SCOPE

This test procedure covers the testing of the Basler BE1-27/59 under/overvoltage relay.  Refer to IM 9170600990 Rev. L (12/12) for testing support information and component level identification.  See pages 4-16 through 4-18 for  internal wiring and schematics and Section 5 for manufacturer test procedures.

SAFETY

An undervoltage target indication may occur when the lower connection paddle is removed if:
 • The instantaneous time function is selected, or
 • A time delay (definite or inverse) below 0.3 seconds is selected.

No actual trip output occurs if the upper paddle is removed first.

Ensure that DC power is applied safely to terminals 3-4.  Use caution during testing.
Per IM pg. 1-4, the maximum continuous voltage rating of this relay is 360 V for the 120 V nominal models.

INTRODUCTION

The BE1-27 Undervoltage, BE1-59 Overvoltage and the BE1-27/59 Under/Overvoltage Relays are solid state devices that provide reliable protection for generators, motors, and transformers against adverse system voltage conditions.

TOOLS, EQUIPMENT, AND MATERIALS

 • One variable ac voltage source with latch timer
 • Variable dc voltage/current source

INSPECTION

1. Remove the cover from the relay, taking care to not shake or jar other relays around it.
2. Pull the relay-connecting plugs to disable the trip circuit and remove the voltage inputs.
3. Unlatch and remove the relay from the case.
4. Visually check the relay for any obvious problems.
5. Clean the relay thoroughly.


TEST PROCEDURE

This procedure will test the ranges of the undervoltage pickup, overvoltage pickup, and time delays.

1. Find the style number on the relay and check the style number identification chart in *Figure 1* to determine the appropriate voltage setting for the power supply.

2. Connect the power supply voltage source to Terminals 3 and 4, turn on, and verify that the power LED comes on.

3. Turn all undervoltage pickup controls fully CCW and all overvoltage pickup functions fully CW. Set all time delay controls to 00.

4. Connect the variable ac voltage source to Terminals 6 and 7 and apply nominal sensing voltage to terminals 6 and 7. (See second digit of style number; 120Vac for Sensing Input Range 3).


UNDERVOLTAGE PICKUP TESTING

1. Slowly decrease the input voltage at terminals 6 and 7 until the "UNDER PICKUP" indicator and the time and instantaneous undervoltage targets toggle.
    *NOTE:* The pickup voltage should be between 53.9 and 56.1 Vac for Sensing Input Range 3.

2. Apply 170Vac to terminals 6 and 7.

3. Adjust both the undervoltage pickup and undervoltage instantaneous controls fully CW.

4. Slowly decrease the input voltage at terminals 6 and 7 until the "UNDER PICKUP" indicator and the time and instantaneous undervoltage targets toggle.
    *NOTE:* The pickup voltage should be between 156.8 and 163.2 Vac for Sensing Input Range 3.


UNDERVOLTAGE TIME DELAY TESTING

1. Apply 100Vac to terminals 6 and 7.

2. Adjust the undervoltage pickup CCW until the relay toggles between pickup and dropout.

3. Apply nominal sensing voltage to terminals 6 and 7.

4. Monitor the time undervoltage output at terminals 2 and 10. (if the relay style includes an auxiliary time undervoltage output, also test this function at terminals 19 and 20)

5. Step the voltage to 90Vac, starting your pickup timer.  Record the pickup time.
   *NOTE:* See fourth and fifth characters of the style number. For instantaneous style relays, the time delay should be less than 50 ms. For definite time style relays, the time delay should be between 0.050 to 0.150 sec. For inverse time style relays, see the appropriate Time Characteristic Curve on IM pages 3-3 to 3-5 for time delays.

6. Apply nominal sensing voltage to terminals 6 and 7.

7. Adjust the undervoltage time delay to 99.

8. Step the voltage to 90Vac, starting your pickup timer.  Record the pickup time.
   *NOTE:* For instantaneous style relays, the time delay should be less than 50 ms. For definite time style relays, the time delay should be between 9.702 to 10.098 sec. For inverse time style relays, see the appropriate Time Characteristic Curve on IM pages 3-3 to 3-5 for time delays.

9. Monitor the instantaneous undervoltage output at terminals 12 and 13. (if the relay style includes an auxiliary time undervoltage output, also test this function at terminals 14 and 15)

10. Adjust the undervoltage pickup fully CCW.

11. Apply 100Vac to terminals 6 and 7.

12. Adjust the undervoltage instantaneous CCW until the relay toggles between pickup and dropout.

13. Apply nominal sensing voltage to terminals 6 and 7

14. Step the voltage to 90Vac, starting your pickup timer.  Record the pickup time.
   *NOTE:* The time delay should be less than 50 ms.


OVERVOLTAGE PICKUP TESTING

1. Apply 150Vac to terminals 6 and 7

2. Slowly increase the input voltage at terminals 6 and 7 until the "OVER PICKUP" indicator and the timed and instantaneous overvoltage targets toggle.
   *NOTE:* The pickup voltage should be between 156.8 and 163.2 Vac for Sensing Input Range 3.

3. Apply 50Vac to terminals 6 and 7.

4. Adjust both the overvoltage pickup and overvoltage instantaneous controls fully CCW.

5. Slowly increase the input voltage at terminals 6 and 7 until the "OVER PICKUP" indicator and the timed and instantaneous overvoltage targets toggle.
   *NOTE:* The pickup voltage should be between 53.9 and 56.1 Vac for Sensing Input Range 3.

OVERVOLTAGE TIME DELAY TESTING

1. Apply 140Vac to terminals 6 and 7.

2. Adjust the overvoltage pickup CW until the relay toggles between pickup and dropout.

3. Apply nominal sensing voltage to terminals 6 and 7.

4. Monitor the time overvoltage output at terminals 1 and 10. (if the relay style includes an auxiliary time overvoltage output, also test this function at terminals 17 and 18)

5. Step the voltage to 160Vac, starting your pickup timer.  Record the pickup time.
   *NOTE:* See fourth and fifth characters of the style number. For instantaneous style relays, the time delay should be less than 50 ms. For definite time style relays, the time delay should be between 0.050 to 0.150 sec. For inverse time style relays, see the appropriate Time Characteristic Curve on IM pages 3-3 to 3-5 for time delays.

6. Apply nominal sensing voltage to terminals 6 and 7.

7. Adjust the overvoltage time delay to 99.

8. Step the voltage to 160Vac, starting your pickup timer.  Record the pickup time.
   *NOTE:* For instantaneous style relays, the time delay should be less than 50 ms. For definite time style relays, the time delay should be between 9.702 to 10.098 sec. For inverse time style relays, see the appropriate Time Characteristic Curve on IM pages 3-3 to 3-5 for time delays.

9. Monitor the instantaneous overvoltage output at terminals 11 and 13. (if the relay style includes an auxiliary time undervoltage output, also test this function at terminals 14 and 16)

10. Adjust the overvoltage pickup fully CW.

11. Apply 140Vac to terminals 6 and 7.

12. Adjust the overvoltage instantaneous CW until the relay toggles between pickup and dropout.

13. Apply nominal sensing voltage to terminals 6 and 7

14. Step the voltage to 160Vac, starting your pickup timer.  Record the pickup time.
    *NOTE:* The time delay should be less than 50 ms.

# FIGURE 1 Style Legend

**NOTES**

All relays are supplied in an S1 case size.

⚠1 If target is B, output must be E or F.

⚠2 If option 2 is A or B, option 3 must be 0, 1, 2, or 5.

⚠3 If option 1 is 0, option 3 must be 0, 1, 2, or 5.

⚠4 If option 3 is 3, 4, or 6, option 1 must be 1, 2, 3, or 4.

⚠5 If sensing input range is 2, timing must be A1, E1, or E2.

**MODEL NUMBER**

BE1-27
OR
BE1-59
OR
BE1-27/59

**STYLE NUMBER**

A ☐ ☐ — ☐ ☐ ☐ — ☐ ☐ ☐ ☐ ☐

**Sensing Input Type**

A) Single-phase

**⚠5 Sensing Input Range**

2) 1 to 40 Vac pickup
3) 55 to 160 Vac pickup
4) 110 to 320 Vac pickup

**Output**

*27 or 59*

E) NO relay
G) NC relay

*27/59*

| | Under | Over |
|---|---|---|
| F) | NO relay | NO relay |
| H) | NC relay | NC relay |
| N) | NC relay | NO relay |
| P) | NO relay | NC relay |

**Timing**

*27 or 59*

A1) Instantaneous
C1) Short inverse
C2) Medium inverse
C3) Long inverse
E1) Definite

*27/59*

| | Under | Over |
|---|---|---|
| A1) | Instantaneous | Instantaneous |
| C4) | Short inverse | Short inverse |
| C5) | Medium inverse | Medium inverse |
| C6) | Long inverse | Long inverse |
| C7) | Medium inverse | Short inverse |
| C8) | Long inverse | Medium inverse |
| D1) | Short inverse | Instantaneous |
| D2) | Medium inverse | Instantaneous |
| D3) | Short inverse | Definite |
| D4) | Medium inverse | Definite |
| E1) | Definite | Definite |
| E2) | Definite | Instantaneous |

**Power Supply**

J) 125 Vdc/120 Vac
K) 48 Vdc
L) 24 Vdc
Y) 48/125 Vdc
Z) 250 Vdc/240 Vac

**Target ⚠1**

N) None
A) Internally operated
B) Current operated

**Option 1 ⚠3**

*27 or 59*

0) None
1) Instantaneous function

*27/59*

0) None
2) Instantaneous under function
3) Instantaneous over function
4) Instantaneous under and over function

**Option 2 ⚠2**

N) None
A) Power supply status output
B) Power supply status output and push-to-energize outputs
S) Push-to-energize outputs

**Option 3 ⚠4**

*27 or 59*

| | Timed Aux. | Inst. Aux. |
|---|---|---|
| 0) | None | None |
| 1) | NO relay | None |
| 2) | NC relay | None |
| 3) | NO relay | NO relay |
| 4) | NC relay | NC relay |
| 5) | SPDT relay | None |
| 6) | SPDT relay | SPDT relay |

*27/59*

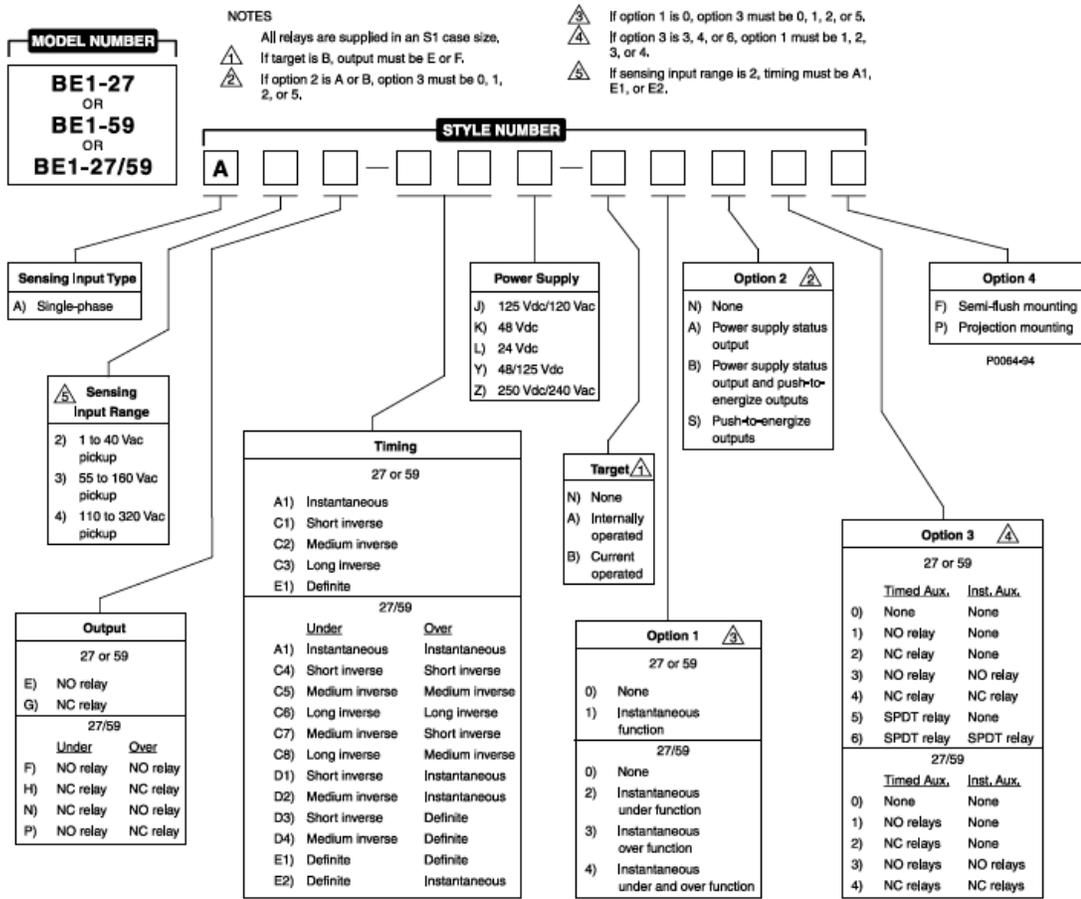| | Timed Aux. | Inst. Aux. |
|---|---|---|
| 0) | None | None |
| 1) | NO relays | None |
| 2) | NC relays | None |
| 3) | NO relays | NO relays |
| 4) | NC relays | NC relays |

**Option 4**

F) Semi-flush mounting
P) Projection mounting

P0064-94

FIGURE 2 *BE1-27/59 Internal Connections*