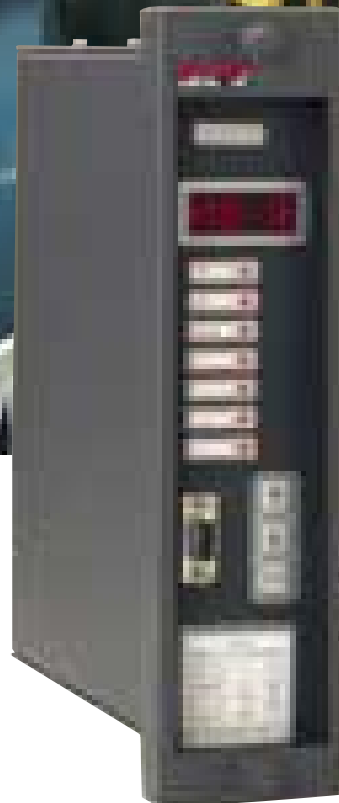




Compatible
ZIVersys®



FGI

Frequency Protection Terminal
Protection, Metering and Communications



Description

The **FGI** is a powerful, microprocessor-based relay designed with state of the art digital technology.

Incorporated into the unit are overfrequency, underfrequency, overvoltage, and undervoltage protection elements, complemented by metering and communication functions.

Each terminal unit can be used either individually or integrated into larger systems with other protective devices (**CPI, MXI, TPI**, etc.). Local and remote communication ports facilitate either type of application.

When the **FGI** is part of an integrated substation protection and control system, it is linked to a substation Central Unit using the remote communication port. The Central Unit is responsible for external communication and, if necessary, will emulate specified communications protocols.

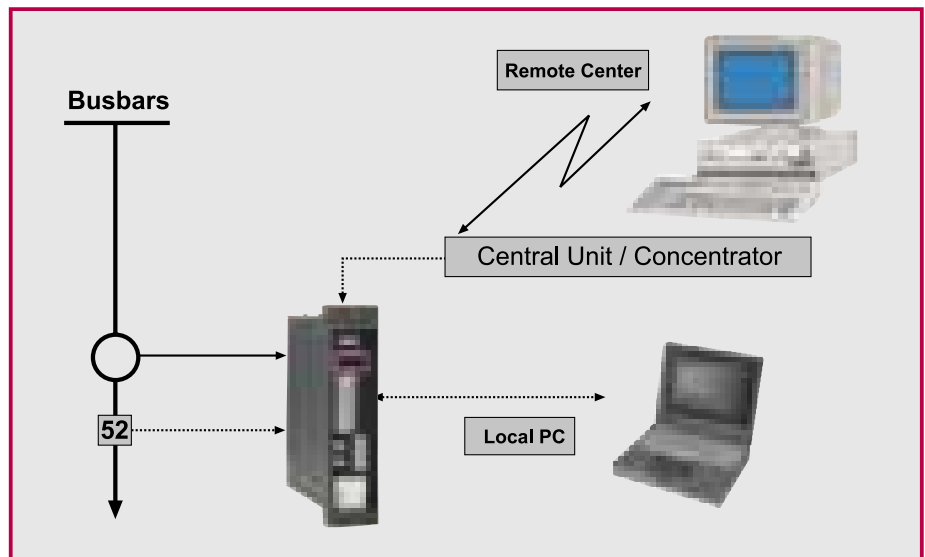
Application

Frequency is one of the defining parameters for "Power Quality" in electrical networks. During normal system operation (balanced generation and load) the power system frequency remains stable and usually very close to its rated value.

Features

The following are standard features incorporated into **FGI** terminal units

- **8 LED targets (7 programmable)**
- **Trip output**
- **Close output (FGI-B only)**
- **2 configurable digital inputs**
- **3 auxiliary outputs (2 programmable)**
- **Local and remote communication interface**
- **Metering: frequency and voltage**
- **Sequence of events recording**



When fault conditions are present or in this situations where the generation - load balance is disturbed, the frequency value changes upsetting the system stability. The **FGI** provides the system with a sensitive, fast and reliable protection against these abnormal situations.

FGI-B models automatically restore service to those circuits that have been cleared due to a load shedding initiated by the relay.

Overfrequency and underfrequency protection are also required at generator interconnection points, complemented with undervoltage, overvoltage and zero sequence voltage protection. **FGI-C** models include these functions.

Out-of-step protection is also required for interconnection systems. The out-of-step conditions may cause severe damage to the generator in cases where the interconnection circuit is provided with recloser. Therefore the protective relay should detect an out-of-step situation within 30 ms and trip the tie breaker. This protection is also included in **FGI-C** models.

Overfrequency and underfrequency protection are required in every substation, regardless of the voltage level.

Human-Machine Interface


FGI units can be accessed in two different ways:

• Local Access:

- 1. Keypad.** The **FGI** lets the user to access and change almost every function in the relay by scrolling through menus via the keypad (3 keys). This feature allows changes without the use of a computer.
- 2. Push Button.** The relays can be furnished with a sealable protective cover to restrict access to the keypad. With the cover installed, access to primary **FGI** information and functions is still available through the cover push button. Pressing the push button cycles through various information screens, displaying information and allowing operations such as:

- Last trip data
- Primary metering values
- LED's and last trip data reset

3. Display. Four (4) character LED type

4. Local PC: **FGI** relays are provided with an RS-232 front port to allow local communication to a PC via a null modem cable. The relay can be accessed with the user-friendly  software package.

• Remote Access

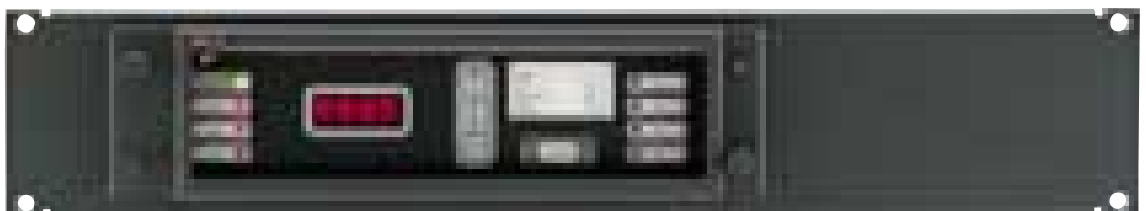
FGI units are provided with a rear communications port. This connection permits remote access via modem, or it can be used to include the **FGI** in an existing system (via RTU, Substation Central Computer or SCADA).



Assistance in U.S.A.
and Canada.



Close view of display



8FGI Model with an adaptor to fit into a 2 standard units high 19" rack



Communications

The **Vercom** communications software program communicates directly with all types of **RIV** terminal units, either locally (via RS-232 front port), or remotely (via rear port).

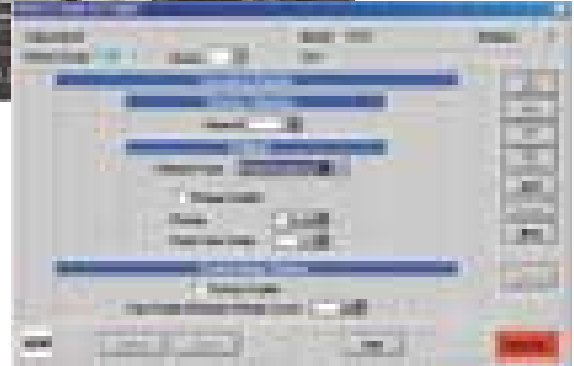
Vercom provides the user access to settings, local operations, input and output programming and data records. The program is password protected and can designate various levels of access to individual users.

Vercom is an intuitive, Windows™ based program. The structure of the software consists of menus and graphical user interface dialog boxes. Each sub-menu prompts the user to enter data or make a selection among the available options.

Vercom enables the user to program settings off-line. The information can be easily stored in the software database to be uploaded to the relays in the future.



Screens from the **Vercom** communications program for PC.




System incorporating different protective relays in a 19" rack

Enclosure

3FGI unit dimensions are 1/7 of a 19" rack wide and 6 standard units high. This relay can be supplied in a 19" wide rack and 6 standard units high enclosure, as part of a system with other protective relays, all of them factory interconnected. **8FGI** units are horizontally mounted and can be supplied with an adaptor to fit into a 2 standard units high 19" rack.

Protection Settings

General Settings

VT Ratio	1 - 4000
Event Mask	YES / NO (setting only available in )

Frequency Protection

Unit Enable	YES/NO (*)
Unit Type	Overfrequency / Underfrequency
Pick-up	40.00 Hz - 70.00 Hz
Time delay	0.00 s - 20.00 s
Undervoltage block	YES/NO (*)
Undervoltage level	40 V - 120 V

Voltage Protection

Phase Units (3 x 27/59)	
Unit Type	Overvoltage / Undervoltage
Time Delay Unit	
Unit Enable	YES/NO (*)
Voltage - Time Characteristic	Inverse Curve / Definite Time
Definite Time Pick-up	20 V - 140 V
Definite Time Delay	0 s - 99.9 s
Curve time dial	0.05 - 1.00
Instantaneous Unit	
Unit Enable	YES/NO (*)
Pick-up	20 V - 220 V
Time Delay	0 s - 99.9 s
Neutral Unit (1 x 59N)	
Unit Enable	YES/NO (*)
Pick-up	4 V - 60 V
Time Delay	0 s - 99.9 s

Out-of-Step Protection

Unit Enable	YES/NO (*)
Pick-up	1° - 25°
Time delay	0.05 s - 20.00 s
Trip Latching Time	0.00 s - 20.00 s

(*) Unit disabling via HMI is done by setting the pickup value to zero.



Rear view of relay



Technical Characteristics

Power Supply Voltage*

24-48 V dc ($\pm 20\%$)
110-125 V dc ($\pm 20\%$)
220-250 V dc ($\pm 20\%$)
Rated Power Consumption: 7 W at 125 V dc

Analog Voltage Inputs

Rated voltage (Vn)	110 Vac, 50Hz 120 Vac, 60Hz
Thermal Withstand Capability	2 Vn (continuous)
Burden	< 0.5 VA (Vn = 110 V)

Digital Inputs

Input Voltage Range*	24-125 Vdc ($\pm 20\%$) 48-250 Vdc ($\pm 20\%$)
Burden	< 5 mA

Auxiliary Outputs

Connection Capability	2000 W
Breaking Capability	75 W (48Vdc) 40 W (100 Vdc)
	1000 VA
Switching Voltage	250 Vdc
Continuous Current	3 A
Make and Carry	5 A (30 sec)

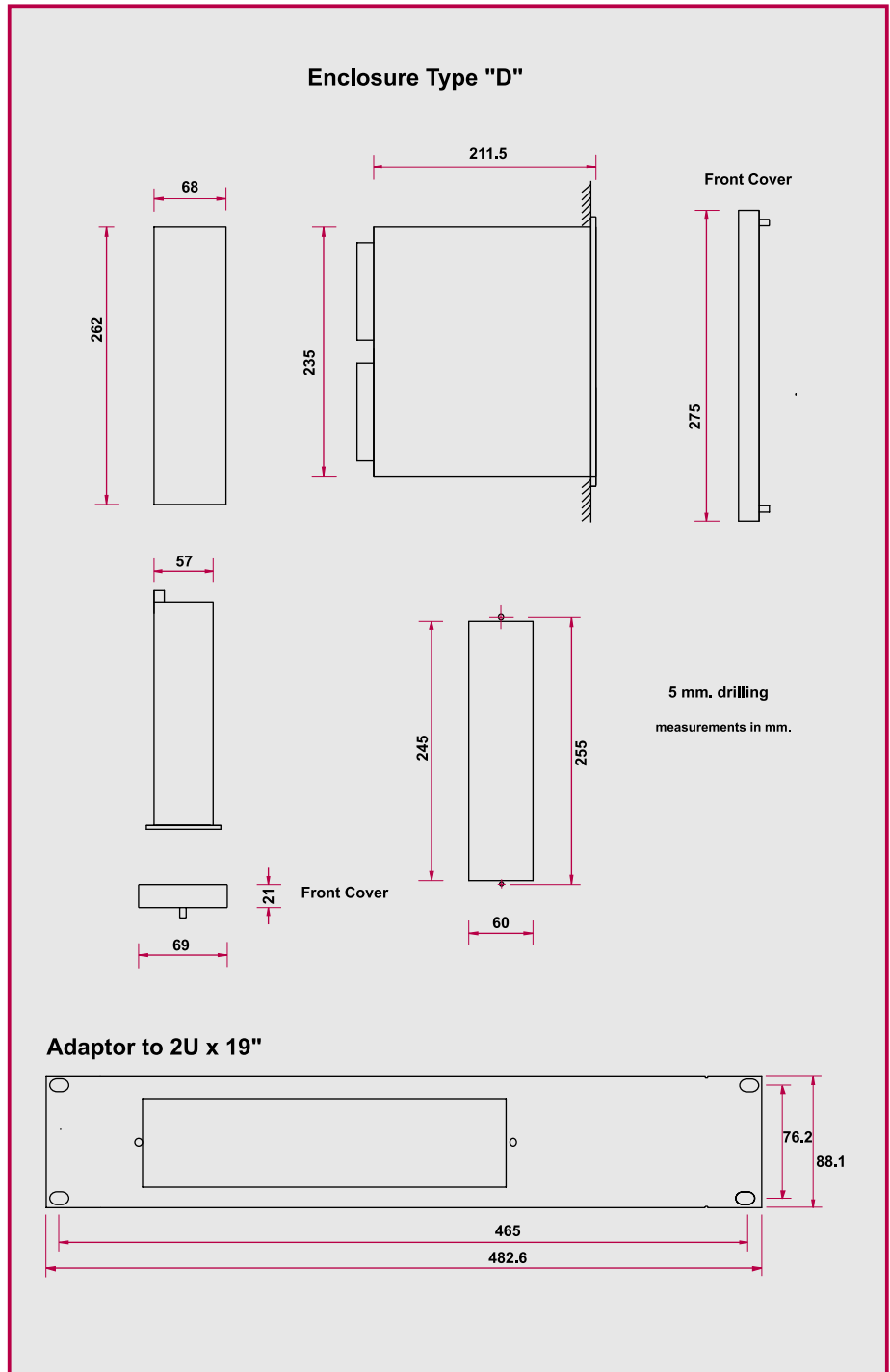
Trip & Close Contacts

Connection Capability	2500 W
Breaking Capability	150 W (48Vdc) 55 W (100 Vdc)
	1250 VA
Switching Voltage	250 Vdc
Continuous Current	8 A
Make and Carry	30 A (1 sec)

Voltage Metering Accuracy

Rated frequency ± 3 Hz	<5%
Display	<5% ± 1 V

Dimensions



* Model selectable

Model Selection

Model selection is determined using the following figure, according to the characteristics required:

Enclosure	
Vertical Mount	3
Horizontal Mount	8

Functions	
81 Over/Under	A
81 o/u for load shedding	B
81 o/u + 2x(3x27/59) + 78 + 59N	C

Power Supply	Status Contact Inputs	
24-48 Vdc (*)	24-48 Vdc	1
110-125 Vdc (*)	24-125 Vdc	2
220-250 Vdc (*)	48-250 Vdc	3

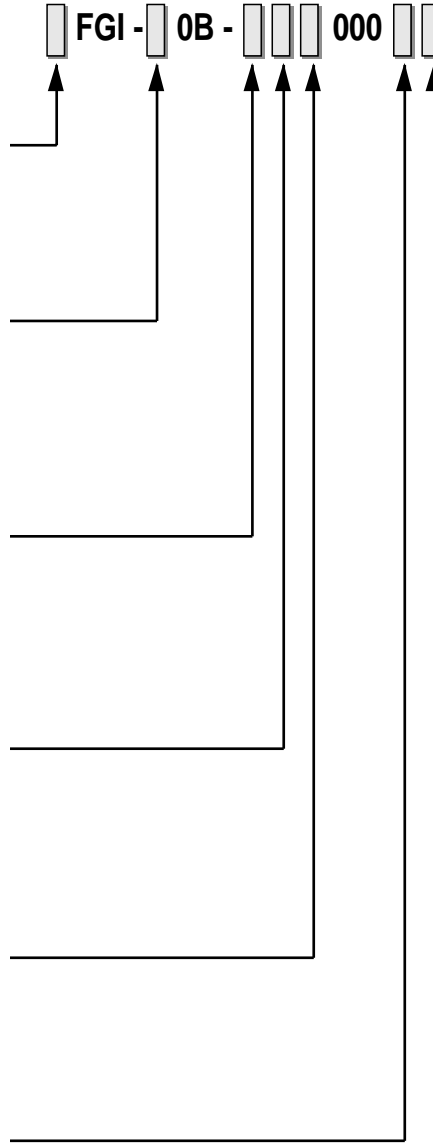
(*) +/- 20%

Frequency / Rated Voltage / Language	
50 Hz / 110 \ 110 3 Vac / Spanish	1
60 Hz / 120 \ 120 3 Vac / English	3
50 Hz / 110 \ 110 3 Vac / English	B
60 Hz / 120 \ 120 3 Vac / Spanish	D
60 Hz / 120 \ 120 3 Vac / Portuguese	F

Communications	
RS232 Front	1
RS232 Front + Plastic Fiber (1mm) Rear	2
RS232 Front / Glass Fiber (SMA) Rear	3
RS232 Front / Glass Fiber (ST) Rear	4

Enclosure Type	
6U x 1/7 of 19" rack	D
1U x 19" rack mount	V

8FGI models are designed to be mounted on 1 rack wide x 2U high adapter element.



Communications Protocol

Standards and Type Tests

Insulation Test	IEC-255-5
Between Circuits and Ground	2 kV, 50/60 Hz for 1 minute
Between Independent Circuits	2 kV, 50/60 Hz for 1 minute
Impulse Test	IEC-255-5
	5 kV; 1,2/50 µs; 0,5 J

1 MHz Disturbance Test	
IEC-255-22-1 Class III	
Common Mode	2,5 kV
Differential Mode	1,0 kV

Fast Transient Disturbance Test	
IEC-255-22-4 Class IV	
	4 kV ±10%

Radiated Electromagnetic Field Disturbance Test	
IEC-1000-4-3	
Amplitude Modulated	10 V/m
Pulse Modulated	10 V/m

Electrostatic Discharge Test	
IEC-255-22-2 Class III	
	8 kV ±10%

Radio Frequency Emissivity	
EN 55011	

Temperature	
IEC-255-6	
Operating Range	-10° C to +55° C
Storage Range	-25° C to +70° C
Humidity	95% (non condensing)

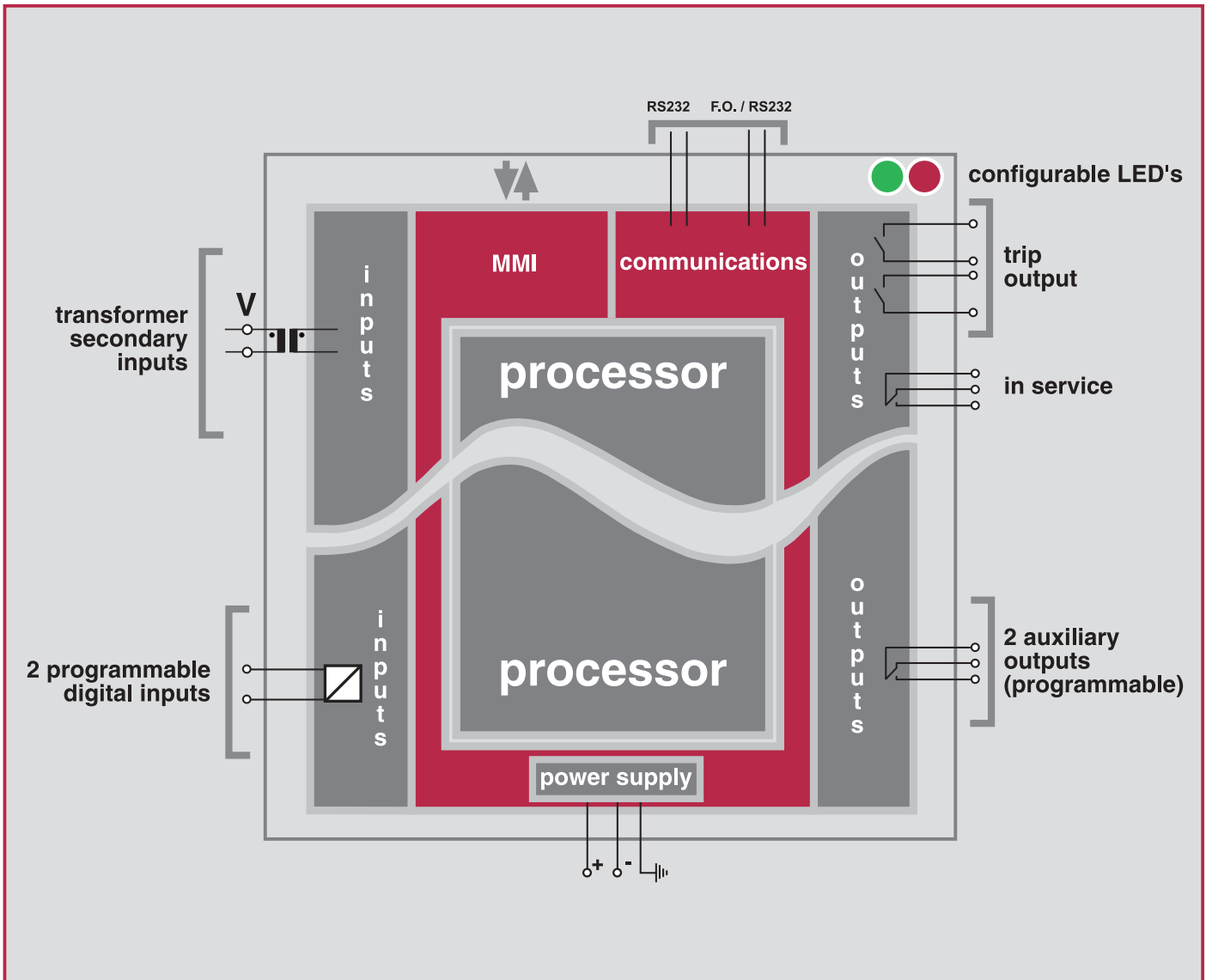
Power Supply Ripple	
IEC-255-11	
	< 20%

Vibration Test (sinusoidal)	IEC 255-21-1 Class I
Shock and Bump Test	IEC 255-21-2 Class I

FGI terminals comply with the EEC 89/336 standard of electromagnetic compatibility



Generic Block Diagram



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