

Important Information for your PowerFlow: E.R.S PRO

- **Installation and User Manual**

IMPORTANT SAFETY INFORMATION, PLEASE READ AND UNDERSTAND THIS MANUAL BEFORE COMMENCING WORK



Thank you for choosing PowerFlow

PowerFlow's Mission is to continually develop efficient energy storage technologies in order to increase the availability of low carbon generated power. This will contribute to CO2 reduction and help to protect our planet for future generations, something all of us at PowerFlow are very passionate about.

Over five decades of combined experience has been deeply integrated into your PowerFlow product. From its class leading efficiency, to the highest of safety standards, every component has been carefully considered to ensure long lasting reliable operation. All of our products are fully designed and 100% manufactured in the UK at our factory in Herefordshire, helping to support Great British manufacturing. By purchasing PowerFlow Products, you are supporting the development of this important technology so future generations can benefit and prosper from cleaner, greener more sustainable energy.

Ian Murray: Managing Director
PowerFlow Energy Ltd

Register Your Product.

Don't forget to register your product on the PowerFlow website. This will extend your 2 year standard warranty for an additional 3 years absolutely free.

Visit: www.powerflowenergy.com/warrantyregistration

Contact Us

If you have any questions about our products, our website is designed to provide support. Should you not find what you are looking for, you can contact us using the details below.

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Made in England

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1. Introductory Information

1.1 Validity

Read fully and understand this manual before commencing work

This manual is for electrically skilled persons. The tasks described in this manual may be performed by electrically skilled persons only. It describes the installation, commissioning, maintenance and warranty procedures for the following PowerFlow Energy Recovery Systems:

- PowerFlow E.R.S **PRO** (ERS-PRO)

1.2 Additional Information

You can find additional information on the design of the complete Energy Recovery system at www.powerflowenergy.com. For electrical design information such as MCB, RCD and cable sizing, please reference BS7671.

1.3 Country Grid Parameters

Using E.R.S PRO Inside and Outside the UK

E.R.S PRO is designed to be connected to an AC supply network with a nominal supply of 230V / 50Hz. ERS PRO is designed to work alongside a grid connected renewable generator such as a wind or solar system. E.R.S PRO does not connect directly to the generation system and therefore will not effect its operation or any tariff rate that may be associated with it. In addition, it does not effect any grid connection standards associated with the generation equipment.

E.R.S PRO can be used outside of the UK provided it is connected to the above stated network supply standard and complies with any other local electrical standards required for connection. Please note that if E.R.S PRO is connected to a supply network which is outside of its scope of operation it will cause permanent damage to the device and will not be covered by any factory warranty. It is important to ensure that the supply voltage and frequency are suitable before connection.

2. Safety Information

2.1 Appropriate Usage

PowerFlow E.R.S PRO is a grid connected energy flow controller diverter designed solely to be used together with any grid connected solar PV or wind generation system. It can be used in energy battery back up or off grid systems provided the electricity network complies to the appropriate grid standard.

Do not use E.R.S PRO for any other purpose other than described in this manual. Alternative uses or modifications to the product are expressly NOT permitted. Any other use will void any warranty claims and operation permissions.

2.2 Safety Instructions

The following terms will be used throughout this manual. Please observe the safety instructions.

DANGER: Danger to life due to high voltages.

- All work detailed by this instruction MUST be carried out by an electrical professional.
- Children may not play with or have access to Sundial.

WARNING: Risk of injury, illness or damage to property.

- All work detailed by this instruction should be carefully considered.
- Children may not play with or have access to Sundial.

IMPORTANT: Recommendations or advice that if not followed correctly may cause installation or system problems and may result in additional product support or damage.

2.3 IMPORTANT: Safety and Legionella Advice



IMPORTANT SAFETY INFORMATION

WARNING: Please take note of the following:

1. Risk of burns due to hot enclosure.

During operation the ERS enclosure may become hot to touch. Always use caution when touching the enclosure after long periods of operation.

2. DO NOT place objects over the enclosure.

PowerFlow ERS uses the metal enclosure to dissipate heat. Covering the enclosure may cause product failure. Please ensure adequate ventilation is provided.

For further information refer to the installation guide.

3. DO NOT disassemble the ERS unit at any time.

PowerFlow ERS contains live parts inside, never disassemble the system.

Important: Legionella Advice

Legionella is a bacteria that can grow in water below 60°C. It is common practice for hot water and heating systems to raise the water temperature on a weekly basis over 60°C in order to kill any bacteria growth. Due to the very nature of ERS it is possible during periods of low energy export to partially heat the water. In systems without a second heating source such as a boiler to 'top up' the water temperature, it is possible that unused warm water could remain in a temperature range where bacteria can grow. Because the particulars of each installation are different, PowerFlow Energy cannot take responsibility for controlling the risk of legionella. It is the installers responsibility to ensure that this risk is controlled. Adequate water exchange and/or additional heating must be supplied in order to raise the water temperature above 60°C on a minimum of a weekly basis. This can be achieved in all electric homes by using the external timer function to override the ERS system once per week. Further advice on Legionella can be found at www.hse.gov.uk/legionnaires

3. Product Description

PowerFlow E.R.S PRO is a grid connected energy diversion system which converts surplus AC electrical energy, or export, from any grid connected solar or wind generator into heat via a hot water or space heating resistive load element. By performing this function, surplus energy generation, which is unable to be used, can be stored and used at a later time when demand for hot water or heating is required. This results in less energy consumption and in turn leads to cost savings.

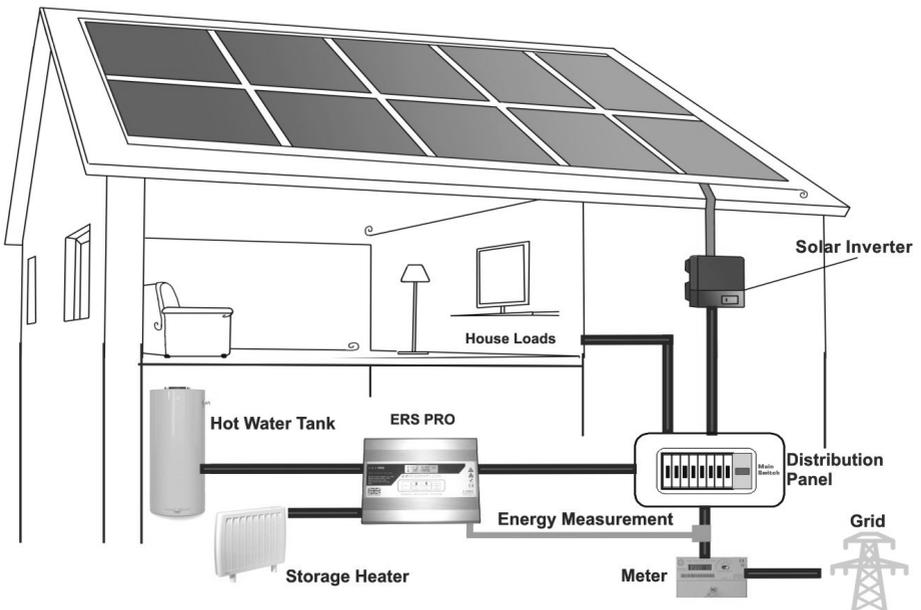
E.R.S PRO is completely independent from the solar or wind generator other than it uses a current measurement device or CT to calculate in which direction energy is flowing and how much energy is available for storage. E.R.S PRO performs energy capture purely based on this measurement alone. This enables E.R.S PRO to work during any time of the day and, together with the solar or wind generator, to ensure that maximum energy capture is possible.

During times when export occurs, the amount of energy available continually changes due to changes in generation and changes in building demand. E.R.S PRO automatically adjusts it's output power level input every 200 milliseconds to match export levels ensuring that only surplus energy is sent to the heating load.

This method of fast accurate power measurement, combined with fast reacting automated self adjusting output power makes E.R.S PRO unique. By utilising these control techniques, the maximum possible self consumption can be achieved through the system.

Only a single E.R.S PRO device can be used on a single phase. For three phase installation, three devices can be used on each independent phase. E.R.S PRO has also been designed to be used in conjunction with the PowerFlow Sundial battery storage system.

The diagram below illustrates a typical system layout.



4. Unpacking

4.1 Scope of Delivery

Please check the delivery for completeness and for any visible external damage. Contact your supplier if anything is damaged or missing. Ensure that the Product Identification Documentation is retained.

The following components should be included:

A



B



C



D



E



F



G



H



Object	Quantity	Description
A	1	E.R.S PRO Device with integral mounting brackets
B	1	Current measurement clamp (CT)
C	1	Main 5 pin power connector
D	1	Current clamp connector
E	1	Auxiliary connector (AUXCON)
F	2	16A 4.0mm 2 pin push fit through connector with lever
G	1	M6 wall fixing set
H	1	Installation and User Manual.

5. Mounting

5.1 Selecting a Suitable Mounting Location

IMPORTANT: E.R.S PRO is rated to IP44. It is suitable for indoor installations only. It is also suitable for damper environments such as un-heated garages or out buildings. Do not mount sundial in direct sunlight due to heat absorption. The device will run hotter and become less efficient.

- The mounting method and location must be suitable for E.R.S PRO's weight and dimensions. It has been designed for wall mounting only in a near vertical orientation. Ensure suitable ventilation.
- The mounting location would normally be close to the main consumers distribution board.
- Only mount on a solid surface and take into account cable runs from the device.
- The mounting location must at all times be clear and safely accessible without the use of additional equipment such as scaffolding or lifting platforms. Non-compliance with this recommendation may restrict servicing.



Vertical Mounting



Titled backwards no more than 15°



Never mount E.R.S PRO with a forward tilt



Never mount E.R.S PRO Horizontally

Extended Mounting Criteria

- The connection panels must always face horizontally DO NOT MOUNT UPSIDE DOWN
- Never mount with a sideways tilt
- If possible Install E.R.S PRO at eye level due to the accessibility of the LCD display, if future service is required, this will facilitate service work.

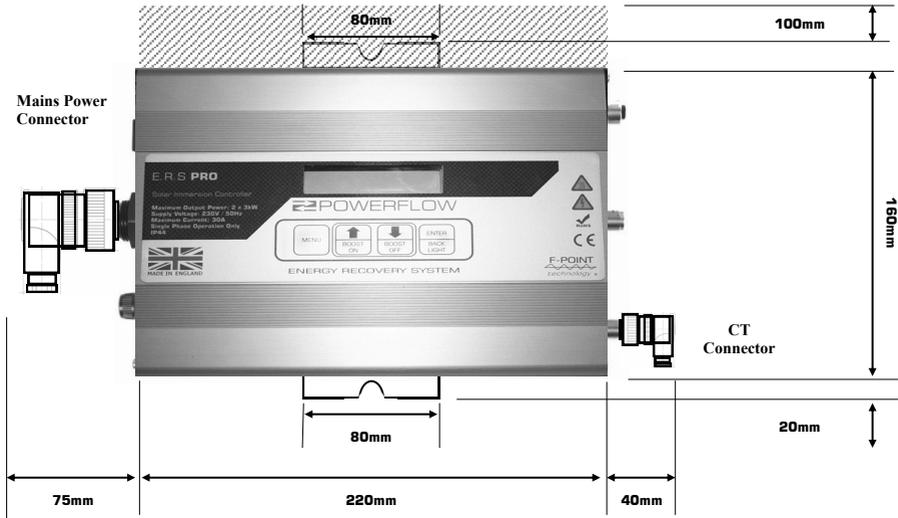
IMPORTANT

Temperature Considerations

Do not expose E.R.S PRO to direct sun light, as this can cause excessive internal heating

It is strongly recommended NOT to install E.R.S PRO into loft spaces due to increased heat during Summer months. Installations in locations which can exceed 40°C will reduce the ability to operate efficiently and could reduce the life span of the device. Note: The free extended 3 year warranty will be void if devices are mounted in unsuitable locations.

5.2 Electrical Mounting Clearances

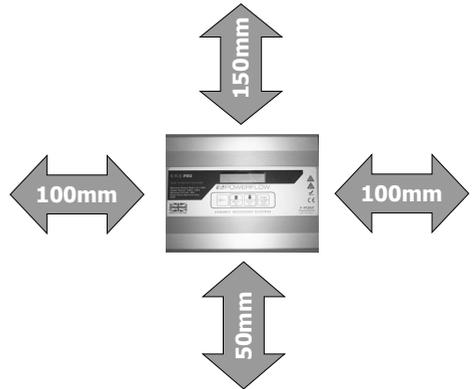


5.3 Ventilation Mounting Clearances

CAUTION:

Observe the minimum clearance to walls and other devices.

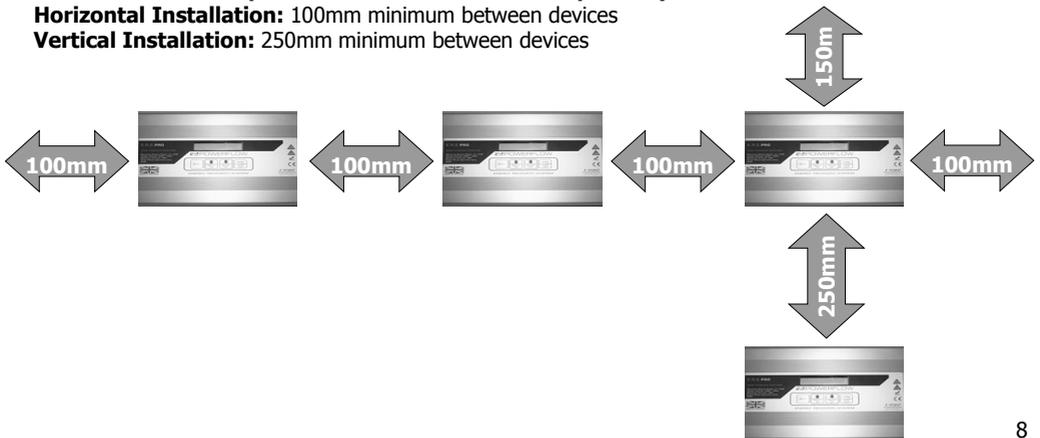
This is to ensure that there is sufficient and suitable space for heat dissipation



Installation of multiple E.R.S PRO devices in three phase systems.

Horizontal Installation: 100mm minimum between devices

Vertical Installation: 250mm minimum between devices



6. E.R.S PRO System Design and Installation

It is important to take note of the following notices. Failure to do so may result in danger to persons, damage to property, or invalidation of the device warranty. All electrical work referenced in this section should be carried out by an electrical professional.

Take note of the following warnings:

DANGER: Risk of electric shock

PowerFlow E.R.S PRO is designed to be fully integrated and simple to install. It is recommended however, that all electrical work is carried out by a competent electrical professional and all local electrical standards such as BS7671 are observed prior to installation.

DANGER: E.R.S PRO has an aluminium enclosure and is considered to be an exposed conductive part. There **MUST** be an earth connection terminated at all times.

Ensure an earth continuity check between the PE supply and the case has been carried out prior to commissioning.

WARNING: Risk of damage to the Device

E.R.S PRO **MUST NOT** be installed in conjunction with Voltage Optimization or power factor correction equipment. Doing so may damage the device. Failure to ensure that no voltage or power factor correction devices of any type are installed on the premises prior to installation will result in the warranty being void. For further information, please refer to the warranty documentation.

6.1 AC System Design

The E.R.S PRO device contains two output connections, each of which are capable of outputting modulated power levels either at the same time (parallel mode) or independently from one another (serial mode). This gives the system designer almost limitless options on how to divert energy into heating applications. Weather utilising an Immersion heating element or storage heater or both.

Parallel Mode

In parallel mode, both outputs will drive two connected loads at the same time. For example, if two 3kW immersion heating elements are connected to each output, E.R.S PRO will divide any available export equally between the two loads. So in this example, if 2000 Watts of export is available, E.R.S PRO will drive 1000 Watts to each 3kW immersion element.

In parallel mode, it is possible to drive up to a maximum of 6kW of output power, 3kW from each output. In this instance, it is possible to pull 27 Amps, therefore the supply circuit must be suitably designed to cope with this level of load current.

A maximum value of a 32A type B MCB should be observed for overcurrent or short circuit protection in this instance.

A practical example of using E.R.S PRO in parallel mode is if two immersion elements are located within a single large hot water tank. This would allow up to 6kW of diverted energy from a larger domestic or small commercial solar PV array. This could be repeated 3 times on a three phase installation to give 18kW of diversion in total.

The AC connection method for parallel mode up to 6kW maximum load

Connection method:	A New Final Circuit is used to supply E.R.S PRO
Cable Size:	4.0mm ² minimum is used (NOT SUPPLIED)
MCB Size:	25A to 32A max Type B
Protection and isolation method:	30mA RCD protection provided.

Serial Mode

In serial mode, each output can be assigned via the menu to act as priority. For example, E.R.S PRO is connected to two 3kW immersion elements, one on each output. Output 1 is set to priority, if 2000W of export is available, E.R.S PRO will divert 2000W to the first immersion element connected to output 1. Once output 1 immersion element switches off due to it reaching temperature, E.R.S PRO will automatically switch over to output 2 where it will divert all available export to this element.

In Serial Mode, only 1 output is driven at the same time, so the maximum load will never be greater than 3kW. A maximum value of a 16A type B MCB should be observed for overcurrent or short circuit protection in this instance.

The AC connection method for serial mode up to 3kW per output maximum load

Connection method:	A New Final Circuit is used to supply E.R.S PRO
Cable Size:	2.5mm ² is used (SUPPLIED)
MCB Size:	16A to 25A max Type B
Protection and isolation method:	30mA RCD protection provided.

6.2: Dynamic Load Control

Background

In a conventional solar immersion controller, the device must calculate the size of load it is connected to. The connected load (for example, a 3kW immersion element) is calculated during the setup procedure by measurement. The size of the load is then stored in the devices memory. During operation the device always refers back to the recorded load size. For example if the storage load is 3kW and the export level is 1.5kW, the device knows to allow power to flow to the load at a rate of 50%. The disadvantage of this method is that it is not possible to vary the load size as it must always be fixed.

Dynamic Load Control with E.R.S PRO

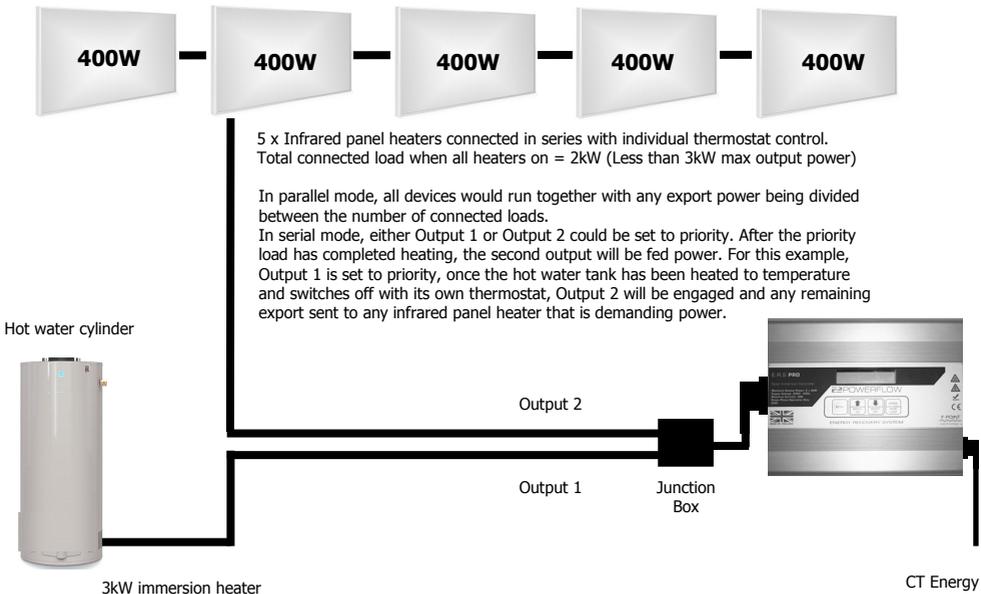
PowerFlow E.R.S PRO has patent pending Dynamic load control. This control method is fundamentally different to conventional devices as E.R.S PRO does not measure or record the connected load size during setup. Instead, it continually re calculates the connected load size every 200 milliseconds and automatically adjusts its output to compensate. This provides two main advantages.

The first is that as the supply voltage from the network fluctuates, due to ohms law, this has an effect on the load size its self. The higher the voltage, the bigger the connected load, the lower the supply voltage, the smaller the load becomes. E.R.S PRO dynamic load control is able to automatically adjust for these fluctuations, ensuring the correct amount of energy is always diverted.

The second advantage is that multiple loads of different sizes can be connected to E.R.S PRO at the same time, provided the total of all connected loads does not exceed the devices maximum output power. For E.R.S PRO this is 3kW per output.

The multiple connected loads may be independently controlled by their own power demand through connected thermostats. As the total load changes as heating devices 'click' in and out of circuit, the dynamic load control will automatically adjust its output in order to share any available export between heating devices.

The example below illustrates how E.R.S PRO and Dynamic Load Control can be used.

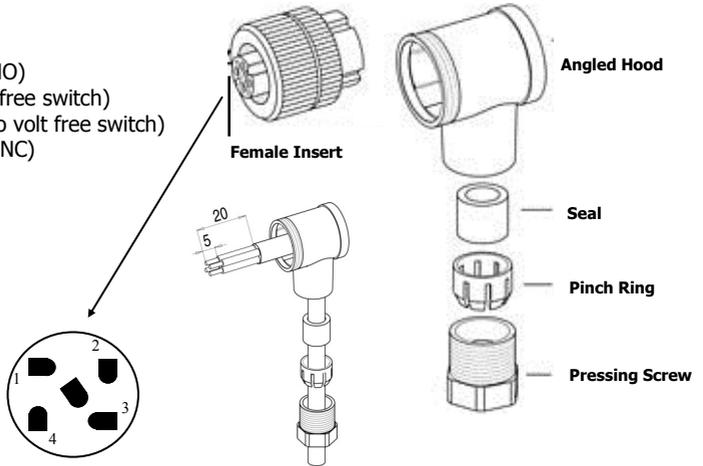


6.3: Auxiliary Connector

The 5 pin Auxiliary input on the right hand end plate offers a number of connection options for the control of external equipment. A volt free external timer and the internal programmable relay can be controlled.

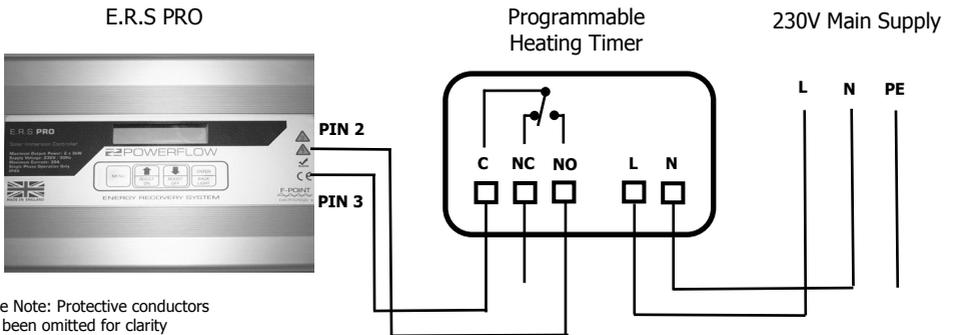
AUXCON PIN Assignments:

- PIN 1: Relay Normally Open (NO)
- PIN 2: Timer IN (5V) (To volt free switch)
- PIN 3: Timer OUT (ground) (To volt free switch)
- PIN 4: Relay Normally Closed (NC)
- PIN 5: Relay COM



6.4: External Timer Connection

A volt free external timer switch connection can be made between Pins 2 and 3 of the AUXCON connector. A voltage must NOT be applied to these pins as it will cause damage to the device. A general heating timer with a volt free connection can be used as per the diagram below.



Note: See section 8, Display and Control Elements for instructions on how to activate the timer function.

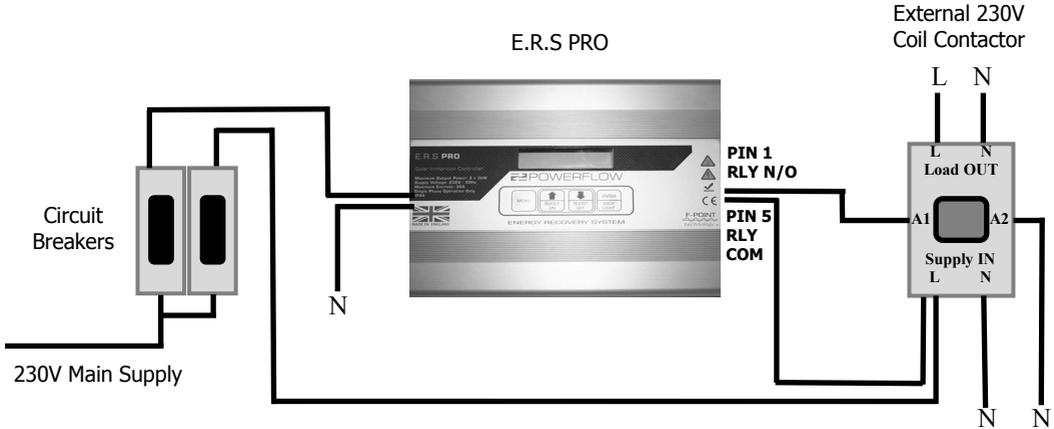
6.5: Smart Relay

A volt free programmable relay can also be accessed via the Auxiliary connection. The smart relay can be set for use in a number of different applications.

Note: Only one function can be used at any one time when using the Smart Relay.

6.5a Connection of a secondary external load

By enabling the smart relay function and setting the desired parameters, a secondary external load can be controlled via an external contactor or relay. In this instance, because the electrical load does not pass directly through E.R.S PRO, but only controlled by it, any type of load, including inductive loads such as pumps and motors can be controlled. The diagram below shows a typical example.



Please Note: Protective conductors have been omitted for clarity

Setting the Smart Relay for secondary load control

Once the Smart Relay has been connected and enabled in the menu, two control settings will become available, '**Relay Trig Level**' and '**Relay Delay Time**'.

The set trigger level detailed below will activate even if E.R.S PRO is driving the primary load output.

Example: One of the primary outputs drives an immersion heater to 1500 watts. The relay trigger level is also set to 1500 watts and the relay delay time to 5 minutes in order to ensure enough export power to drive a 1200 watt fan heater. Once the E.R.S PRO device has been driving the primary output at 1500 watts or above for 5 minutes, E.R.S PRO will shut down the primary load and activate the smart relay in order to turn on the secondary load at 1200 watts. Once the secondary load is running, there will remain 300 watts of export and which point E.R.S PRO will re-start the primary output and divert the remaining 300 watts into the immersion heater. Should the export level fall below the 1200 watts required to drive the secondary load, E.R.S PRO will shut down the secondary load and continue to drive the primary load with all available export.

Relay Trigger Level Setting

The trigger level sets the amount of export power that must be available in order to switch on the external load. This value should be set approximately 10% higher than the power value of the secondary load intended to be driven. When the export value setting is reached, E.R.S PRO will activate the smart relay which in turn should energize the connected contactor, which in turn will energize the load circuit.

Relay Delay Time

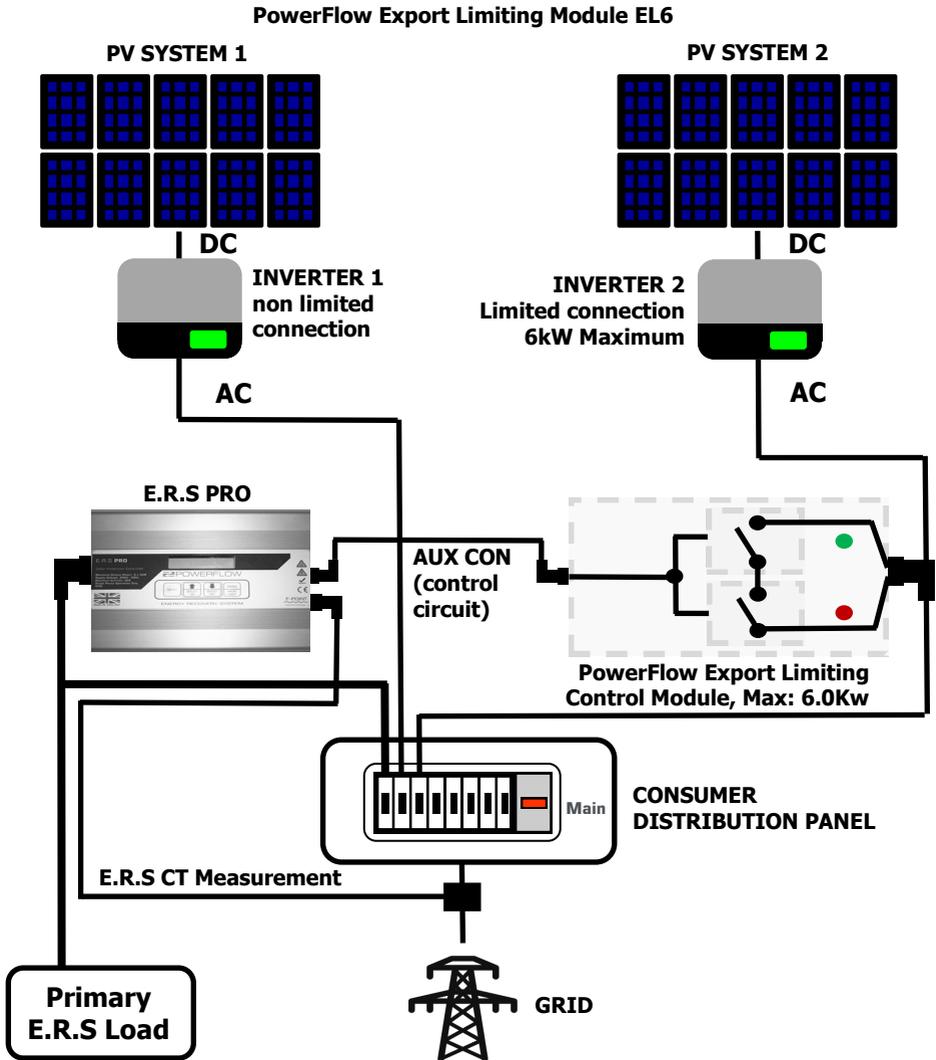
The relay delay time sets the time period in which the trigger level must exceed before switching the smart relay. This stops unwanted activation during a very short period of increased export levels and aids stability in the control system

6.5b: This section is reserved for a future upgrade to add specific control parameters to a hot water De-stratification pump circuit.

6.5c: E.R.S Export Limitation Module Overview

The smart relay can also be used for the control connection for PowerFlow's E.R.S EL6 export limitation module. The E.R.S EL6 is designed to connect and disconnect a solar inverter's AC supply in order to comply with a G59/3 and G100 agreed network connection scheme for export limitation.

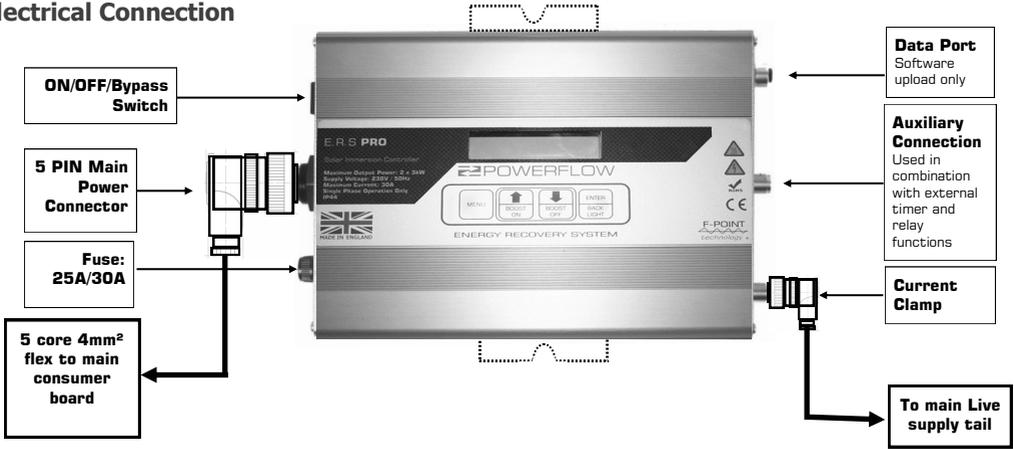
The diagram below shows a typical system layout, further detailed information can be found within the E.R.S EL6 documentation.



Note: See section 8, Display and Control Elements for full instructions on how to activate and change the smart relay settings

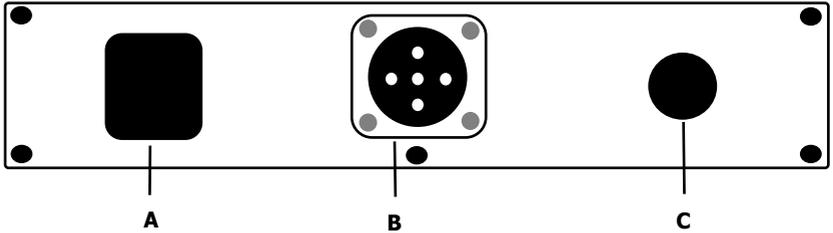
6.6 Overview of Connections:

- Electrical Connection

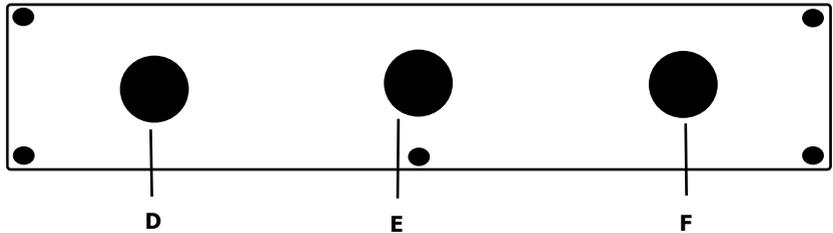


- Connection Panels

Left hand connection plate.



Right hand connection plate.



Object	Description
A	Main Power Switch, ERS ON, OFF, BYPASS
B	Main Power IN and OUT Connection
C	Main Fuse, 30A MAX
D	Current Clamp Connection
E	Auxiliary Connection
F	Data Connection (for internal use software upload only)

6.7 Connector Assemblies: Assemble each connector following the guide below:

5 PIN Power Connector Assembly: PF-PC-07-FM

Pin connections for main power connector
(Recommended cable: 2.5mm² 5 core flex)

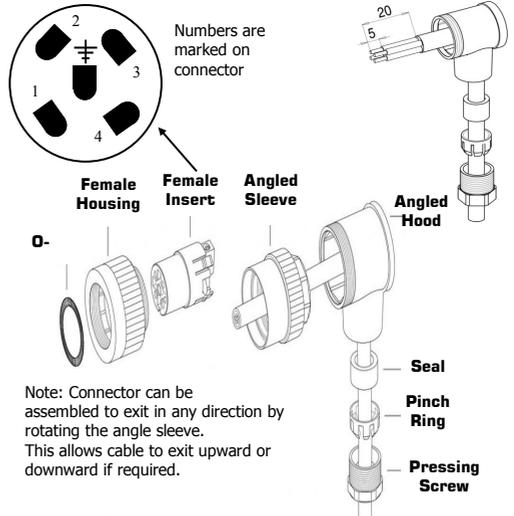
PIN 1: Live In (from supply) (**Brown**)

PIN 2: Live Output 1 (To Load 1) (**Black**)

PIN 3: Live Output 2 (To Load 2) (**Grey**)

PIN 4: Neutral (From Supply) (**Blue**)

CENTRE PIN: Protective Earth (**Green/
Yellow**)



5 PIN Current Clamp Connector: PF-CC-05-ML

Pin connections for current clamp connector

PIN 1: Spare

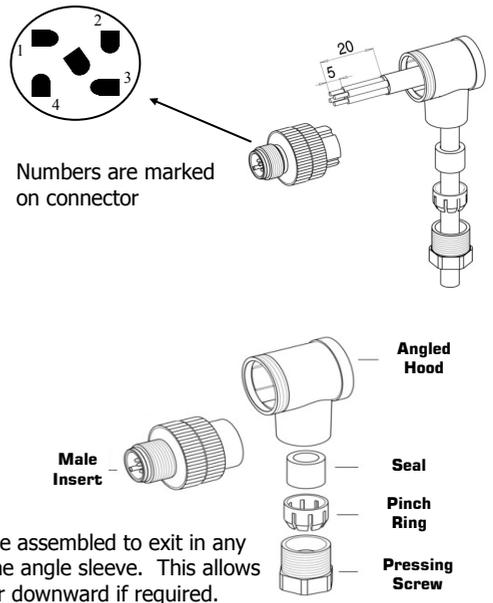
PIN 2: Spare

PIN 3: Live (Black)

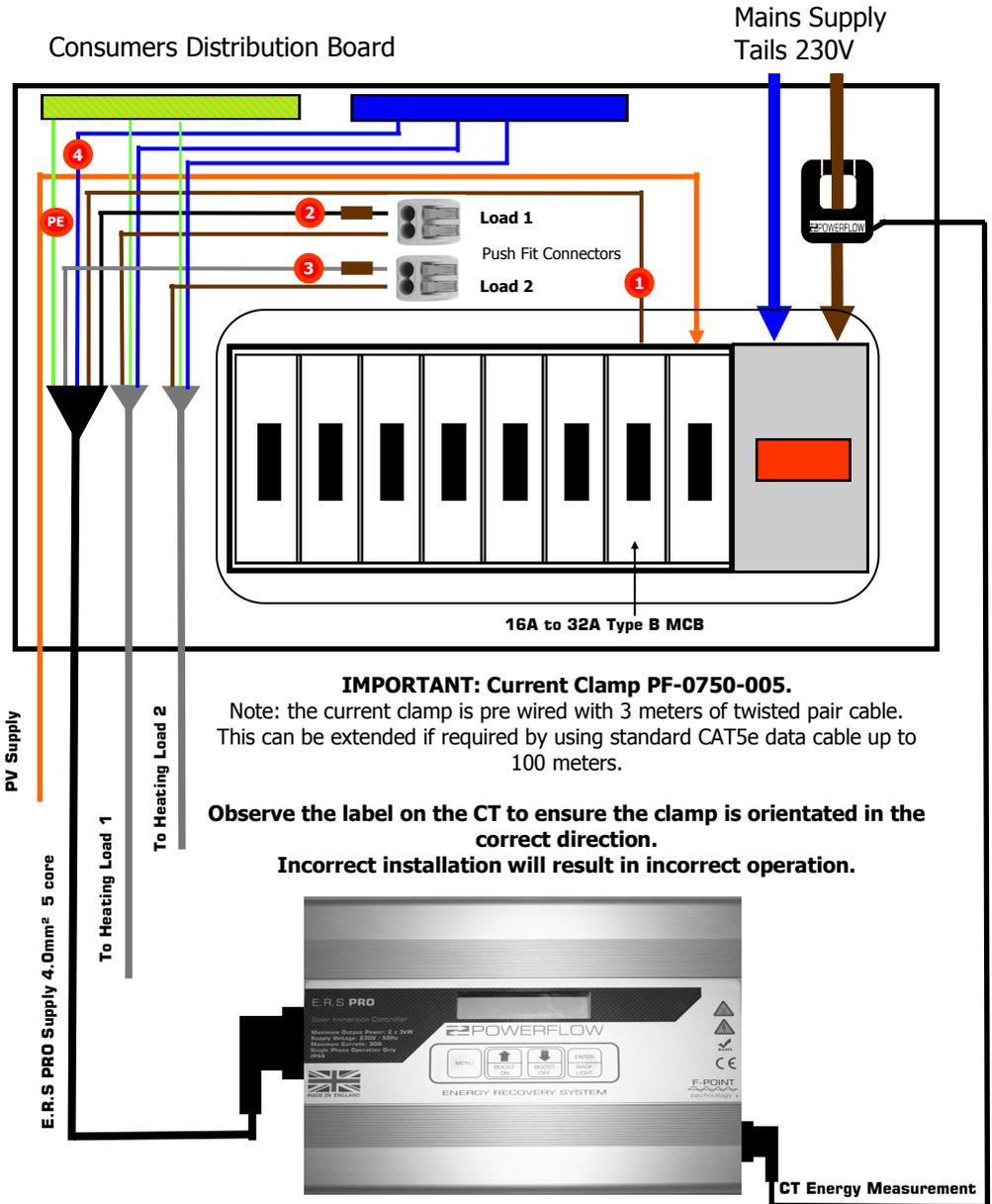
PIN 4: Ground (White)

CENTRE PIN: Spare

The current clamp cable may be extended by up to 100 meters by using CAT5e cabling. Only a single twisted pair is required for this application.



6.8 AC Connection and Wiring Diagram: Parallel and Serial Mode



IMPORTANT

- 1:** Terminate **PIN 1:** > Live In (from supply) (**Brown**) to existing MCB (**16A to 32A Max**)
 - 2:** Terminate **PIN 2:** > Live Output 1 (**Black**) to push fit connector to load 1 live inside DB
 - 3:** Terminate **PIN 3:** > Live Output 2 (**Grey**) to push fit connector to load 2 live inside DB
 - 4:** Terminate **PIN 4:** > To Neutral Bar (**Blue**) in DB together with load 1 and load 2 neutrals
- PE: CENTRE PIN** to earth bar in DB together with earths from loads 1 and 2.

7. Commissioning

7.1 Commissioning E.R.S PRO

Before switching on for the first time, check that the following has been completed.

1. E.R.S PRO has been mounted to a secure surface, the correct way up and with adequate Ventilation.
2. All cable runs are correctly fixed and supported.
3. The main power cable has been terminated observing the correct pin numbers.
4. Ensure all the terminations inside the consumer unit are correct and the terminals have been tightened.
5. Ensure earth continuity between the earthing bar inside the consumer unit and one of the cover fixing screws on the device.
6. Carry out all circuit tests in accordance with BS7671.
7. Ensure the current clamp connector has been terminated observing the correct pin numbers and is securely clamped around the incoming live supply conductor in the correct location.
8. Check the orientation of the current clamp to ensure the label faces the incoming supply and that it is installed between the main meter position and the main consumer board.
9. Ensure any safety labelling has been securely fitted in the correct locations.
10. Ensure the customer has been issued with a user manual and has been given an overview of how their system works and how to use it.

Only once all of the above has been completed should the system be energised.

7.2 E.R.S PRO Automated Setup

PowerFlow E.R.S PRO is an intelligent device with no initial setup required. It automatically detects the import/export voltage and current, and the size of the connected loads. At the left hand end plate, push ON/OFF switch to ERS operation.

7.3 Adjusting the existing heating system

IMPORTANT: For use with immersion heaters where hot water is currently heated by Gas or Oil boilers:

All default settings are optimised for installations containing gas or oil boilers.

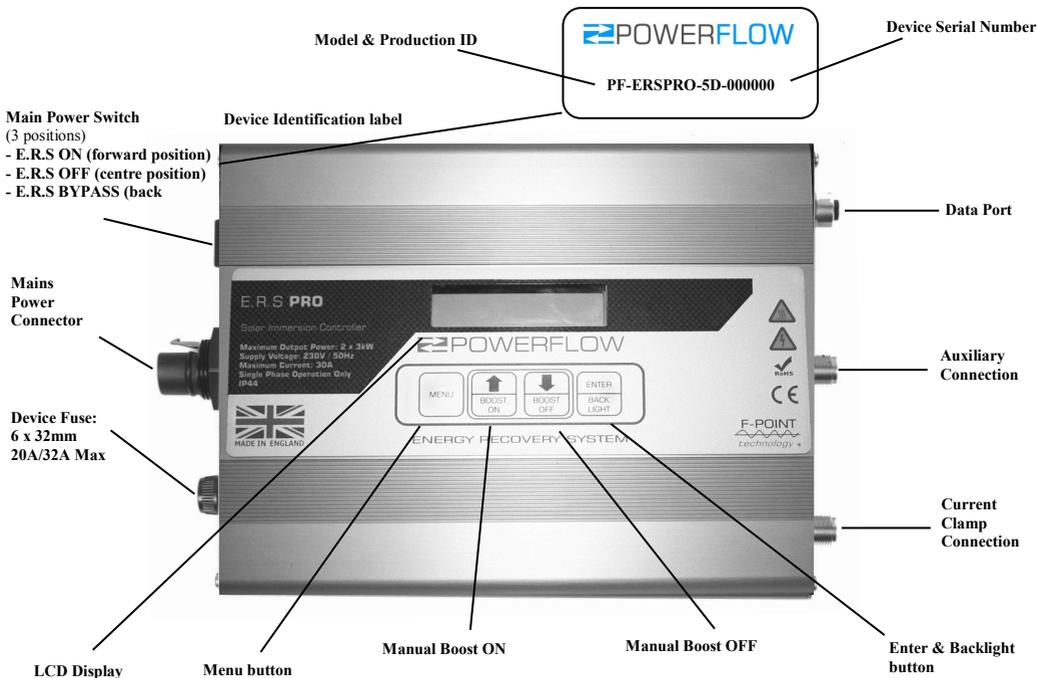
To maximise savings, it is advised to re-time the boilers domestic hot water timer to come on after sunset to allow the E.R.S PRO to heat or pre-heat the hot water. This will allow maximum energy capture and lead to maximum savings .

IMPORTANT: For use with immersion heaters where this is the only method of heating the water tank.

If the water is currently heated using the immersion element, when solar generation is low, there will not be enough export energy to heat the water tank fully. When E.R.S PRO is used in this way where the only heating source is the immersion the risk of legionella is significantly increased. Due to this it is mandatory to connect an external programmable timer to override the heating system once per week a minimum. If the installation is used in combination with night rate energy, set the timer to come on each night to ensure the tank is hot.

8. Control and Display Elements

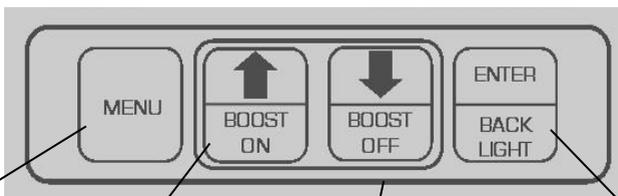
8.1 Device Control Elements Overview



8.2 Control Pad Overview

E.R.S PRO included an LCD display and a four button control pad which is used to access the menu options.

The figure below shows the control pad



Menu Button
Home Screen:
 Enter Menu
Menu Screen:
 Exit Menu

Boost ON Button
Home Screen:
 Start Manual Boost
Menu Screen:
 Up / change setting

Boost OFF Button
Home Screen:
 Stop Manual Boost
Menu Screen:
 Down / change setting

Enter / Backlight Button
Home Screen: (backlight OFF)
 Turn on backlight
Home Screen: (backlight ON)
 Display kWh Meter
Menu Screen: Next screen

8.3 LCD Display Overview

E.R.S PRO includes an LCD display designed to give live operational information to the user. The LCD display contains two lines which are both used on the home screen.

- The top line is dedicated to displaying the live power measurement of the building.
- The bottom line is dedicated to displaying operational data of the connected load

8.4 LCD Display Icons The following icons are used on the home screen.



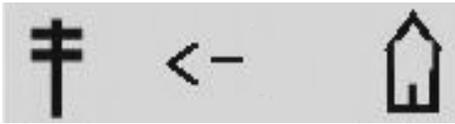
Grid Icon

Represents the electricity grid.



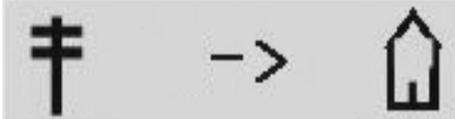
House Icon

Represents the house or building.



Energy Flow Arrow

If the arrow points from the house icon to the grid icon, this indicates power is being exported to the grid.



Energy Flow Arrow

If the arrow points from the grid icon to the house icon, this indicates power is being imported from the grid.



Parallel Mode

Indicates Parallel Mode is selected



Serial Mode

Indicates Serial Mode is selected and output 1 is set to priority



Serial Mode

Indicates Serial Mode is selected and output 2 is set to priority



Manual Timer Icon

Indicates the Manual Boost timer is in operation.



EXT. TIMER

Indicates External programmable timer has been activated.

LOAD OFF

LOAD OFF

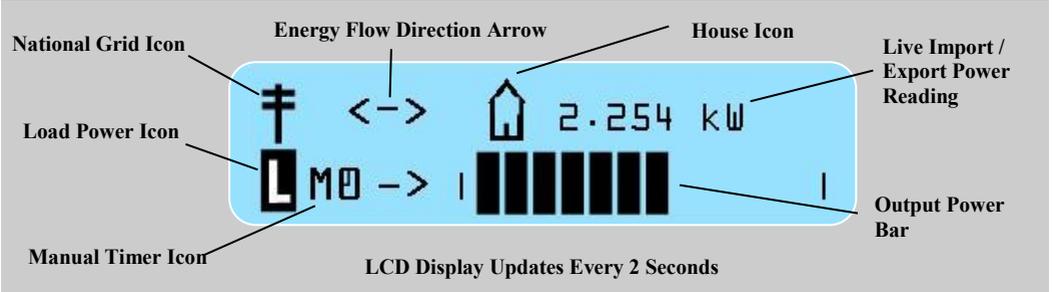
Indicates that there is export energy available but the heating load is disconnected from E.R.S PRO. This could indicate that the heating cycle has completed successfully.

8.5 Home Screen

When powering up E.R.S PRO, the display will show:
POWERFLOW ERS PRO VX.X (software version number)

After this the device will automatically boot to the home screen and display the following information.

Home Screen Display Icons

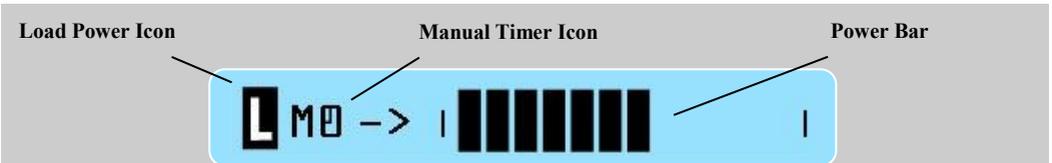


Live Energy Measurement Display (Top Line)



The top line of the LCD display shows live information about changes in the amount of power being imported from, or exported to, the National Grid. The energy flow direction arrow changes, pointing from the grid icon to the house icon when the building is importing energy, and from the house icon to the grid icon when the solar generator is exporting energy. The numerical value of the live energy import or export (dependent on the direction of energy flow) in kilo Watts (kW) is displayed opposite. In the example above, the building is exporting 2.254 kW to the national grid. The import/export power reading is accurate to 3 decimal places.

Live Energy Measurement Display (Bottom Line)



The bottom line of the LCD display shows live information about the power output to the heating load (L). As energy export increases and decreases, ERS is continually reacting to this change by varying the amount of power supplied to the heating load. This is indicated by the Power Bar which moves from left to right according to how much power the ERS is diverting. The display is updated every 2 seconds. As the Power Bar steps increase, the live export reading on the top line decreases, depicting the movement of recovered energy from the grid to the heating load. Each step represents 5% of the total heating load, (e.g: 5% of 3kw load = 150w steps). When ERS is recovering energy during the day, it will always leave a small amount of export as a power buffer to ensure inadvertent import does not occur. During the night, ERS will display the live imported energy of the building in kW. The power bar will be empty indicating that ERS is not powering the heating load.

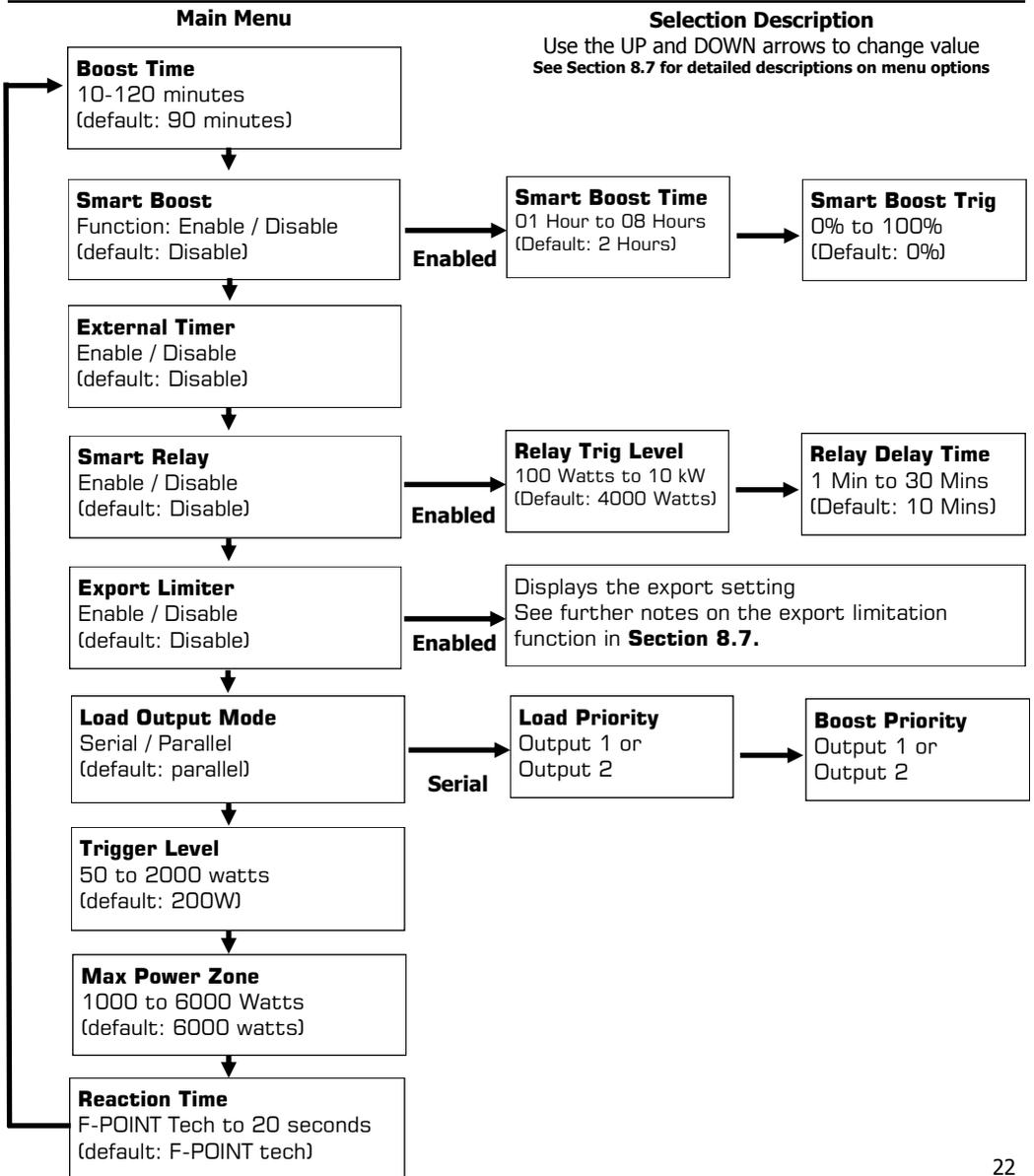
8.6 Main Menu

E.R.S PRO contains a main menu where all settings can be configured for the installation.

- **To access the main menu, press and hold the MENU button for 1 second.**
- **To exit and save all settings press and hold the MENU button for 1 second.**

The main menu operates in a loop. Press the ENTER button to skip to the next menu option. If a menu option is set to enabled and alternative sub options are available for that selection, they will appear automatically by pressing the ENTER button.

Note: If the display is left in the main menu, it will default to the home screen after 5 minutes.



8.7 Detailed Menu Explanation and Advanced Setup

E.R.S PRO has been designed to be as simple to install as possible. All default menu settings have been carefully considered to give the best performance in conventional installations. The device has also been designed to give the installer or user advanced setup features which can be essential when setting up the system for special requirements. When making changes to the device, it is essential to understand the detail of these changes.

IMPORTANT: Failure to observe the correct settings may cause system problems.

This section gives a detailed explanation on the standard and advanced settings for E.R.S PRO

STANDARD SETTINGS

1. Boost Time

When the manual boost button is pressed it starts a count down timer which can be changed in the menu settings. This determines how long the manual boost program will run. The larger the hot water tank, the longer it will take to heat up, therefore the time must be associated with the volume of water to be heated.

Tip: Most hot water tanks up to 200L will heat up within 90 minutes, larger tanks may require longer.

Note: When using the smart boost function, the time setting will also effect this function and must be set accordingly.

2. Smart boost

The boost function intelligently and automatically applies the manual boost function without the use of a timer, based on a set of pre defined conditions.

During periods of low solar generation, such as during the winter months, where export is very low, E.R.S PRO will not be able to fully heat the hot water tank. In these conditions further control is necessary if heating by a secondary source such as gas or oil is not possible. Enabling the Smart Boost function gives two additional settings, Smart Boost Time and Smart Boost Trigger Level.

The Smart Boost Trigger Level determines a threshold of output power to the load which if not exceeded after the Smart Boost Time period will result in the triggering of the Smart Boost function. This will then run for the period of Boost Time set.

Example: E.R.S PRO is connected to a 3kW immersion heater. The Boost Time is left on default at 90 minutes, the Smart Boost function is Enabled and the Smart Boost Trigger Level set to 50%, the Smart Boost Time set to 6 hours. There is very little solar generation so E.R.S PRO over the next 6 hours is only able to achieve a maximum output of 25%. Due to low export levels E.R.S PRO is not able to heat the water to the desired temperature set on the immersion thermostat. Because 25% is less than the pre set 50%, after 6 hours E.R.S PRO automatically applies the boost function and heats the water to the desired temperature from import electricity.

3. External Timer

If connecting an external programmable timer (see section 6.4) the external timer function **MUST** be set to enabled. E.R.S PRO then allows the external timer to take control and turn on the priority output to 100%. This function is essential in all electric homes where night rate energy tariffs are used. In this scenario the external programmable time should be set to activate each night during the low rate tariff times. If the water has already been heated by solar, there will be no electrical demand, however if the water has not been fully heated due to low export levels, the timer will act as a boost to complete the water heating cycle.

4. Smart Relay

When connecting an external contactor for use with the Smart Relay function to run a secondary external load, the Smart Relay must be set to enabled.

See section 6.5 for further information on connection and settings advice.

5. Export Limiter

The Export Limiting function can only be factory set and used with the E.R.S EL6 Export Limitation device (sold separately). This function, if set to enabled cannot be changed due to regulatory conditions but will provide control of a AC connected solar inverter for export limiting schemes. Please refer to the EL6 documentation for further details and advice.

6. Load Output Mode

E.R.S PRO had dual outputs that can be set to run together in Parallel Mode or independently in Serial mode. **In Parallel Mode**, both outputs will run together, splitting any available export energy between the two loads at the same time. If a single load is connected, set the device to Parallel Mode. **In Serial Mode**, each output can be assigned to serve as the priority output, sending power to that output first before switching over to the second output once the first has completed its heating cycle.

ADVANCED SETTINGS

IMPORTANT: The following three settings will affect the basic function of E.R.S PRO. If set incorrectly they may cause the system to stop working. Care must be taken to fully understand these settings before making any changes.

7. Trigger Level

E.R.S PRO works by sending power to the heating load in 5% steps. This is indicated by a half of a power bar on the lower line of the home screen during operation. If for example E.R.S PRO is connected to a 3kW immersion heater, 5% would = 150Watts. Therefore, E.R.S PRO will work in 150W steps to modulate power to the load based on available export levels.

The trigger value indicates the minimum amount of export power that must be available in order for E.R.S PRO to start diverting power to the load. The default setting is 200 watts, therefore in the example above each step is 150 Watts, after the first step, 50Watts of export will remain. This 'buffer' of export is essential to promote system stability from voltage fluctuation from the supply network. It is recommended that a 50 watt buffer is always maintained. Should the connected load size be lower than 3kW, the trigger level may be lowered accordingly. In addition, changes to the trigger level can also be used in conjunction with other third party storage equipment in order to set storage priority.

For Example: if a third party battery storage product has a trigger level of 300 watts and priority to charge the battery is required, E.R.S PRO trigger level must be set to greater than 300 watts to prevent energy being diverted to hot water storage first.

8. Max Power Zone

Setting the Maximum Power of E.R.S PRO will cap the maximum output power the device can deliver. This may be useful in small sized PV systems where low amounts of export energy are available. By capping the output power, a 3kW immersion heater can be reduced to 1.5kW, for example.

9. Reaction Time

During operation E.R.S PRO is continually collecting energy level measurement data from the connected current transformer (CT). The sample rate at which the device collects and reacts to this data significantly effects its performance. The faster the sample rate, the more accurate the device will track and react to available export levels. F-POINT technology is a patent pending method of data collection and unique to PowerFlow. It enables E.R.S PRO to have a sample rate of just 200 milliseconds. This make the device the fastest reacting immersion control product on the market today. Due to its faster reactions, when connected to systems with third party storage equipment, it will always control the diversion of energy simply because it reacts faster. This menu setting enables the engineer to slow the sample rate down in order for E.R.S PRO to be compatible with third party equipment.

For Example: If E.R.S PRO is to be used with a third party storage device with a reaction time of 5 seconds and it is a requirement for the third party device to be the priority, then the reaction time must be slowed down to more than 5 seconds.

9. Trouble shooting

Below is a sample of the most commonly asked question from our support line.

If you can't find the answers to your questions in this manual, then for further information please visit www.powerflowenergy.com or you can also send us an email via our website at www.powerflowenergy.com/contact-us

Why does E.R.S PRO not switch ON?

- Check all AC connections are terminated correctly.
- Check that all MCB's, fuses are in place
- Check all isolators are in the ON position.
- Check the AC power connection plug has been terminated correctly and is seated correctly into the connector on the connection plate.

My E.R.S PRO device seems to be running even when there is no export?

- E.R.S PRO is receiving incorrect data from the connected current clamp (CT)
- Ensure that the current clamp is orientated the right way round. The silver label MUST be facing towards the incoming supply. (Refer to section 6.8)
- Ensure the CT connector is not terminated back to front. (refer to section 6.7)
- Ensure that the current clamp is in the correct location and clamped around the correct cable. It MUST be connected around the main incoming live supply tail between the main consumers distribution board and the main incoming electricity meter.

The home screen shows Load OFF all the time?

This is normal if the heating load has reached temperature and has switched off on its own thermostat. When E.R.S PRO operates it is able to detect if the heating load is connected or not. If E.R.S PRO is Continually displaying LOAD OFF when export is available, then it is likely the load is not connected.

- Check that the immersion switch is turned on
- Many modern immersion heating elements contain a thermal cut out switch which often looks like a small disc which you will need to push inwards. It will be located on the immersion heating device.
DANGER: Ensure the power is supply is isolated before removing any covers.

I have a red neon light on my immersion switch which flashes when E.R.S PRO is operating, is this normal?

Yes, this is a completely normal by-product of operation and actually quite useful. It can act as a quick reference that E.R.S is diverting energy at that time. The faster the neon light flashes the more energy is being diverted.

When I put my volt meter on the immersion terminals during when E.R.S PRO is outputting power I get a funny reading?

This is completely normal. E.R.S PRO operates by controlling the AC sign wave. Standard multimeters are unable to detect this control method due to it's speed. This is why you see a lower average voltage reading which is constantly changing.

I don't understand the display?

- Refer to section 8 of this manual for further details on the display.

10. Technical Specification

TECHNICAL DATA	POWERFLOW E.R.S PRO
Output power: Max / Nominal	6000 Watts
Output current: Max / Nominal	25A / 30A
Phase Operation	Single Phase
Voltage range / frequency	206-262V / 50 Hz
Fuse Protection (replaceable)	25A (Serial) 30A (Parallel)
Compatible Generator Type	Solar PV / Wind / Hydro
Recommended renewable generator size	10kW + per phase (with 6kW load)
Output load	Resistive Only
Output control range	5% - 100%
Minimum output load	100 W
Minimum export power level / Export tracking range	25W / 25-200W (adjustable)

General Data

Dimensions (without connectors) (W / H / D) mm	230 / 160 / 54
Weight	1.9kg
Noise emissions	<10dBA
Self-consumption (night)	8mA
Degree of protection	IP44
Operating temperature range	-10 °C to +60 °C
Cooling concept	Convective Cooling
Efficiency	98%
Compliant Standards	CE / RoHs / BS EN: EMC / LVD

 POWERFLOW



Made in England

www.powerflowenergy.com