high as 10 k Ω of the fault resistance. Especially in compensated and isolated neutral networks, where accurate and selective earth-fault detection is challenging, this is a long-awaited breakthrough. This easy-to-use earth-fault detection algorithm is already used by ABB's Relion protection and control relays. Applying the same algorithm throughout the entire distribution network is also highly beneficial from an asset management and protection selectivity perspective.

02



Future-proof sensor technology for retrofit installations

01 Ensured linearity throughout the whole measurement range

02 KECA 80 D85 — with a clamping system for fast and easy installation

03 KEVA C — for easy replacement of original insulated plugs in cable connectors

04 KEVA B — for use as either post insulator or stand-alone voltage sensor

ABB's current and voltage sensors have been designed for secondary switchgear to ensure perfect linearity throughout the whole measurement range. The sensors are compact and lightweight, and are easy and secure to install. As a result, time-consuming network upgrade maintenance planning and scheduling, and the duration of the power outages in the distribution network can be minimized.

The current and voltage sensors can be used for both measuring and protection purposes. The current sensor is based on the Rogowski-coil and consists of an air-core winding, which is immune to saturation due to the lack of a ferromagnetic core. The voltage sensor is based

on a non-saturable, resistive divider and generates an output signal that is proportional to the primary voltage. The sensor can be safely connected to the remote I/O unit RIO600, since the measurement signal of the sensor is a low-voltage signal.

Sensors for secondary air-insulated switchgear (AIS):

- Current sensors KECA 80 D85 (split core type)
- Voltage sensors KEVA B

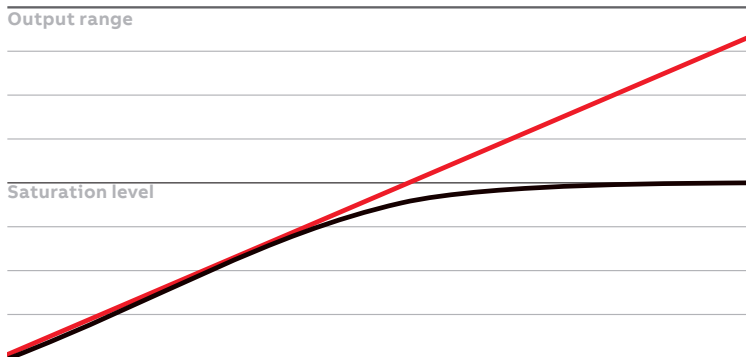
Sensors for secondary gas-insulated switchgear (GIS):

- Current sensor KECA 80 D85 (split core type)
- Voltage sensors KEVA C.

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Output range

Saturation level



Sensor output characteristic

U_s

Current transformer characteristic

I_s

02



03



04





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