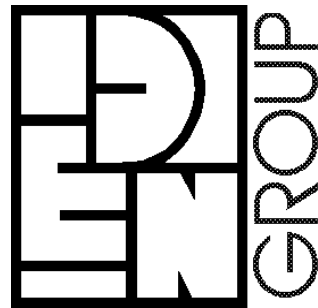




BATTERY CHARGER CAN MESSAGES SPECIFICATIONS

HISTORY OF THE DOCUMENT

<i>Revision</i>	<i>Date</i>	<i>Amendment</i>
A	28/11/2011	Creation of the document
B	11/05/2012	Added messages for ADP interface; set timeout of CAN at 600ms.
	30/07/2012	Changed Setup messgae to add extra load current external to the charger
C	08/03/2013	Defined By ID 617 the setup for FAN Output and for HW Output voltage and hours-counter. Defined transmission of diagnostic every 15 minutes.
D	16/04/2013	Added description about cycle time and transmission fault with Diagnostic messages
E	17/04/2013	Modified the Fault Table
	29/04/2013	Modified the ID0x612 Message and added the description of the code 0x61A
F	31/05/2013	Deleted FANSetup from ID617. Added automatic transmission of ID0x616.

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Introduction

This document defines the CAN Messages exchanged between the EDN GROUP's chargers and user's BMS control logic or the Vehicle Management Unit (VMU) and a PC system monitoring software application.

CAN BUS FRAMES

CAN BUS specification

CAN Spec.:	CAN 2.0B
Bitrate:	500 kbit/s
Message Type:	Standard (11-bit Identifier)
Remote Frame:	Not used
Terminating Resistor:	Not present

Data Field specification

Data order (as sent):

Byte: from 0 to 7

Bit: 8 bits transferred MSB first

Word: transferred High Byte first

Long: transferred High Word first

All Bits not indicated are transferred as "0".

CAN messages overview

<i>Messages contents</i>		
Control	Ctl	Iout & Vout reference value, control bits
Status	Stat	Status of charger
Values	Act1, Act2	Actual Iout & Vout values of the charger
Temperatures	Temp	Internal temperature
Errors	Err	Errors & Warning
Diagnostic	Tst1	Real Time diagnostic
SAE J1772 Info	Sae	SAE J1772 information (only with ADP Module)
ADP Internal Diagnostic	Adp	ADP Module diagnostic. (See ADP User's Manual)

CAN messages exchanged

<i>Rx, Tx</i>	<i>Message Name</i>	<i>ID Charger A</i>	<i>ID Charger C</i>	<i>ID Charger B (18kW)</i>	<i>DLC</i>	<i>Transmit Time (mS)</i>
Rx	Ctl	0x618	0x608	0x5F8	7	100
Tx	Stat	0x610	0x600	0x5F0	4	100
Tx	Act1	0x611	0x601	0x5F1	8	100
Tx	Act2	0x612	0x602	0x5F2	8	100
Tx	Temp	0x613	0x603	0x5F3	8	1000
Tx	Err	0x614	0x604	0x5F4	5	1000
Tx	Tst1	0x615	0x605	0x5F5	8	100
Rx	Sae	0x619	0x619	0x619	8	100

CAN messages exchanged between the PCAN

These messages are reserved.

<i>Rx, Tx</i>	<i>Message Name</i>	<i>ID Charger A</i>	<i>ID Charger C</i>	<i>ID Charger B (18kW)</i>	<i>DLC</i>	<i>Transmit Time (mS)</i>
Rx	Setup	<u>0x617</u>	<u>0x617</u>	<u>0x617</u>	8	Single Shot
Tx	Tst2	0x616	0x606	0x5F6	8	Single Shot

CAN FRAMES specification

Rx, Tx	Message Name	Signal Name	ID Charger A	Start Byte	Start Bit	Bit Lenght	DLC	Transmit Time (ms)	Physical Value		Application Value		Resolution Signal	Offset Signal	Unit	Note
									Min	Max	Min	Max				
Rx	Ctl		0x618				7	100								
		Ctl.CanEnable		0	7	1			0	1	False	True				If both Ctl.CanEnable and hardware enable pin ⁽¹⁾ are active and no error occurs, the charger is ready to start (true condition)
		Ctl.VoutMaxSet		3	31	16			0	10000	0	1000	0,1	0	V	Set Vout max
		Ctl.IoutMaxSet		5	47	16			0	1500	0	150	0,1	0	A	Set Iout max

D0	D1	D2	D3	D4	D5	D6	D7	0x618 Ctl Messages Examples
80	00	0	0E	10	00	AA		Ctl.CanEnable enabled, Vout = 360V, Iout = 17

⁽¹⁾ Hardware Enable Pins: to enable the charger, the hardware connection controlled is the link between pin D of J3A and J3B (DC output connectors). If the pins D are connected together, the charger can start to work.

Rx, Tx	Message Name	Signal Name	ID Charger A	Start Byte	Start Bit	Bit Length	DLC	Transmit Time (ms)	Physical Value		Application Value		Resolution Signal	Offset Signal	Unit	Note
									Min	Max	Min	Max				
Tx	Stat		0x610				4	100								
		Stat.PowerEnable		0	7	1			0	1	False	True				Indicates if the hardware enable pin is active
		Stat.ErrorLatch		0	6	1			0	1	False	True				If True, a failure or a soft failure has occurred (See the table of Fault Code at pag. 23)
		Stat.WarnLimit		0	5	1			0	1	False	True				If True, a warning condition is present (See the table of Fault Code at pag. 23)
		Stat.LimTemp		2	19	1			0	1	False	True				If True, the derating characteristic is active
Tx	Act1		0x611				8	100								
		Act1.Iacm		0	7	16			0	500	0	50	0,1	0	A	AC Input Current
		Act1.Vacm		2	23	16			0	5000	0	500	0,1	0	V	AC Input Voltage
		Act1.VOut		4	39	16			0	10000	0	1000	0,1	0	V	DC Output Voltage
		Act1.IOut		6	55	16			0	1500	0	150	0,1	0	A	DC Output Current
Tx	Act2		0x612				8	100								
		Act2.AcPower		0	7	16			0	1000	0	100	0,1		kW	AC input power
		Act2.AcEnergy		2	23	16			0	1000	0	100	0,1		kWh	AC energy
		Act2.SAEcurrentLimit		6	55	16			0	500	0	50	0,1	0	A	It defines the maximum AC input current available considering the ExtraLoad current (see ID 0x617 message)
Tx	Temp		0x613				8	1000								
		Temp.Log		2	23	16			0	65535	-40	+300	0,1	+40	°C	Temperature over Logic Board
		Temp.Mag		4	39	16			0	65535	-40	+300	0,1	+40	°C	Temperature over Magnetics parts

Rx, Tx	Message Name	Signal Name	ID Charger A	Start Byte	Start Bit	Bit Length	DLC	Transmit Time (ms)	Physical Value		Application Value		Resolution Signal	Offset Signal	Unit	Note
									Min	Max	Min	Max				
		Temp.Power		6	55	16			0	65535	-40	+300	0,1	+40	°C	Temperature over Power Stage
Tx	Err		0x614				5	1000								
		Err.OVP		0	7	1			0	1	False	True				DC Output Over Voltage flag (true if the output voltage is over the maximum level)
		Err.TherSensors		1	13	1			0	1	False	True				Thermal sensors defective (True if the sensor is defective or not correctly connected)
		Err.CanTimeOut		2	17	1			0	1	False	True				True if Ctl message (ID 0x618) is not received for more than 600ms
		Err.CanTx		3	31	1			0	1	False	True				True if REC > 127 (Counter of Rx CAN bus Register)
		Err.CanRx		3	30	1			0	1	False	True				True if TEC > 127 (Counter of Tx CAN bus Register)

Rx, Tx	Message Name	Signal Name	ID Charger A	Start Byte	Start Bit	Bit Lenght	DLC	Transmit Time (ms)	Physical Value		Application Value		Resolution Signal	Offset Signal	Unit	Note
									Min	Max	Min	Max				
Tx	Tst1		0x615				8	100								
		Tst1.liok_fail		0	6	1			0	1	False	True				Line and phases flag (only for CMP278)
		Tst1.PFC_EN		0	2	1			0	1	False	True				PFC Stage enable flag
		Tst1.lineFail		0	1	1			0	1	False	True				AC input Fail flag
		Tst1.acInFail		0	0	1			0	1	False	True				AC in Fail flag
		Tst1.ovp		1	15	1			0	1	False	True				DC output over voltage flag
		Tst1.connOpen		1	14	1			0	1	False	True				Control loop Fail flag (over J3A and J3B connectors)
		Tst1.ntcLog		1	13	1			0	1	False	True				NTC logic flag (failure over Logic board sensor)
		Tst1.ntcMag		1	12	1			0	1	False	True				NTC mag flag (failure over Magnetism sensor)
		Tst1.uvloLog		1	11	1			0	1	False	True				UVLO (under voltage logic) flag
		Tst1.therFail		1	10	1			0	1	False	True				Thermal Fail flag, True if the temperature is over the maximum level
		Tst1.ntcError		1	9	1			0	1	False	True				NTC error flag
		Tst1.rx618Fail		1	8	1			0	1	False	True				RX ID618 fail flag
		Tst1.bulk1_fail		2	23	1			0	1	False	True				DC bulk1 fail flag
		Tst1.bulk2_fail		2	22	1			0	1	False	True				DC bulk2 fail flag
		Tst1.TempLow		2	21	1			0	1	False	True				Temperature low flag
		Tst1.PUMPon		2	20	1			0	1	False	True				Pump active request flag
		Tst1.FANon		2	19	1			0	1	False	True				Fan active request flag
		Tst1.LineOk		2	18	1			0	1	False	True				True if AC Input voltage is over 80Vac (only for CMP326)
		Tst1.Rx619Fail ⁽²⁾		2	16	1			0	1	False	True				RX ID619 fail flag

<i>Rx, Tx</i>	<i>Message Name</i>	<i>Signal Name</i>	<i>ID Charger A</i>	<i>Start Byte</i>	<i>Start Bit</i>	<i>Bit Length</i>	<i>DLC</i>	<i>Transmit Time (ms)</i>	<i>Physical Value</i>		<i>Application Value</i>		<i>Resolution Signal</i>	<i>Offset Signal</i>	<i>Unit</i>	<i>Note</i>
									Min	Max	Min	Max				
		Tst1.cntHours		6	55	16			0	65535	0	65535	1	0	hours	Hours counter

(2) This flag is true only if ADP392-01 is used with CMP326.

Charger Configuration Message (ID 0x616)

The message “Tst2” with ID 0x616 (also ID 0x606 and ID 0x5F6) shows the charger configuration. In this message there are all the parameters defined during setup procedure. Normally this parameters are defined in the Factory.

When the charger is switched on, the charger immediately sends this message once.

But, after 30 seconds, the charger sends automatically this message 30 times with cycle time of 1 second.

Rx, Tx	Message Name	Signal Name	ID Charger A	Start Byte	Start Bit	Bit Length	DLC	Transmit Time (ms)	Physical Value		Application Value		Resolution Signal	Offset Signal	Unit	Note
									Min	Max	Min	Max				
Tx	Tst2		0x616				8	100								
		Tst2.PwmInEnable		0	7	1			0	1	False	True				PWM IN ENABLE
		Tst2.rx618Enable		0	6	1			0	1	False	True				Rx618 ENABLE
		Tst2.J1772		0	5	1			0	1	False	True				True if SAE J1772 is enabled
		Tst2.Power		0	4	1			0	1	False	True				True if ADP392 is connected to CMP326-02, Reset if CMP326-01
		Tst2.VoutHW		0	3	1			0	1	False	True				True if Vout Hardware is 360Vdc
		Tst2.IacmMaxSet		1	15	8			0	255	0	51	0,2	0	A	Define the maximum AC Input current
		Tst2.IoutScale		2	23	8			1	100	0,1	10	0.1	0		Current Scaling Factor
		Tst2.CntHours		3	31	16			0	65535	0	65535	1	0	hours	Hours counter from re-flash. Old working Hours
		Setup.ExtraLoad		6	55	8			0	255	0	51	0,2	0	A	Set DC Iout max
		Tst2.Psw		7	63	8			0	255	0	255				System Password 0b10100101 (0xA5)

SETUP CAN Specifications

This part generally should not be performed. ID 0x617 is a setup message used for changing initial charger set-up. When the Charger leaves the factory, it has already entered with the initial setup. It is preferred not to enter the Setup mode if the existing one is already acceptable.

Rx, Tx	Message Name	Signal Name	ID	Start Byte	Start Bit	Bit Length	DLC	Transmit Time (ms)	Physical Value (dec)		Application Value		Resolution Signal	Offset Signal	Unit	Note
									Min	Max	Min	Max				
Rx	Setup		0x617				8	100								
		Setup.PwmInEnable		0	7	1			0	1	False	True				PWM IN ENABLE
		Setup.rx618Enable		0	6	1			0	1	False	True				Rx618 ENABLE
		Setup.J1772		0	5	1			0	1	False	True				Set if SAE J1772 is enabled
		Setup.Power		0	4	1			0	1	False	True				Set if ADP392 is connected to CMP326-02, Reset if CMP326-01
		Setup.VoutHW		0	3	1			0	1	False	True				Set if Vout Hardware is 360Vdc
		Setup.IacmMaxSet		1	15	8			0	255	0	51	0,2	0	A	Define the maximum AC Input current
		Setup.IoutScale		2	23	8			1	100	0,1	10	0.1	0		Current Scaling Factor
		Setup.CntHours		3	31	16			0	65535	0	65535	1	0	hours	Hours counter from re-flash. Old working Hours
		Setup.ExtraLoad		6	55	8			0	255	0	51	0,2	0	A	Set Extra charger current
		Setup.Psw		7	63	8			0	255	0	255				System Password 0b10100101 (0xA5)

D0	D1	D2	D3	D4	D5	D6	D7	0x617 Setup Messages (CMP326 Series)								
40	A0	14	00	00	00	14	A5	PwmIn Disabled, Rx618 Enabled, ID618 TxIDSet set, IoutScale = x2, DC Extra charger current = 4A, AC Iin = 32A; CntHours = 0.								
60	6C	14	00	0A	00	14	A5	PwmIn Disabled, Rx618 Enabled, ID618; J1772 Enabled; CMP326-01 on use; TxIDSet set, IoutScale = x2, DC Extra charger current = 4A, AC Iin = 21,6A, CntHours = 0x000A = 10 hours								
60	6C	14	13	88	00	14	A5	PwmIn Disabled, Rx618 Enabled, ID618; J1772 Enabled; CMP326-01 on use; TxIDSet set, IoutScale = x2, DC Extra charger current = 4A, AC Iin = 21,6A CntHours = 0x1388 = 5000 hours								

CAN FRAMES messages parameters

Ctl.VoutMaxSet	This parameter sets the maximum output voltage of the charger during runtime The upper limit value is defined by factory and depends by charger model. It can be find in: ID616.Tst2.VoutMaxSet. The output voltage value is calculated as follow: $\text{Ctl.VoutMaxSet} = \text{Vout} \times 10 = \dots\dots [\text{hex}]$ (Ex. 360V: $360 \times 10 = 3600$ in hexadecimal = 0E10)
Ctl.IoutMaxSet	This parameter sets the maximum output current of the charger during runtime The upper limit value is defined by factory and depends by charger model. It can be find in: ID616.Tst2.IoutMaxSet. The output current value is calculated as follow: $\text{Ctl.IoutMaxSet} = \text{Iout} \times 10 = \dots\dots [\text{hex}]$ (Ex. 17A: $17 \times 10 = 170$ in hexadecimal = 00AA)
Setup.IacmMaxSet	This parameter sets the maximum AC input current of the charger The upper limit value is defined by factory and depends by charger model. The AC input current value is calculated as follow: $\text{Ctl.IacmMaxSet} = \text{Iac} \times 10 = \dots\dots [\text{hex}]$ (Ex. 32A: $32 \times 5 = 160$ in hexadecimal = A0)

Setup.Power	This parameter define which is the Type of the charger is used. There are two charger Models: 12kW charger (CMPxxx-02) == > the Setup.Power flag should be true. 18kW charger (CMPxxx-01) == > the Setup.Power flag should be false.
Setup.VoutHV	This parameter define which is the maximum output Voltage defined by Hardware Setting. Previous chargers were setting at maximum output voltage at 360Vdc. Last chargers are set to providing 376Vdc on output. If this flag is true the charger is set as 360Vdc Model. (To enable the 376V Model, you must assure that your hardware is compliant)
Setup.IoutScale	This parameter sets a DC current multiplication factor this value provide the requested match between the BMS DC current value and the Charger DC current value. $\text{Setup.IoutScale} = (\text{Charger DC current} / \text{BMS DC current}) \times 10 = \dots \text{ [hex]}$ (Ex. $\text{Setup.IoutScale} = (20\text{A}/10\text{A}) \times 10 = 20$ in hexadecimal = 14)
Setup.CntHours	When a charger is re-flashed, the hours fixed in the EEPROM of the charger controller is set to zero. So, to avoid to lose this information, you have to make note of the hours-counter before re-flashing of the charger. For example: the charger worked for 5000hours. But you have to change the firmware inside it. To have this information after the firmware changing, you have to put in the ID 617 message this: $\text{Setup.CntHours} = 0\text{x}1388$ in decimal is 5000.

Setup.ExtraLoad	This parameter sets the value of the current of an extra load connected to AC. this value is defined by the customer. This value need to the charger to define the maximum AC current available defined by the pilot signal of ADP392-01 connected to the charger by CAN Bus. It can be find in: ID616.Tst2.ExtraLoad. This value must be used during set up operation. If avoid the charger doesn't work properly. IF LOST MUST BE REQUEST TO EDN GROUP TECH DEPARTMENT PROVIDING SERIAL NUMBER
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Starting Up Setup Mode

During start up, the charger send one ID616 message with the factory's set parameters for each module (ID616, ID606, ID5F6).

These parameters can be changed by the customer.

Otherwise the charger should be re-flashed, so It need to send to the charger the set-up parameters by ID 0x617,

EDN will provide the procedure for re-flashing and the procedure for set-up the parameters of the charger.

In particular there are two documents:

- **CST_CMP** : Set-up procedure by CAN.
- **MPF_CMP** : Microprocessor procedure.

ADP FRAMES Specification

This message is received from SAE J1772 adapter. This Message is considered by the charger only if SAE J1772 flag on ID 0x617 message is set-up.

Rx, Tx	Message Name	Signal Name	ID	Start Byte	Start Bit	Bit Length	DLC	Transmit Time (ms)	Physical Value		Application Value		Resolution Signal	Offset Signal	Unit	Description
									Min	Max	Min	Max				
Tx	Sae		0x619				8	100								
		Sae.Prox		0	7	1			0	1	False	True				True if the proximity level is valid
		Sae.Pilot		0	6	1			0	1	False	True				True if the pilot signal is valid
		Sae.Pwm		0	5	1			0	1	False	True				True if pwm pilot is valid
		Sae.Freq		0	4	1			0	1	False	True				True if frequency of pilot signal is valid
		Sae.S2		0	3	1			0	1	False	True				True if S2 switch is closed
		Sae. Current		6	55	16			0	1000	0	100	0,1	0	A	AC input current detected by pilot signal.

ADP392 Diagnostic Message

This message is transmitted by SAE J1772 adapter (ADP392). It shows some parameters of the ADP module. This message hasn't any effect over the charger. To get a full description of the functions of the Adapter, you should check the User's Manual of ADP392.

Rx, Tx	Message Name	Signal Name	ID	Start Byte	Start Bit	Bit Lenght	DLC	Transmit Time (ms)	Physical Value		Application Value		Resolution Signal	Offset Signal	Unit	Description
									Min	Max	Min	Max				
Tx	Adp		0x629				8	100								
		Adp. Enable		0	7	1			0	1	False	True				True if the ADP module is enabled
		Adp. Failure		0	5	1			0	1	False	True				True if there is a device failure
		Adp. TempLow		0	3	1			0	1	False	True				True if internal temperature is under Minimum temperature Level
		Adp. TempHigh		0	2	1			0	1	False	True				True if internal temperature is over Maximum temperature Level
		Adp. BAT12V		1	15	1			0	1	False	True				True if a LV battery is a 12V system is connected to ADP
		Adp. BAT24V		1	14	1			0	1	False	True				True if a LV battery is a 24V system is connected to ADP
		Adp. BatUnder		1	13	1			0	1	False	True				True if LV Battery voltage is under Minimum LV Voltage Level
		Adp. BatOver		1	12	1			0	1	False	True				True if LV Battery voltage is over Maximum LV Voltage Level
		Adp. Hours		4	39	16			0	65535	0	65535	1	0	hours	Number of hours that the device had worked
		Adp. Temp		6	55	16			0	65535	-40	+300	0,005188	+40	°C	Internal Temperature of the device.

DIAGNOSTIC

The charger will store inside the faults detected during the charging and it will provide the information of the fault (for example, the “fault Code”, the timing and the occurrence, the severity) defined in the following paragraphs.

CAN Messages:

This Diagnostic messages can be transmitted by CAN in two way:

1. “On Demand”: When the charger will receive a request (with request message (Req) with ID0x61B), the charger will send back some messages with the fault detected. In particular:
 - Software message (ID0x61E) is transmitted 30 times with cycle time of 100ms.
 - the “Active fault” message (ID 0x61D) and “Inactive fault” message (ID 0x61C) are transmitted once for Fault Code.
2. Automatic transmission. Below are shown the steps about Automatic transmission:
 - AC mains Input is switched on.
 - Charger starts to transmit the CAN messages.
 - After 50 seconds, the charger sends 30 times the Software message (ID 0x61E) with cycle time of 100ms.
 - After 15 minutes the charger transmit the “Inactive fault” message (ID 0x61C) with cycle time of 100ms.
 - Every fault message is repeated 20 times.
 - In particular, the first fault is transmitted 20 times, after, the second, it is transmitted 20 times and so on for all other fault messages.
 - After the charger transmit the “Active fault” (ID 0x61D) with cycle time of 100ms. Every fault message is repeated 20 times.

So, every 15 minutes the charger transmit the fault messages.

For example, if the fault is only one, the transmission goes on for only 2seconds.

Also, if a fault is not picked up when Active. The fault will always be included in the “Passive fault” data (as historical fault stored in the charger memory) which the charger sends out every 15 minutes.

Request Message permits to stop and start the communication of the charger. It's necessary to send a Request message with the code 0x61A.

In this way, it's possible to reduce the traffic over the CAN BUS and to detect the Active and the Inactive fault messages. At page 19, it's described the correct value used to act over the CAN BUS communication.

CAN Message Overview:

<i>Messages contents</i>			DLC
Request	Req	Message request	4
FaultActive	FltA	Message with Fault active detected	8
FaultPassive	FltP	Message with Fault inactive detected	8
SW	SW	Message with the software present on the charger	8
RestartTx	ResTx	Restart the transmission when the communication is stopped	4

CAN messages exchanged valid for Diagnostic Communication

<i>Rx,Tx</i>	<i>Message Name</i>	<i>ID Charger A</i>	<i>ID Charger C</i>	<i>ID Charger B (18KW)</i>	<i>DLC</i>	<i>Transmit Time (mS)</i>
Rx	Req	0x61B	0x61B	0x61B	4	-
Tx	FltA	0x61D	0x60D	0x5FD	8	100
Tx	FltP	0x61C	0x60C	0x5FC	8	100
Tx	SW	0x61E	0x60E	0x5FE	8	-

CAN FRAMES Request Specification (ID 0x61B, Req)

Rx,Tx	Message Name	Signal Name	ID	Start Byte	Start Bit	Bit Length	DLC	Physical Value		Application Value		Resolution Signal	Offset Signal	Unit	Note
								Min	Max	Min	Max				
Rx	Req		0x61B				4								
		Req. RequestEnable		0	7	1		0	1	False	True				Bit Enable of Request to the charger
		Req. Confirm		1	8	1		0	1	False	True				Bit confirm only for stop7start communication
		Req.IDmsb		2	23	8		0	65535	0	65535				MSB of ID requested
		Req.IDmsb		3	31	8		0	65535	0	65535				LSB of ID requested

Example and type of request:

D0	D1	D2	D3	0x61B Req Messages Examples	Type of request
80	00	06	1A	Req. RequestEnable Enabled, ID requested 0x61A	This frame stop all the communication of the charger through the CAN Bus
80	01	06	1A	Req. RequestEnable Enabled, ID requested 0x61A	This frame start all the communication of the charger through the CAN Bus
80	00	06	1C	Req. RequestEnable Enabled, ID requested 0x61C	This frame is the request to send the fault inactive stored
80	00	06	1D	Req. RequestEnable Enabled, ID requested 0x61D	This frame is the request to send the fault active stored
80	00	06	1E	Req. RequestEnable Enabled, ID requested 0x61E	This frame is the request to send the software present in the charger

CAN FRAMES Specification**Software Message (ID 0x61E)**

Rx,Tx	Message Name	Signal Name	ID	Start Byte	Start Bit	Bit Length	DLC	Physical Value		Application Value		Resolution Signal	Offset Signal	Unit	Note
								Min	Max	Min	Max				
Tx	SW		0x61E				8								
		SW.firstByte		0	7	8		0	65535	0	65535				First ASCII Byte of the software
		SW.SecondByte		1	15	8		0	65535	0	65535				Second ASCII Byte of the software
		SW.ThirdByte		2	23	8		0	65535	0	65535				Third ASCII Byte of the software
		SW.FourthByte		3	31	8		0	65535	0	65535				Fourth ASCII Byte of the software
		SW.fifthByte		4	39	8		0	65535	0	65535				Fifth ASCII Byte of the software
		SW.SixthByte		5	47	8		0	65535	0	65535				Sixth ASCII Byte of the software
		SW.SeventhByte		6	55	8		0	65535	0	65535				Seventh ASCII Byte of the software
		SW.EighthByte		7	63	8		0	65535	0	65535				Eighth ASCII Byte of the software

D0	D1	D2	D3	D4	D5	D6	D7	0x61E Software Messages Examples							
53	57	33	32	32	38	41	35	The software of the charger is SW3225A5 and it is transmitted in ASCII Code							

CAN FRAMES Specification for Error messages

For every fault stored the charger will send a single frame where is present a code of the fault, the occurrence of the fault, the first time that the fault there was and the last time the fault there was.

If there is more than one fault stored, the charger will send a frame for each fault with a time delay transmission of 100ms.

Every fault will have a particular Binary code which defines his name. It is defined the level of failure: failure = 11, soft failure = 10, warning = 01;

The structure of the frame is the same for Active fault (ID: 0x61D) and for Inactive fault (ID: 0x61C).

Active Fault (ID 0x61D)

Rx,Tx	Message Name	Signal Name	ID	Start Byte	Start Bit	Bit Length	DLC	Physical Value		Application Value		Resolution Signal	Offset Signal	Unit	Note
								Min	Max	Min	Max				
Tx	FltA		0x61D				8								
		FltA.TypeFrame		0	7	2		0	3	1	2				Define if there one or more fault to trasmitt (MULTI frame, SINGLE frame)
		FltA.Totalerror		0	5	6		0	63						Define the total number of fault
		FltA.framenumber		1	13	6		0	63						Define the number of frame which is trasmitting at that time
		FltA.Flt.codeerror		2	23	8		0	255						Define the code of the fault
		FltA.Occurence		3	31	6		0	63						Define the occurrence of the fault
		FltA.FailureLevel		3	25	2		0	15						Define the level of the faulure
		FltA.First		4	39	16		0	65535	0	65535	1		h	Define the first time that fault there was
		FltA.Last		6	55	16		0	65535	0	65535	1		h	Define the last time that fault there was

D0	D1	D2	D3	D4	D5	D6	D7	0x61D Active Fault Messages Examples							
41	01	A8	17	00	1E	00	78	Single frame, frame total 1, frame in trasmission 1, codice errore 0xA8, hard failure, occurrence 5, First time 30h, last time 120h							
00	FF	FF	FF	FF	FF	FF	FF	This is the particular frame for No fault detected							

Inactive Fault (ID 0x61C)

Rx,Tx	Message Name	Signal Name	ID	Start Byte	Start Bit	Bit Length	DLC	Physical Value		Application Value		Resolution Signal	Offset Signal	Unit	Note
								Min	Max	Min	Max				
Tx	FltP		0x61C				8								
		FltP.Typeframe		0	7	2		0	3	1	2				Define if there one or more fault to trasmitt (MULTI frame, SINGLE frame).
		FltP.Totalerror		0	5	6		0	63						Define the total number of fault
		FltP.framenumber		1	13	6		0	63						Define the number of frame which is trasmitting at that time
		FltP.Flt.codeerror		2	23	8		0	255						Define the code of the fault
		FltP.Occurence		3	31	6		0	63						Define the occurrence of the fault
		FltP.FailureLevel		3	25	2		0	3						Define the level of the fauilure
		FltP.First		4	39	16		0	65535	0	65535	1		h	Define the first time that fault there was
		FltP.Last		6	55	16		0	65535	0	65535	1		h	Define the last time that fault there was

D0	D1	D2	D3	D4	D5	D6	D7	0x61C Inactive Fault Messages Examples							
41	01	A0	17	00	1E	00	78	Single frame, frame total 1, frame in trasmission 1, codice errore 0xA0, hard failure, occurrence 5, First time 30h, last time 120h							
00	FF	FF	FF	FF	FF	FF	FF	This is the particular frame for No fault detected							

Table of FAULT CODE

In the table below are shown the fault detected and stored in the charger.

Fault Number	Signal	Description	Code Error [Hex]	Trigger Condition	Exit Condition	Failure type ⁽³⁾	Stat. ErrorLatch (ID 0x610)	Stat. WarnLimit (ID 0x610)
1	Bulk 1 Voltage	Internal charger voltage supply is under the minimum voltage level	A0	Trigger condition shall be the Charger detects an internal Bulk voltage error (Vbulk less than 350Vdc)	Exit condition shall be if bulk voltage is above 360Vdc for 1s the soft failure is reset.	Soft Failure	True	False
2	Bulk 2 Voltage	Internal charger voltage supply is under the minimum voltage level	A1	Trigger condition shall be the Charger detects an internal Bulk voltage error (Vbulk less than 350Vdc)	Exit condition shall be if bulk voltage is above 360Vdc for 1s the soft failure is reset.	Soft Failure	True	False
3	Bulk Error	Internal charger voltage supply is under the minimum voltage level for long time	A2	Trigger condition shall be if the BULK1 or BULK2 voltage error is present for more than 1 minute	Exit condition shall be made when AC MAINS Line is disconnected and reconnected	Failure	True	False
4	CAN Registers	Main indicator of CAN broadcasting. CAN registers are monitored by charger ECU	A3	Trigger condition shall be the based on a Charger counter of nonsequential message errors reaching 127, with every good message causing the same counter to decrement until it saturates at zero.	Exit condition shall be if the counter return to zero, the warning is reset.	Warning	False	True
5	CAN Command	Main indicator of CAN Command is not received by the charger	A4	Trigger condition shall be the CAN Command not received for 600 ms or greater	Exit condition shall be at first valid CAN Command received the Soft Failure is reset	Soft Failure	True	False
6	Cold plate temperature: LOW	Main indicator of charger temperature is too low	A5	Trigger condition shall be when the cold plate temperature is less than -30 degC for 1 second or greater	Exit condition shall be if cold plate temperature is above -25 degC for 1 second, the warning is reset	Soft Failure	True	False

7	Cold plate temperature: DERATING	Main indicator of charger temperature too high. If the temperature is over of limit temperature so the output power is derated	A6	Trigger condition shall be when the cold plate temperature is Higher than +65 degC for 1 second or greater. Charger shall derate the Output current to keep the temperature below the maximum cold plate temperature	Exit condition shall be if cold plate temperature is below +60 degC for 1 second, the warning is reset	Warning	False	True
8	Cold plate temperature: HIGH	Main indicator of charger temperature is over maximum cold plate temperature.	A7	Trigger condition shall be when the cold plate temperature is higher than the maximum cold plate temperature for 1 second or greater.	Exit condition shall be if cold plate temperature is below the maximum cold plate temperature for 1 second, the Soft Failure is reset	Soft Failure	True	False
9	Cold plate temperature: FAILED	Main indicator of the soft failure for temperature not happened	A8	Trigger condition shall be when the cold plate temperature is Higher than the maximum cold plate temperature and the charger works yet and the soft failure is not happened	Exit condition shall be made when AC MAINS Line is disconnected and reconnected	Failure	True	False
10	Input current MAX	Alternating Current Input limit is overcame.	A9	Trigger condition shall be when the Input Current exceeds 33 amps for more than 1 minute.	Exit condition shall be made when AC MAINS Line is disconnected and reconnected	Failure	True	False
11	input voltage	Alternating Voltage Input limit is overcame.	AA	Trigger condition shall be a voltage that exceeds the safe input voltage of the charger 274 Volts for 300 ms or greater.	Exit condition shall be made when AC MAINS Line is disconnected and reconnected	Failure	True	False
12	Interlock loop	High voltage interlock loop signal	AB	Trigger condition shall be when the any connector interlock is open	Exit condition shall be made when connector interlock is closed	Soft Failure	True	False
13	Logic temperature	Logic circuit temperature is too high	AC	Trigger condition shall be when the Logic temperature exceeds Maximum logic temperature for 1 second or greater.	Exit condition shall be if logic board temperature is below the maximum cold plate temperature for 1 second, the soft failure is reset	Soft Failure	True	False
14	Magnetics temperature	Magnetic components temperature too high	AD	Trigger condition shall be when the Magnetics temperature exceeds Maximum Magnetics temperature for 1 second or greater.	Exit condition shall be made when AC MAINS Line is disconnected and reconnected	Soft Failure	True	False

15	Output Overvoltage	Charger output voltage higher than max output limit.	AE	Trigger condition shall be when the DC voltage exceeds, Maximum Output voltage limit of the charger or the Output voltage limit sent in the Command Message for 300 ms.	Exit condition shall be made when AC MAINS Line is disconnected and reconnected	Failure	True	False
16	RX ADP message ID 0x619 Fail	Main indicator of ADP message is not received by the charger	AF	Trigger condition shall be the ADP Message not received for 600 ms or greater	Exit condition shall be at first valid ADP message received the Soft Failure is reset	Soft Failure	True	False

⁽³⁾ **Failure Type:**

Warning: Charger work normally, but in de-rated way.

Soft Failure: Charger stop to work, but the charger will re-start only if the fault disappear.

Failure: Charger stop to work, but the charger will re-start only if the AC Mains is disconnected and re-connected.