

Fault Detector

Overview

In the scope of the latest **Smart Power** solutions for Smart Grids, Efacec introduced the **G Fault**, part of the **SmartGate** product family. The **G Fault** is a standalone fault detector device, designed to be used in MV networks. It includes fault detection and measurement functions, isolated digital inputs, relay digital outputs and AC analog inputs.

As a fault detector, **G Fault** includes phase and neutral overcurrent and current unbalance fault detection with capabilities for fault direction determination, and provides means for local and remote fault signaling and cancelation.

As a measurement device, **G Fault** provides segregated phase current and voltage measurements together with measured or calculated neutral current. Additionally it provides calculated values for frequency, angles between voltages and currents, active power and reactive power by phase.

In addition to the local I/O **G Fault** devices also include one RS 485 standard communication interface through which standard slave protocols can be deployed.

By introducing **G Fault** units the user benefits from integrated fault detection and measurement within the distribution automation scheme, thereby allowing significant improvements on service indexes such as SAIDI, CAIDI, ASUI, ASAI or ENS.

By deploying **G Fault** units together with the **G Smart** controller in true Smart Grid applications, the user benefits from additional plug-and-play integration together with innovative value-adding applications such as automated FDIR, meter management, condition monitoring, LV automation, etc.

Key Features

- Fault detection (ANSI 50/50N, 51/51N, 67 and 46)
- Fault external signaling
- Fault reset input
- Digital I/O for circuit breaker control or generic I/O:
 - 8 isolated digital inputs and 8 relay digital outputs
- AC analogue inputs:
 - 4 current inputs and 3 voltage inputs
- Communication-ready

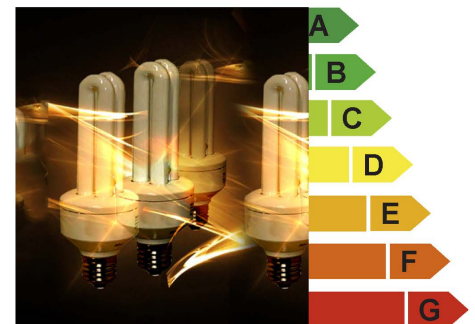
Customer Benefits

- Increase the reliability of the system
- Easy to install
- Quickly and efficiently detect typical faults
- High availability and low maintenance
- Integrates I/O expansion and communications with fault detection



G Fault in a polycarbonate enclosure

A **SmartGate** Product



Product Features

Overcurrent Fault Detection

G Fault provides instantaneous or time-defined overcurrent function (ANSI 50/51, 50N/51N) through four sets of parameters corresponding to four simultaneous fault stages. Each stage can be disabled or enabled and is fully adjustable regarding overcurrent setting and operating time. The overcurrent function can detect line to earth or line to line fault.

Fault Directionality

Together with overcurrent fault detection **G Fault** units also allow fault directionality indication using voltage measurements. The directional characteristic can be user defined to cope with line impedance.

Current Unbalance Fault Detection

In addition to overcurrent fault detection **G Fault** units include current unbalance detection (ANSI 46) with four stages with independent operating time. Each stage can have a different operating principle, either by monitoring the amplitude the negative sequence current or by monitoring the ratio between the negative and positive current components.

Fault Signaling

The fault is signaled through the communication interface, by dry contact output and through the on-board LED display.

Fault Cancelation

After fault condition clearance, the active fault signal can be reset by:

- Dedicated digital input
- Auto-cancelation by voltage restoration
- Any of the above conditions (logical-OR)
- Remote control
- Auto-cancelation by time delay

Measurement

Two measurements of current (per phase and neutral) and voltage (per phase) are provided: RMS value and magnitude of the fundamental component (50 or 60 Hz), calculated based on 64 samples obtained in each cycle.

Frequency estimation is made over voltages waveform analysis, with phase swap if its magnitude gets below of a minimum threshold, guaranteeing measurement even if a voltage phase is compromised in the presence of a close-in fault.

The angle between voltage and current is measured per phase on each cycle.

G Fault units also calculate active and reactive power by phase using the RMS values of voltages and currents by phase and their electrical angles.

Communications

Available at the RS 485 interface **G Fault** units provide configuration-free Modbus protocol, by default, as well as IEC 60870-5-101 or DNP 3.0 as an option. Telecontrol and indications, as well as function parameters, are accessible and modifiable through the protocol interface for maximum integration.

Configuration and Management

The **G Fault** requires minimal configuration, mainly fault detection settings and protocol addressing. Settings can be adjusted either through local USB port or the communication interface. It is therefore possible to create user-defined schemes for maximum sensitivity to faults that can also be adjusted remotely by stage activation or setting modification. Through the local console interface it is also to monitor and manage the device.

Fault Detection

Independent phase overcurrent (50/51)	●
Directional phase overcurrent (67)	●
Neutral overcurrent (50 N/51 N)	●
Current unbalance (46)	●

Fault reset by

Digital input	●
Time delay	●
Voltage restoration	●
Remote control	●

Fault signaling by

On-board LED display	●
Telesignaling	●
Dry contact output	●

Measurements

RMS value of phase currents	●
Fundamental component of phase currents	●
Direct and inverse component of phase currents	●
RMS value of the neutral current	●
Fundamental component of neutral current	●
RMS value of phases voltages	●
Fundamental component of phase voltages	●
System frequency	●
Angle between phase voltage and current	●
Active Power (3 phase)	●
Reactive Power (3 phase)	●

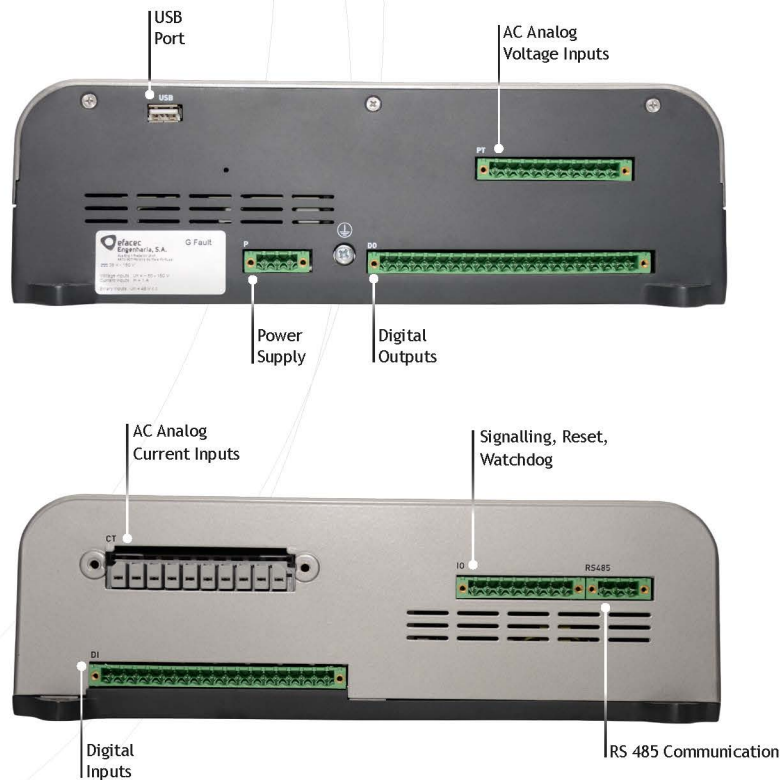
Communications

ModBus RTU/ASCII	●
IEC 60870-5-101 (please contact for protocol options)	○
DNP (please contact for protocol options)	○
Others (please contact)	○

● - Base Function | ○ - Optional Function

Technical Characteristics


Platform	
Dimensions	276 x 87.5 x 159.1 (H x W x D, mm)
Weight	2 kg
Power Supply	39...150 V d.c.
Serial Ports	1 x RS 485
USB Port	1 (console interface for local diagnostics and configuration)
Standards	
CE Mark	●
I/O	
AC current inputs (phase)	3
AC current input (neutral) - Neutral current may be internally calculated if external CT is not available	1
AC voltage inputs - Required for directionality and voltage-dependent measurement	3
Digital input for local fault signaling reset	1
Digital inputs for local process supervision	8
Digital output for local fault signaling	1
Digital outputs for process control	8



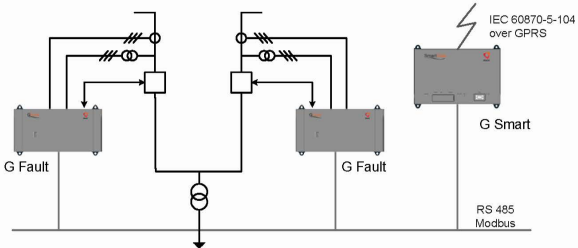
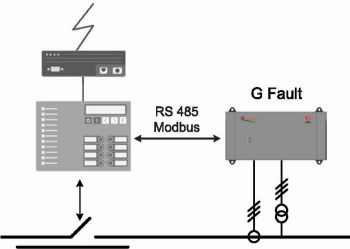
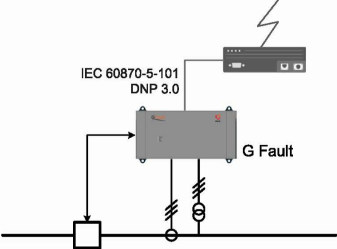
Product Family Overview

The **SmartGate** family is composed by products targeted for modularity, offering a set of configurable functions, according to the requirements of each project. These characteristics are adequate for the implementation of phased solutions, thus, protecting the customer's initial investment.



SmartGate Product Family	
G Smart Smart Controller / Meter Concentrator	Smart controller, with built-in Web server, I/O, data storage, fault detection, communications, condition monitoring, metering and power quality analysis. By integrating multiple automation functions with LV smart meter concentration through multiple standard communication interfaces, G Smart units enable true smart grid solutions from MV network automation through street lighting, EV charging and microgeneration control up to LV network automation.
G Fault Fault Detector	Standalone fault detector device or small RTU for distribution networks. G Fault units can also be deployed as I/O and fault detector extenders for other SmartGate products.
 automation studio Integrated Engineering Environment	Engineering tool for device configuration and management (communications, database, etc.), including automation functions according to IEC 61131-3 standard.

Application Overview

G Fault Example Applications	
Smart RMU/ Secondary Substation <ul style="list-style-type: none"> • Integrated with G Smart controller • MV cell monitoring and control • MV fault detection and measurement • Smart Grid applications 	
Fault Detector for MV network <ul style="list-style-type: none"> • Integration with existing RTU via I/O or RS 485 interface • MV fault detection and measurement • RTU I/O Extension 	
Integrated Fault Detector and small RTU <ul style="list-style-type: none"> • Remote monitoring and telecontrol • MV fault detection • Measurement 	



Automation Business Unit

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