Basler Electric’s BE3-GPR generator protective relay offers multiple protective features in a single package. Its microprocessor-based design provides high accuracy, reliability and repeatability. It is extremely easy to set up with an IBM compatible PC or from a menu-driven settings screen or from the front panel. The digital readout makes calibration quick, easy, and accurate without the need to bench test the relay to verify settings.

FEATURES

- Microprocessor-based design
- Up to 10 protective functions
- Displays relay set points
- Two versions, stand-alone and paralleled
- Front panel programmability
- PC programmable
- True RMS sensing
- Isolated current inputs
- Adjustable trip set points
- Adjustable reset set points
- Adjustable time delays for each function
- Accepts single phase, three phase 3 or 4 wire voltage inputs
- 12 or 24 Vdc power inputs
- IEEE C37.90.1-1989 for Surge Withstand
- IEEE C37.90.1-1989 for Fast Transient
- UL Standard 508 recognized
- CSA Standard 14 certified
- Accepts 1 or 5 Amp CT secondaries

WINDOWS® SOFTWARE
Interface for setting and communicating with Basler products (standard)
Request BESTCOMS-BE3GPR-32 (Windows® 95, NT, 98, Me)

ADDITIONAL INFORMATION

INSTRUCTION MANUAL
Request Publication 9278200993

TIMING CURVES
Request Publication 9252000999

ORDERING INFORMATION
Page 8
DESCRIPTION

BE3-GPR (Generator protective relay) utilizes microprocessor-based technology to provide total generator protection in a single package. This microprocessor design allows for exact set point adjustment and precise generator system protection. BE3-GPR provides multiple functions in a single case, and that adds up to significant installation and setup savings. BE3-GPR allows for direct setup via a PC for easy, fast setup. Low sensing burdens mean that BE3-GPR does not require dedicated PTs and CTs. Optional protection features allow for customizing the BE3-GPR to meet your system's requirements.

PROTECTIVE FUNCTIONS

BASIC STAND-ALONE GENERATOR VERSION

- 27/59 Under/Overvoltage
  - Trip points are settable from 70 to 600 Vac in 1 volt steps.
  - Reset set points are settable from 70 to 600 Vac in 1 volt steps.
  - Trip timing is adjustable from 0-20 seconds in 1 second steps.

- 810/U Under/Overfrequency
  - Trip points are settable from 35 to 75 Hz in 0.1 Hz steps.
  - Reset set points are settable from 35 to 75 Hz in 0.1 Hz steps.
  - Trip timing is adjustable from 0-20 seconds in 1 second steps.

- 81U Underfrequency
  - Trip point is settable from 35 to 75 Hz in 0.1 Hz steps.
  - Reset set points are settable from 35 to 75 Hz in 0.1 Hz steps.
  - Trip timing is adjustable from 0-20 seconds in 1 second steps.

BASIC PARALLELED GENERATOR VERSION

- 27/59 Under/Overvoltage
  - Trip points are settable from 70 to 600 Vac in 1 volt steps.
  - Reset set points are settable from 70 to 600 Vac in 1 volt steps.
  - Trip timing is adjustable from 0-20 seconds in 1 second steps.

- 810/U Under/Overfrequency
  - Trip points are settable from 35 to 75 Hz in 0.1 Hz steps.
  - Reset set points are settable from 35 to 75 Hz in 0.1 Hz steps.
  - Trip timing is adjustable from 0-20 seconds in 1 second steps.

- 81U Underfrequency
  - Trip point is settable from 35 to 75 Hz in 0.1 Hz steps.
  - Reset set points are settable from 35 to 75 Hz in 0.1 Hz steps.
  - Trip timing is adjustable from 0-20 seconds in 1 second steps.

- 32R Reverse Power
  - Trip point is settable from 50 to 999 Watts in 1 Watt steps.
  - Reset set points settable from 50 to 999 Watts in 1 Watt steps.
  - Trip timing is adjustable from 0-20 seconds in 1 second steps.
  - Style Option “P” provides single element reverse power protection. Style Option ”W” provides three phase three element reverse power protection.

OPTIONAL PROTECTIVE FUNCTIONS

- 25 Sync Check with Dead Bus
  - (Paralleled version only)
  - Phase Angle is settable from 2 to 20° in 1° steps.
  - Voltage difference is settable from 1 to 100 Vac in 1 volt steps.
  - Time delay is adjustable from .2-2 seconds in 0.1 second steps.
  - Slip frequency is adjustable from .1 to 1.0 Hz in .1 Hz steps.
  - Dead bus is adjustable from 10 to 50 volts in 1 volt steps.
  - Breaker closure is selectable for Gen Hz > Bus Hz only or with Gen Hz > or < Bus Hz.
PROTECTIVE FUNCTIONS, Continued

OPTIONAL PROTECTIVE FUNCTIONS (Continued)

- **47** Phase Balance
  - Trip point is settable from 5 to 100 Volts in 1 Volt steps.
  - Reset set points are settable from 5 to 100 Volts in 1 Volt steps.
  - Trip timing is adjustable from 0-20 seconds in 1 second steps.

- **40** Loss of Excitation
  - Measures Reactive Current into the paralleled generator.
  - (Paralleled version only)
  - Trip point is settable from 0.15 to 2.5 in 0.01 Amp steps (5 Amp).
  - Trip point is settable from 0.03 to 0.5 in 0.01 Amp steps (1 Amp).
  - Reset point is settable from 0.15 to 2.5 in 0.01 Amp steps (5 Amp).
  - Reset point is settable from 0.03 to 0.5 in 0.01 Amp steps (1 Amp).
  - Trip timing is adjustable from 0-20 seconds in 1 second steps.

- **51N** Neutral Ground Fault
  - Trip point is settable from 0.2 to 3 in 0.01 Amp steps (5 Amp).
  - Trip point is settable from 0.04 to 0.6 in 0.01 Amp steps (1 Amp).
  - Reset point is settable from 0.2 to 3 in 0.01 Amp steps (5 Amp).
  - Reset point is settable from 0.04 to 0.6 in 0.01 Amp steps (1 Amp).
  - Trip timing is adjustable from 0-20 seconds in 1 second steps.

- **51/27R** Three Phase Time Overcurrent with Voltage Restraint
  - Trip point is settable from 0.1 to 9.99A in 0.1 Amp steps (5 Amp).
  - Trip point is settable from 0.1 to 2.00A in 0.01 Amp steps (1 Amp).
  - Reset point is settable from 0.1 to 9.99A in 0.1 Amp steps (5 Amp).
  - Reset point is settable from 0.1 to 2.00A in 0.01 Amp steps (1 Amp).
  - Time dial settings 0.0 to 9.9 in 0.1 increments (100 settings).
  - Time curves: 16 inverse and 1 fixed time curve, including:
    - S1 - CO Short Inverse
    - S2 - IAC Short Inverse
    - L1 - CO Long Inverse
    - L2 - IAC Long Inverse
    - D - CO Definite
    - M - CO Moderately Inverse
    - I1 - CO Inverse
    - I2 - IAC Inverse
    - F - Fixed Time

  - Voltage Restraint characteristics:
    - Under fault conditions, system voltage may collapse to a low value compared to the relatively small voltage drop associated with overloads. The time overcurrent relay with voltage restraint decreases the current pickup proportionally to this voltage reduction to increase overcurrent sensitivity of the relay during fault conditions.

* The 51N and 51/27R functions and mutually exclusive.
FEATURES

Front Panel Programmability:
The front panel of the BE3-GPR has a LCD display and pushbuttons for programming. These buttons allow for the selection of items like energized or de-energized contact tripping, threshold adjustments, reset adjustments, time delays and enable/disable of specific protection features and much more. This front panel programming takes the guesswork out of relay setup. The front panel pushbuttons can be locked out for added security.

Watchdog Timer:
The watchdog timer monitors the microprocessor for specific indications of proper operation. If something occurs to inhibit proper operation, the watchdog timer energizes an output relay with a Form C contact arrangement for customer use.

Packaging:
The BE3-GPR is provided either in a semi-flush mounting package or a behind-the-panel mounting configuration. Compression type terminal strips are located so that wiring is simple. These terminals accept 1-#10 Ga. wire or 2-#14 Ga. wires.

Programmable Contact Status:
The output contacts can be programmed to either energize or de-energize to trip. In other words, the contact status can be selected so that the relay, for a particular function, either picks up or drops out when the setting is exceeded.

Reset Input:
An input is available to allow the relay to automatically reset when the fault goes away, or the relay can maintain an output until this input is momentarily received.

Disable Input:
A contact input disables the relay to avoid nuisance tripping during generator build-up.

RS232 Communications:
BESTCOMS is a Windows®-based PC software program that is included with each BE3-GPR relay. This program provides a user-friendly means to set up all parameters of the BE3-GPR. Also, communications can be made using a terminal emulation program such as TELIX to send (type) or receive (display) ASCII characters in serial data format.

Figure 1 - Functional Block Diagram

Note: The integrated design of BE3-GPR greatly simplifies wiring over discrete relays.
SPECIFICATIONS

OUTPUTS:
Each protective function has a Form C output contact arrangement.

Contact ratings:
Resistive
- 120/240Vac - Make 30A for 0.2 seconds, carry 7A continuously, break 7A.
- 250Vdc - Make 30A for 0.2 seconds, carry 7A continuously, break 0.3A. (L/R=0.04)
- 10A @ 30Vdc resistive

Inductive
- 120/240Vac, 125 Vdc - Break 0.3A (L/R=0.04)
- 5A @ 30Vdc Inductive
- 0.3A @ 240Vac Inductive (L/R=0.04)

Surge withstand Capability
Qualified to IEEE C37.90.1-1989 standard
Surge Withstand Capability (SWC) tests for protective relays and relay systems

INPUTS (continued)
24Vdc nominal systems (16-32Vdc)
(both negative ground systems)
Power input burden is 6.5 Watts.

Generator/Bus Voltage Input:
- 100 to 480Vac nominals, 50/60Hz
- <1VA/phase
- 1.2 times nominal continuously
- 1.5 times nominal for 10 seconds
- May be single phase, three phase three wire or three phase four wire

Generator Line Current:
- 1 or 5 Amp input @ 1VA/phase
- 2 times nominal continuously
- 10 times nominal for 1 second

ENVIRONMENTAL:
Vibration: 10 to 500 Hz @ 2 Gs in three mutually perpendicular planes
Shock: 15 Gs in each of three mutually perpendicular axes
Ambient Operating Temperature range:
-25°C (-13°F) to +60°C (+149°F).
(Operates readout is limited to -25°C to +60°C operation.)

AGENCY RATINGS:
UL Standard 508
CSA Certified
Patent #5309312

ACCURACIES OFFERED:

<table>
<thead>
<tr>
<th>Function</th>
<th>Accuracy</th>
<th>Repeatability</th>
<th>Steps</th>
<th>Temp</th>
</tr>
</thead>
<tbody>
<tr>
<td>27/59</td>
<td>±2%</td>
<td>±1.0%</td>
<td>1V</td>
<td>-25°C to +60°C</td>
</tr>
<tr>
<td>81O/U</td>
<td>±0.02 Hz</td>
<td>±0.004Hz</td>
<td>0.1Hz</td>
<td>-25°C to +60°C</td>
</tr>
<tr>
<td>32R</td>
<td>±2% or ±10W@PF&gt;10.5I</td>
<td>±1.0%</td>
<td>1W</td>
<td>-25°C to +60°C</td>
</tr>
<tr>
<td></td>
<td>±5% or ±10W@PF&gt;10.5I</td>
<td>±1.0%</td>
<td>1W</td>
<td>-25°C to +25°C</td>
</tr>
<tr>
<td>25 (Phase Angle)</td>
<td>±0.5° max</td>
<td>±0.1°</td>
<td>1°</td>
<td>-25°C to +60°C</td>
</tr>
<tr>
<td>(Delta V)</td>
<td>±3% or ±2V</td>
<td>±1.5%</td>
<td>1V</td>
<td>-25°C to +60°C</td>
</tr>
<tr>
<td>(Slip Frequency)</td>
<td>±0.02Hz</td>
<td>±0.01Hz</td>
<td>0.1Hz</td>
<td>-25°C to +60°C</td>
</tr>
<tr>
<td>47</td>
<td>±3% or ±2V</td>
<td>±1%</td>
<td>1V</td>
<td>-25°C to +60°C</td>
</tr>
<tr>
<td>40</td>
<td>±3.5% or ±0.05A</td>
<td>±1%</td>
<td>0.01A</td>
<td>-25°C to +60°C</td>
</tr>
<tr>
<td>51N</td>
<td>±2%</td>
<td>±1%</td>
<td>0.01A</td>
<td>-25°C to +60°C</td>
</tr>
<tr>
<td>51/27R</td>
<td>±2.5%</td>
<td>±1%</td>
<td>0.1/0.01A</td>
<td>-25°C to +60°C</td>
</tr>
</tbody>
</table>

Accuracy of all timing functions is ±1% or less than ±50 msec, whichever is greater.
CONNECTIONS and DISPLAY

NOTES: IT IS IMPERATIVE THAT THIS INPUT BE PROPERLY CONNECTED IN RELATIONSHIP WITH TERMINALS 21, 23, AND 25.

INPUT IS NOT REQUIRED IF SYNC-CHECK IS NOT PRESENT.

Figure 2 - Typical Interconnection Diagram
BE3-GPR-P1 or BE3-GPR-W1 with 3 Phase L-L Sensing and 5A CTs

Red LED illuminates for a sync-check condition.

Pushbutton used to toggle the menu selections, scroll for set point adjustments, fast scroll by pressing for one second, and, when simultaneously pressed with the SELECT button, makes the menu selection sequence move in the forward direction.

Pushbutton used to scroll and fast scroll by holding for one second for set point adjustments, and, when simultaneously pressed with the SELECT button, to reverse the menu selection sequence from the forward direction.

Pushbutton used to simultaneously save settings in the nonvolatile memory and move on to the next selection sequence. Also, when pressed in conjunction with either the RAISE or LOWER button, the direction of the user option sequence can be forced forward or reverse, respectively.

LCD provides the primary visual interface to the user. Used when performing Relay settings and monitoring Relay functions.

Figure 3 - Front Panel Display
Figure 4 - Dimensions - Front panel view (Behind-the-panel Mounting)

Figure 5 - Dimensions - Side view (Behind-the-panel Mounting)

Figure 6 - Dimensions - Front panel view (Semi-flush Mounting)

Figure 7 - Dimensions - Side view (Semi-flush Mounting)

NOTE: All dimensions are in inches (millimeters). All drawings and data subject to change without notice.
ORDERING

STYLE NUMBER SELECTION CHART

MODEL TYPE
S - STAND ALONE
P - PARALLELED GEN w/SINGLE ELEMENT REVERSE POWER
W - PARALLELED GEN w/3-PHASE, 3-ELEMENT REVERSE POWER

OPTION 2
PHASE BALANCE
N - NO PHASE BALANCE
B - PHASE BALANCE

OPTION 4
SYNC-CHECK
N - NO SYNC-CHECK
S - SYNC-CHECK

OPTION 1
OVERCURRENT TYPE
1 - 3-PHASE OVERCURRENT
2 - NEUTRAL GROUND FAULT

OPTION 3
REACTIVE CURRENT
0 - NO REACTIVE CURRENT
V - REACTIVE CURRENT

MOUNTING CONFIGURATION
F - SEMI-FLUSH
B - BEHIND-THE-PANEL

NOTES: * Paralleled models only.
** Requires 3 phase overcurrent option 1-1.

Example of style number: BE3-GPR-P2BVSF

OPTIONAL EQUIPMENT

15W Power Supply: | P/N | Power Input | Power Output |
-----------------|-----|-------------|-------------|
5 1013700100     | 120ac/125dc | 24Vdc       |
5 1013700101     | 230ac/250dc | 24Vdc       |

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