APEX

MCS-G2 Microgrid Controller

Installation Manual

The APEX Microgrid Control System (MCS) is designed to manage all available power sources in a microgrid according to the site requirements, including operational requirements, utility requirements, grid and other conditions. It can optimize for backup today, PV self consumption tomorrow and perform tariff arbitrage after that.

Microgrid control for medium and large commercial applications.

- Ideal for on or off -grid applications.
- Monitor and control your Apex MCS-G2 on any compatible browser at **fleet.apexsolar.tech**
- Manage power flow between diesel generators, grid-tied PV inverters, commercial batteries, loads and the grid.

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1. INTRODUCTION

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1.1 DEVICE DOCUMENTATION

Apex MCS documentation includes this manual, its datasheet and the warranty terms.
All latest version documents can be downloaded from **www.ApexSolar.Tech**

1.2 ABOUT THIS MANUAL

This manual describes the correct installation, use and features of the Apex MCS-G2 microgrid controller. It includes technical data as well as user instructions and specifications to provide information about its correct functioning.

This document is subject to regular updates.

The contents of this manual might change partially or completely, and it is the responsibility of the user to make sure that they are using the latest version which is available at **www.ApexSolar.Tech**.

Apex reserves the right to modify the manual without prior notice.

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2. SAFETY WARNINGS

Please read and follow all the below safety instructions and precautions before installation and use Of the Apex MCS.

2.1 SYMBOLS

The following symbols are used in this manual to highlight and emphasize important information.
The general meanings of the symbols used in the manual, and those present on the device, are as follows:


General Caution


Prohibited


General Electrical Hazard

Direct Current


Information


Reinforced Insulation

2.2 PURPOSE

These safety instructions are intended to highlight risks and dangers of improper installation, commissioning and use of the MCS-G2.

2.3 TRANSPORT DAMAGE CHECK

Immediately after receiving the package, make sure that the packaging and the device have no signs of damage. If the packaging shows any sign of damage or impact, damage of the MCS-G2 should be suspected and it should not be installed. If this occurs, please contact Apex customer service.

2.4 STAFF

This system should be installed, handled and replaced solely by qualified personnel.

Qualification of the staff mentioned herein must meet all the safety-related standards, regulations, and legislation applicable to the installation and operation of this system in the country concerned.

2.5 GENERAL HAZARDS RESULTING FROM NON-COMPLIANCE WITH SAFETY STANDARDS

The technology employed in the manufacturing of the Apex MCS-G2 ensures safe handling and operation.

Nonetheless, the system might pose hazards if it is used by unqualified staff or handled in a way that is not specified in this user manual.

Any person in charge of the installation, commissioning, maintenance, or replacement of an Apex MCS-G2 must first read and understand this user manual, especially the safety recommendations and shall be trained to do so.

2.6 SPECIAL HAZARDS

The Apex MCS-G2 is designed to form part of a commercial electrical installation. Applicable safety measures must be observed, and any additional safety requirements should be specified by the company who has installed or configured the system.

The responsibility to select qualified staff lies with the company that the staff work for. It is also the responsibility of the company to assess the ability of the worker to carry out any kind of work and ensure their safety. Staff must comply with workplace health and safety regulations. It is the responsibility of the company to provide their staff with the training necessary for handling electrical devices and to make sure that they familiarize themselves with the contents of this user manual.

Dangerous voltages may be present in the system and any physical contact could cause serious injury or death. Please ensure that all covers are securely fastened and that only qualified staff service the Apex MCS-G2. Ensure that the system is switched off and disconnected during handling.

2.7 LEGAL / COMPLIANCE

ALTERATIONS

It is strictly prohibited to carry out any alteration or modification to the Apex MCS or any of its accessories.

OPERATION

The person in charge of handling the electrical device is responsible for the safety of persons and property.
Insulate all the system's power conducting components which could cause injuries while carrying out any work.
Confirm that dangerous areas are clearly marked and access is restricted.
Avoid accidental re-connection of the system using signs, isolating locks and closing or blocking the work site.
Accidental reconnection may cause serious injuries or death.
Determine conclusively, using a voltmeter, that there is no voltage in the system before commencing work.
Check all the terminals to make sure that there is no voltage in the system.

2.8 LOCAL REQUIREMENTS

In all cases, local regulations shall be followed and take preference over this manual or other documents related to the Apex MCS-G2. No part of this manual shall supersede any local laws, bylaws or other regulations. These include but are not limited to: earthing, installation rules, local electrical isolation requirements and so on.

2.9 OTHER CONSIDERATIONS

This device is exclusively designed to manage power flow between energy sources such as the grid, a solar array or a generator and storage via appropriate, approved PCSs and is to be installed in a commercial setting.

The Apex MCS-G2 should only be used for this purpose. Apex is not liable for any damages caused by inappropriate installation, use or maintenance of the system.

To ensure safe use, the Apex MCS-G2 must only be used in compliance with the instructions in this manual.

Legal and safety regulations must also be adhered to, to ensure correct use.

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3. DEVICE DESCRIPTION

TECHNICAL SPECIFICATIONS

Parameter	Value
Dimensions	155mm (l) x 130mm (w) x 60mm (h)
Mounting Method	Surface or DIN Mounted
Ingress Protection	IP20
Power Supply	230Vac 50Hz or 9-18V DC
Signal Inputs	3 x V AC + 1 x N (330V AC Max.) 4 x I AC 5A secondary CT (5.8A AC Max.)
Digital Inputs	2 volt-free inputs
Digital Outputs	2 relay outputs • Rated switching current: 5A (NO) / 3A (NC) • Rated switching voltage: 250 V AC / 30 V AC
Comms	2 x Ethernet ports 2 x RS485
Operating Temperature Range	0 - 35°C
Remote Monitoring and Control	**fleet.apexsolar.tech**

COMPATIBLE EQUIPMENT

Equipment Types	Compatible Products
Generator Controllers*	Deepsea 8610 ComAp Inteligen
Battery Inverters (PCSs)*	ATESS PCS series WECO Hybo series
PV Inverters*	Huawei Goodwe Solis SMA Sungrow Ingeteam Schneider Deye Sunsynk
3rd Party Controllers*	Meteocontrol Bluelog Solar-Log
Power Meters*	Lovato DMG110 Schneider PM3255 Socomec Diris A10 Janitza UMG104

*Other types on request.

OVERVIEW AND DESCRIPTION

The front of the Apex MCS-G2 has the following features:

- **LED indicator to indicate system power**

FUNCTIONALITY

The MCS-G2 is designed for management and control of power conversion hardware at site level. It provides the logic needed to optimise various elements of a microgrid and ensure safe and effective operation. Multiple modes of operation are available and you can discuss your site requirements with your Apex engineer.

The following table describes some of the primary features and functions:

Site Type	Available Logic
Grid And PV Only	Zero export DNP3 communication to PUC
Grid, Grid Tied PV And Diesel	Zero Export
	DNP3 communication to PUC
	PV integration with genset with minimum load presets
Grid, Grid Tied PV, Diesel And Battery	Zero Export DNP3 communication to PUC PV integration with genset with minimum load presets Battery use logic: • Optimise for backup • Energy Arbitrage (TOU tariffs) • Peak load shaving / Demand management • Fuel optimisation • PV self consumption Load management VPP participation

4. INSTALLATION

Contents Of The Box

Inside the box you should find:

- 1 x Apex MCS-G2 Microgrid controller

4.1 TOOLS REQUIRED

Appropriate tool for your choice for fastener to secure the MCS-G2 to the selected surface.
Flat screwdriver no wider than 3mm for terminals.
PC and network cable for configuration and troubleshooting.

4.2 PLANNING THE INSTALLATION

Location

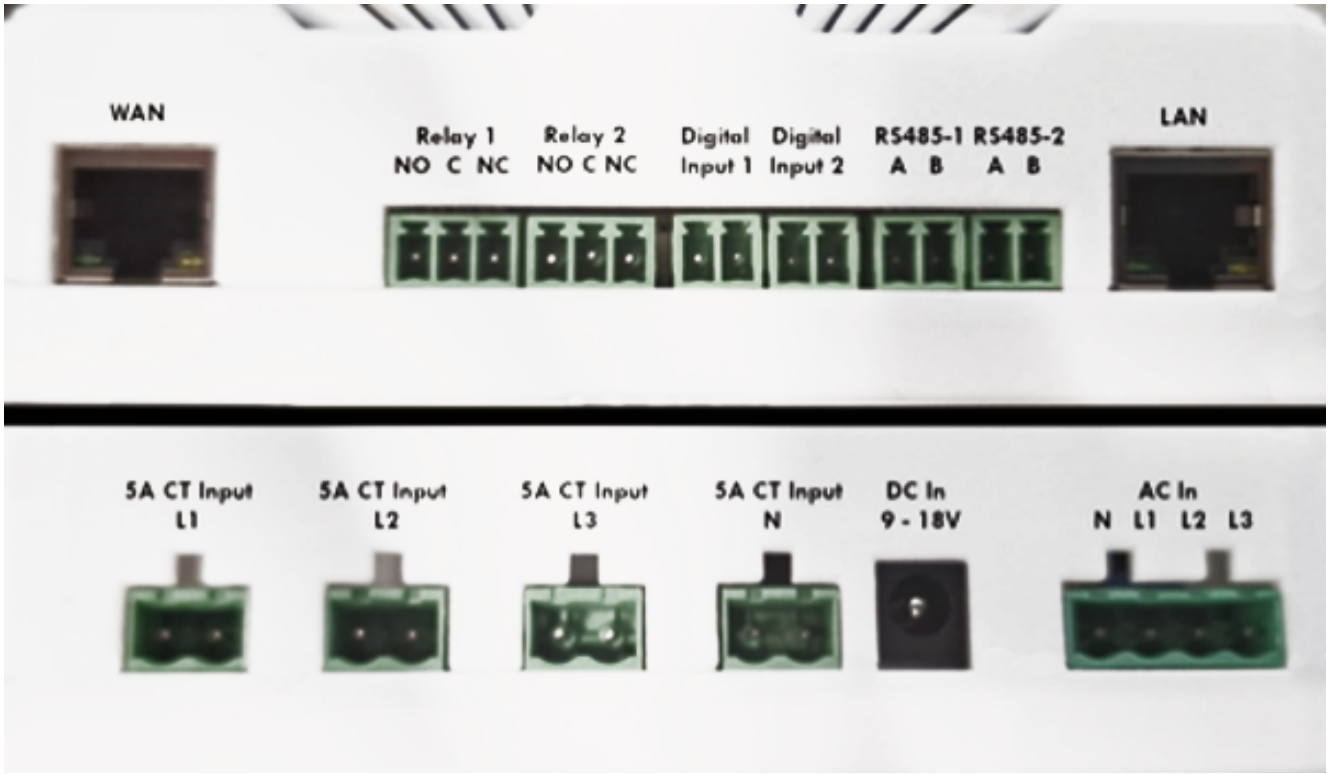
The Apex MCS-G2 may only be installed indoors, within an electrical enclosure and must be protected from moisture, excessive dust, corrosion and humidity. It should never be installed in any location where a potential water leak could occur.

Mounting the MCS

The MCS-G2 can either be DIN rail mounted or using the 2 “keyhole” slots on the rear of the enclosure for direct surface mounting. The MCS should be fixed onto a firm surface.

Wiring of the MCS

Each side of the MCS has a row of connectors. These are used for connecting the measurement signals and the communications, as follows:



Metering and power analysis:

MCS-G2 contains a high-speed power meter used for power quality analysis. The meter can measure 4 currents using 5A secondary CTs and can measure 3 mains AC voltages.

Device power:

The MCS-G2 is either powered from 230V via the "Voltage L1" and "Neutral" terminals on the top of the device, or from 9 - 18V DC via the DC jack. Commonly available 1.5mm² cable is recommended for both.

Whichever power interface is used, it is very important that it is uninterrupted. A UPS must ALWAYS be used with the MCS-G2 to ensure continuity of control in the event of any kind of power outage

Network:

The device has 2 Ethernet interfaces and can connect to standard 100 or 1000 base-T Ethernet networks for communication with MODBUS TCP equipped slave devices and for remote system monitoring, using standard RJ45 connectors. For remote monitoring, the network requires transparent internet connectivity and a DHCP server.

Note: It is recommended that the "WAN" interface is used only for the internet uplink and the "LAN" interface is only used for the control / equipment network. For security and system stability purposes, it is always recommended that 2 separate networks are used. It is, however, possible to only use either 1 of the network ports, should that be desirable or a technical necessity.

In all cases, care should be taken to secure all networks with appropriate firewalls etc.

Wifi is also provided but this is only for configuration or local interface monitoring and should not be used for control or uplink purposes.

RS485:
For field equipment requiring Modbus RS485 communications, the MCS is equipped with 2 RS485 interfaces. The 2 ports are terminated using an onboard terminator, so the device should be installed at the end of the respective busses.

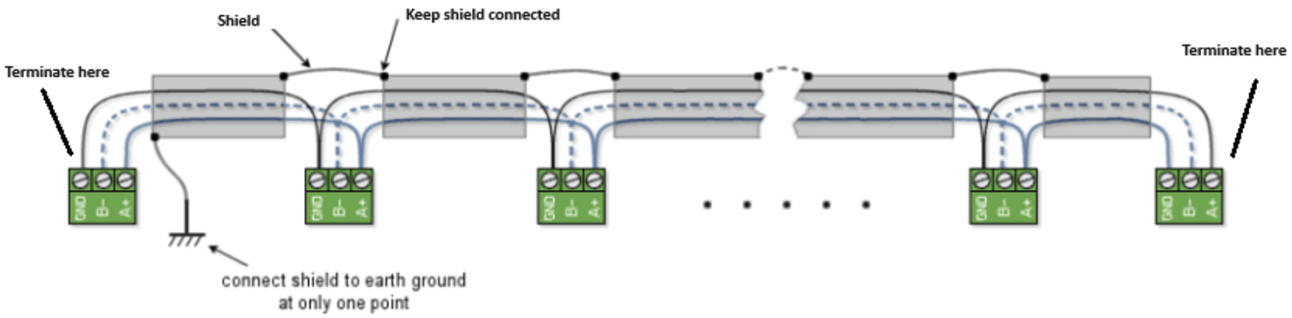
I/O:
Terminals on the bottom of the device provide configurable I/O interfaces. These interfaces are used where binary input or output signals are required.

2 volt-free inputs and 2 volt-free relay output contacts are provided.

To activate an input, bridge the 2 terminals with a relay / switch. Do not apply any power to them as this will damage them.

Communications wiring:
RS485 connections must be done with a high quality, shielded, twisted pair communications cable.

Please follow this diagram to ensure that your RS485 busses are correctly laid out and terminated.



Always terminate both ends of the bus and never terminate elsewhere. Incorrect bus wiring will result in the device failing to communicate or communicating erratically.

5. COMMISSIONING AND OPERATION

5.1 POWERING UP FOR THE FIRST TIME

Check your work.

Ensure the device is connected to internet via ethernet.

Apply power.

5.2 STARTUP SEQUENCE

On first start-up, you should see the LED turn green when the device is ready.

The MCS requires our engineers to configure the device for you, once it has been connected into your site and has a transparent internet connection. With this in place, you may now proceed to commissioning with remote support from Rubicon. When ready, please contact the Rubicon engineer assigned to your project.

You can book an engineer with the forms here:
https://www.apexsolar.tech/engineering-support

6. EXAMPLE CIRCUIT DIAGRAMS

See the end of this document for example diagrams which are provided as a reference. Please contact us for detailed assistance with your layout.

7. CLEANING AND MAINTENANCE

Cleaning and maintenance should only be carried out with the Apex MCS-G2 disconnected from any supplies. Before taking any action, make sure that the system has been correctly isolated by opening the electrical isolators. To clean the MCS, wipe the exterior surface with a damp (not wet) soft, non-abrasive cloth. Pay attention to the CPU's heatsink and any dust build-up thereon which may affect the ability of the MCS to dissipate heat generated.

Do not try to repair the device yourself in case of any malfunction. If the need arises, contact Apex customer service. The system does not require any special maintenance, except for standard physical cleaning to ensure good air flow and the maintenance required by any electrical device connected with terminals that need to be tightened.

8. ORDERING INFORMATION

HARDWARE

Sku Code	Device	Comment	Compatibility
FG-MG-G2-1	MCS-G2 Hardware device	Hardware only (please add licenses)	Various meters, Deepsea genset controllers, Huawei, Ingeteam, Sungrow, Fronius, Solis, Goodwe, Meteocontrol, SMA, ATESS PCS, DEYE Hybrid inverters.**
FG-MG-AC	Stand-alone DNP3 Hardware	Hardware & Software incl (CoCT only), complete. No further licenses required.	Huawei, *Solis, Deye, *Sungrow, Fronius, Ingeteam, Goodwe, Bluel-og, Canadian Solar, SMA, Sun-synk, Ingeteam, Meteocontrol, **
FG-ED-OO	Edge Device	Hardware & Software incl	-
FG-ED-CA	DNP3 site solution, complete assembly	Assembled solution	Huawei, Solis, Deye, Sungrow, Fronius, Ingeteam, Goodwe, Bluel-og, Canadian Solar, SMA, Sun-synk, Ingeteam, Meteocontrol, **

LICENSES

Sku Code	Device	Comment	Compatibility
LI-G2-DNP3-PV	DNP3 License for MCS-G2	CoCT DNP3 protocol comms for 100kW+ sites	APEX Gen 2 MCS
LI-G2-DNP3-HYB	DNP3 License for MCS-G2 (Hybrid)	CoCT DNP3 Protocol comms for Hybrid sites 100kW+	APEX Gen 2 MCS, ATESS
LI-G2-BAT-LITE	Battery Lite license for MCS-G2	PV/Genset/BESS, < 200kW AC	APEX Gen 2 MCS
LI-G2-BAT-STAND	Battery Standard license for MCS-G2	PV/Genset/BESS, 200 - 600kW AC	APEX Gen 2 MCS
LI-G2-BAT-PREMIUM	Battery Premium license for MCS-G2	PV/Genset/BESS, > 600kW AC	APEX Gen 2 MCS
LI-G2-PVGEN-LITE	PV/Genset Lite license for MCS-G2	PV/Genset, < 250kW AC	APEX Gen 2 MCS
LI-G2-PVGEN-STAND	PV/Genset Standard license for MCS-G2	PV/Genset, > 250kW AC	APEX Gen 2 MCS

LICENSES

Sku Code	Device	Comment	Compatibility
LI-G2-SLR	Smart Load resumption (per end point) for MCS-G2	Software Key (Once off)	APEX Gen 2 MCS, APEX SGS, APEX EDGE
LI-G2-ILM	Intelligent Load Management (per end point) for MCS-G2	Software Key (Once off)	APEX Gen 2 MCS
LI-G2-MVA	Device Emulation. Used with meter aggregation, for MCS-G2	Software Key (Once off)	APEX Gen 2 MCS
LI-ED-MP	Edge Device Commercial site monitoring-only license for Fleet platform (Max 12 devices). (No control)	Software Key (Once off)	Various meters, Deepsea genset controllers, Huawei, Ingeteam, Sungrow, Solis, Goodwe, Canadian Solar, SMA, ATESS PCS, DEYE Hybrid inverters.**
LI-MG-PQ	Power quality measurement	Software Key (Once off)	***Availability TBC
FG-SS-UG1	Site software minor update	Update to existing plant (IP Address changes, minor site adjustments)	Post commissioning request
FG-SS-UG2	Site software major update	Update to existing plant (BESS add-on, Major software changes)	Post commissioning request

All license pricing includes engineering cost for commissioning of the device.
Before purchasing of your controller, please visit our website and complete the form to get your site approved with our controller.
https://www.apexsolar.tech/engineering-support

- Additional APEX Edge device may be required to complete functionality if paired with OEM's smart logger / datalogger. Confirm with your representative.

** Other hardware integrations on request.

WARRANTY EXTENSIONS

Sku Code	Device	Comment	Compatibility
WE-MG-G2	MCS G2 Controller	5-year extension	APEX Gen 2 MCS
WE-MG-DNP3	DNP3 Controller	5-year extension	APEX DNP3
WE-H2-00	SGS Controller	3-year extension	APEX SGS

The above items are only warranty extensions. For the limited warranty document, please see the link below.

9. WARRANTY

The Apex Edge Device is warranted to be free from defects for a period of 2 years from purchase, subject to Apex's Warranty terms and conditions, a copy of which is available here:
Warranty Document

10. SUPPORT

You can contact our support centre for technical assistance with this product or the associated services.

10.1 PRODUCT SUPPORT

When contacting Product Support via telephone or email please provide the following information for the fastest possible service:

- Type of Inverter
- Serial number
- Battery type
- Battery bank capacity
- Battery bank voltage
- Communications type used
- A description of the event or problem
- MCS serial number (available on product label)

For site approvals or commissioning bookings, please follow this link:
https://www.apexsolar.tech/engineering-support

10.2 CONTACT DETAILS

Telephone:	+27 (0) 80 782 4266
Online:	**https://www.rubiconsa.com/pages/support**
Email:	support@rubiconsa.com
Address:	Rubicon SA 1B Hansen Close, Richmond Park, Cape Town, South Africa

You can reach technical support by telephone directly Monday to Friday between 08h00 and 17h00 (GMT +2 hours). Queries outside of these hours should be directed to support@rubiconsa.com and will be answered at the earliest opportunity. When contacting technical support, please ensure that you have the above listed information available.

11. ANNEXURES

Installation examples.

Example 1:

Genset and PV integration.