



Picture shown may not reflect actual configuration

FEATURES

General Description

The Cat[®] MMC-M is designed for medium-to-large industrial/ commercial installations. The MMC-M integrates a variety of traditional and renewable energy sources within a microgrid by providing optimized monitoring and control.

Panel

- Rugged metal enclosure.
- Wall mountable.
- 15" industrial color touch-screen display
- Industrial PC for asset control CPU with 8GB RAM, 512GB storage, Linux OS.
- Industrial PC for data management CPU with 8GB RAM, 512GB storage, MS Windows OS.
- Ethernet switch allows connection of user assets to hybrid LAN (with 2 optical fiber ports single or multi-mode).
- Digital I/O module for interfacing with ATS and other relays (ioLogik E1212, 8x DI, 8x DIO, Sink).
- Input Circuit Breaker Protection (Single phase 120/240 VAC 50/60 Hz total full load amps 6.25/3.13 A).
- Lightning Arrestor & Surge Protector.
- Fan and heater for temperature control.
- Uninterruptible Power Supply (UPS) with sealed lead acid (SLA) battery, 10 mins run time.
- Space and prewired connections to accept PLR809 router (sold separately), for internet connection to Cat Connect.
- Operating temperature: 0°C to 40°C (32°F to 104°F) at 5%-85% relative humidity (non-condensing).
- Software features activated depending upon the option set chosen.

Cat[®] Microgrid Master Controller-Medium (MMC-M)

Caterpillar is leading the renewable microgrid market with hybrid power solutions engineered to deliver unmatched performance, reliability, durability, and cost effectiveness. The MMC-M control panel provides the supervisory control and monitoring of power generation assets within a microgrid system.

User Interface

Provides graphical user interface (GUI) to all control elements to simplify operator interactions with the distributed energy resources. Includes system visualization and user interface for manual or automatic control of the distributed energy resources.

Distributed Energy Resource Dispatch

The MMC-M starts, stops, and sets power points of the distributed energy resources within a microgrid, including solar photovoltaic (PV), wind turbines, hydroelectric generators, energy storage system (ESS) and engine generator sets. Using the optimization goals chosen by the operator, the MMC-M determines the energy contributions needed from each energy resource including grid when available. The MMC sends commands 1 to 4 times per second. A scheduler function allows the optimization objectives to be changed according to a preset calendar.

Asset Optimization

The MMC-M may be configured to optimize overall performance based on user-selectable criteria. The optimization can be based on several different goals, such as minimizing fuel consumed, optimizing engine operation, charging batteries only from renewables or maximizing system reliability. The system may also be configured to provide an optimal level of spinning reserve to respond to sudden load/source transients.

Grid Import/Export Control

The MMC-M can regulate the amount of real and reactive power flowing between the grid and the microgrid based on programmable set points.

Sequence of Operation

- The functional sequence of operation for common microgrids are configurable with the MMC-M.
- The MMC is capable of local-manual black start operation.
- Contact your Cat[®] dealer to configure the sequence of operation to meet application requirements that are aligned with the site power distribution architecture Single Line Diagram (SLD).

Technical Specifications

The MMC-M is used to control assets in common Microgrid configurations. Three options are available: Low asset quantity, Standard asset quantity, and Custom (for greater asset quantities or unique Single Line Diagrams-SLD's).

Asset Type ⁽¹⁾	Asset Qty ⁽²⁾			Site Power System Configuration			
	Options (choose one)			Off Grid	Grid Connected		
	Low	Standard	Custom		PV and/or ESS with Standby Genset	Full Grid Parallel	
Photovoltaic (PV) Inverter	20	200	Custom (design to specific SLD requirements)	●	●	●	
Energy Storage System (ESS) Inverter	4	25		●	●	●	
Generator set (G)	4	16		●	●	●	
Automatic Transfer Switch (ATS)	Open or Closed Transfer	1		2	N/A	●	N/A
	Soft Load Transfer	1		2	N/A	custom	N/A
Loads (Controllable)	10	20		●	●	●	
Virtual Assets	10	10		●	●	●	
Power Meter	10	20		●	●	●	
Protective Relay	1	2		●	●	●	
Grid Connection					●	●	
Points of Common Coupling (PCC)	1	2			N/A	●	
Wind and/or Hydroelectric Power	custom	custom			custom	N/A	custom
SLD's ⁽³⁾							
Typical	<p>B=Breaker</p>			<p>Grid PCC₁ and PCC₂</p>		<p>Grid PCC₁ and PCC₂</p>	
Benefits	<p>Off Grid</p> <ul style="list-style-type: none"> ✓ PV can operate whenever Genset or grid forming ESS is online ✓ PV energy reduces fuel consumption during genset operation ✓ Any PV energy exceeding load can charge ESS ✓ ESS can provide reserve power, enabling shutdown of one or more generators, reducing fuel consumption ✓ ESS can be grid-forming, allowing all gensets to shut down for zero fuel consumption or "silent mode" operation. ✓ ESS supports genset response to block-loads, enabling gas genset island-mode ✓ ESS State of Charge management ✓ Split bus capable with tiebreaker⁽⁴⁾ 			<p>ATS</p> <ul style="list-style-type: none"> ✓ ATS can be replaced by non-grid-parallel switching gear <p>ATS in Normal position (Grid)</p> <ul style="list-style-type: none"> ✓ ESS and/or PV reduces grid import and may provide grid export ✓ Limits grid import / export to zero or user-set value ✓ One or two grid Points of Common Coupling ✓ ESS State of Charge management ✓ Split bus capable with tiebreaker⁽⁴⁾ <p>ATS in Emergency position (Genset)</p> <ul style="list-style-type: none"> ✓ All Off Grid benefits apply 		<p>Full Grid Parallel</p> <ul style="list-style-type: none"> ✓ Gensets, ESS and/or PV reduce grid import and may provide grid export ✓ Limits grid import or export to zero or user-set value ✓ One or two grid Points of Common Coupling ✓ ESS State of Charge management ✓ Split bus capable with tiebreaker⁽⁴⁾ ✓ All Off Grid benefits apply when utility breaker is open 	

● – Applicable
N/A – Not Applicable

⁽¹⁾ – Refer to Table (a) Connected Asset Compatibility for list of approved assets.

⁽²⁾ – For MMC-M Low/Standard asset quantity, review Sequence of Operation and SLD with your local Cat® dealer.

⁽³⁾ – Detailed SLD's are available to meet application requirements. Contact your local Cat dealer for more information.

⁽⁴⁾ – For more information about split bus architecture (with tiebreakers within microgrid) contact your local Cat dealer.

* – Paralleling Genset controllers (such as EMCP4.4) or Paralleling Switchgear Required.

Standard Components

Managed Ethernet Switch provides:

- 8 RJ45 10/100Base-T ports that allow connection of user assets to hybrid LAN.
- 2 Gigabit combo ports SFP (Small Form-Factor Pluggable) provides fiber optic connections.
- Swappable SD flash card and mini-USB connector.

Applicable Standards and Certifications

- UL Listed to the following standards
 - UL508A
- Designed to IP54 / NEMA 3R

Remote Monitoring (Optional)

The complete system may be monitored remotely using Cat® Connect Technology telematic device (PLR809 router) to provide real time monitoring of the performance and health of the installation. If an issue is detected, local technicians can be dispatched to resolve the problem.

Worldwide Product Support

- Cat dealers provide extensive post-sale support including maintenance and repair agreements.
- Cat dealers have over 1,800 dealer branch stores operating in 200 countries.

Table (a) - Connected Asset Compatibility

The MMC-M standard compatibility asset list (other assets will be evaluated upon request):

(*) Preconfigured Asset Compatibility	
PV Inverters	SMA TP 12000TL-US / 15000TL-US / 20000TL-US / 24000TL-US / 25000TL-30 / 30000TL-US Sunny High Power, Peak 3, Sunny Boy, CORE1, CORE2 (Sunspec) Generic Sunspec (*) Other PV inverters evaluated upon request.
Energy Storage Inverter	BDP250, BDP1000, Generic Sunspec
EMCP Genset Controls	EMCP 4.3, 4.4 EMCP 4.2, 4.2B (both require serial to Ethernet converter)
Other Genset Controls	ComAp: IntelliGen NTC BaseBox (IG-NTC-BB), IG 200 Deep Sea: DSE8600, DSE8610 MKII, DSE8700 DEIF: AGC-4, AGC 150 Woodward: easYgen-3000 (*) Other genset controls evaluated upon request.
Loads (Controllable)	Loads which can be controlled by providing curtailment setpoints
Virtual Assets	System diagram representations of physical assets that are not directly monitored or controlled (example: transformers or aggregate meters)
Power Meters	Bitronics M571, Bitronics M871, PowerPlex II SATEC Power Solutions PM175 (*) Other power meters evaluated upon request.
Protective Relay (PCC)	Beckwith M-7651A, Schweitzer Engineering Laboratories SEL651 (*) Other protective relays evaluated upon request.
Switchgear	(*) Custom
Wind Power Generator	(*) Custom
Hydroelectric Generator	(*) Custom

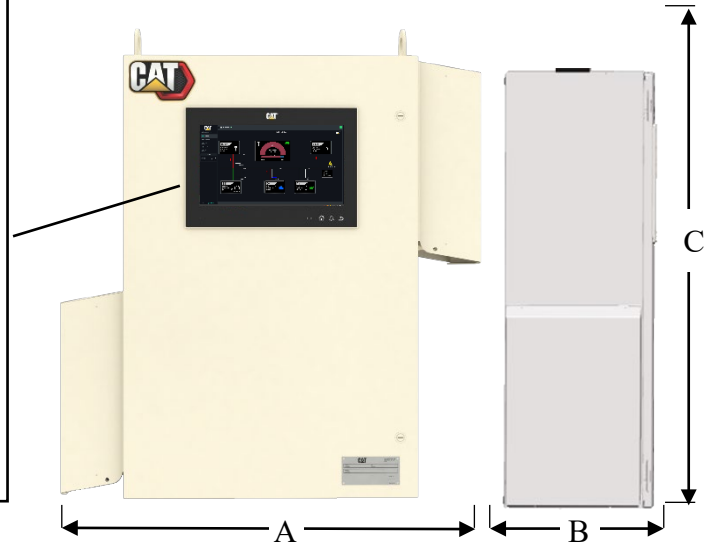
(*) This list is updated frequently – other assets will be considered upon request. “Assets” are defined as system components that are controlled or monitored by the MMC to manage the power system.

System Screen



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High-Resolution LCD	
Colors	16.7 million
Backlight	Thin-film-transistor (TFT)
Resolution 15.6"	1024 x 768



Dimensions			
A	B	C	Weight dry
mm (in)	mm (in)	mm (in)	kg (lbs)
873 (34.4)	323 (12.7)	914 (36.0)	75 (165)

Materials and specifications are subject to change without notice.
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