

This document is intended as a reference guide for installing and using a BENDER isoPV ground fault detector and AGH-PV voltage coupler for ungrounded solar (PV) arrays. This document includes installation, setup, and usage instructions. For complete details, including installation, setup, settings, and troubleshooting, refer to the isoPV user manual, document number TGH1454en. This document is intended as a supplement and not a replacement to the complete user manual.

Only qualified maintenance personnel shall operate or service this equipment. These instructions should not be viewed as sufficient for those who are not otherwise qualified to operate or service this equipment. This document is intended to provide accurate information only. No responsibility is assumed by BENDER for any consequences arising from use of this document.



Installation

Mounting

The isoPV and AGH-PV are designed for DIN rail mounting.

Wiring - General

See figure 1 for basic wiring schematic. Use of the AGH-PV voltage coupler is required. Use minimum AWG 24, maximum AWG 12 wire. For more information, refer to the isoPV user manual.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Disconnect all power before servicing.
- Observe all local, state, and national codes, standards, and regulations.

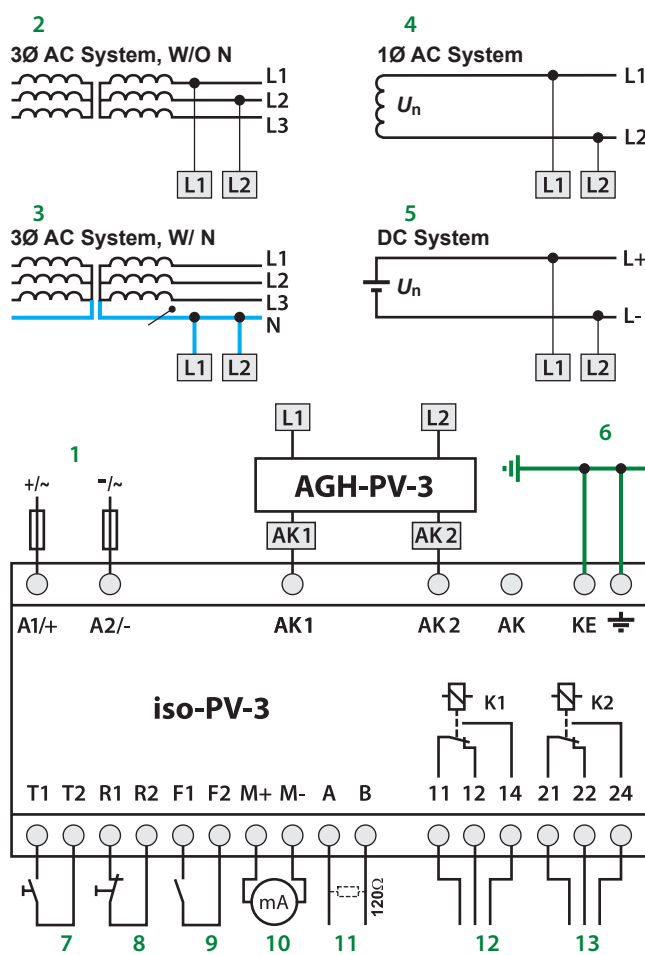


Figure 1 - isoPV and AGH-PV wiring diagram

- | | |
|--|--|
| <ol style="list-style-type: none"> 1. External supply voltage; 6A fuse recommended for internal device protection 2. Connection to three-phase AC system without neutral 3. Connection to three-phase AC system with neutral 4. Connection to single-phase AC system 5. Connection to DC system 6. Equipment ground connection | <ol style="list-style-type: none"> 7. External TEST terminal, N/O contact 8. External RESET terminal, N/O contact 9. STANDBY terminals: Closing F1/F2 will stop measurements 10. Analog outputs: 0... 400 μA on standard version, 0/4... 20 mA on "B" version 11. RS-485 interface 12. Alarm relay K1: SPDT contact 13. Alarm relay K2: SPDT contact |
|--|--|

Wiring - Multiple isoPV Devices in Arrays with a Common Bus

Only one isoPV detector at a time may be online and measuring in a complete isolated system. Arrays connected to a common bus, which may or may not be connected simultaneously, require special connections in order to ensure that only one device is on at a time. These requirements may be accomplished in one of two ways:

- Option 1: Connecting each device's F1/F2 standby terminals and manually controlling the switching with control logic
- Option 2: Automating the switching by connecting each device together via RS-485

For option 1, closing the F1/F2 terminal set puts the device into standby mode. Using control logic from the tiebreaker will allow for manual control to ensure that only one device is on when the tiebreaker is closed.

Option 2 automates the process. Complete the following steps:

1. Connect each isoPV in series with each other via the "A" and "B" terminals. Use RS-485 cable.
2. The devices at the beginning and the end of the chain require activating the termination resistor. Switch the "Ron" DIP switch to "ON."
3. Each device requires a unique communication address. Under the menu option "COM SETUP > Addr." set one device to address 1. Set the address for each other device sequentially. Each address must be unique.
4. For each device, under the menu option COM SETUP > ISONet, set this option to "ON." This setting automates the process of ensuring only one device is measuring at any time. See the reverse side of this document for more information on menu settings.

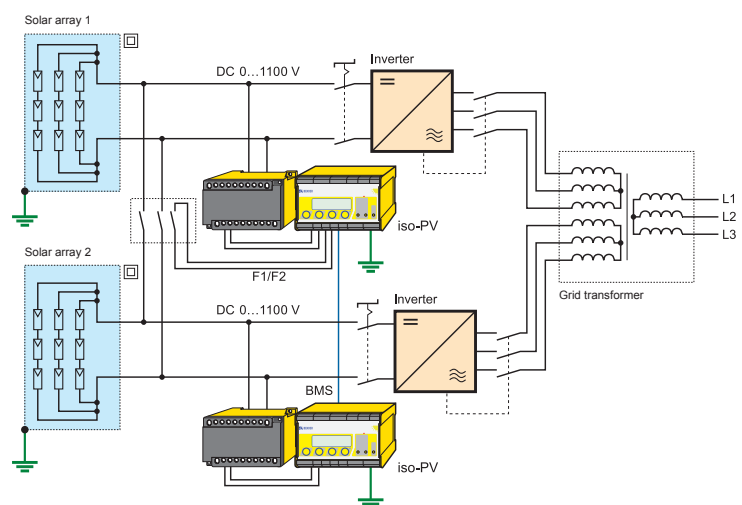


Figure 2 - Using the F1/F2 standby terminals with two isoPV devices and two arrays on a common bus

Wiring - Contacts

Using a normally closed or normally open contact utilizes two factors: wiring out of the proper terminal, and setting the respective contact to normally energized or deenergized operation. Refer to the chart below for relay conditions.

The energized state of the contact may be changed by setting options ISO SETUP > K1 and ISO SETUP > K2. In the device's settings, option "N/O" refers to normally deenergized, and option "N/C" refers to normally energized.

Device Relay Conditions			
Relay Operation Setting	Device Alarm State	K1 STATE	K2 STATE
Normally deenergized mode (N/D) Non-failsafe mode "N/O" in device settings menu	Power ON, normal state (no alarms)	11-12 CLOSED 11-14 OPEN	21-22 CLOSED 21-24 OPEN
	Energized in the alarm state Relay will switch when the alarm is activated.	Power OFF 11-12 CLOSED 11-14 OPEN	21-22 CLOSED 21-24 OPEN
Normally energized mode (N/E) Failsafe mode "N/C" in device settings menu	Power ON, normal state (no alarms)	11-12 OPEN 11-14 CLOSED	21-22 OPEN 21-24 CLOSED
	Energized in the normal state Relay will switch when the alarm is activated, or when supply voltage to the device is lost.	Power OFF 11-12 CLOSED 11-14 OPEN	21-22 CLOSED 21-24 OPEN
	Power ON, alarm state	11-12 OPEN 11-14 CLOSED	21-22 OPEN 21-24 CLOSED
	Power ON, alarm state	11-12 CLOSED 11-14 OPEN	21-22 CLOSED 21-24 OPEN

Menu Structure Flow Chart

Figure 5 shows the structure of the menu built into the isoPV. The menu is used for viewing alarms, viewing the status of the system, and making any necessary settings changes. Use the supplied gray boxes to take note of applied settings for future reference. Note that some settings do not have more than one selectable option - these are special options tuned specifically for PV systems.

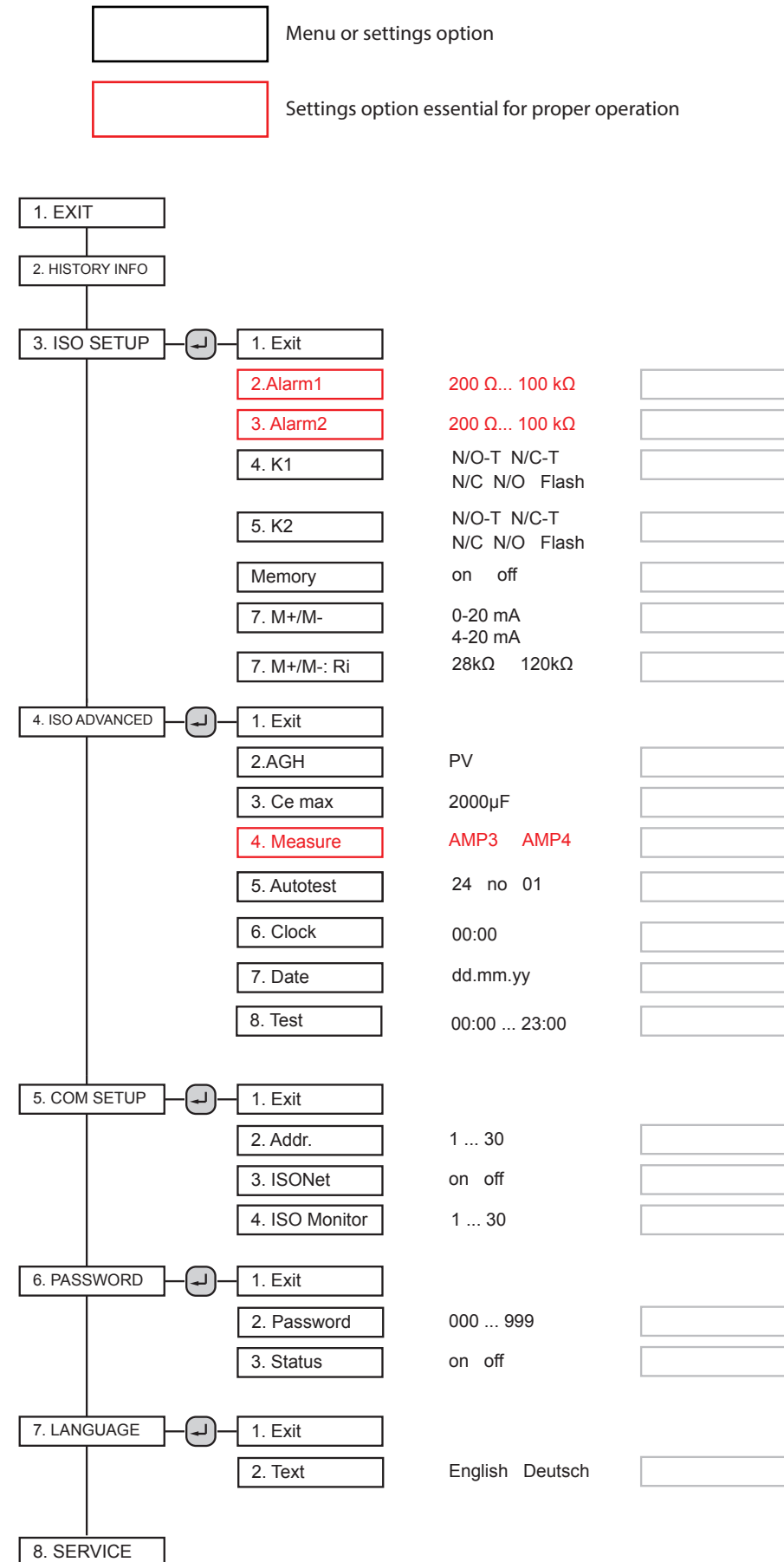


Figure 5 - isoPV menu flow chart

Dimensions

Dimensions in inches (mm).

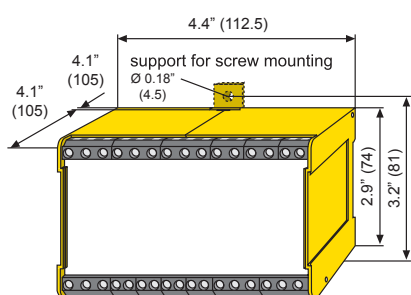


Figure 3 - isoPV dimensions in inches (mm)

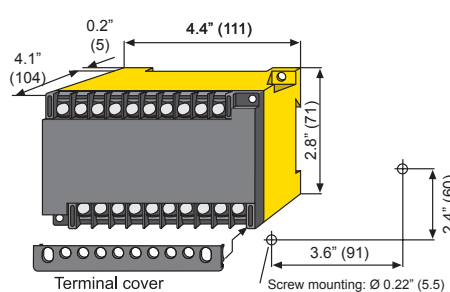
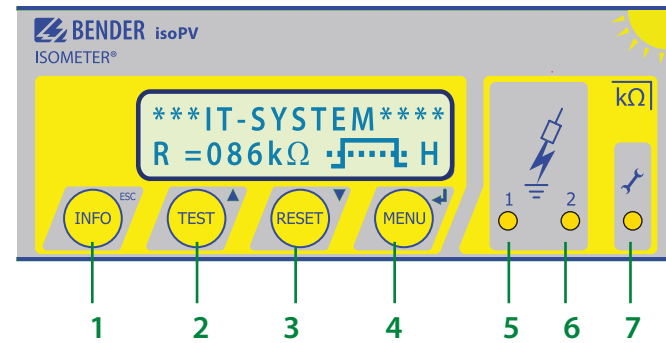


Figure 4 - AGH-PV dimensions in inches (mm)

Front Panel Display



1. INFO / ESC key: Displays system information / goes back a step in menu
2. TEST / UP key: Initiates self-test / moves up in menu
3. RESET / DOWN key: Resets device when latching mode is active / moves down in menu
4. MENU / ENTER key: Opens the main menu / confirms changes in menu
5. LED "ALARM 1": Illuminates when alarm 1 is active.
6. LED "ALARM 2": Illuminates when alarm 2 is active.
7. LED "ERROR": Illuminates when a device error has occurred.

Device Setup Tips

- Ensure that all menu options in red in the menu structure flow chart are set correctly. Incorrect settings may lead to improper readings. For alarm trip values, use the factory defaults when possible.
- Use the following guidelines when setting the measuring principle under the ISO ADVANCED > Measure menu option:
 - Use option "AMP3" for arrays with mono- or polycrystalline solar panels
 - Use option "AMP4" for arrays using thin-film solar panels
- Options ISO SETUP > K1 and ISO SETUP > K2 refer to the energized state of the output relays K1 and K2 during operation. Refer to the section "Wiring - Contacts" on the reverse side of this document for more information. The menu options stand for:
 - N/C: Normally energized operation (failsafe mode)
 - N/O: Normally deenergized operation (nonfailsafe mode)
 - N/C-T: Normally energized operation, switches during self-test
 - N/O-T: Normally deenergized operation, switches during self-test
 - Flash: During alarm, contact switches app. every 2 seconds

Analog Outputs

isoPV models feature a 0 - 20 mA or 4 - 20 mA output, selectable in the main menu under ISO SETUP > M+/M-. Under menu option ISO SETUP > M+/M-: Ri, the midpoint of the equation may be set to 28 kΩ or 120 kΩ. When using an externally connected analog meter, ensure the midpoint setting is the same as the external meter. For integrating into control systems, use the midpoint value appropriate for the system's requirements.

0 - 20 mA output

$$R_F = \frac{20 \text{ mA} \times R_I}{I} - R_I$$

R_F Insulation resistance in kΩ
 I Current output in mA
 R_I Midpoint setting

4 - 20 mA output

$$R_F = \frac{16 \text{ mA} \times R_I}{I - 4 \text{ mA}} - R_I$$

R_F Insulation resistance in kΩ
 I Current output in mA
 R_I Midpoint setting

Ordering Information

Part No.	System Voltage	Supply Voltage	Ordering No.
iso-PV-327 with AGH-PV	3(N)AC 0...793 V / DC 0...1100 V	DC 19.2...72 V	B 9106 5132W
iso-PV-335 with AGH-PV	3(N)AC 0...793 V / DC 0...1100 V	AC 88...264 / DC 77...286 V	B 9106 5133W

Technical Data

Refer to isoPV series user manual (document TGH1454en) or isoPV series datasheet (document NAE1012370) for detailed technical information.