Manufacturer's CLS Product Information

This form is available in a Microsoft Word version from the ENA's website.

G100/2 - Form B - Compliance Verification Report for Customer Export or Import Limitation Schemes

This form shall be used by the **Manufacturer** to demonstrate and declare compliance with the requirements of EREC G100. The form can be used in a variety of ways as detailed below:

1. For **Fully Type Tested** status

    The **Manufacturer** can use this form to obtain **Fully Type Tested** status for a **CLS** by registering this completed form with the Energy Networks Association (ENA) Type Test Register.

2. To obtain **Type Tested** status for a product

    The **Manufacturer** can use this form to obtain **Type Tested** status for one or more **Components** which are used in a **CLS** by registering this form with the relevant parts completed with the Energy Networks Association (ENA) Type Test Register.

3. One-off Installation

    The **Installer** can use this form to confirm that the **CLS** has been tested to satisfy the requirements of this EREC G100. This form shall be submitted to the **DNO** before commissioning.

A combination of (2) and (3) can be used as required, together with Form C where compliance of the **CLS** is to be demonstrated on site.

Note:

If the **CLS** is **Fully Type Tested** and registered with the Energy Networks Association (ENA) Type Test Register, Form C shall include the **Manufacturer**'s reference number (the Type Test Register system reference), and this form does not need to be submitted.

Where the **CLS** is not registered with the ENA Type Test Register or is not **Fully Type Tested** this form (all or in parts as applicable) shall be completed and provided to the **DNO**, to confirm that the **CLS** has been tested to satisfy all or part of the requirements of this EREC G100.

| **CLS Designation**		G100 CSL Control System	
Manufacturer name		Eleven Energy Ltd	
Address		28 Chesterton Road Cambridge United Kingdom CB4 3AZ	
Tel	+44 1638 750 660	Web site	https://www.elevenenergy.co.uk/
E:mail	info@elevenenergy.co.uk		
Installer's name			
Address			

Tel	Web site	
E:mail		

Export/Import capabilities

Export	Y / ~~N~~	Import	Y /~~-N~~

Description of Operation

EREC G100 section requires a description of the **CLS**, and schematic diagram, to be provided to the **Customer**. Please provide that description and the diagram here.
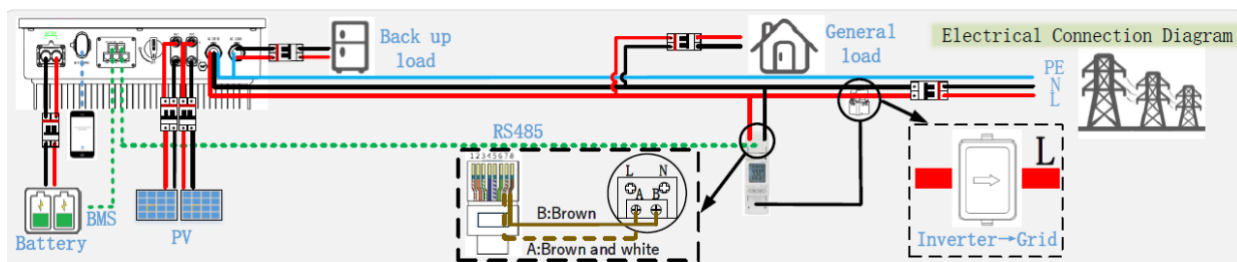
CLS Operation

The Customer Limitation Scheme (CLS) integrates a MODBus-connected Acrel ADL200n-CT meter, which employs a Current Transformer (CT) to monitor the incoming grid supply. The meter transmits averaged Active Power measurements every second to the Energy Management System (EMS) housed within the inverter's control board. The EMS processes these measurements to issue setpoints and regulate the inverter's AC output power.

The Maximum Power Point Tracking (MPPT) controller optimises the power transfer from the photovoltaic (PV) panels to the inverter. When the system approaches the maximum allowable export limit, the MPPT adjusts by curbing power output from the PV panels or reducing battery export to ensure compliance with the agreed limits.

CLS Configuration

The CLS is programmed with a site-specific export limit (in watts), configured exclusively by users with engineering-level access. This ensures compliance with the G100/2 requirements (para 4.2) and prevents unauthorised changes by system owners.

CLS Response Time

The CLS identifies and mitigates export limit excursions within a response time of 5 seconds, ensuring adherence to the Agreed Export Capacity (AEC).

CLS State Compliance

The Acrel ADL200n-CT meter conforms to the timing and excursion thresholds specified for States 1, 2, and 3, as outlined in the G100/2 framework.

- **State 1**: Normal operation where current flows remain within set limits.
- **State 2**: Temporary excursions, mitigated within defined response times.
- **State 3**: A fail-safe mode triggered by prolonged or excessive excursions.

CLS Connection Method

The CLS employs a hard-wired connection between the Acrel ADL200n-CT meter and the inverter. This configuration ensures reliable communication under all conditions.

Power Quality Compliance

The Acrel ADL200n-CT, integrated with the inverter, fully meets the power quality requirements stipulated in the G100/2 standard. This includes maintaining voltage stability and mitigating any harmonic distortions.

CLS Modes of Operation

The CLS operates in compliance with **G100** requirements, with the **Maximum Export Limit (MEL)** and **Export Import Limit (EIL)** values configured accordingly. The system operates in three distinct states:

State 1: Normal Operation

- The inverter continuously monitors data sampled by the monitoring meter.
- Based on the sampled data, the inverter regulates its output or input to ensure that power levels remain within the predefined MEL and EIL limits.

State 2: Load Adjustment

- If the system transitions to State 2 due to load fluctuations or other factors, the monitoring meter rapidly adjusts the inverter settings.
- The inverter is brought back to State 1 within **2 seconds**, ensuring compliance with the agreed limits.

State 3: Safety Shutdown

- In the event of communication line interruptions, grid voltage abnormalities, or other critical faults:
    - The inverter shuts down or ceases output within **5 seconds**.
    - Operation remains halted until the installer confirms that the equipment's operating environment meets the necessary requirements.
- Once confirmed, the inverter is restarted and resumes operation.

Communications Media

Document the provisions made for the use of various communication media, and both the inherent characteristics and the design steps made to ensure security and reliability.

Internal Communication

All internal components of the CLS communicate with the inverter using the following methods:

1. **Hard-Wired ModBus RS485 Protocol**: Ensures robust and reliable data transmission between devices.
2. **Hard-Wired Dedicated Current Transformer (CT)**: Provides accurate and consistent current measurement.

External Communication

External communication is facilitated via a datalogging device, with the following features:

- **Secure Setup**: During commissioning, the Eleven Energy App automates the setup process, securing access settings. A login password is created and securely stored in the database, alongside the generated WiFi encryption key for future use if needed.
- **Secure Data Transmission**: Communication between the datalogging device and the customer's network is carried out over a secure WiFi connection, all data is exchanged over the Internet between the inverter and the cloud servers is encrypted using TLSv3.
- **Heartbeat Monitoring**: A continuous "heartbeat" signal is sent and received to maintain the connection between the datalogging device and the cloud server. This ensures the link remains active.

Error Handling

In the event of an internet connection interruption:

- The CLS system flags the status as "Offline."
- The user is promptly notified of the communication issue, enabling timely resolution.

Cyber Security

Confirm that the **Manufacturer** or **Installer** of the **CLS** has provided a statement describing how the **CLS** has been designed to comply with cyber security requirements, as detailed in section.

The energy storage system adheres to the cybersecurity standards specified in **ETSI EN 303 645 V2.1.**. A detailed cybersecurity declaration is provided separately.

Password Security and Commissioning

- **Provision 5.1-1 Compliance**: The system enforces secure password practices during commissioning. The user is required to set a new password before completing the process.

Brute Force Protection

In accordance with **ETSI Provision 5.1-5**, the system includes robust measures to prevent brute force attacks on login credentials:

- If the administrative login fails **three times**, the system locks the login for an incrementally increasing duration with each subsequent failed attempt.
- This mechanism significantly reduces the risk of sustained attacks by making login attempts progressively more difficult.

Power Quality Requirements

Where the **CLS** includes the power electronics that controls generation or loads (as opposed to the power electronics being included in **Devices** that are subject to their own power quality compliance requirements) please submit the harmonic and disturbance information here as required by EREC G5 and EREC P28.

Power quality requirements are met in the respective G99 declarations. Separately provided, along with full test reports.

Fail Safe

CLS internal failure: please submit here the description of the internal **Fail Safe** design and operation. Please also document how it has been demonstrated, including the non-volatile recording of times and numbers of state 2 operations, and confirm the overall response of the **CLS** to this internal failure.

Fail safe design and operation:
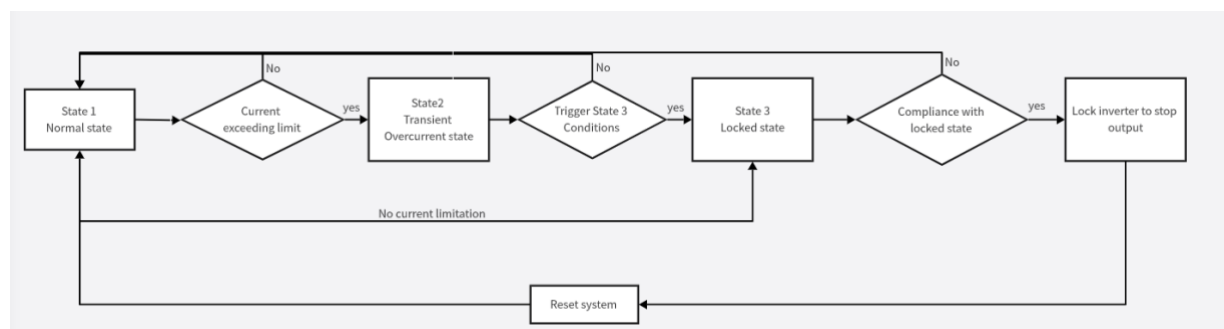
The system incorporates robust fail-safe mechanisms to address various failure scenarios, ensuring safety and compliance with operational standards:

1. **Grid Power Failure**:

    - As the meter is located at the grid connection point, a grid power failure will automatically isolate the PV system via standard **G99** disconnection methods.

2. **Energy Meter Failure**:

    - If the meter fails, the RS485 communication link will be disrupted.
    - The inverter will:
        - Immediately reduce its output to **0W**.
        - Trigger an alarm, notifying the user with a **"Meter Communication Error"** message.

3. **EMS Power Loss or Failure**:

    - If the EMS loses power or fails:
        - The inverter will be unable to output power, effectively shutting down.

4. **RS485 Communication Failure**:

- If the RS485 communication cable is damaged or connections are disrupted:
    - The RS485 signal will be lost.
    - The inverter will:
        - Reduce its output to **0W**.
        - Notify the user with a **"Meter Communication Error"** alarm.
        -

5. **Current Transformer Signal Loss**:

- If the current transformer (CT) wiring is disconnected or the signal is lost:
    - The inverter will permanently reduce its output to **0W**.
    - Without a valid grid power reference, the inverter cannot operate.

Operation records：

Note: Record of entering state 2 for the first time

2024-11-28 14:30:50: ################# Publishing CLS state #################

2024-11-28 14:31:32: info cls: MIL: 27.2, MEL: 27.2

2024-11-28 14:31:32: info cls: export Curr: 32.640000 A

2024-11-28 14:31:32: info cls: cls state: 2 -- WARNING

2024-11-28 14:31:32: info cls: import out of range: false

2024-11-28 14:31:32: info cls: export out of range: true

2024-11-28 14:31:32: info cls: meter coms lost: false

2024-11-28 14:31:32: info cls: inv coms lost: false

2024-11-28 14:31:32: info cls: --state2: enter state time :2024-11-28 14:31:22

2024-11-28 14:31:32: info cls: --cnt in state2: 1

Note: Resets state 1

################# Publishing CLS state #################

2024-11-28 14:31:52: info cls: MIL: 27.2, MEL: 27.2

2024-11-28 14:31:52: info cls: cls state: 1 -- NORMAL

2024-11-28 14:31:52: info cls: import out of range: false

2024-11-28 14:31:52: info cls: export out of range: false

2024-11-28 14:31:52: info cls: meter coms lost: false

2024-11-28 14:31:52: info cls: inv coms lost: false

Note: Record of entering state 2 for the second time

################# Publishing CLS state #################

2024-11-28 14:31:59: info cls: MIL: 27.2, MEL: 27.2

2024-11-28 14:31:59: info cls: export Curr: 29.920000 A

2024-11-28 14:31:59: info cls: cls state: 2 -- WARNING

2024-11-28 14:31:59: info cls: import out of range: false

2024-11-28 14:31:59: info cls: export out of range: true

2024-11-28 14:31:59: info cls: meter coms lost: false

2024-11-28 14:31:59: info cls: inv coms lost: false

2024-11-28 14:31:59: info cls: --state2: enter state time :2024-11-28 14:31:49

info cls: --cnt in state2: 2

Note: Resets state 1

################# Publishing CLS state #################

2024-11-28 14:32:19: info cls: MIL: 27.2, MEL: 27.2

2024-11-28 14:32:19: info cls: cls state: 1 -- NORMAL

2024-11-28 14:32:19: info cls: import out of range: false

2024-11-28 14:32:19: info cls: export out of range: false

2024-11-28 14:32:19: info cls: meter coms lost: false

2024-11-28 14:32:19: info cls: inv coms lost: false

Note: Record of entering state 2 for the third time

################# Publishing CLS state #################

2024-11-28 14:32:25: info cls: MIL: 27.2, MEL: 27.2

2024-11-28 14:32:25: info cls: import Curr: 32.640000 A

2024-11-28 14:32:25: info cls: cls state: 2 -- WARNING

2024-11-28 14:32:25: info cls: import out of range: false

2024-11-28 14:32:25: info cls: export out of range: true

2024-11-28 14:32:25: info cls: meter coms lost: false

2024-11-28 14:32:25: info cls: inv coms lost: false

2024-11-28 14:32:25: info cls: --state2: enter state time :2024-11-28 14:32:15

info cls: --cnt in state2: 3

Note: Resets state 1

################# Publishing CLS state #################

2024-11-28 14:32:50: info cls: MIL: 27.2, MEL: 27.2

2024-11-28 14:32:50:info cls: cls state: 1 -- NORMAL

2024-11-28 14:32:50: info cls: import out of range: false

2024-11-28 14:32:50:info cls: export out of range: false

2024-11-28 14:32:50: info cls: meter coms lost: false

2024-11-28 14:32:50: info cls: inv coms lost: false

Note: The CSL system directly enters state 3:

The fourth occurrence of state 2 within 24 hours is greater than 10 seconds

################# Publishing CLS state #################

2024-11-28 14:32:57: info cls: MIL: 27.2, MEL: 27.2

2024-11-28 14:32:57: info cls: import Curr: 32.640000 A

2024-11-28 14:32:57: info cls: cls state: 3 -- ERROR

2024-11-28 14:32:57: info cls: import out of range: false

2024-11-28 14:32:57: info cls: export out of range: true

2024-11-28 14:32:57: info cls: meter coms lost: false

2024-11-28 14:32:57: info cls: inv coms lost: false

2024-11-28 14:32:57: info cls: --state3: enter state time :2024-11-28 14:32:52:

2024-11-28 14:32:57: info cls: --cnt in state3: Inverter shutdown

Communication and power supply failures between **Components** and **Devices**. Please document here compliance with EREC G100 section.

Component/Device number/description	Communication failure test	Power supply failure test
CLS Monitoring meter	Inverter disconnected from grid <5sec	Inverter disconnected from grid <5sec
RS485 Communication Port	Inverter disconnected from grid <5sec	Inverter disconnected from grid <5sec
Inverter	Inverter disconnected from grid <5sec	Inverter disconnected from grid <5sec
Communication cable	Inverter disconnected from grid <5sec	--

Operational Tests

In accordance with EREC G100 section undertake the tests A and B to confirm correct operation in state 1 and state 2, that transition into state 3 occurs as required, and that behaviour in state 3 is also as required.

Test A

Nominal Export Limit (for type tests this will be at maximum, minimum and one intermediate setting) in Amp:					20A	
Nominal Import Limit (for type tests this will be at maximum, minimum and one intermediate setting) in Amp:					20A	

No	Starting level	Step value	**CLS** registers change in level?	**CLS** and/or **Component** and/or **Device** initiates correct response of ≥ 5%?	Duration of step in test	Correct state 1/ state 2 operation
1	Below export limit(EL)	105% of EL	**Yes**	**Yes**	60seconds	Yes
2	Below export limit(EL)	110% of EL	**Yes**	**Yes**	60seconds	Yes
3	Below export limit(EL)	120% of EL	**Yes**	**Yes**	60seconds	Yes
4	Below import	105% of IL	**Yes**	**Yes**	60seconds	Yes

	limit(IL)					
5	Below import limit(IL)	110% of IL	**Yes**	**Yes**	60seconds	Yes
6	Below import limit(IL)	120% of IL	**Yes**	**Yes**	60seconds	Yes
Test B						
Nominal Export Limit:						20A
Nominal Import Limit						20A
No	Starting level	Step value	**CLS** registers change in level?	**CLS** and/or **Component** and/or **Device** initiates correct response of ≥ 5%?	Duration of step in test	Correct state 3 operation
7	Below export limit(EL)	105% of EL	**Yes**	**Yes**	60seconds	Yes
8	Below import limit(IL)	105% of IL	**Yes**	**Yes**	60seconds	Yes
Test C						
Nominal Voltage						230V
No	Starting voltage	Step value	**CLS** registers change in voltage?	**CLS** and/or **Component** and/or **Device** initiates correct response?	Duration of step in test	Correct state 1/ state 2 operation
9	100% Vn	Voltage 112% of nominal	**Yes**	**Yes**	60seconds	Yes
10	100% Vn	Voltage 87% of nominal	**Yes**	**Yes**	60seconds	Yes
11	100% Vn	Voltage 108% of nominal	**Yes**	**Yes**	60seconds	Yes
12	100% Vn	Voltage 92% of nominal	**Yes**	**Yes**	60seconds	Yes
Test D						
Nominal Voltage						230V
No	Starting voltage	Step value	**CLS** registers change in voltage?	**CLS** and/or **Component** and/or **Device** initiates correct response?	Duration of step in test	Correct state 3 operation
13	100% Vn	Voltage 112% of	**Yes**	**Yes**	60seconds	Yes

		nominal				
14	100% Vn	Voltage 87% of nominal	**Yes**	**Yes**	60seconds	Yes
15	100% Vn	Voltage 108% of nominal	**Yes**	**Yes**	60seconds	Yes
16	100% Vn	Voltage 92% of nominal	**Yes**	**Yes**	60seconds	Yes

State 3 Reset

These tests are to demonstrate compliance with section EREC G100.

Please document how the reset from state 3 to state 1 has been demonstrated. Please include how the reset is achieved.

Please confirm that for **CLSs** to be installed in **Domestic installations** three (3) resets causes lockout or that for non-domestic installations lockout can only be reset after four hours. Please explain how lockout is reset.

When **State 3** is triggered, the system records the event in its internal log, marking the state as active. The following steps outline the reset process:

1. **Confirmation of Operating Conditions**:

   - After the permitted time period has elapsed, the installer must confirm with the user that the operating environment complies with all requirements.

2. **Reset Procedure**:

   - Once compliance is verified, the system can be reset to **State 1** via the associated app.
   - The reset process ensures that the system is operating within the agreed **Export Limit (EL)** and/or **Import Limit (IL)** range before transitioning back to normal operation.

Note:

This report covers Eleven Energy EL3000, EL3600, EL4000, EL4600, EL5000 and EL6000 series of Hybrid Inverter products.