MG Master LV

Communication guide

Firmware version: 1.24

Version: 8
Date: 07-09-2020

MG Energy Systems B.V. | Foeke Sjoerdswei 3 | 8914 BH Leeuwarden | The Netherlands
+31 (0)58 750 89 47 | info@mgenergysystems.eu | www.mgenergysystems.eu

1 Communication with the MG Master LV

Communication with the MG Master LV can be established via CAN-Bus.
There are 3 protocols implemented which can be selected:

- NMEA2000 protocol (Victron Energy);
- SMA protocol;
- General BMS protocol;

Note:
- Only on protocol can be selected, a combination of SMA with NMEA2000 is not possible.
- General BMS protocol is the SMA protocol with added messages not supported by SMA.

1.1 CAN Interface

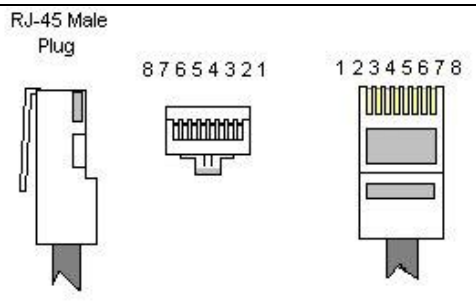
The CAN interface on MG products is available in two different physical connectors: RJ45 and M12.

1.2 Pin definitions

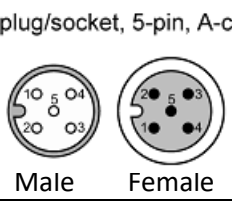
Below the pin definitions of the two connectors:

RJ45	M12 pin 5-pin A-coded	Description	Ethernet cable wire color
1			
2			
3	3	GND	White/Green
4			
5			
6	2	V+	Green
7	4	CAN-H	White/Brown
8	5	CAN-L	Brown

1.2.1 RJ45 definition

Pin	Description	Wire color	
1			
2			
3	GND	White/Green	
4			
5			
6	V+	Green	
7	CAN-H	White/Brown	
8	CAN-L	Brown	

1.2.2 M12 definition

Pin	Description	CANOpen, NMEA2000 connector
1	Shield	
2	V+	
3	GND	
4	CAN-H	
5	CAN-L	

1.3 SMA protocol

The SMA protocol will only support 48V systems based on the specifications of the Sunny Island 6.0H. Invalid value of a un16 is marked with 0xFFFF and a sn16 with 0x8000.

1.3.1 Interface definition

Speed : 500 kbps
ID : 11-bit CAN 2.0A

1.3.2 Message definition

BMS Limits				Dir	Interval	
	CAN-ID 0x351			Tx	500 ms	
			Name	**Type**	**Res.**	**Length**
	Byte 0	Low	Battery charge voltage	un16	0,1V	16 bits
	Byte 1	High				
	Byte 2	Low	DC Charge current limitation	sn16	0,1A	16 bits
	Byte 3	High				
	Byte 4	Low	DC Discharge current limitation	sn16	0,1A	16 bits
	Byte 5	High				
	Byte 6	Low	Battery discharge voltage	un16	0,1V	16 bits
	Byte 7	High				

Battery status				Dir	Interval	
	CAN-ID 0x355			Tx	500 ms	
			Name	**Type**	**Res.**	**Length**
	Byte 0	Low	SOC value	un16	1%	16 bits
	Byte 1	High				
	Byte 2	Low	SOH value	un16	1%	16 bits
	Byte 3	High				
	Byte 4	Low	SOC high resolution	un16	0,01%	16 bits
	Byte 5	High				

Battery basic info				Dir	Interval	
	CAN-ID 0x356			Tx	500 ms	
			Name	**Type**	**Res.**	**Length**
	Byte 0	Low	Battery voltage	un16	0,01V	16 bits
	Byte 1	High				
	Byte 2	Low	Battery current	sn16	0,1A	16 bits
	Byte 3	High				
	Byte 4	Low	Temperature	sn16	0,1°C	16 bits
	Byte 5	High				

Alarm and warning information				**Dir**	**Interval**	
	CAN-ID 0x35A			Tx	500 ms	

		Bit	**Name**	**Type**	**Res.**	**Length**
Alarms	Byte 0	0	General alarm	Bitfield	1=Alarm raised, 2=Alarm cleared	2 bits
		2	Battery high voltage alarm			2 bits
		4	Battery low voltage alarm			2 bits
		6	Battery high temperature alarm			2 bits
	Byte 1	0	Battery low temperature alarm			2 bits
		2	Battery high temperature charge alarm			2 bits
		4	Battery low temperature charge alarm			2 bits
		6	Battery high current alarm			2 bits
	Byte 2	0	Battery high charge current alarm			2 bits
		2	Contactor alarm			2 bits
		4	Short circuit alarm			2 bits
		6	BMS internal alarm			2 bits
	Byte 3	0	Cell imbalance alarm			2 bits
		2	Reserved			2 bits
		4	Reserved			2 bits
		6	Reserved			2 bits
Warnings	Byte 4	0	General warning	Bitfield	1=Warn. raised, 2=Warn. cleared	2 bits
		2	Battery high voltage warning			2 bits
		4	Battery low voltage warning			2 bits
		6	Battery high temperature warning			2 bits
	Byte 5	0	Battery low temperature warning			2 bits
		2	Battery high temperature charge warning			2 bits
		4	Battery low temperature charge warning			2 bits
		6	Battery high current warning			2 bits
	Byte 6	0	Battery high charge current warning			2 bits
		2	Contactor warning			2 bits
		4	Short circuit warning			2 bits
		6	BMS internal warning			2 bits
	Byte 7	0	Cell imbalance warning			2 bits
		2	Reserved			2 bits
		4	Reserved			2 bits
		6	Reserved			2 bits

Event information				Dir	Interval	
	CAN-ID 0x35B			Tx	500 ms	

		Bit	Name	Type	Res.	Length
Events	Byte 0	0	Start of SOC Recalibration (not used)	Bitfield	1=active	1 bits
		1	Stop of SOC Recalibration (not used)			1 bits
		2	Start of Power limitation (not used)			1 bits
		3	Stop of Power limitation (not used)			1 bits
		4	Preventive battery shutdown			1 bits
		5	reserved			1 bits
		6	reserved			1 bits
		7	reserved			1 bits

Manufacturer name			Dir	Interval	
	CAN-ID 0x35E		Tx	500 ms	

		Name	Type	Res.	Length
	Byte 0	Manufacturer name: “MG-BMS”	Char		
	Byte 1				
	Byte 2				
	Byte 3				
	Byte 4				
	Byte 5				
	Byte 6				
	Byte 7				

System Information			Dir	Interval	
	CAN-ID 0x35F		Tx	500 ms	

			Name	Type	Res.	Length
	Byte 0	Low	Master type ID 0x3A9B -> 15003	un16		16 bits
	Byte 1	High				
	Byte 2	High	Software version (note: MSB first) 0x0118 -> V1.24	un16		16 bits
	Byte 3	Low				
	Byte 4	Low	Total battery capacity Ah	un16	1 Ah	16 bits
	Byte 5	High				
	Byte 6	Low	Master product ID hardware configuration.	un16		16 bits
	Byte 7	High				

1.4 General BMS protocol

The general BMS protocol will support 24 and 48V systems. Invalid value of a un16 is marked with 0xFFFF, sn16 with 0x8000 and a un32 with 0xFFFFFFFF.

1.4.1 Interface definition

Speed : 500 kbps
ID : 11-bit CAN 2.0A

1.4.2 Message definition

BMS Limits				Dir	Interval	
	CAN-ID 0x351			Tx	500 ms	
			Name	**Type**	**Res.**	**Length**
	Byte 0	Low	Battery charge voltage	un16	0,1V	16 bits
	Byte 1	High				
	Byte 2	Low	DC Charge current limitation	sn16	0,1A	16 bits
	Byte 3	High				
	Byte 4	Low	DC Discharge current limitation	sn16	0,1A	16 bits
	Byte 5	High				
	Byte 6	Low	Battery discharge voltage	un16	0,1V	16 bits
	Byte 7	High				

Battery status				Dir	Interval	
	CAN-ID 0x355			Tx	500 ms	
			Name	**Type**	**Res.**	**Length**
	Byte 0	Low	SOC value	un16	1%	16 bits
	Byte 1	High				
	Byte 2	Low	SOH value	un16	1%	16 bits
	Byte 3	High				
	Byte 4	Low	SOC high resolution	un16	0,01%	16 bits
	Byte 5	High				

Battery basic info				Dir	Interval	
	CAN-ID 0x356			Tx	500 ms	
			Name	**Type**	**Res.**	**Length**
	Byte 0	Low	Battery voltage	un16	0,01V	16 bits
	Byte 1	High				
	Byte 2	Low	Battery current	sn16	0,1A	16 bits
	Byte 3	High				
	Byte 4	Low	Temperature	sn16	0,1°C	16 bits
	Byte 5	High				

Alarm and warning information				**Dir**	**Interval**	
	CAN-ID 0x35A			Tx	500 ms	

			Name	**Type**	**Res.**	**Length**
Alarms	Byte 0	0	General alarm	Bitfield	1=Alarm raised, 2=Alarm cleared	2 bits
		2	Battery high voltage alarm			2 bits
		4	Battery low voltage alarm			2 bits
		6	Battery high temperature alarm			2 bits
	Byte 1	0	Battery low temperature alarm			2 bits
		2	Battery high temperature charge alarm			2 bits
		4	Battery low temperature charge alarm			2 bits
		6	Battery high current alarm			2 bits
	Byte 2	0	Battery high charge current alarm			2 bits
		2	Contactor alarm			2 bits
		4	Short circuit alarm			2 bits
		6	BMS internal alarm			2 bits
	Byte 3	0	Cell imbalance alarm			2 bits
		2	Reserved			2 bits
		4	Reserved			2 bits
		6	Reserved			2 bits
Warnings	Byte 4	0	General warning	Bitfield	1=Warn. raised, 2=Warn. cleared	2 bits
		2	Battery high voltage warning			2 bits
		4	Battery low voltage warning			2 bits
		6	Battery high temperature warning			2 bits
	Byte 5	0	Battery low temperature warning			2 bits
		2	Battery high temperature charge warning			2 bits
		4	Battery low temperature charge warning			2 bits
		6	Battery high current warning			2 bits
	Byte 6	0	Battery high charge current warning			2 bits
		2	Contactor warning			2 bits
		4	Short circuit warning			2 bits
		6	BMS internal warning			2 bits
	Byte 7	0	Cell imbalance warning			2 bits
		2	Reserved			2 bits
		4	Reserved			2 bits
		6	Reserved			2 bits

Event information				Dir	Interval	
	CAN-ID 0x35B			Tx	500 ms	

		Bit	Name	Type	Res.	Length
Events	Byte 0	0	Start of SOC Recalibration (not used)	Bitfield	1=active	1 bits
		1	Stop of SOC Recalibration (not used)			1 bits
		2	Start of Power limitation (not used)			1 bits
		3	Stop of Power limitation (not used)			1 bits
		4	Preventive battery shutdown			1 bits
		5	reserved			1 bits
		6	reserved			1 bits
		7	reserved			1 bits

Manufacturer name			Dir	Interval	
	CAN-ID 0x35E		Tx	500 ms	

		Name	Type	Res.	Length
	Byte 0	Manufacturer name: “MG-BMS”	Char		
	Byte 1				
	Byte 2				
	Byte 3				
	Byte 4				
	Byte 5				
	Byte 6				
	Byte 7				

System Information			Dir	Interval	
	CAN-ID 0x35F		Tx	500 ms	

			Name	Type	Res.	Length
	Byte 0	Low	Master type ID 0x3A9B -> 15003	un16		16 bits
	Byte 1	High				
	Byte 2	High	Software version (note: MSB first) 0x0118 -> V1.24	un16		16 bits
	Byte 3	Low				
	Byte 4	Low	Total battery capacity Ah	un16	1 Ah	16 bits
	Byte 5	High				
	Byte 6	Low	Master product ID hardware configuration.	un16		16 bits
	Byte 7	High				

Battery cell info				Dir	Interval	
	CAN-ID 0x373			Tx	500 ms	

			Name	Type	Res.	Length
	Byte 0	Low	Lowest cell voltage	un16	1mV	16 bits
	Byte 1	High				
	Byte 2	Low	Highest cell voltage	un16	1mV	16 bits
	Byte 3	High				
	Byte 4	Low	Lowest cell temperature	un16	1Kelvin	16 bits
	Byte 5	High				
	Byte 6	Low	Highest cell temperature	un16	1Kelvin	16 bits
	Byte 7	High				

Energy charged and discharged				Dir	Interval	
	CAN-ID 0x378			Tx	500 ms	

			Name	Type	Res.	Length
	Byte 0	Low	Energy charged	un32	0,01KWh	32 bits
	Byte 1					
	Byte 2					
	Byte 3	High				
	Byte 4	Low	Energy Discharged	un32	0,01KWh	32 bits
	Byte 5					
	Byte 6					
	Byte 7	High				

Serial number high part				Dir	Interval	
	CAN-ID 0x380			Tx	500 ms	

			Name	Type	Res.	Length
	Byte 0		BMS serial number, first 8 characters.	Char		
	Byte 1					
	Byte 2					
	Byte 3					
	Byte 4					
	Byte 5					
	Byte 6					
	Byte 7					

Serial number low part				Dir	Interval	
	CAN-ID 0x381			Tx	500 ms	

			Name	Type	Res.	Length
	Byte 0		BMS serial number, last 8 characters.	Char		
	Byte 1					
	Byte 2					
	Byte 3					
	Byte 4					
	Byte 5					
	Byte 6					
	Byte 7					

1.5 NMEA2000 protocol

Note, when Powerfinn charger is enabled, 11-bit CAN messages with ID 0x600 will be added on the NMEA2000 bus. This messages are not included in this document.

1.5.1 Interface definition

Speed : 250 kbps
ID : 29-bit CAN 2.0B

1.5.2 Message definition

NMEA2000 Identifier definition.

<3-bits priority><1-bit reserved><1-bit datapage>< 16-bits PGN >< 8-bit source address >

As described in the list below a PGN consists of datapage + PGN. For example 0x1F214 means:

Datapage = 1
PGN = 0XF214

1.5.3 PGN list

Data	PGN Name	PGN dec	PGN hex	Field	Remarks
Battery pack voltage	Battery Status	127508	0x1F214	2	Battery instance 0
Battery pack current	Battery Status	127508	0x1F214	3	Battery instance 0
Battery pack highest temperature	Battery Status	127508	0x1F214	4	Battery instance 0
State-Of-Charge (SOC)	DC detailed status	127506	0x1F212	4	DC instance 0
Time-To-Go (TTG)	DC detailed status	127506	0x1F212	6	DC instance 0
Lowest cell voltage in pack	Battery Status	127508	0x1F214	2	Battery instance 1
Lowest cell temperature in pack	Battery Status	127508	0x1F214	4	Battery instance 1
Highest cell voltage in pack	Battery Status	127508	0x1F214	2	Battery instance 2
Highest cell temperature in pack	Battery Status	127508	0x1F214	4	Battery instance 2

Notes:

- Battery instance 0 and DC Instance 0 are the same;
- One or more MG Lithium-Ion batteries together in one system are a Battery pack;
- The DC detailed status is a NMEA2000 fast packet;
- The default source address of the MG Master LV is 0x50;
- PGN name BATTERY_BANK is also named BATTERY_STATUS.

The Data instance from PGN: 127508BATTERY_BANK or PGN: 127506DC_DETAILED can be changed by steps of 32 -> 0, 32, 64, 96, 128. If data instance from BATTERY_BANK is changed, also data instance of DC_DETAILED will change, vice versa. Data instance from BATTERY_BANK_MIN, BATTERY_BANK_MAX are increased with the data instance from BATTERY_BANK.

Data instance from PGN's		
BATTERY_BANK DC_DETAILED	BATTERY_BANK_MIN	BATTERY_BANK_MAX
0	1	2
32	33	34
64	65	66
...	...	...
224	225	226

- Data instance is stored, if during boot data instance is invalid, it will be restored to 0.
- DeviceInstance can be changed and is stored.
- DeviceFunctionInstance can be changed and is stored.
- Device Class Instance can be changed and is stored.

1.5.3.1 PGN: Battery Status, 127508 (0x1F214)

There are three battery status messages that are separated by the "Battery Instance".

1.5.3.1.1 Battery Instance "0"

0x1F214 - Battery Status			
Periodicity: Priority Default: Format: Single Frame:		1500 milliseconds 6 Little Endian/Intel convention Yes	
1	Byte 0	**Battery Instance = 0**.	
		Data Length: Unit: Resolution: Range:	8 bit, uint8 Generic numeric ID, short 1 bit 0 to 252
2	Byte 1 Byte 2	Battery Voltage DC.	
		Data Length: Unit: Resolution: Range:	16 bit, int16 Voltage, DC 0.01 V +/- 327.64 V
3	Byte 3 Byte 4	Battery Current, + = battery is charged, - = battery is discharged.	
		Data Length: Unit: Resolution: Range:	16 bit, int16 Current, Electric 0.1 A +/- 3276.4 A
4	Byte 5 Byte 6	Highest Battery Temperature	
		Data Length: Unit: Resolution: Range:	16 bit, int16 Generic Temperature, Kelvin 0.01 K 0 to 655.32 deg K
5	Byte 7	Sequence ID, an upward counting number used to tie related information together between different PGNs.	
		Data Length: Unit: Resolution: Range:	8 bit, uint8 Sequence ID, short 1 bit 0 to 252

1.5.3.1.2 Battery Instance "1"

0x1F214 - Battery Status Lowest Value's			
Periodicity: Priority Default: Format: Single Frame:		1500 milliseconds 6 Little Endian/Intel convention Yes	
1	Byte 0	**Battery Instance = 1.**	
		Data Length: Unit: Resolution: Range:	8 bit, uint8 Generic numeric ID, short 1 bit 0 to 252

2	Byte 1 Byte 2	Lowest cell voltage in pack	
		Data Length: Unit: Resolution: Range:	16 bit, int16 Voltage, DC 0.01 V +/- 327.64 V
3	Byte 3 Byte 4	not implemented (0x7FFF)	
		Data Length: Unit: Resolution: Range:	16 bit, int16 - - -
4	Byte 5 Byte 6	Lowest cell temperature in pack	
		Data Length: Unit: Resolution: Range:	16 bit, int16 Generic Temperature, Kelvin 0.01 K 0 to 655.32 deg K
5	Byte 7	Sequence ID, an upward counting number used to tie related information together between different PGNs.	
		Data Length: Unit: Resolution: Range:	8 bit, uint8 Sequence ID, short 1 bit 0 to 252

1.5.3.1.3 Battery Instance "2"

0x1F214 - Battery Status Highest Value's		
Periodicity: Priority Default: Format: Single Frame:	1500 milliseconds 6 Little Endian/Intel convention Yes	
1	Byte 0	**Battery Instance = 2.**
		Data Length: Unit: Resolution: Range: 8 bit, uint8 Generic numeric ID, short 1 bit 0 to 252
2	Byte 1 Byte 2	Highest cell voltage in pack
		Data Length: Unit: Resolution: Range: 16 bit, int16 Voltage, DC 0.01 V +/- 327.64 V
3	Byte 3 Byte 4	not implemented (0x7FFF)
		Data Length: Unit: Resolution: Range: 16 bit, int16 - - -
4	Byte 5 Byte 6	Highest cell temperature in pack
		Data Length: Unit: Resolution: Range: 16 bit, int16 Generic Temperature, Kelvin 0.01 K 0 to 655.32 deg K

5	Byte 7	Sequence ID, an upward counting number used to tie related information together between different PGNs.	
		Data Length: Unit: Resolution: Range:	8 bit, uint8 Sequence ID, short 1 bit 0 to 252

1.5.3.2 PGN: DC Detailed Status, 127506 (0x1F212)

0x1F212 -DC Detailed Status			
Periodicity: Priority Default: Format: Single Frame:		1500 milliseconds 6 Little Endian/Intel convention No (fast packet)	
1	Byte 0	Sequence ID, an upward counting number used to tie related information together between different PGNs.	
		Data Length: Unit: Resolution: Range:	8 bit, uint8 Sequence ID, short 1 bit 0 to 252
2	Byte 1	DC Instance.	
		Data Length: Unit: Resolution: Range:	8 bit, uint8 Generic numeric ID, short 1 bit 0 to 252
3	Byte 2	DC Type	
		Data Length: Unit: Resolution: Range:	8 bit, int8 - 1 bit Variable
		0x00 = Battery, 0x01 = Alternator, 0x02 = Convertor, 0x03 = Solar Cell, 0x04 = Wind Generator, 0x05 = Reserved, thru 0xFD = Reserved 0xFE = Error 0xFF = Data Not Available	
4	Byte 3	State-Of-Charge	
		Data Length: Unit: Resolution: Range:	8 bit, uint8 Generic Absolute Percentage 0-252% 1 % 0 to 252 %
5	Byte 4	State-Of-Health (not implemented)	
		Data Length: Unit: Resolution: Range:	8 bit, uint8 Generic Absolute Percentage 0-252% 1 % 0 to 252 %

6	Byte 5 Byte 6	Time remaining	
		Data Length: Unit: Resolution: Range:	16 bit, uint16 Time 1 minute 0 to 65532 minutes
7	Byte 7 Byte 8	Ripple voltage (not implemented)	
		Data Length: Unit: Resolution: Range:	16 bit, uint16 AC ripple voltage 1 mV 0 to 65532 mV
8	Byte 9 Byte 10	Amp hours	
		Data Length: Unit: Resolution: Range:	16 bit, uint16 Battery capacity 1 Ah 0 to 65532 Ah

The DC detailed status is actually two messages that are combined as one.

NOTE: The DC detailed message is a NMEA2000 fast packet. This means that it has a little protocol overhead.

The message consists out of 2 messages.

Message	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
1	b0 to b4 = 00000 b4 to b7 = 3-bit Sequence counter	Total number of data bytes. For this PGN it is 0x0B.	SID	DC Instance	DC type	SOC	SOH (=0xFF)	Time remaining byte 0
2	b0 to b4 = frame counter b4 to b7 = 3-bit Sequence counter	Time remaining byte 1	0XFF	0XFF	Amp hours byte 0	Amp hours byte 1	0XFF	0XFF

= DC Detailed Status PGN

1.5.4 VREGS

1.5.4.1 Message definition

CAN-ID : 1CEF <target address><source address>

Example : 1CEF5030 means source address 0x30 end target address 0x50

0xFF as target address means broadcast message. Every node will receive this message.

All fields are sent in Little Endian order. Message data of a VREG looks like the following:

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
0x66	0x99	regId.L	regId.H	Data	Data	Data	Data

1.5.4.2 VREG ID List

Description	VREG ID	Period-ically/on Change	Comments
Device			
Product ID	0x0100	No/No	MG Master LV general = 0xA390 MG Master LV 150 = 0xA391 MG Master LV 400 = 0xA392 MG Master LV 600 = 0xA393 MG Master LV 1000 = 0xA394
Firmware version	0x0102	No/No	un8 = Identifier : un24 = Firmware Version, 0xFFFFFF = no firmwarepresent, Firmware version: 0x123456=v12.34.56
Device instance	0x0105	No/No	un8 = Instance (not implemented yet)
Serial number	0x010A	No/No	stringZeroEnded[32] = Serial : un8 = padding, 0 =zeropadding (not implemented yet)
Model name	0x010B	No/No	stringZeroEnded[64] = Model : un8 = padding, 0 = zeropadding(not implemented yet)
BMS Status values			
Voltage	0xED8D	Yes/No	sn16 = DC Channel 1 Voltage [0.01V], 0x7FFF = Not Available
Current	0xED8F	Yes/No	sn16 = DC Channel 1 Current [0.1A], 0x7FFF = Not Available
Cell Volt. max/min	0x0385	Yes/No	un16 = Minimum voltage [0.01V] : un16 = Maximumvoltage [0.01V]
Cell Temperature max/min	0x0386	Yes/No	un16 = Minimum temperature [0.01K] : un16 =Maximum temperature [0.01K]
State-of-Charge	0x0FFF	Yes/Yes	un16 = SOC [0.01%]
Time-to-go	0x0FFE	No/No	un16 = Time to go [1minutes], 0xFFFF = not available
Consumed Ah	0xEEFF	No/No	sn32 = Consumed Ah [0.1Ah]
Last error 1-4	0x2110	No/Yes	un8 = Error 1, Last error : un8 = Error 2 : un8 = Error 3 : un8 = Error 4, Oldest error
Last error 1 time	0x2111	No/Yes	un32 = BMS: UTC time of last error 1

Last error 2 time	0x2112	No/Yes	un32 = BMS: UTC time of last error 2
Last error 3 time	0x2113	No/Yes	un32 = BMS: UTC time of last error 3
Last error 4 time	0x2114	No/Yes	un32 = BMS: UTC time of last error 4
Status flags	0x2100	No/Yes	un32 = BMS page BMV flags (bit flags) bit 0 = Charged bit 1 = Almost charged bit 2 = Discharged bit 3 = Almost discharged bit 4 = Charging bit 5 = Discharging bit 6 = Balancing in progress bit 7 = Main safety contactor closed bit 8 = Main safety contactor closed bit 9 = Not implemented bit 10 = Warning over voltage bit 11 = Not implemented bit 12 = Warning under voltage bit 13 = Warning high charge current bit 14 = Warning high discharge current bit 15 = Not implemented bit 16 = Warning over temperature bit 17 = Warning under temperature charge bit 18 = Not implemented bit 19 = Warning under temperature discharge bit 20 = Not implemented bit 21 = Low SOC (< 20%) bit 22 = Not implemented bit 23 = Not implemented bit 24 = Not implemented bit 25 = Allowed to charge bit 26 = Allowed to discharge
BMS State	0x0371	No/Yes	un8 =BMS state (Value) 0-8= Initializing 9 = Running 10= Error 11 = Not implemented 12 = Shutting down 13 = Updating battery firmware 14 = Standby 15 = Going to running state 16 = Pre-charging
BMS Error	0x2101	No/Yes	un8 = BMS error (Value) 0 = No error, system OK 1 = Not implemented 2 = No batteries found 3 = Not implemented 4 = Batteries connected are not the same type 5 = Number of batteries connected incorrect

			6 = Not implemented 7 = Measure error 8 = Not implemented 9 = Not implemented 10 = Not implemented 11 = Not implemented 12 = Watchdog error 13 = Over voltage detected 14 = Under voltage detected 15 = Over temperature detected 16 = Under temperature detected 17 = Not implemented 18 = Battery protection automatic shutdown 19 = Not implemented 20 = Not implemented 21 = Not implemented 22 = Not implemented 23 = BMS slave failure 24 = Not implemented 25 = Pre-charge failure 26 = Contactor failure 27 = Reserved 28 = Slave update failure 29 = Slave update unavailable
Programmable relay state	0x034E	No/Yes	un8 = programmable relay state, 0 = open, 1 = closed.
System configuration			
Battery installed capacity	0x1000	No/Yes	un16 = Battery capacity [Ah]
Battery installed configuration	0x0380	No/Yes	un8 = Number of batteries : un8 = Cells per battery : un8= Number of batteries in parallel : un8 =Number of batteries in series
History values			
Deepest discharge	0x0300	No/No	sn32 = Deepest discharge [0.1Ah]
Total Ah drawn	0x0305	No/No	sn32 = Cumulative Ah drawn from the battery [0.1Ah]
Minimum voltage	0x0306	No/No	sn32 = Minimum battery voltage [0.01V]
Maximum voltage	0x0307	No/No	sn32 = Maximum battery voltage [0.01V]
Automatic syncs	0x0309	No/No	sn32 = Number of automatic synchronizations
Discharged energy	0x0310	No/No	un32 = The amount of energy drawn from the source [0.01kWh]
Charged energy	0x0311	No/No	un32 = The amount of energy put into the source [0.01kWh]
Maximum temperature	0x0312	No/No	un16 = The maximum temperature [0.01K]
Minimum temperature	0x0313	No/No	un16 = The minimum temperature [0.01K]

Min/Max cell voltage	0x0384	No/No	un16 = Minimum voltage [0.01V] : un16 = Maximum voltage [0.01V]
BMS Limits			
Battery charge voltage	0x0390	Yes/Yes	un32 = Charge voltage [0.01V], 0xFFFFFFFF = Not Available
DC charge current limitation	0x0391	Yes/Yes	un32 = Charge current [0.1A], 0xFFFFFFFF = Not Available
DC discharge voltage	0x0392	Yes/Yes	un32 = Discharge voltage [0.01V] , 0xFFFFFFFF = Not Available
Battery discharge current limitation	0x0393	Yes/Yes	un32 = Discharge current [0.1A] , 0xFFFFFFFF = Not Available
Charger link percentage	0x2014	Yes/Yes	un8 = Percentage [1%], 0xFF = Not Available, valid range 0 till 100
Charger link current limit	0x2015	Yes/Yes	un16 = Link Charge Current Limit [0.1A], 0xFFFF =Not Available
Settings	This VREG's can be read and written.		
Synchronize group number	0x0374	No/Yes	Un8 = group, 0 = Disabled, 1-3 = Enabled. Used to synchronize multiple BMSS in parallel that are set to this group number.
Start up when charger detected	0x0375	No/ Yes	Un8 = Charger detected, 0 = Disabled, 1 = Enabled.
Battery strategy	0x0376	No/ Yes	Un8 = Battery strategy, 0 = Default, 1 = Performance.
Combined BMS	0x0377	No/ Yes	Un8 = Combined BMS, 0 = Disabled, 1 = Enabled.
Re-start request	0x0379	No/ Yes	Un8 = Restart request, 0 = Disabled, 1 = Enabled, BMS will shut down and startup again.
Number of batteries in parallel	0x0387	No/ Yes	Un8 = batteries parallel, 0 = automatically detected, 1-96 = Number of batteries connected to BMS in parallel.
Number of batteries in series	0x0388	No/ Yes	Un8 = batteries series, 0 = automatically detected, 1-96 = Number of batteries connected to BMS in series.
Bluetooth enabled	0x0090	No/ Yes	Un8 = Bluetooth enabled, 0 = Disabled, 1 = Enabled.
	Read 0xFF = Not available (System is in error state)		

Periodically / on Change:

If "periodically" is "Yes" the VREG is broadcasted with an interval of 5 seconds. If "on change" is "yes" the VREG will be broadcasted directly if the value has been changed. The "on change" condition can have a maximum delay of 1 second.

1.5.4.3 Examples

Request (0x0001) for Firmware Version (0x0102) of node at address 0x50 from address 0x20:

CAN-ID	Data
0x1CEF5020	0x66 0x99 0x01 0x00 0x02 0x01 0xFF 0xFF

Reply (is always broadcast) firmware verion 1.04:

CAN-ID	Data
0x1CEFFF50	0x66 0x99 0x02 0x01 0x00 0x00 0x04 0x01

If the request was not supported for this register, the reply will be an ACK (0x0002) with code 0x8000, invalid request:

CAN-ID	Data
0x1CEF2050	0x66 0x99 0x02 0x00 0x02 0x01 0x00 0x80

2 Revision history

Rev	Date	MG Master LV Communication guide
8	20200907	
	Modifications: • Added General BMS protocol, see 1.4 “General BMS protocol”.	
7	20200701	
	Modifications: • Typo, name of “DC discharge voltage” and “DC discharge current limitation” swapped, see 1.5.4.2 “BMS Limits”. • Added status flags VREG 0x2100, bit 13 and 14, see 1.5.4.2 “Status flags”. • Added BMS error flags VREG 0x2101, bit 18, see 1.5.4.2 “BMS error”. • Added setting Bluetooth enable VREG 0x0090, see 1.5.4.2 “Bluetooth enable”. • Typo, removed “(not implemented yet)” from VREG’s Battery charge voltage, DC charge current limitation, Battery discharge voltage, DC discharge current limitation, see 1.5.4.2.	