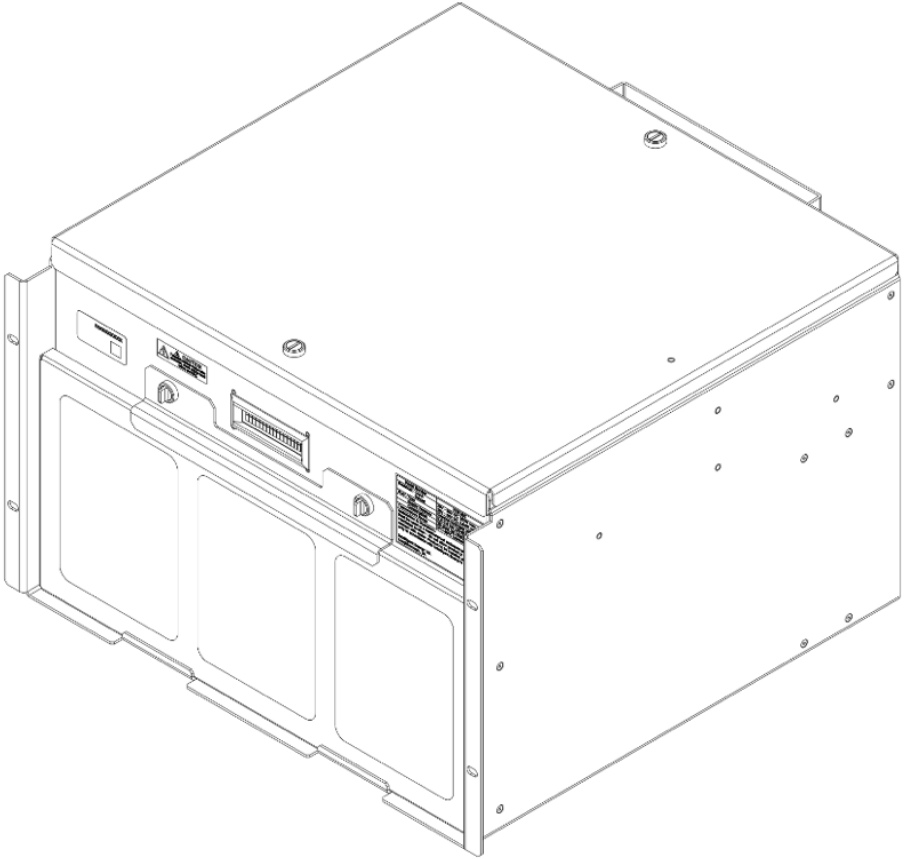




Intelligent  
Energy



# FCM-802/804 User Manual

This User Manual is intended as a general guidance only and does not purport to address the specific situations that could potentially arise from the use of fuel cell systems and their usage in connection with all stationary and portable power applications. The recipient is responsible for ensuring that all personnel have read and understood this User Manual before being allowed to handle, operate, install and store any equipment supplied by Intelligent Energy.

The recipient must ensure that any personnel responsible for operating fuel cell stationary and portable power applications are suitably trained and certified in compliance with any applicable local, state and federal laws and regulations and good industry practice. The recipient is responsible for complying with any relevant health and safety policies and procedures that may apply to the operation of stationary and portable power applications and use and storage of hydrogen on any sites.

Intelligent Energy warrants to the recipient and it will repair and replace any defective equipment resulting from the authorised use of the equipment provided. Notwithstanding the above, Intelligent Energy, to the fullest extent permitted by law, accepts no liability (including liability in respect of any error or defects in the fuel cell system) for any damage caused as a result of Recipient's unauthorised use of the equipment provided. The recipient acknowledges that the manner in which the equipment is stored, used or operated is not under the control of Intelligent Energy Limited.

Intelligent Energy has made every effort to ensure that this User Manual is accurate and disclaims liability for any inaccuracies or omissions that may have occurred.

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# 1 Safety and warnings



## 1.1 In case of an emergency

- Stop power generation from the fuel cells by disconnecting the FCM enable pin
- Isolate the DC supply (application specific)
- Isolate the fuel supply (application specific)

## 1.2 Warning: Fire or explosion hazard

Failure to follow safety warnings exactly could result in serious injury, death or property damage.

- Do not store or use gasoline or other flammable vapours and liquids in the vicinity of the FCM(s)
- Installation and service must be performed by a qualified installer, service agency or gas supplier

The Fuel Cell Modules (FCM) 802 and 804 use hydrogen gas to provide electrical DC power. They must only be used by personnel who have been trained for the safe use of the products by Intelligent Energy.

The FCM is designed for heavy industrial applications. The safety assessment applied to this product considers its use to be limited to non-essential / non-critical applications or where it is the back-up to another form of power supply rather than being the primary source.

This is an important distinction and particularly in the systems response to failure, in this case the response to failure is to shut down the output, normally by isolating the hydrogen supply. This course of action would not be appropriate where it is intended as the single source of supply or in the provision of critical supplies to, for example medical equipment, emergency lighting, interlocking, etc.

Where the intended use is outside that assessed by Intelligent Energy, the customer must assess and design their system appropriately with regard to this limitation.



- High current electrical hazard is present
- Risk of electric shock, be aware of consequential injury
- There is a risk of residual voltage on live component after shutdown
- Do not electrically overload the FCM-802/804
- Pressurised hydrogen present, highly flammable!
- Ensure hydrogen supply can be isolated in case of an emergency
- Unit must be inspected for damage and leak checked prior to use
- Fault diagnosis must be carried out by trained and competent personnel only
- Do not use this fuel cell if any part has been underwater. A flood damaged fuel cell is potentially dangerous. Attempts to use the fuel cell can result in fire or explosion No naked flames in the vicinity of hydrogen operation area
- Do not remove the air filter while operating
- Do not remove the external covers
- Keep operational area free from combustible materials
- Do not obstruct air flow to inlet or exhaust
- The terminal cover must always be fitted except during installation and maintenance
- For use in a ventilated indoor environment, or
- For use in a weather protected outdoor environment; must protect from wind and rain ingress
- Environmental protection required from snow, excessive dust and vegetation
- Do not use FCM if there is water visible on it
- Do not install equipment above FCM that could release flammable/corrosive material on the module e.g. batteries
- Do NOT electrically overload the FCM-802/804. Overloading will lead to excessive load being drawn from the battery. Drawing excessive load may lead to a shutdown of the fuel cell and load not being supported
- When the FCM-802/804 is running it will stay live if the power cables are disconnected
- EVEN when the FCM802/804 is NOT running the cables may still be powered from the load side battery or external power source
- Do not use the power ground as a reference for the communications and vice versa
- Ensure communication cables are not more than 3m long
- During installation and maintenance, the FCM must be off and the load side battery or external power supply must be made safe

## 2 Product specification

<b>Performance</b>	Rated net power <sup>1</sup>	48V: 2.4kW (FCM-802) 4.0kW (FCM-804) 24V: 1.92kW (FCM-802) 2.88kW (FCM-804)
	Output voltage regulation	to ETS 300-132-2
	Rated current	48V: 50A (FCM-802) 80A (FCM-804) 24V: 80A (FCM-802) 120A (FCM-804)
	Emissions	Water vapour
<b>Fuel</b>	Fuel type	Hydrogen gas
	Fuel pressure	650mbar.g ±150mbar.g
	Fuel consumption	Less than 70g per kWh <sup>2</sup>
	Fuel storage	External storage available separately Compatible with reformer technology or compressed hydrogen gas
	Fuel composition	99.9% gaseous hydrogen or better <sup>3</sup>
<b>Operations and maintenance</b>	User interface	Options available <sup>4,9</sup>
	Start-up time	Less than 10s
	Automatic start/stop	Standard
	Manual start/stop	Available
	IP rating	IP20 <sup>9</sup>
<b>Safety and health monitoring</b>	Certification	Designed in accordance with CE requirements <sup>5</sup>
	Health monitoring	Options available <sup>6,9</sup>
<b>Physical</b>	Mass	~18kg (FCM-802) ~20kg (FCM-804)
	Max dimensions	448mm (W) × 306mm (H) × 473mm (D) <sup>10</sup>
	Connections, gas	G1/8 parallel BSP threaded port with face seal, female
	Connections, electrical	Power studs 2 × M10, GND Stud 1 × M10, 1 × FCM run input, 1 × FCM enable input, 1 × CAN hi/low/GND, 1 × 30mA driver (status), 4 × PFC
	<b>Normal operating conditions</b>	Altitude
Operating ambient temperature range		+5°C to +40°C
Relative humidity		10% to 90% <sup>8,9</sup>
Storage temperature		-40°C to +70°C

1 >95% duty cycle

2 Achieved at 25°C, beginning of life

3 According to quality specified in BS 14687-3:2014(E)

4 CAN interface can be provided, see section 6.5

5 For details see Declaration of Conformity

6 Options available for continuous health monitoring

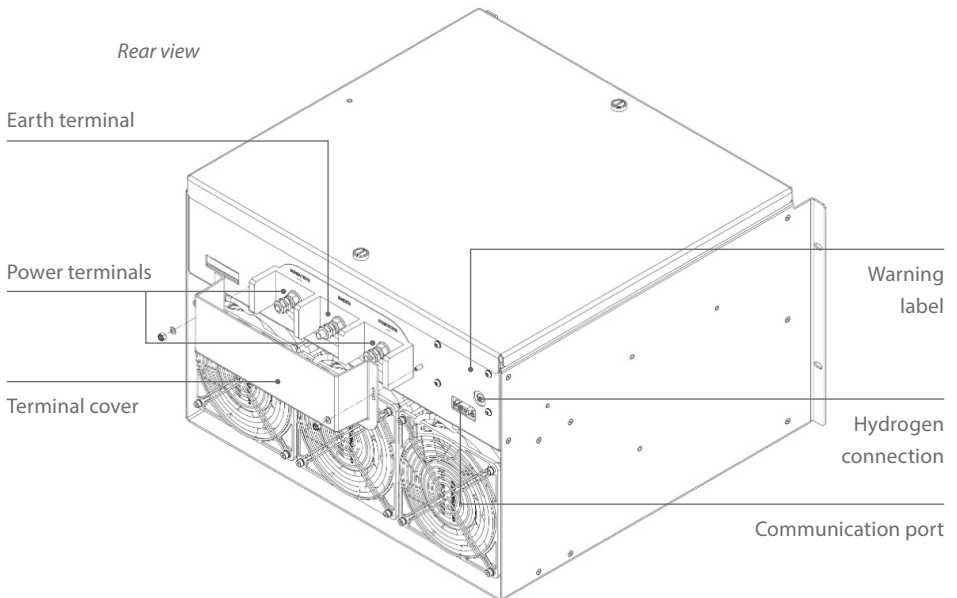
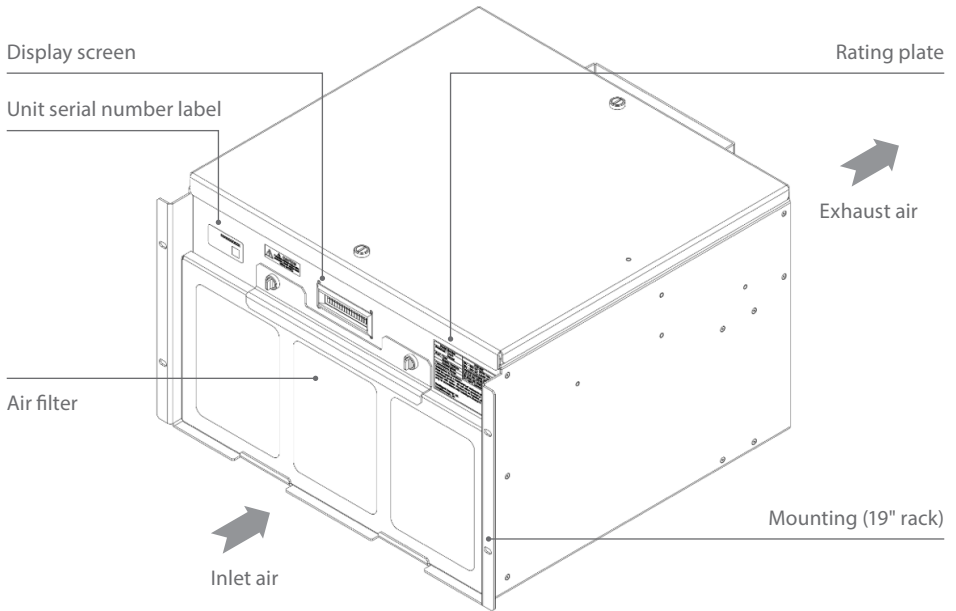
7 Rated power to 1500m. Power de-rate commences above 1500m

8 Rated power from 30%. Power de-rate commences below 30%

9 Please contact Intelligent Energy to discuss your requirements

10 Allow space for power cables and hydrogen connection to rear

The key components of the FCM-802/804 are:



## 4 Product interface

### 4.1 Interface specification

Performance	Function	Specification
Hydrogen inlet 500mbar.g – 800mbar.g	Fuel supply	G1/8 parallel thread, with face seal
Air inlet 0-16 Sm <sup>3</sup> /min 5–40°C	Ambient air filtration and supply	510 × 240mm duct
Exhaust air 0-16 Sm <sup>3</sup> /min 5–60°C	Air exhaust to ambient	3 × 140mm dia. duct
Power connection 15.0–56.0V	Connection to DC bus	M10
Communication port See section 6.5	Operational commands & diagnostics	D type 9 way

## 5 FCM-802/804 overview

This manual sets out an operating overview for Intelligent Energy's 802 and 804 FCMs. The 802 and 804 FCMs are part of the 800 Series products, which also feature a FCM 801 which can provide power up to 1.2kW.

The FCM-802/804 provides regulated DC at nominal output voltage, which can be defined by the user at a nominal 24V or 48V. The FCM-802/804 will hold the DC output at the nominal voltage while connected to an external battery or power supply so that the system will act as a hybrid system. In the hybrid system, the battery is used to provide power whilst the fuel cell starts, supports the load during the fuel cell Performance Optimisation Cycle (POC) and in the standby state. Hydrogen gas must be provided at a regulated pressure to the module inlet. The FCM-802/804 will generate power when it is given both Enable and Run signals (see Section 7.1 & 7.2).

During normal operation, the FCM-802/804 will conduct a POC where power delivery is briefly interrupted. In this period, the fuel cell will hybridise with the external battery (see Section 8.3 Performance Optimisation Cycle (POC)). If during normal operation the load drops to a low level (less than 6A, as default for FCM-804), the fuel cell will enter a standby state (see Section 8.4 Standby State). This is designed to optimise fuel consumption. If the DC Bus voltage then dips below a pre-set voltage, the fuel cell will restart.

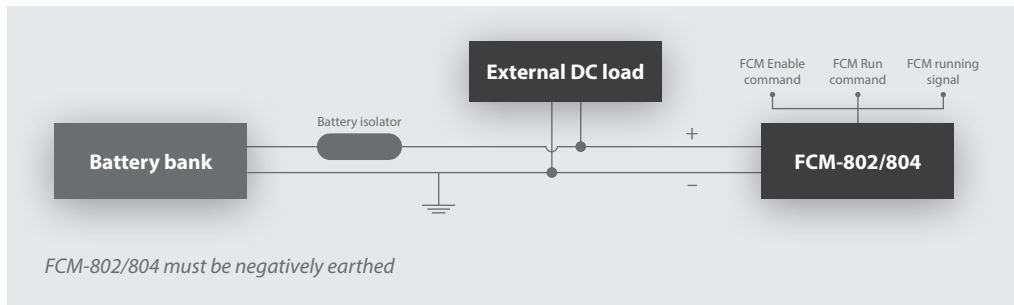
During normal operation, the FCM-802 or 804 will periodically conduct an optimisation cycle which improves the performance of the fuel cell. Power production is reduced or suspended for up to 12 seconds during the cycle so an external power source may be needed to briefly provide power to the load, for more details see section 8.3.



The FCM-802/804 must be set up in a well-ventilated environment with consideration given to the precautions of hydrogen safety.

### 6.1 Electrical configuration

The FCM-802/804 is supplied with studs which are M10 threads. These must be connected in a star configuration as shown in the figure below.



**Warning:** Do **NOT** electrically overload the FCM-802/804. Overloading will lead to excessive load being drawn from the battery. Drawing excessive load may lead to a shutdown of the fuel cell and load not being supported.

**Note:** System can be set up for positive ground applications in the factory, please contact Intelligent Energy if this is a requirement.

Cable sizing needs to consider the maximum output current of the unit, acceptable cable voltage drop, cable length, cable grouping and thermal loading etc. The cable runs should be as short and direct as practicable. The isolator should be rated for the maximum power deliverable in the installed application. See table below:

Description	Max current Deliverable	Conductor Area	AWG
FCM-802	80Amps	26.7mm <sup>2</sup>	3
FCM-804	120Amps	53.5 mm <sup>2</sup>	0

These values are for guidance and must be checked they are suitable for the proposed application.

**Note:** Do NOT disconnect the main power leads with the enable signal present.

**Warning:** When the FCM-802/804 is running it will stay live if the power cables are disconnected.

**Warning:** EVEN when the FCM802/804 is NOT running the cables may still be powered from the load side battery or external power source.

**Note:** The battery pack must provide power at the desired voltage. The battery pack must be capable of powering the load during module performance optimisation cycle (see section 8.3). For description of the command and signal connections see Section 6.5.

## 6 Connections

### 6.2 Electrical isolation and over-current protection

Suitable means of isolation must be provided by the installer to isolate both wires between the FCM 802/804 and the external battery/load. Suitable over-current protection (fuses or circuit breakers) must be provided by the installer between the FCM 802/804 and the external battery load.

The battery and associated isolation and over-current protection must conform to:

*EN IEC 62485-2:2018. Safety requirements for secondary batteries and battery installations. Stationary batteries.*

### 6.3 Air supply

To produce electrical power, the FCM-802/804 requires an unobstructed air supply which must not be recirculated between the exhaust and inlet.

- Ensure that the air inlet cannot be blocked
- Ensure that the air exhaust cannot be blocked
- Do not recirculate the exhaust to the inlet

The air must be free of the following contaminants:

- Sulphur
- Hydrocarbons
- Carbon Monoxide
- Ammonia

### 6.4 Hydrogen fuel

The FCM-802/804 must be set up in a well-ventilated environment with consideration given to the precautions of hydrogen safety. The hydrogen supply needs to be regulated to 650mbar.g ( $\pm 150$ mbar.g), and maintain the pressure during rapid changes of flow rate.

When installing and operating hydrogen systems, hydrogen general safety guidance must be considered:

- The hydrogen must be at least 99.9% pure and comply with the specification:
- ISO 14687-3:2014 grade E category 3
- ISO/TR 15916 basic considerations for the safety of hydrogen systems

### 6.5 Hydrogen connection

The hydrogen connection to the system is at the rear of the module just above the communication port (see Section 2 Product Interface). The hydrogen supply is connected via a female G1/8 parallel BSP thread with a face seal. It is required that this is then connected via an appropriate mating connection.

The hydrogen pipework must be checked periodically for leaks, particularly when connectors have been re-connected, such as cylinder exchange or installation.

## 6.6 Communication connection

To operate FCM-802/804, communications need to be provided through the D-type connector. The pins of the connector have the following functions:

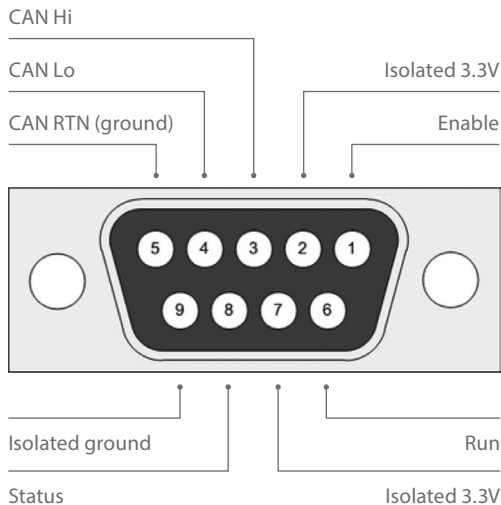
Performance	Function	Specification
1	Enable	Provides power to the FCM
2	Enable Positive	Power source for the Enable signal
3	CAN high	CAN pin
4	CAN low	CAN pin
5	CAN return	CAN reference
6	Run	Starts the fuel cell
7	Run Positive	Power for the start command
8	Status	Status indicator
9	Isolated ground	Ground pin

**Warning:** Do not use the power ground as a reference for the communications and vice versa.

**Warning:** Ensure communication cables are not more than 3m long.

## 6.7 CAN connection

The pins for the connector are as follows:



The CAN connection can be used to communicate with the FCM-802/804 using Intelligent Energy's proprietary CAN protocol. CAN in J1939 configuration can be provided, please contact Intelligent Energy to discuss this requirement.

## 6 Connections

### 6.8 Potential free contacts

There are four potential free contacts (PFC) for auxiliary signals to and from the FCM. The PFCs are setup to be one output and three inputs. These are software configurable by Intelligent Energy. The signals are shown in the following table:

Description	Pins
Input 1	1, 2
Output 1	3, 4
Output 2	5, 6
Output 3	7, 8

---

## 7 FCM commands and status

### 7.1 Module enable

To enable the FCM, the Enable pin needs a signal. To provide the signal, a connection must be made between pins 1 and 2.

### 7.2 Module run

To produce power, the Run pin needs a signal. To provide the signal, a connection must be made between pins 6 & 7 (N.B: Enable must also be present). When the signal is received, the FCM will start and maintain the battery voltage. If the current draw is at a low level (less than 6 Amps as default, for FCM-804) the FCM will go to standby state. The battery voltage will be monitored. If it drops below the nominal battery voltage (user defined Delay Start Under Voltage, see 13 Control Parameters), the fuel cell will then switch back to running mode.

### 7.3 FCM-802/804 status

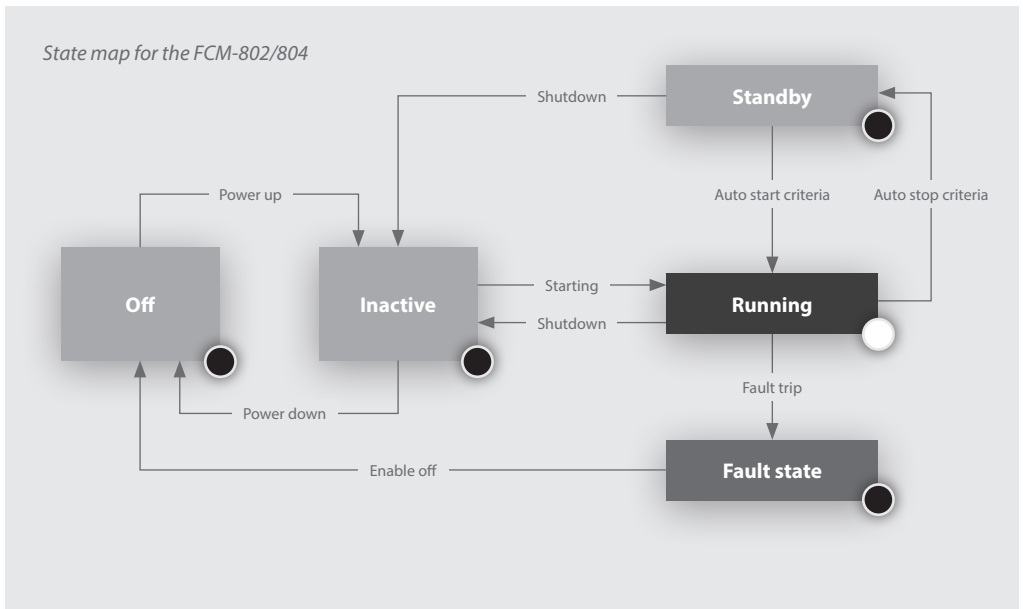
A continuous FCM-802/804 status signal, via the Communication Connection, will be present whilst the fuel cell is running with no fault present and the unit has not moved to standby.

If the Enable is off there is no status signal. If the Enable is on but there is no Run signal, then there will be no status signal present. If the Enable and Run signals are present and there is no FCM status signal then the FCM is in Standby or Fault.

## 7.4 FCM-802/804 software states

The FCM-802/804 has five possible states:

- Off
- Inactive
- Running
- Standby
- Fault



Please note the following points:

- 1 The small circle in each state box indicates the condition of the FCM-802/804 status pin. This is low (black: ●) in all states apart from fuel cell running where it is high (white: ○).
- 2 In all states, removing the Enable signal returns the FCM-802/804 to the module controller off state.
- 3 If the FCM-802/804 enters a fault condition the fault is latched. The Enable line must be cycled to clear it.
- 4 For start and stop criteria see section 13 Control parameters and standard factory setting.

## 8 Operation of FCM-802/804

### 8.1 Overview FCM 802/804

The FCM-802/804 provides regulated DC at nominal 24V or 48V output to a battery bus. The DC bus will be held at nominal voltage by a battery or external supply to act as a hybrid system. In the hybrid system, the battery is used to provide power whilst the fuel cell starts. It supports the load during the fuel cell performance optimisation cycle and while the system is in the standby mode. The nominal operating voltage is factory settable upon request.

The hydrogen pressure must be provided in a regulated state to the module inlet. The FCM-802/804 will generate power when it is given both 'Enable' and 'Run' signals and detects DC bus and fuel pressure are present.

### 8.2 Anode purge

As the fuel cell operates, it is necessary to remove water and any impurities from the anode (the hydrogen side of the fuel cell). This is done by exhausting a small amount of hydrogen to the coolant air stream. The hydrogen is mixed with the air stream so that, as the mixture exhausts the module, the concentration is low enough that it will not sustain a flame. There is no impact on power production during anode purge.

### 8.3 Performance Optimisation Cycle (POC)

During normal operation, the FCM-802 or 804 will periodically conduct an optimisation cycle which improves the performance of the fuel cell. Multiple cycles are triggered in rapid succession at start-up. Cycles occur less than 15 times an hour during running. Power production is reduced or suspended for up to 12 seconds during the cycle so an external power source may be needed to briefly provide power to the load.

### 8.4 Standby state

As a fuel saving measure the FCM-802/804 will stop producing power if the load drops below 6A, default for FCM-804 (see Delay Stop Under Current, 13 Control Parameters) for more than a minute; below this point, the ancillary equipment compromises the fuel cell efficiency. The load will then be provided by the battery.

The FCM-802/804 will continue to monitor the battery and, if its voltage drops below the nominal voltage, it will restart (See Delay Start Under-Voltage in Section 12). When the fuel cell is running, it will power the load (if present) and float the battery voltage to the nominal set-point. This feature is designed to achieve the maximum useful energy from the fuel available.

### 8.5 Fault state

If the parameters of the FCM-802/804 leave the normal operational range then a fault is triggered. When a fault has been triggered the controller will latch. To clear the fault, the controller needs to be turned off via the Enable signal. For reset instructions see Section 9.

### 9.1 Procedure to reset the fault

If the FCM-802/804 has a fault it will disconnect the internal DC-DC converter and stop providing power. To reset a fault, follow the procedure below:

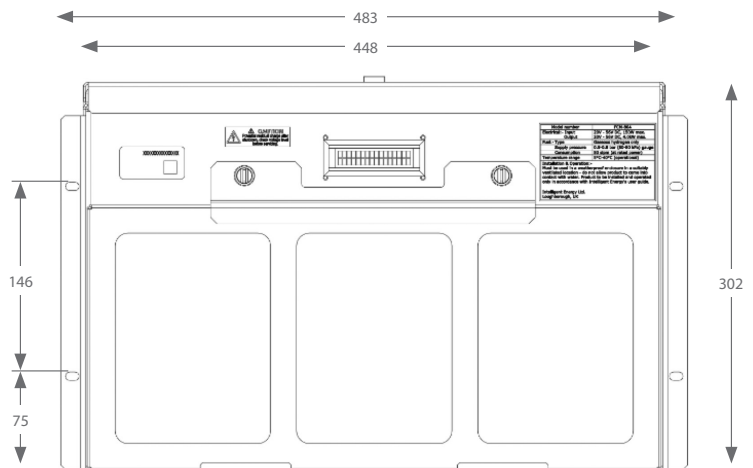
- Check that the load is disconnected
- Switch the Enable signal to 'Off'
- Wait for five seconds
- Return the Enable signal to 'On'
- Set the Run signal to 'On'
- Return the load to required setting

**Note:** The safety case of the overall installation must consider the fault condition of the fuel cell as part of its analysis of the full function of the system.

## 10 Installation and set up

### 10.1 Mechanical mounting points

The FCM-802/804 must be installed as a standard 19" rack unit. This should then be mounted on a flat surface with four retaining points, these must be tightened to a torque not exceeding 25Nm. When installing the FCM, inspect it and do not install if there is visible damage to the unit. Any surfaces in contact with the FCM must not be above +50°C. The FCM is 473mm deep (+45mm for the connection terminals) Allow at least 50mm to the rear of the FCM for the cables/pipes to run in. It is recommended to mount on a shelf with front and rear access for maintenance activity, as shown below:



## 10 Installation and set up

### 10.2 Mechanical protection and covers

The FCM-802/804 must be mounted with protection from weather and the elements. The FCM-802/804 has been designed to comply with IP20 rating, it must be mounted within an enclosure which is at least IP24 if used outside.

The covers of the unit must not be removed by unauthorised personnel. The unit contains live electrical components which could be hazardous, even when not operating. The covers and the installation must protect the FCM-802/804 from precipitation and vegetation ingress. The covers must consider the need for maintenance.

**Warning:** Do not remove the lid.

**Warning:** Do not remove terminal cover during operation.

### 10.3 Mechanical connection to the power terminals

It is important to use the correct procedure to connect the power terminals. Incorrect procedure could damage the unit if excessive torque is used. Excessive load may distort the internal busbars.

**Warning:** During Electrical maintenance/installation the FCM must be off and the load side battery or external power supply must be made safe.

- 1 Two spanners (13mm).
- 2 One to hold first nut to prevent it from rotating.  
Note: There is a lock nut at the back holding the stud in place, which must not be adjusted.
- 3 The other to tighten the second nut to secure cable/conductor terminal against first nut.

### 10.4 Mechanical connection to the Ground terminal

As standard the FCM 802/804 is provided negatively earthed. Positive earth version is available as a factory configurable feature. The Ground terminal is located between the two power terminals and should be used to earth the unit. The cable should be sized to provide protection to the unit during operation and in foreseeable fault conditions.

### 10.5 Vibration and shock loads

The mounting of the FCM-802/804 must ensure that it is not exposed to shock or vibration loads. Ensure that the FCM-802/804 is stationary while it is operating.

**Note:** If the FCM has been stressed due to vibration or shock, return to Intelligent Energy for investigation.



### 10.6 Air supply and ventilation

The FCM-802/804 requires a free supply of clean air to deliver power output. The unit will require up to 16 Sm<sup>3</sup> /min of unrestricted air flow. The operator must consider the air flow required for the environmental conditions expected. The enclosure must not unduly restrict the air flow. The covers must be designed such that the exhaust gas cannot be recirculated into the air inlet.

As part of the design, the main air flow is also used to manage the risk of a hydrogen build-up. The hydrogen purge gas is routed into the air flow such that it is diluted to below the low flammability limit at the point of exit from the unit; therefore, the installer must take care not to restrict the exhaust stream. Also, this gas stream will contain hydrogen, this is at a concentration where it is not flammable. However, the air exhaust design must consider the hydrogen risk.

The FCM-802/804 must be provided with free venting air in the range of +5 to +40°C, it must not be operated outside this range. The installation of the FCM 802/804 must consider other equipment near FCM 802/804 may elevate the local ambient temperature during their operation. A local increase of ambient temperature may affect the performance of the fuel cell. Do not use if the air has contaminants such as smoke, volatile organics or corrosive gas present.

**Warning:** Hot air that is generated by other equipment within 0.6m of the inlet of the FCM 804 is of concern and should be limited to 5% of expected operating power of the FCM 802/804 in order to limit the ingestion of hot air.

The FCM802/804 consumes oxygen as it operates it is therefore minimum air ventilation requirement must be observed at all time to ensure safety of personnel in the room:

- Rooms of less than 5m<sup>3</sup> must have a permanent vent area of 100cm<sup>2</sup>
- Rooms between 5 and 10m<sup>3</sup> must have a permanent vent area of 50cm<sup>2</sup>
- Rooms greater than 10m<sup>3</sup> do not require a permanent vent

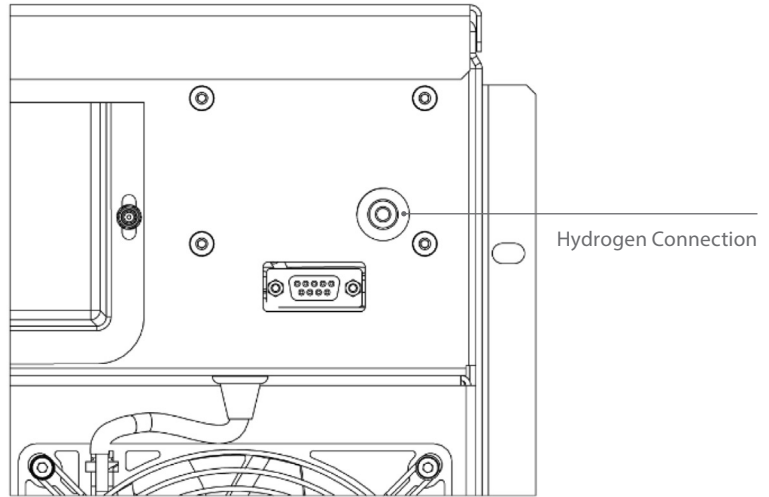
The above is applicable only if openable windows (or equivalents such as grilles or louvre panels) are also present. Extraction must be provided in cases where the above does not apply. This covers case such as internal rooms without windows. If the extraction is adjacent to the fuel cell system the rate must be at least 30l/s. If the extraction is elsewhere in the room the rate must be at least 60l/s.

## 10 Installation and set up

### 10.7 Hydrogen connection

The FCM-802/804 requires hydrogen to fuel the electro-chemical reaction. Connection of the hydrogen fuel will be at the rear of the module. The connection type is a female **G1/8 parallel BSP thread** with a face seal, this must be connected via an appropriate mating connector.

At installation the external hydrogen pipework must be bled of air or inert gas before operation. The hydrogen pipework must be checked periodically for leaks.



### 10.8 Hydrogen fuel physical requirements

The FCM-802/804 requires regulated fuel pressure to feed hydrogen into the cell. The inlet pressure for operation must be:

500mbar.g to 800mbar.g

The FCM-802/804 will consume a less than 70g/kWh at rated power. This is equivalent to 34slpm (FCM-802) and 56slpm (FCM-804) at rated power. It must be noted that the flow will spike high during hydrogen purges, which, if poorly regulated, can lead to a low pressure fault of the FCM.

It is required that the external system has an automatic shut-off valve as part of the hydrogen feed line. This allows the hydrogen to be isolated at source if required.

**11.1 User maintenance**

The user can perform the following maintenance on the FCM-802/804:

- Monthly filter inspection
- Filter change
- Troubleshooting (see below)

Not performing these basic checks will reduce unit efficiency. For all other maintenance tasks, contact Intelligent Energy Ltd.

**11.2 Contact Intelligent Energy Product Support Team**

In the event of a fault with the FCM-802/804, please contact the Intelligent Energy Product Support Team. Either contact your local representative or email:

`servicing@intelligent-energy.com`

Please have the part number of your product and the serial number (on the name plate). The part numbers are:

**802:** 10004360

**804:** 10004361

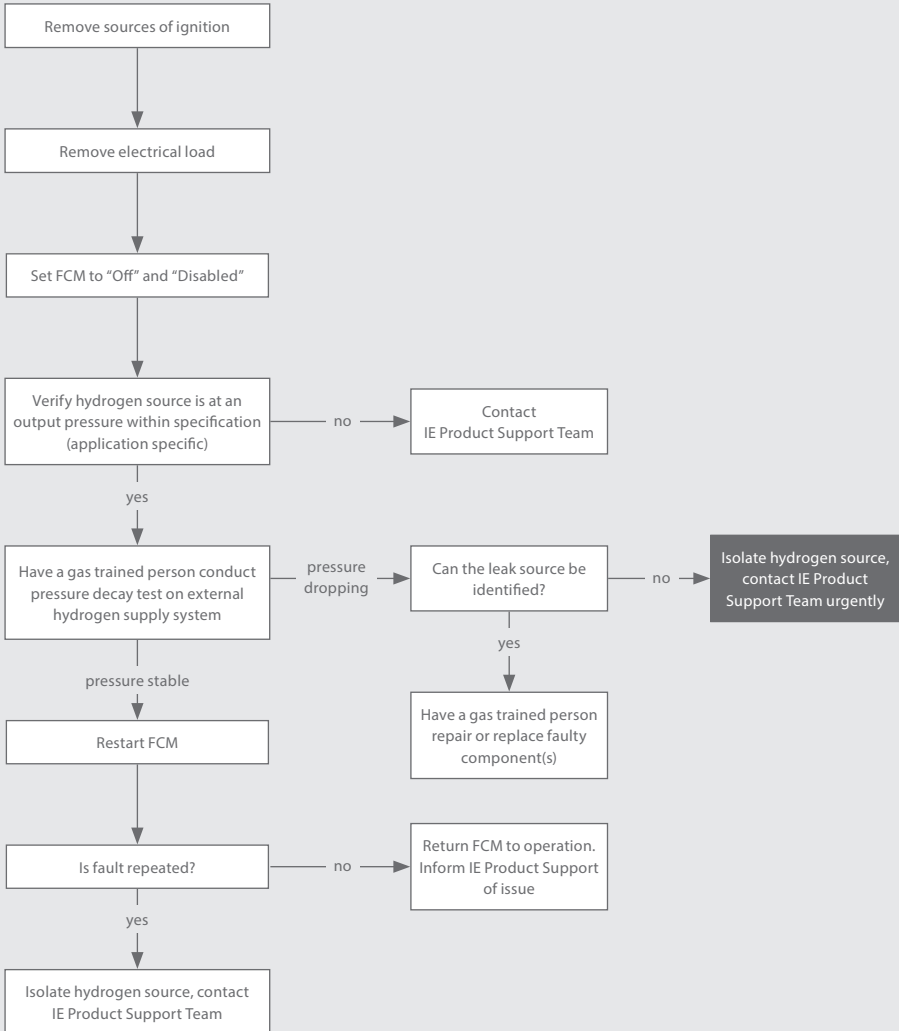
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## 12 Trouble-shooting guide

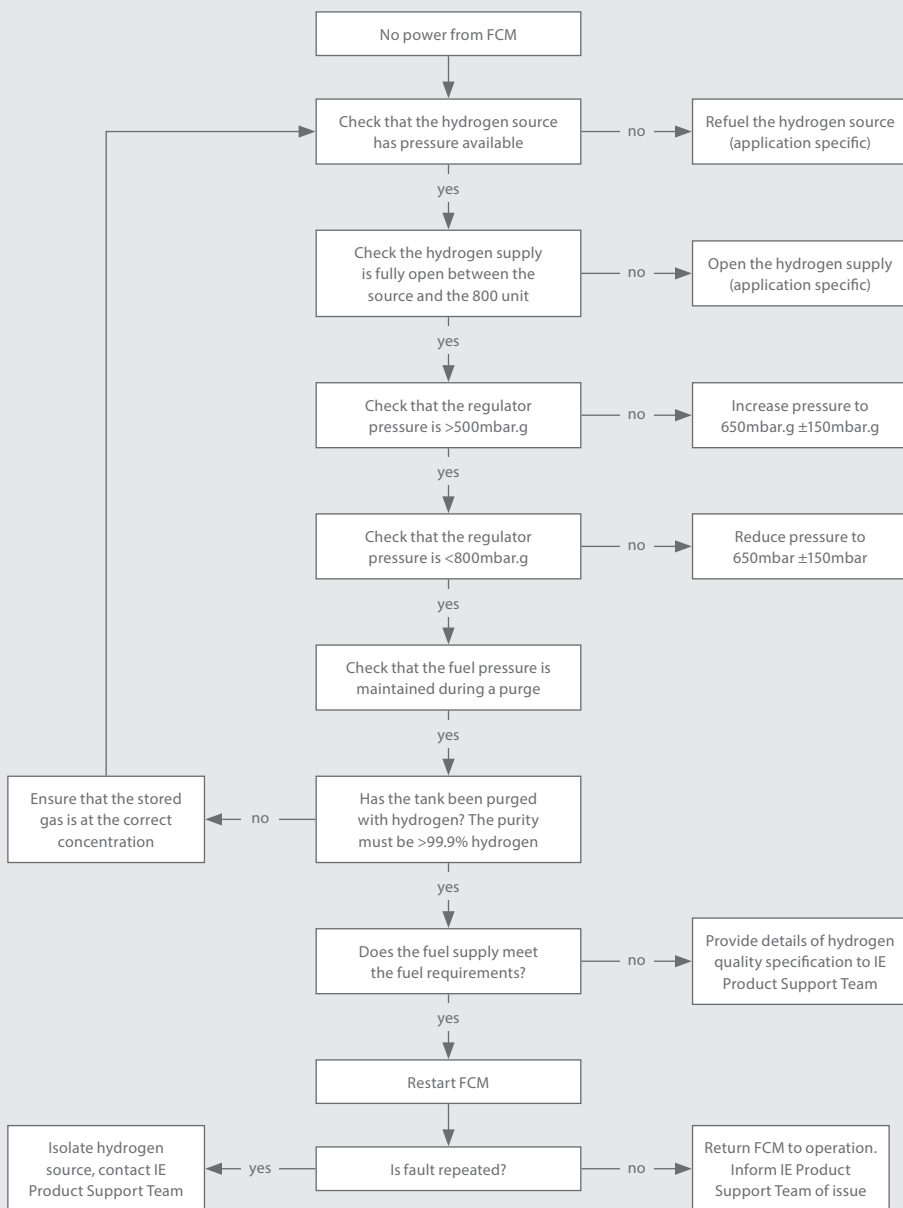
**12.1 Possible causes of faults**

Fault	Cause	Action
No power from the module	No command to start	Verify that the module is in Enable and Run modes (see section 6.5 Communications)
	Hydrogen leak	See 12.2 <i>Check for fuel leak</i>
	Incorrect hydrogen pressure	See 12.3 <i>Fuel check procedure</i>
	No power provided	See 12.4 <i>Electrical system check procedure</i>
	Fuel cell is over temperature	See 12.5 <i>Stack temperature check procedure</i>

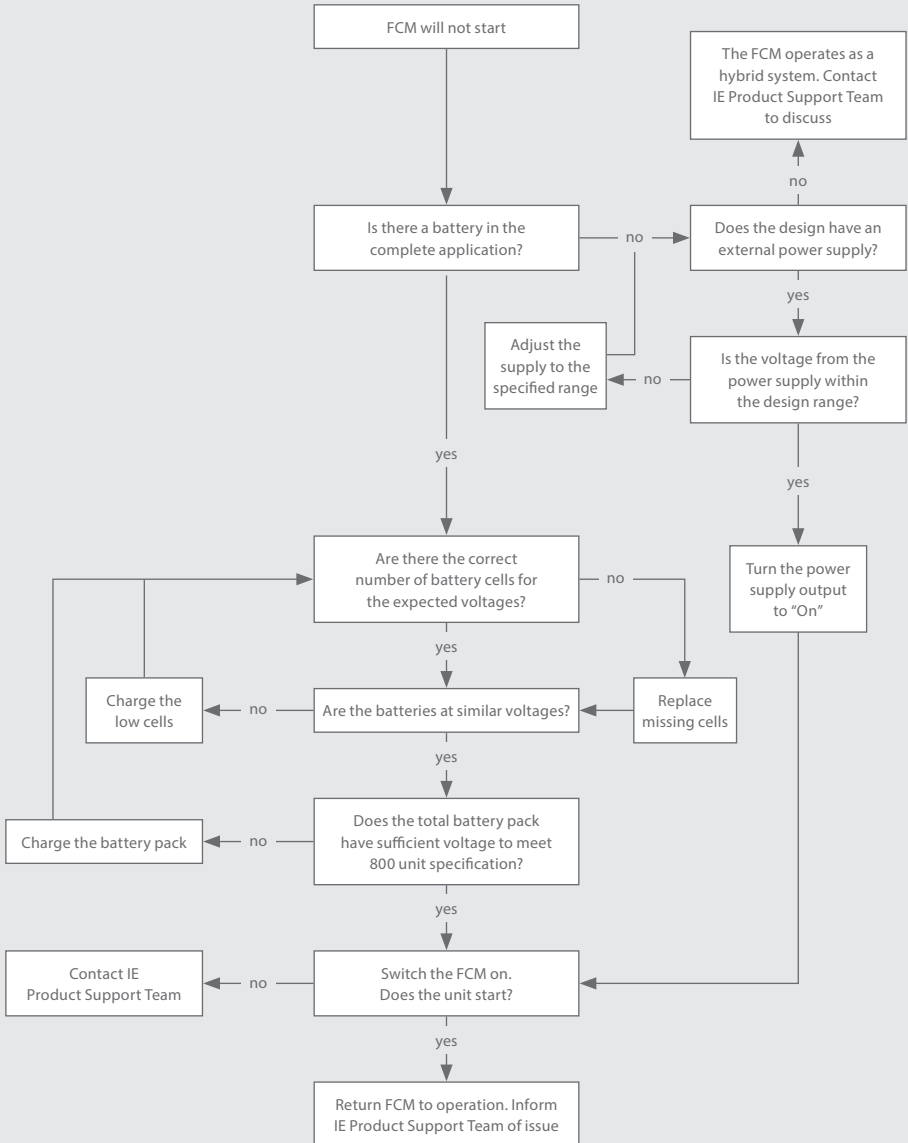
## 12.2 Check for fuel leak



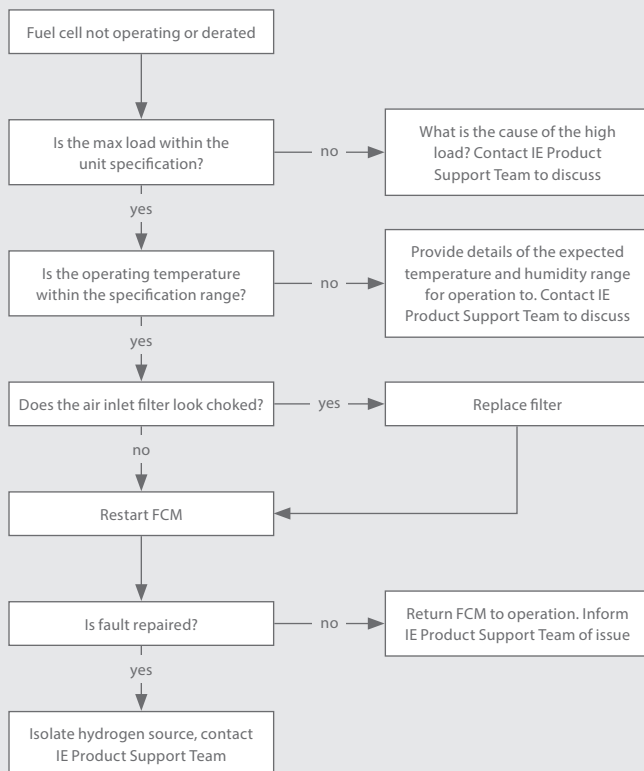
## 12.3 Fuel check procedure



## 12.4 Electrical system check procedure



### 12.5 Stack temperature check procedure



### 12.6 Filter change procedure

- 1 Switch off the Enable and Run signals.
- 2 Isolate hydrogen supply.
- 3 Wait 15 minutes.
- 4 Remove two quarter turn thumb screws from the frame on the front of FCM-802/804.
- 5 Remove the retaining clamp.
- 6 Pull top of frame forward. **Note:** Take care not to touch the fuel cell. Potentially live components
- 7 The dirty filter can be lifted out.
- 8 Discard dirty filter.
- 9 Place clean filter in front of FCM-802/804 and refit frame and screws.

**Do not touch the fuel cell stack during this procedure**

## 13 Control parameters and standard factory setting

The FCM 800 series configuration is factory settable. If there is a need to adjust the configuration after installation contact Intelligent Energy Product support.

### 13.1 Power Setup Configuration (802)

Parameter	Unit	Range	Factory Setting (24V)	Factory Setting (48V)
Target Output Voltage	V	15.0 to 56.0	26	52
Delayed Start Under-Voltage	V	0.0 to 60.0	24	48
Delayed Start Qualification Time	s	0 to 14400	60	60
Immediate Start Under-Voltage	V	0.0 to 60.0	22	46
Delayed Stop Over-Voltage	V	0.0 to 60.0	32	54
Delayed Stop OV Qualification Time	s	0 to 3600	60	60
Delayed Stop Under-Current	A	0.0 to 120.0	4	4
Delayed Stop UC Qualification Time	s	0 to 3600	20	20
Deny Start Under-Voltage	V	0.0 to 50.0	20	40
System Index	-	1 to 8	1	1
Output Voltage Rise Rate	V/s	0.017 to 2000.00	0.017	0.017
Minimum Output Voltage	V	0.0 to 60.0	24	48
Output Current Limit	A	0.0 to 80.0	60	80
Hard Set Output Voltage	-	0 or 1	0	0
Output Power Limit	W	0 to 2400	1920	2400
Restart Delay	s	0 to 3600	20	20



## 13.2 Power Setup Configuration (804)

Parameter	Unit	Range	Factory Setting (24V)	Factory Setting (48V)
Target Output Voltage	V	15.0 to 56.0	26	52
Delayed Start Under-Voltage	V	0.0 to 60.0	24	48
Delayed Start Qualification Time	s	0 to 14400	60	60
Immediate Start Under-Voltage	V	0.0 to 60.0	22	46
Delayed Stop Over-Voltage	V	0.0 to 60.0	32	54
Delayed Stop OV Qualification Time	s	0 to 3600	60	60
Delayed Stop Under-Current	A	0.0 to 120.0	6	6
Delayed Stop UC Qualification Time	s	0 to 3600	20	20
Deny Start Under-Voltage	V	0.0 to 50.0	20	40
System Index	-	1 to 8	1	1
Output Voltage Rise Rate	V/s	0.017 to 2000.00	0.017	0.017
Minimum Output Voltage	V	0.0 to 60.0	24	48
Output Current Limit	A	0.0 to 120.0	105	120
Hard Set Output Voltage	-	0 or 1	0	0
Output Power Limit	W	0.0 to 4000	2880	4000
Restart Delay	s	0 to 3600	20	20

## 14 Spare parts, storage and disposal

### 14.1 Spare parts

The customer changeable spare part list is:

Air filter 10004602

Terminal cover 10005293

Only use Intelligent Energy approved parts.

### 14.2 Disposal

When the FCM-802/804 reaches end of life, please contact Intelligent Energy Product Support or your local representative for support with reconditioning or disposal.

### 14.3 Storage

The FCM-802/804 must be stored as follows:

- The FCM-802/804 must be stored level, resting on the base
- The FCM-802/804 must be stored in a sealed plastic bag
- Do not place desiccant inside the plastic bag
- The FCM-802/804 can be stored in temperatures between -40°C and +70°C  
However, the ideal temperature for storage is between +10°C and +25°C
- The FCM-802/804 must be protected from moisture and dust during storage
- The FCM-802/804 hydrogen inlet port must be protected during storage

### 14.4 Transportation

For transport, follow the guidance for storage taking care that:

- The FCM-802/804 must be transported in a level orientation
- The FCM-802/804 must not be subjected to mechanical shocks where possible
- The FCM-802/804 must be protected from moisture and dust during transport
- The FCM-802/804 hydrogen inlet port must be protected during transport



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