



# BMS Main X 1.x

CANopen PDO protocol

Revision 2 (22-June-2022)

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# 1 General information

The BMS Main X 1.x supports CiA 301 CANopen protocol for configuring and monitoring the battery system.

The communication parameters of the device are:

- CAN speed – 125, 250 (default), 500 or 1000 kbps.
- COBID of the board by default – 64 (0x40).

The BMS Main X 1.x supports the following features:

- SDO protocol (for configuring the system).
- PDO protocol (for interacting with external devices).
- Sync.
- Heartbeat producer.
- Heartbeat consumer.

The BMS Main X 1.x transmits TPDO packets on every Sync message (CANID = 0x80, data length is 0). The device can send Sync messages itself.

There is the description of parameters in the TPDO packets below. Column "Parameter type" contains an integer type of the parameter:

U8 – unsigned 8-bit integer;

U16 – unsigned 16-bit integer;

S16 – signed 16-bit integer;

U32 – unsigned 32-bit integer.

Words are in the **little endian**.

## 2 TPDO packets

### 2.1 CANID = 0x180+COBID (0x1C0 by default)

Packet length – 8 bytes.

Packet content:

Byte number	Parameter name	Parameter type	Converting
0	Discrete inputs 1 (bitfield): bit 0 – “Battery cover”; bit 1 – “Charge request”; bit 2 – “Precharge request”; bit 3 – “Discharge request”; bit 4 – “CH contactor feedback”; bit 5 – “DCH contactor feedback”; bit 6 – “CH/DCH contactor feedback”; bit 7 – “Insulation status”.	U8	
1-2	Battery current	S16	0.1A/bit
3	Minimum cell temperature	S8	1°C/bit
4	Maximum cell temperature	S8	1°C/bit
5	State of charge (SOC)	U8	1%/bit
6-7	Battery voltage	U16	0.1V/bit

### 2.2 CANID = 0x280+COBID (0x2C0 by default)

Packet length – 8 bytes.

Packet content:

Byte number	Parameter name	Parameter type	Converting
0-3	Device internal state (bitfield):	U32	

	<p>bit 0 – “Init”, signal of initializing the BMS (during the initialization battery modules are scanning);</p> <p>bit 1 – state of the main charging contactor (0 – open, 1 – closed);</p> <p>bit 2 – state of the main discharging contactor (0 – open, 1 – closed);</p> <p>bit 3 – “Charging current present”;</p> <p>bit 4 – “Discharging current present”;</p> <p>bit 5 – state of the Charging/Discharging contactor;</p> <p>bit 6 – state of the precharging contactor;</p> <p>bits 7–29 – reserved;</p> <p>bit 30 – set to 1;</p> <p>bit 31 – reserved.</p>		
4–7	<p>Errors register (bitfield):</p> <p>bit 0 – “Battery cover”;</p> <p>bit 1 – “Module offline”;</p> <p>bit 2 – “Critical error”;</p> <p>bit 3 – “Voltage unbalance (CH)”;</p> <p>bit 4 – “Voltage unbalance (DCH)”;</p> <p>bit 5 – “Current unbalance (CH)”;</p> <p>bit 6 – “Current unbalance (DCH)”;</p> <p>bit 7 – “Charging current unbalance”;</p> <p>bit 8 – “Discharging current unbalance”;</p> <p>bit 9 – “Need acknowledgement”, errors were detected in the past and should be acknowledged;</p> <p>bit 10 – “CH contactor feedback error”;</p> <p>bit 11 – “DCH contactor feedback error”;</p> <p>bit 12 – “CH/DCH contactor feedback error”;</p> <p>bit 13 – “Insulation fault”;</p> <p>bits 14–31 – reserved.</p>	U32	

## 2.3 CANID = 0x380+COBID (0x3C0 by default)

Packet length – 8 bytes.

Packet content:

Byte number	Parameter name	Parameter type	Converting
0-3	Reserved	U32	
4	Discrete inputs 2 (bitfield): bit 0 – “Join to charge”; bit 1 – “Join to discharge”; bits 2-7 – reserved.	U8	
5	Reserved	U8	
6-7	Reserved	U16	

### 3 Contacts

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## 4 Revision history

Rev. number	Rev. date	Changes
1	03-December-2021	First revision.
2	22-June-2022	<p>Added the discrete input signals “Charge request”, “Precharge request”, “Discharge request”, “CH contactor feedback”, “DCH contactor feedback”, “CH/DCH contactor feedback”, “Insulation status” to the 1<sup>st</sup> TPDO packet.</p> <p>Added the state of the precharging contactor and errors “CH contactor feedback error”, “DCH contactor feedback error”, “CH/DCH contactor feedback error” and “Insulation fault” to the 2<sup>nd</sup> TPDO packet.</p> <p>Added the 3<sup>rd</sup> TPDO packed.</p>