



Innovative Electrical Automation Solutions

IES GRID FEED-IN LIMITER

Installation and User Manual



Model

IPS-01

IPS-01-W

**CONTAINS IMPORTANT INSTALLATION AND TESTING PROCEDURES
THAT MUST BE FOLLOWED TO ENSURE COMPLIANCE WITH THE
DISTRIBUTION NETWORK SERVICE PROVIDER.**

www.integrelec.com.au

Version 5.1, 31 March 2020

(07) 3123 9538

Manufactured by



Disclaimer

The Information contained in this document is subject to change without notice. Integrelec reserves the right to make modifications and/or improvements to this document as well as to the products that this document refers to. Such changes will be incorporated into new editions of this document.

IPS series feed-in limiters and grid protection devices are designed and manufactured by Integrelec.

The design, installation and certification the solar installation (including the equipment this manual refers to) must also be done in accordance with all regulations and requirements of the local distribution network service provider.

Warranty Information

This product is supplied with 12 months manufacturer warranty.

Contact Information

Phone:
(07) 3123 9538

Internet:
www.integrelec.com.au

Email:
admin@integrelec.com.au

Address:
8/19 Lensworth St
Coopers Plains
QLD 4108

Table of Contents

Disclaimer.....	2
Warranty Information.....	2
Contact Information.....	2
1 Product Overview	4
1.1 Functional Description	5
2 Package Contents.....	6
3 Safety instructions	6
4 Installation and Setup	6
4.1 Mounting.....	6
4.2 Configuration	7
4.3 Electrical Connections.....	8
4.3.1 External Connections	8
4.3.2 Inverter Protocol Selection	9
4.4 Cable Selection & Installation Guide.....	10
4.4.1 Voltage Monitoring.....	11
4.4.2 RS485 Cable.....	11
4.4.3 Current Transformer Cables and Installation.....	11
4.5 Setting CT ratio.....	12
4.6 Setting the Export Limit	13
5 Testing.....	16
5.1 Verify Communications with Inverter.....	16
5.2 Test Operation	16
6 Operation Guide.....	18
6.1 “BUILDING MAINS NET POWER FLOW” display.....	18
6.2 “SYSTEM STATUS” display.....	18
6.3 System Status Faults	18
6.4 Display Indicators.....	18
7 Technical Data.....	19

1 Product Overview

The IPS-01 has been developed specifically to meet the requirements set by Energex and Ergon Energy for small and medium scale inverter installations where export control only is required. The following inverter brands are currently supported for export control: ABB Trio, ABB PVS, Huawei, Sungrow, SMA, and Fronius.

These are also suitable for use in other states and territories subject to local regulations. This board does not incorporate secondary network protection as required for systems larger than 30kW.

- For systems larger than 30kW, where secondary network protection is required, the following model variants may be used:
 - IPS-02 (export control and secondary network protection)
 - IPS-03 (secondary network protection only – 3rd party export control systems can be fitted)
 - IPS-04 (secondary network protection and solar distribution for multiple inverters up to 100kW. 3rd party export control systems can be fitted.)

The optional IPS-01-W model is outfitted with a wireless transmitter module. This module allows IPS-W-RX boards to further control multiple remotely located inverters from a single mains supply. Multiple receiver units can be paired to a single transmitter.



1.1 Functional Description

- After switching on, a start delay of 30 seconds will occur while net building load is measured with the inverter relay turned off. A minimum inbound load must be met for 30 seconds. If not, “waiting for load” will be displayed on the display. After 30 seconds of minimum load, the inverter relay is switched on, energising the inverter. The red ‘Tripped’ indicator on the front panel will turn off.
- For the IPS-01-W, during start-up, the system will also run the pairing sequence, and any connected receiver units will be connected.
- After this initial inverter connection there is a 60 second start-up period, allowing the inverter to go through its standard start-up procedures, during which time the inverter will not output power.
- After this 60 second start-up period, a soft ramp-up will begin, allowing the inverter to produce up to 100% of its capacity or until net building load decreases below minimum load. The green ‘Running’ indicator on the front panel will turn on.
- If the power export limit is exceeded, the inverter will be ramped down towards 0% (or until the export limit is no longer exceeded) in less than 15 seconds.
- The inverter power output will be continually adjusted (ramped up or down) so as to maximise the inverter output, whilst preventing the export limit being exceeded.
- Once the inverter is ramped down to 0%, the green ‘Running’ indicator on the front panel will turn off. If net export power continues to exceed the export limit for more than 5 seconds (indicating a possible failure of the communications to the inverter), the inverter will be disconnected from the grid via the contactor. The red ‘Tripped’ indicator on the front panel will turn on.
- After any disconnect event there is a 30 second delay before a reconnect attempt.
- If 5 disconnection events occur within a space of 20 minutes (indicating a possible failure of the communications to the inverter), the inverters will be locked out with “trip count exceeded” displayed. A power cycle is required to reset the system.

1.2 Antenna Options

Integrelec offers two antenna options for use with the IPS-01-W system.

- The 4.5dBi antenna pair – capable of 350m line-of-sight.
- The 6dBi high-gain antenna pair – capable of 450m line-of-sight.

2 Package Contents

- 1 x Installation and User Manual
- 1 x IPS-01 IES Grid Feed-In Limiter (GFIL)

In addition, the installer must also supply: (see Sec. 4.3 for details)

- 4C+E cable from Main Switch Board to GFIL
- 1 x 3 phase circuit breaker rated to protect cable from Main Switch Board to GFIL
- 1 x 3 Pole Contactor (rated to the full inverter output current) per inverter.
- RS485 cable from GFIL to Inverter
- 3 x Current Transformers sized based on maximum site load
- Transmitter Antenna (Can be purchased separately – IPS-01-W only)

3 Safety instructions

Installation and testing of this device must be performed by a licenced electrician in accordance with AS3000, AS4777 and all other applicable standards.

4 Installation and Setup

For the GFIL to function as an approved power limiting device in accordance with the connection standard as discussed in Sec. 1, it must be installed as follows.

4.1 Mounting

Wall mount the GFIL as close as possible to the main switch board.

For the IPS-01-W, the attached antenna should be placed as high as practicable, mounted vertically.

4.2 Configuration

Figure 1 shows the overall cable topology for installation.

NOTE: The CTs must be installed before all site loads:

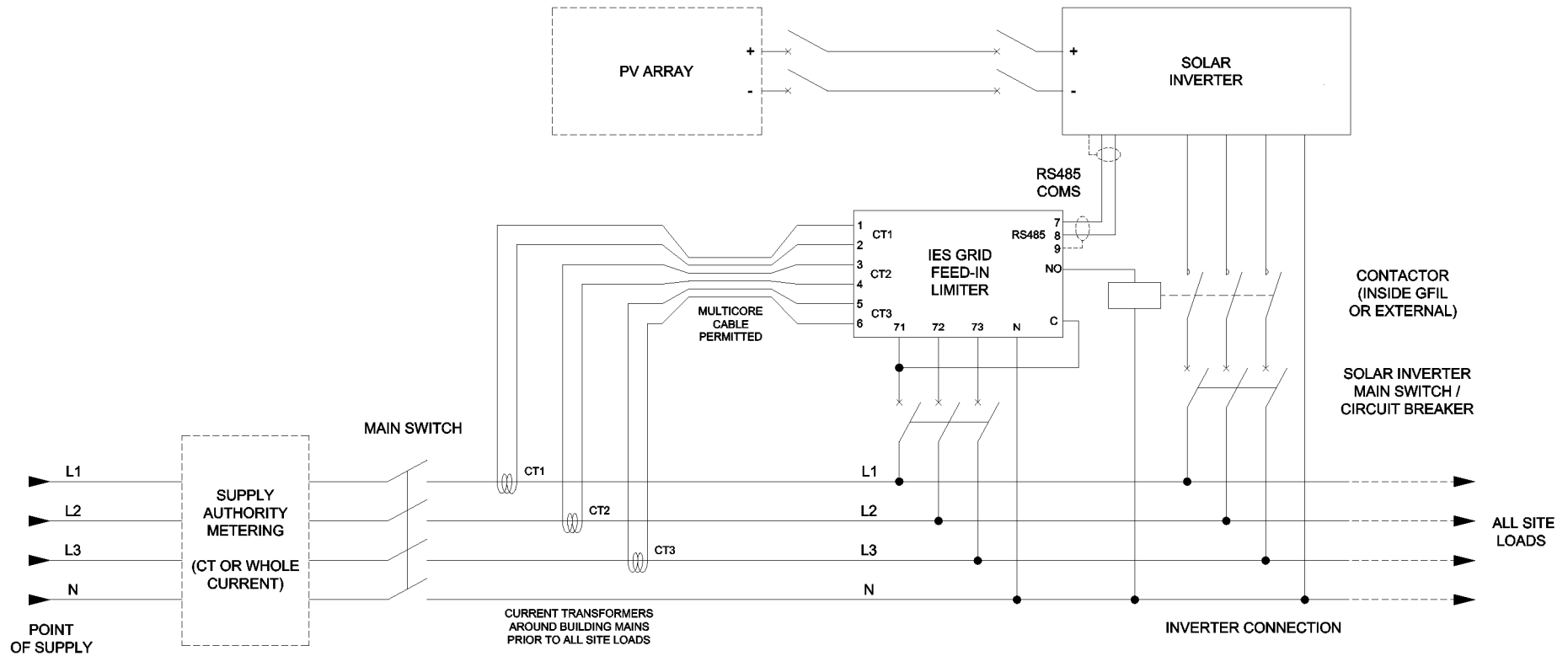
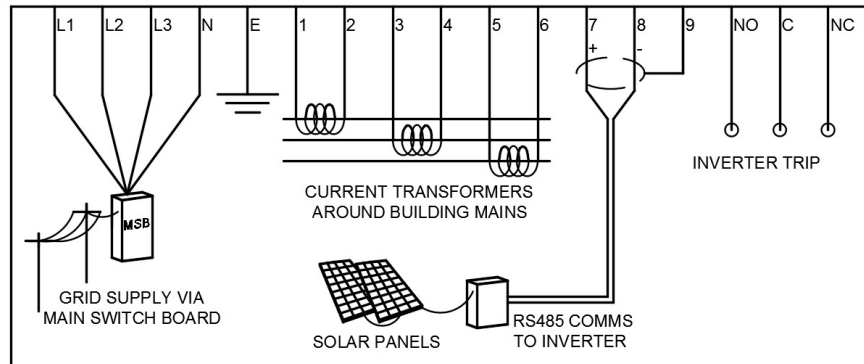


Figure 1 - Installation Topology

4.3 Electrical Connections

4.3.1 External Connections

All electrical connections to the device are made at the terminals inside the enclosure:



CONNECTION TERMINALS

71	VOLTAGE SUPPLY - L1
72	VOLTAGE SUPPLY - L2
73	VOLTAGE SUPPLY - L3
N	VOLTAGE SUPPLY - N
E	EARTH
1	CURRENT TRANSFORMER L1 - S1
2	CURRENT TRANSFORMER L1 - S2
3	CURRENT TRANSFORMER L2 - S1
4	CURRENT TRANSFORMER L2 - S2
5	CURRENT TRANSFORMER L3 - S1
6	CURRENT TRANSFORMER L3 - S2
7	RS485 INVERTER INTERFACE - D+
8	RS485 INVERTER INTERFACE - D-
9	RS485 INVERTER INTERFACE - SCREEN
NO	INVERTER CONTACTOR TRIP (N/O) to contactor coil - switched coil voltage supply
C	INVERTER CONTACTOR TRIP (COM) continuous contactor coil voltage supply
NC	INVERTER CONTACTOR TRIP (N/C)

Figure 2 - Interface Terminals for the GFIL

The NO (normally open), C (common), and NC (normally closed) terminals are supplied as dry contacts to control inverter contactors. Appropriate control voltage must be wired to the common (C) terminal to power contactor coils, wired as normally open.

Inverter contactors may either be installed inside the GFIL board or in another enclosure if more convenient to do so.

4.3.2 Inverter Protocol Selection

The IPS-01 is compatible with the following Inverter brands: ABB Trio, Huawei, Sungrow, SMA, Fronius and ABB PVS.

The brand of inverter in use must be selected via the input terminals of the Delta DVP-14SS2 PLC so that the corresponding inverter communication protocol is enabled. 24V must be applied at terminal X1-X5 depending on the inverter protocol required. The example shown below selects the ABB inverter protocol.

- Do not move - S/S
- Do not move - X0
- Select 24V for Sungrow Inverters – X1**
- Select 24V for SMA Inverters – X2**
- Select 24V for ABB PVS-100/120 Inverters – X3**
- Select 24V for Fronius Inverters – X4**
- Select 24V for ABB Trio or ABB PVS-50/60 Inverters – X5**
- For Huawei Inverters – No X1-X5 input required**
- Do not move – X6
- Do not move – X7



4.4 Transmitter / Receiver Pairing (IPS-01-W ONLY)

Prior to installation at the receiving site, the WFIL must be paired to the transmitting GFIL. To do this, follow the below steps:

1. Locate the WFIL next to the GFIL board and ensure both are powered-off.
2. Connect the transmitter to the receiver via the pairing cable provided.
3. Place a jumper between the two CC pins on the receiver board.
4. Power the WFIL, followed by the GFIL – Wait 5 seconds.
5. Disconnect the jumper from the CC pins.
6. Disconnect the pairing cable and deenergize the boards.

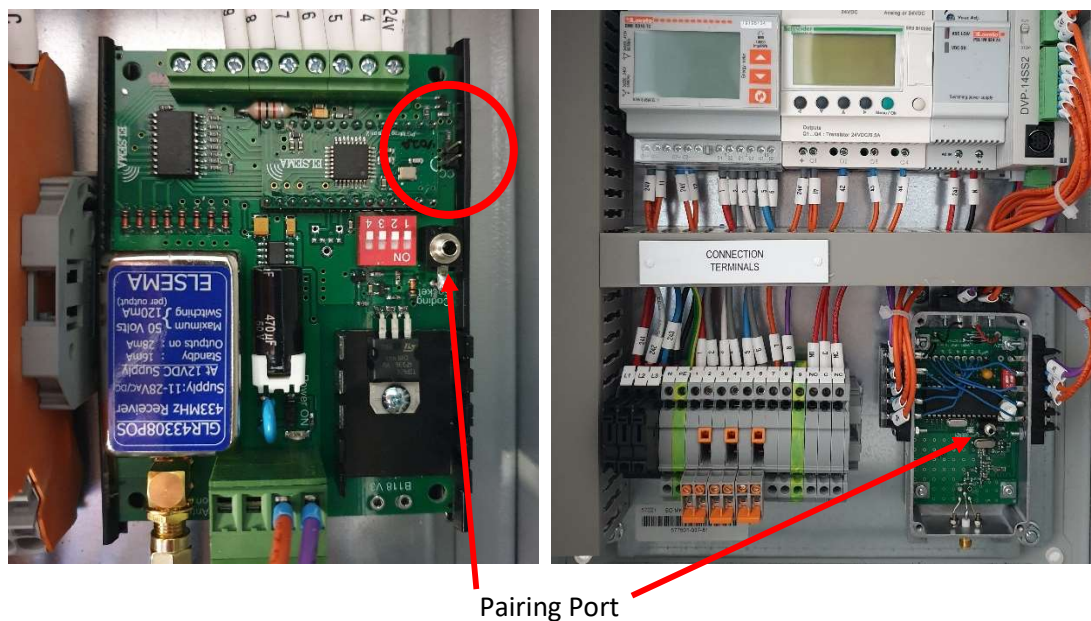


Figure 3 - CC Pins and Pairing Port Location

Once paired, the receiver can then be installed at the receiving site. Repeat 1-6 to pair multiple receivers to the single transmitter.

To unpair a receiver from the transmitter – temporarily connect the two CC pins on the receiver board whilst powered.

Note: If purchased together (IPS-01-W + IPS-W-RX), Integrelec will pre-pair the devices in-house, and these steps will not be necessary.

4.5 Cable Selection & Installation Guide

Use appropriate cable glands through the bottom gland plate of the enclosure to gain cable access to connection terminals.

4.5.1 Voltage Monitoring

Terminals 'L1', 'L2', 'L3', 'E', 'N' of the connection terminals are used for voltage monitoring.

4.5.2 RS485 Cable

Terminals 7-9 in the connection terminals are used for the RS485 interface to the inverter. Use 0.25mm² (minimum) twisted pair, shielded cable. Refer to figure 2 for correct wiring configuration at the GFIL end. Refer to inverter documentation for wiring configuration at the inverter end. For multiple inverter applications, a parallel connection of RS485 cable looping to each inverter is required.

4.5.3 IPS-01-W Antenna

The optional wireless outfitted IPS-01-W requires an antenna be connected. This antenna shall be brought through an appropriately sized cable gland with the antenna mounted externally. The antenna should be mounted as high as practicable, preferably with minimal obstructions to line-of-sight towards the receiver(s).

Do **not** power the IPS-01-W without an antenna connected, as doing so may damage the transmitter module.

4.5.4 Current Transformer Cables and Installation

NOTE: EXTRA CARE MUST BE TAKEN WHEN INSTALLING CURRENT TRANSFORMERS TO ENSURE THAT EACH CT IS MATCHED TO THE CORRECT PHASE AND HAS CORRECT POLARITY.

Terminals 1-6 in the connection terminals are used for current transformer connections. Cable length for current transformers must be kept to a minimum to maintain measurement accuracy.

- Use 2.5mm² cable (minimum).
- Multicore cable may be used.
- Terminals 2, 4, and 6 may share a common conductor.

CT Connection terminals:

- Terminals 1 and 2 for line 1 current transformer
- Terminals 3 and 4 for line 2 current transformer
- Terminals 5 and 6 for line 3 current transformer

WARNING: CREATING AN OPEN CIRCUIT ON A CURRENT TRANSFORMER CAN PRODUCE DANGEROUS VOLTAGES. IF WORKING ON THE CT WIRING, UTILISE THE CT BRIDGING LINKS.

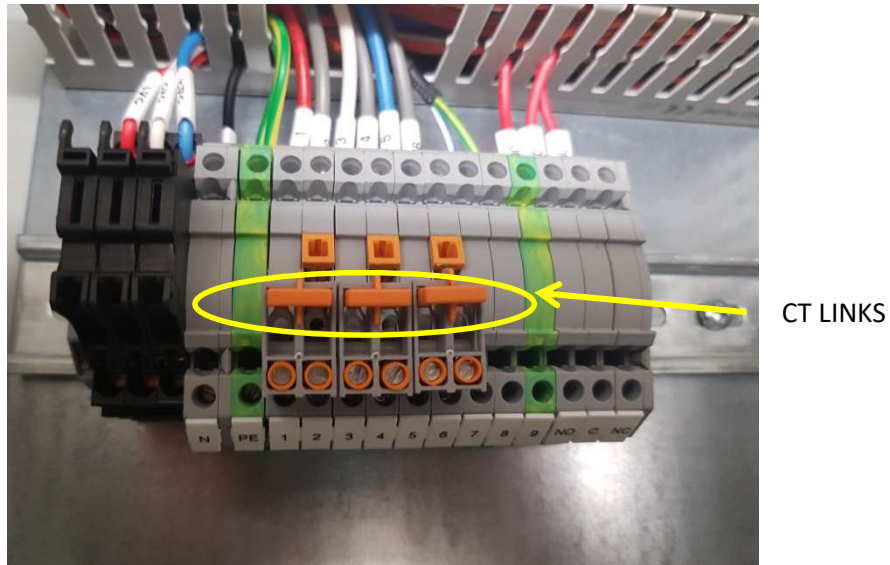


Figure 4 - CT Link Location

To bypass, push the links into the screws and fasten in place.

After completing work and ensuring the device is correctly wired again, unscrew and disconnect the CT links.

4.6 Setting CT ratio

When powering up the device for the first time, the CT ratio on the power meter must be set to match the ratio of the installed CTs using the following procedure:

1. Press the Up and Down Arrow buttons together on the Lovato Power Meter to enter the menu
2. Use the Arrows to select the "SETUP MENU", press OK



3. Select Menu "M01 GENERAL", press OK and then select Parameter P01.01 – CT Primary, press enter. Use the up and down arrows to select the required CT ratio. Press the up and down arrows together to return to the previous menu. The example below shows a 400:5 CT:



4. Press the Up and Down Arrow Buttons together again to save the changes. The Relay will restart.
5. After the relay has restarted, press the down arrow until the “Current” display screen appears.
6. Check that measured current matches actual current at the connection point for each phase.
7. Confirm there is a positive reading on each phase.
8. Negative current indicates current transformer polarity is reversed.

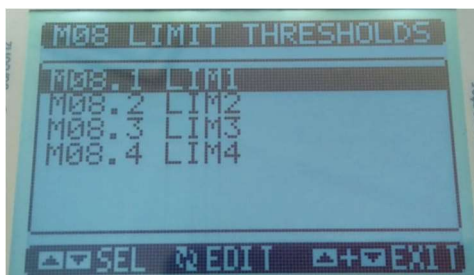
4.7 Setting the Export Limit

By default, the unit is configured to operate with a zero-export limit i.e. The inverters will be controlled so that no power is exported to the grid. If your electricity provider allows partial export, the Lovato power meter can be reconfigured accordingly.

Ramp Down Limit

This is the power limit at which the inverters are instructed to ramp down in power output due to excess export. Inverters will continue to ramp down until net measured power increases above this limit.

- Hold both the Up and Down Arrow buttons on the Lovato Power Meter inside the GFIL to open the menu
- Use the Arrows to select the “SETUP MENU”, press Enter
- Arrow down to menu item M08 – Limit Thresholds, press Enter



- Select menu item M8.1 - Lim1, press Enter



- Select menu item M08.1.04 – Multiplier, press Enter



- Use the arrows to set the multiplier to 'x10', press Enter



- Select menu item M08.1.03 – Upper Threshold, press Enter
- Use the arrows to set the ramp down limit (in watts). Note that in the previous step, a multiplier of 10 was set to this value so actual value is 1/10 of the actual required power. For example: For an export limit of 30kW, set to -3000, press Enter. (note the negative sign for power export)



- Select menu item M08.1.06 – Lower Threshold, press Enter
- Set to the same value that was just set in menu item M08.1.03, press Enter
- Exit this menu by pressing the up and down arrows together

Ramp Up Limit

This is the power limit at which the inverters are instructed to ramp up in power output because the export limit has not been exceeded. This value must be slightly larger than the ramp down limit (typically by 5kw) but may be varied depending on specific site loads so as to minimise how often the system is ramped down unnecessarily. Begin with a value 5kw larger than the ramp down limit set above and modify if required.

The configuration process for setting the Ramp Up Limit is similar to the Ramp Down Limit described above.

- Navigate to menu item M08 – Limit Thresholds, press Enter (same as described above)
- Select menu item M8.2 – Lim2, press Enter
- Select menu item M08.2.04 – Multiplier, press Enter
- Use the arrows to set the multiplier to 'x10', press Enter
- Select menu item M08.2.03 – Upper Threshold, press Enter
- Use the arrows to set the ramp up limit (in watts). Note that in the previous step, a multiplier of 10 was set to this value so actual value is 1/10 of the actual required power. For example: For an export limit of 30kW, set to -2500 – 5kw larger than the export limit, press Enter. (note the negative sign for power export)
- Select menu item M08.2.06 – Lower Threshold, press Enter
- Set to the same value that was just set in menu item M08.2.03, press Enter
- Fully reverse out of the menu by pressing the up and down arrows together repeatedly.

5 Testing

5.1 Verify Wireless Communications with Rx WFIL (IPS-01-W only)

- The connection status can be viewed with the indicator LED on the enclosure door of the WFIL. If a connection exists, then the communications can be tested.
- Put the transmitting GFIL into manual mode by pressing the left and right buttons together on the Schneider Zelio Controller inside the GFIL until “TEST MODE” is displayed on the screen.
- Hold the Up arrow until the contactor relay energizes.
- Check that the Corresponding contactor relay on the receiving WFIL has also energized.
- Return the system to automatic mode by pressing the left and right buttons together on the Schneider Zelio controller again, or by power cycling the board.

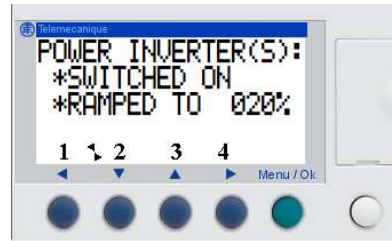
5.2 Verify Communications with Inverter

- To test and confirm that the RS485 interface is correctly communicating with the inverter, refer to the inverter documentation. For multiple inverter applications, ensure that each inverter has been configured with a unique RS485 port address.
- Put the GFIL into manual mode by pressing the left and right buttons together on the Schneider Zelio Controller inside the GFIL until “TEST MODE” is displayed on the screen.
- Use the Up and Down arrows on the Schneider Controller to manually drive the inverter limit from 0 to 100% and check the measured site loads changes accordingly on the Lovato Power Meter.
- Return the system to automatic mode by pressing the left and right buttons together on the Schneider Zelio controller again, or by power cycling the board.

5.3 Test Operation

Power up the GFIL and all inverters and check the system is operating correctly.

- Wait for all start-up procedures to complete as described in sec. 1.
- Once normal operation commences, the current inverter power limit will be displayed.



- If possible, reduce on site loads so that there is excess solar production, causing the export limit to be temporarily exceeded. Verify that the inverter power limit is reduced accordingly so that the export limit is no longer exceeded.
- If possible, increase on site loads so that onsite consumption exceeds the export limit. Inverters are allowed to ramp all the way to 100%. Verify inverters operate at 100% of capacity.

6 End User Guide

Once installed and tested, GFIL is a fully automated system that requires no end user interaction. The two internal LCD displays show current status of the inverter system. This is only visible by opening the enclosure and should only be done by a qualified electrician.

6.1 “BUILDING MAINS NET POWER FLOW” display

This display gives a readout of instantaneous net power flow of the building mains. Positive power indicates power flowing into the building from the grid. Negative power indicates power feed-in back to the grid. Negative power flow should persist only for very short periods of time (maximum of 15 seconds while the inverter is ramped down).

6.2 “SYSTEM STATUS” display

This display gives a readout of the current status of the device. In normal operation, the display will show percentage of full capacity that the inverter is operating at.

The display will also show if any detected fault conditions are present in the system.

6.3 System Status Faults

Once the inverter is ramped down to 0%, if net export power continues to be detected for more than 15 seconds (indicating a possible failure of communication with the inverter), the inverters will be disconnected from the grid. The System Status will display “RAMPED TO 000%, EXCESS FEED IN!!”

If 5 disconnection events occur within a space of 20 minutes, the inverters will be locked out. This indicates likely failure of communication with the inverter. The System Status will display alternating messages of “FEED-IN FAULT! EXCESS DISCONNECTS” and “SWITCH POWER OFF AND ON TO RESET”. Power will need to be switched off and back on to reset the system.

6.4 Display Indicators

There are 2 LED indicators on the front panel that show overall system status.

The red ‘Tripped’ indicator shows that a fault has occurred on the GFIL and that the Inverter has been disconnected.

The green ‘Running’ indicator shows that the inverter is enabled and running.

7 Technical Data

Parameter	MODEL
MODEL	IPS-01
Phases	3
Inverter compatibility	ABB Trio, Huawei, Sungrow, SMA, Fronius, ABB PVS
Maximum Inverter Size	30kVA
Input Voltage	415V (3P + N)
Power Consumption	7W
Inverter Interface	RS485
Current Transformer Ratio	Customisable
Dimensions	400(h)x300(w)x200(d)
Weight	7.7kg
Ingress Protection	IP54
Warranty	12 months
Approvals	Energex Ergon Energy

IPS-01

IES GRID
FEED-IN LIMITER

Designed & Manufactured
By



www.integrelec.com.au