

# IEC 61851-1 Charging control unit TR-LSS

Version 1.4





## Special features

- suitable for type 1 and type 2 vehicle plugs (with or without locking)
- controls 3- and 4-pole actuators – standard model is set for 3 pole Duosida ELM actuator
- supports charging modes 1, 2 and 3
- Simplified and typical pilot circuits are implemented
- No power consumption if no charging cable is connected to the vehicle
- CAN connection to the EMUS battery management system – standard model is set to 250 kbs
- Display connection for displaying the maximum AC and DC charging currents

## Product description

The charge control unit is designed in such a way that it covers as many applications as possible but still remains as simple as possible in structure. Various configurations are available for this purpose, whereby the hardware is always identical, so that changes can easily be made with a software update. Systems with simple enabled controlled chargers up to chargers with CAN connection in combination with the EMUS BMS are supported.

In order to give the BMS an exact charging current specification regardless of the charger and battery used, the maximum DC charging current is calculated in the charging controller and communicated to the BMS via CAN. The number of chargers in the BMS must be set to 3 so that the calculation is correct when charging with three-phase current. The fast and slow current parameter must be set to the total current of 3 devices or three times the current of one device. This setting is also necessary if there is only one charger or only one phase is used for charging. Both the type 1 vehicle connector and the type 2 vehicle connector in conjunction with a lock are supported. Both 3-pole and 4-pole actuators from Duosida and 3-pole actuators from Hella can be used as locks.

When designing the control, special attention was paid to power consumption. The power consumption in the idle state, i.e. when no charging plug is connected to the vehicle, is zero.

All 3 charging modes are supported, whereby the control only works for certain modes, e.g. 2 and 3 can release.

The factory settings of the EMUS BMS are used as standard CAN parameters. But here, too, different configurations are available depending on the system requirements. The requirement for communication with the EMUS BMS is the use of firmware V2.5.3.0 and higher.

In order to support not only chargers that allow current setting but also simple chargers that cannot, the simple pilot circuit was implemented in addition to the typical pilot circuit, which at least allows single-phase charging up to 10 A.

Depending on the system, up to three different mechanisms are available for setting the charging current. The maximum charging current is initially determined by the fast and

and Slow current specification determined in the BMS. Furthermore, a limitation can be specified for type 2 plugs via the PP resistor. With additional current specification via the CP signal, the current can finally be limited further. Mode 1 is also limited to 16 A.

As a result of the current control, no other AC loads, such as power packs or battery heaters, can be taken into account in the current limitation in addition to the charger or chargers.



## Electrical connections

The connection is made via push-in terminal connections with the following assignment.

The pin assignment can be found in Table 1. The connection of the various actuators is shown in Tables 2, 3, 4 and 5.

Please note the following when wiring:

- The control unit must be able to switch the charger on and off via the "Charge enable" signal, for example via a contactor.
- The LEDs included in the scope of delivery are connected to the internal series resistor on the signal "LED\_1 anode" and "LED\_2 anode" designed. When using the output CHG. IND. An additional series resistor of 1 kΩ must be used on the EMUS BMS.
- With 3-pole actuators, "Actuator-1" must be left unused.
- If external relays or contactors are to be controlled, they must be equipped with a flyback diode.

**Table 1**

CONNECTION	SIGNAL	DESCRIPTION
ACT 4	Aktuator-4	Locking
ACT 3	Aktuator-3	Locking
ACT 2	Aktuator-2	Locking
D_TX	Display_TX	Display by RS232
STOP	Stop charging	+12V Input
LED 2	LED_2 Anode	Internal resistor 270Ω - 5V (15 mA max.)
LED 1	LED_1 Anode	Internal resistor 270Ω - 5V (15 mA max.)
CHG	Charging release	+12V Signal (1 A max.)
INT	Interlock	+12V Signal (1 A max.)
CAN L	CAN_L	Connection to EMUS BMS
CAN H	CAN_H	Connection to EMUS BMS
CP	CP	Charging connector CP
PP	PP	Charging connector PP
GND	Masse	Chassis or charging plug PE
12V	+12V / Aktuator-1	Permanent plus / Locking

**Table 2**

<b>DUOSIDA EL (4-POLE)</b>	
Charge control	Wire Colour
Aktuator-1	Yellow
Aktuator-2	Blue
Aktuator-3	Red
Aktuator-4	White

**Table 3**

<b>DUOSIDA ELB (3-POLE) - STANDARD</b>	
Charge control	Wire Colour
Aktuator-1	---
Aktuator-2	Blue
Aktuator-3	Red
Aktuator-4	White

**Table 4**

<b>DUOSIDA ELE (4-POLE)</b>	
Charge control	Wire Colour
Aktuator-1	Yellow
Aktuator-2	White
Aktuator-3	Red
Aktuator-4	Blue

**Table 5**

<b>HELLA (3-POLE)</b>	
Charge control	Plug number
Aktuator-1	---
Aktuator-2	2
Aktuator-3	1
Aktuator-4	3

### Signal descriptions

- LED\_1 Anode: For type 1 plugs, this indicates that a charging cable has been recognized. With type 2 plugs, it is displayed whether the lock is closed or open.
- LED\_2 Anode: Indicates the release for charging. 12V is now present at the "Load enable" output.
- Loading enabled: Indicates that loading can begin. The signal is reset as soon as either a pulse is detected at the "End charging" input or the request to end charging has been received via the CP pin. The signal is available as a short-circuit-proof 12V output.
- Interlock: Indicates that a charging cable is plugged in. This can be used in the vehicle to prevent driving away. The signal is available in a short-circuit-proof 12V output.
- End charging: A short 12V pulse ends charging and opens the lock.

### **Tip:**

When using the EMUS BMS, the output CHG. IND. can be used to control a second LED on the type 2 vehicle connector.



## Order information

TR-LSS - Connector - Mode - Actuator - Pilot circuit - CAN speed

The options for the corresponding placeholders can be found in Table 6.

**Table 6**

<b>PLACEHOLDER</b>	<b>OPTION 1</b>	<b>OPTION 2</b>	<b>OPTION 3</b>	<b>OPTION 4</b>
Connector	Type 1	Type 2		
Mode	1	2+3	1+2+3	
Actuator	3 poles	4 poles		
Pilot circuit	Simplified	Typical		
CAN speed	125	250	500	No CAN

The configuration can be seen on the bottom of the controller.

Standard model is set to 250 kbs CAN speed, mode 2+3 and 3 pole actuator

When using the CAN please note that only the factory setting of the EMUS BMS is supported by default:

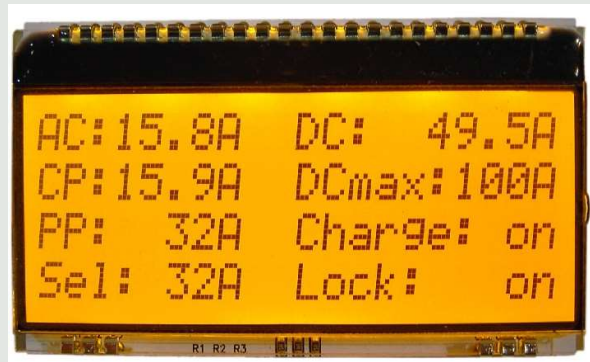
- CAN ID: 29 bit
- Base address: 0x19B5
- Periodic data transmission (broadcast): off
- Login: without a password

## Technical specs

Voltage:	8 up to 16 V
Strom:	depending on system integration
Temperature:	-20 up to 70 °C
Dimensions:	125 x 51 x 25 mm
Wire diameter:	max. 1,5 mm <sup>2</sup>
Protection class (enclosure):	IP20

## Options

### Display



## Special Instruction for using a locking actuator

As soon as the charging control detects a resistance between PP and PE, it is assumed that the charging cable is plugged in and the locking procedure is initiated. However, if the charging plug is not inserted completely or too slowly, the locking pin may extend before the plug. In this case, the control will recognize the connector as locked and release the charge even though no correct locking has taken place. With the actuator of the Duosida DSIEC-EL type, it can also happen that the charging release is given if the locking pin only hits the edge of the connector instead of the recess provided in the connector.

It is therefore the responsibility of the user to ensure that it is properly locked. To do this, the plug must be inserted completely and quickly!

If a problem should nevertheless arise, the charging process can be aborted via "End charging", the plug removed and reinserted. If the locking pin is extended in front of the plug and the plug was then removed without having previously performed "End charging", the plug must be reinserted as far as possible. After 2 s the lock opens, and the plug can then be fully inserted so that it can then be locked.

Application Example

