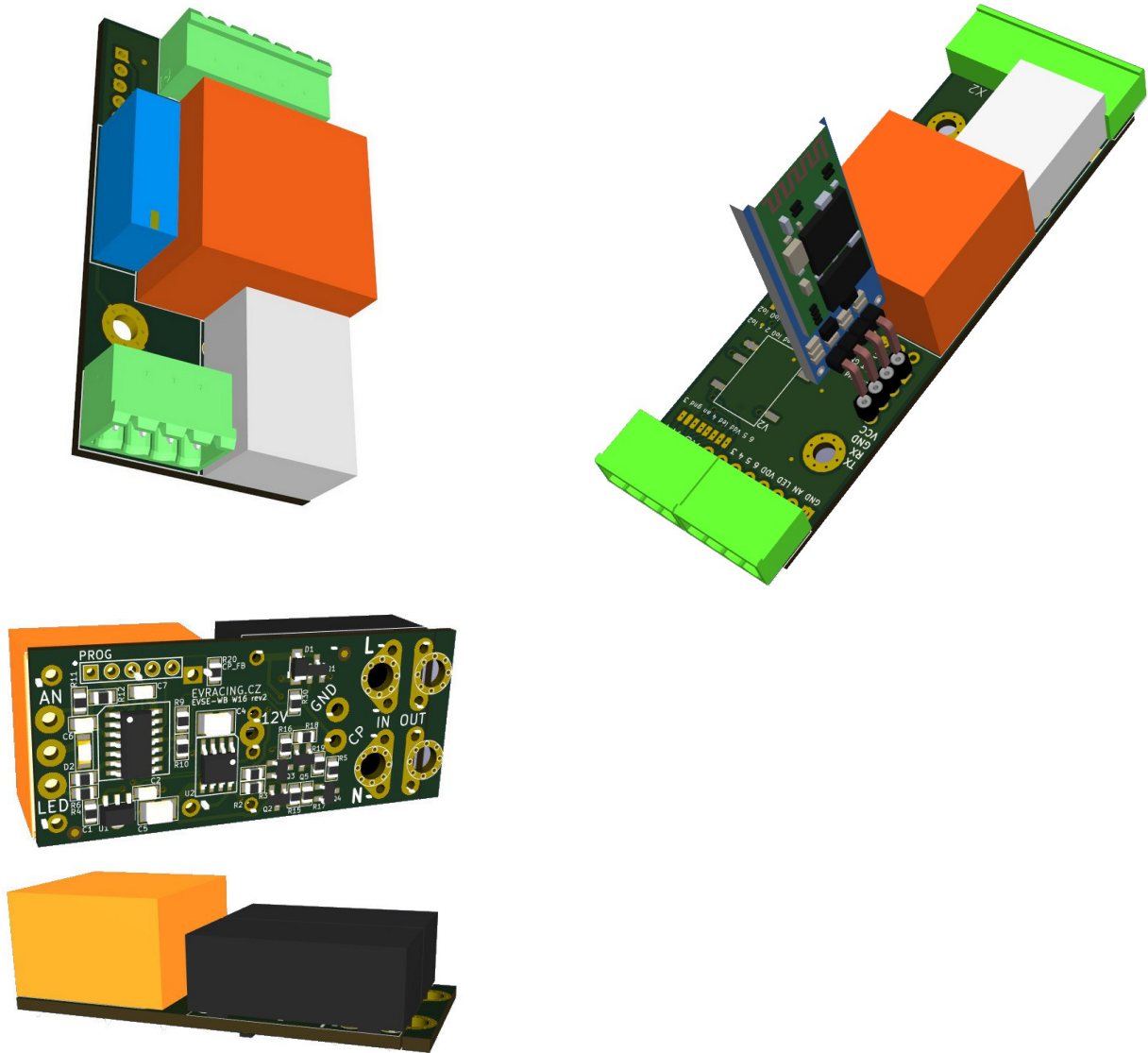


EVSE

Wallbox, DIN, W16 datasheet



*) these are 3D generated models, real product can look differently and have different accessories

Last document update: February 2, 2021

Table of Contents

Introduction.....	3
Read me first.....	3
Theory of operation.....	3
Compatibility.....	3
General description EVSE WB, DIN, W16.....	4
EVSE WB - board description.....	5
EVSE DIN - board description.....	7
EVSE W16 - board description.....	9
Customizations.....	11
Current limitation A – using PROG pin 5.....	11
Current limitation B – using PROG pin 4.....	11
Precise current setting with Analog Input.....	11
Current limitation based on PV production.....	11
Application examples.....	12
3phase wallbox with keyswitch and low tarif signal input.....	12
3phase wallbox including a cable and plug.....	12
32A EVSE with connector J1772.....	14
Recommended contactors.....	15
Using external 12V relay.....	15
Continuous EVSE current regulation using a pot (e.g. 6-32A).....	16
0 - 10V configuration.....	16
Cable selection guide.....	17
Customer solutions and projects.....	18
FAQ.....	19
1) How many PP resistors do I need?.....	19
2) EVSE does not work (config problem).....	19
3) LED indication explained.....	19
4) How to keep current settings after grid failure?.....	19
Advanced configuration.....	20
HC06 bluetooth module + Android app.....	20
Flashing new firmware.....	21
Bootloader mode.....	21
Troubleshooting.....	22
How to determine firmware version?.....	22
Analog input control.....	22
Firmware updates.....	26
Communication examples.....	28
Read holding registers example.....	28
Reading the data out with Python (USB – serial adapter).....	28

Introduction

EVSE stands for *electric vehicle supply equipment*. It is an element that supplies electric energy for the recharging of electric or plug-in vehicles.

Read me first

The EVSE board is supplied with default 32A settings (or 16A for EVSE W16). Please check the chapter “Customizations” for more information about further possibilities of changing maximum charging current. 220 Ohm R_{PP} is included with the kit (EVSE WB).

Theory of operation

Pilot signal duty cycle provided by EVSE defines maximum charging capacity. The car can define several states by pulling the pilot signal down to certain voltage levels (3V, 6V, 9V). Based on this feedback EVSE will trigger the relay for the vehicle to charge or evaluate the state as an error (electricity will not be provided to the output socket/connector).

For more information please check:

- http://en.wikipedia.org/wiki/IEC_62196
- http://en.wikipedia.org/wiki/SAE_J1772
- <https://github.com/kortas87/simple-evse/wiki> (<https://code.google.com/p/simple-evse/>)

Resistance PP-PE (max cable throughput)		
Resistance [ohm]	Current limit [A]	Wire cross-section [mm ²]
> 1500 *	6	--
1500	13	1.5
680	20	2.5
220	32	6
100	63	16
<100 **	80	—

* no resistor connected

** recommended ~50 Ohm

Compatibility

- Tesla Model S
- Nissan Leaf
- Mitsubishi iMiev (Peugeot iOn, Citroen cZero)
- Opel Ampera
- eGolf
- Mitsubishi Outlander PHEV
- Citroen Berlingo Electrique
- and others...

General description EVSE WB, DIN, W16

Parameters	
Supply voltage	90 – 265 VAC
Power consumption	<1W
AC/DC power	1W or 3W
Operating temperature	-20 to 80 °C
Protection index	IP00
Onboard resistor for external LED	1k
Vehicle compatibility	all vehicles according to IEC 62196
Connection options	HC06 bluetooth, UART-USB converter, wifi ESP8266, ethernet USR-TCP232/GSM, ...

All boards are based on the same software and hardware. Main differences between each other are described in this table:

EVSE	WB	DIN	W16	W50
DIN rail mounting	yes with 3D printed case *)	yes	no	yes
PP detection	yes	yes	no	yes
power relay	no	no	yes 2x16A **)	yes 4x50A
3phase	yes	yes	no **)	yes
fits inside Type2 or Type1	no	no	yes	no
wiring	easy	easy	medium	easy
supports vehicles	all	all	all	all
uart communication	yes	yes	yes	yes
in production	yes	yes	yes	late 2019

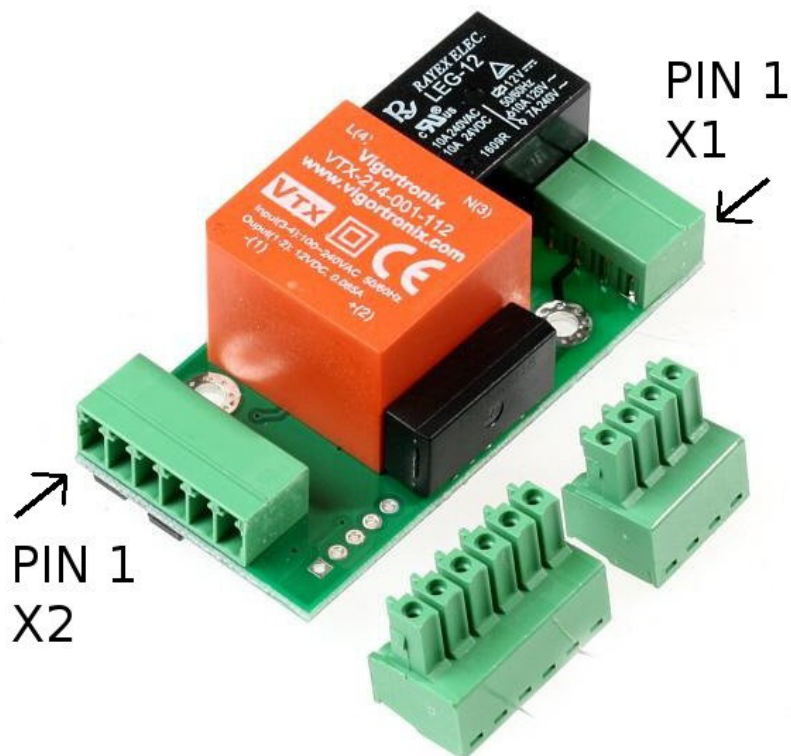
*) 3D data available on request

**) possible to change for 1x32A Panasonic relay with the same size or add another 2pcs 16A relay to get compact 11kW 3phase charger (wiring = difficult)

EVSE WB - board description

Parameters	
Dimension (without connectors)	60 x 30 x 25 mm
Mounting holes spacing	30 x 20 mm
Relay	5A 250V
Weight	80 g
Order code	EVSE-WB
Options	HC06 bluetooth, UART-USB converter

EVSE WB board has 2 connectors. 4-pin X1 for high voltage side and 6-pin for signaling wires and control purposes. There is also PROG connector used for flashing new firmware (ICSP), additional communication and can be further used for adjusting EVSE current (see “Customizations” chapter).



Picture 1: EVSE WB

X1 connector = 4pins		
pin	name	description
1: L	phase	230V power supply for EVSE board and external contactor
2: N	neutral	
3: PE	protection-earth	Ground reference
4: rel	relay output	This output drives coil of an external contactor Maximum allowed current is 3A.

X2 connector = 6pins		
pin	name	description
1: CP	control pilot	To vehicle connector
2: PP	proximity pilot	To vehicle connector
3: 5V	5V power output	Used as a power supply for external components (max 40mA)
4: GND	ground	Ground reference
5: LED	external LED	Includes 1k resistor onboard, connects to LED anode against ground
6: AN	analog input	Used for button or current sensor input

PROG connector = 5pin header		
pin	name	description
1	V _{PP}	ICSP** / RFU* [marked by rectangle] from Jan 2018 bootloader enable pin
2	V _{DD}	5 V
3	GND	Ground
4	DAT / TX	ICSP** / current boost / communication function
5	CLK / RX	ICSP** / current limit / communication function

* reserved for future use

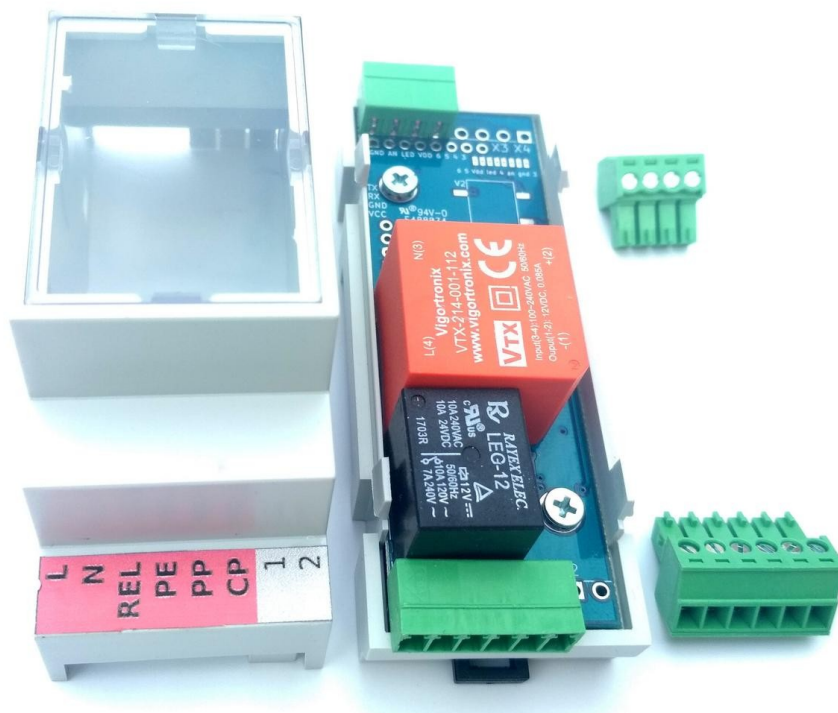
** firmware upgrade interface

EVSE DIN - board description

(for reference only, was replaced by EVSE-DIN v2 during 2020, see details below)

Parameters	
Dimension (without connectors)	86 x 29 x 25 mm
Mounting holes spacing	54 x 18 mm
Relay	5A 250V
Weight	85 g
Order code	EVSE-DIN
Options	RS485 driver, HC06 bluetooth, UART converter, 3W AC/DC

For the minimum installation you can only wire 6pin X1 connector (required: L,N,REL,PE,PP,CP).



Picture 2: EVSE DIN

X1 connector = 6pins		
pin	name	description
1: L	phase	230V power supply for EVSE board and external contactor
2: N	neutral	
3: rel	relay output	This output drives coil of an external contactor Maximum allowed current is 3A
4: PE	protection-earth	Ground reference
5: PP	proximity pilot	To vehicle connector
6: CP	control pilot	To vehicle connector

X2 connector = 2pins (OPTION)		
pin	name	description
1:1		function defined by extension module
2:2		function defined by extension module

X3 connector = 4pins		
pin	name	description
1: 5V	5V power output	Used as a power supply for external components (max 40mA)
2: LED	external LED	Includes 1k resistor onboard, connects to LED anode against ground
3: AN	analog input	Used for button or current sensor input
4: GND	ground	Ground reference

X4 connector = 4pins (OPTION)		
pin	name	description
1:3		function defined by extension module
2:4		function defined by extension module
3:5		function defined by extension module
4:6		function defined by extension module

PROG connector = 5pin header (OPTION)		
same function as EVSE WB		

UART connector = 4pin header (OPTION)		
can be used for direct connection of HC06 (female header)		

EVSE DIN v2 - board description

Version 2020

Parameters	
Dimension (without connectors)	86 x 29 x 25 mm
Fusing	Integrated fuse
Relay	5A 250V
Weight	85 g
Order code	EVSE-DIN
Terminals	Push terminals
Options	RS485 module, HC06 bluetooth, UART converter, locking module

For the minimum installation you can only wire 4pin X1 connector (required: L,N,REL,PE)
+ X2 (required CP)

Picture 3: EVSE DIN v2



X1 connector = 4pins (push terminals)		
pin	name	description
1: L	phase	230V power supply for EVSE board and external contactor
2: REL	relay output	This output drives coil of an external contactor maximum allowed current is <1A, fused
3: rel	neutral	230V power supply for EVSE board and external contactor
4: PE	protection-earth	Ground reference

X2 connector = 8pins (push terminals)		
pin	name	description
1:CP	control pilot	To vehicle connector
2:PP	proximity pilot	To vehicle connector
3:12V	Power output	Possible to power external components. Default 12V, can be switched to 5V by onboard resistor jumper X7 (max 100mA)
4:GND	Ground reference	PE
5:LED	external LED	Includes 1k resistor onboard, connects to LED anode against ground
6:AN	analog input	Used for button or current sensor input
7:A		function defined by extension module
8:B		function defined by extension module

PROG connector = 5pin header
same function as EVSE WB, part of the X3 header

UART connector = 4pin header
can be used for direct connection of HC06 (female header), part of the X3 header

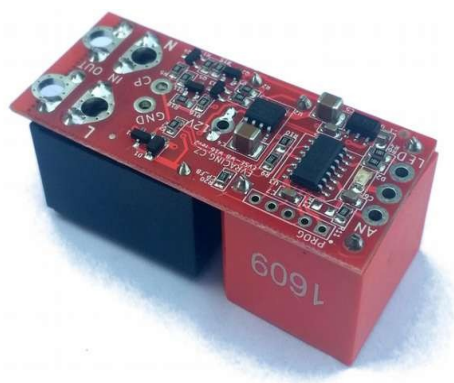
EVSE W16 - board description

Parameters	
Dimension rev2	59 (55) x 26 x 22 mm
Dimension rev3	58 x 25 x 20 mm
Relay (default)	2x16A 250V
Relay option 32A	1x32A
Weight	Approx. 50 g
Order code	EVSE-W16 (2x16A relay) EVSE-W16_32A (1x32A relay)
Options	HC06 bluetooth, USB-UART converter

EVSE-W16 is the smallest board and also includes power relays for 16A. It can be considered as a successor of the original Simple EVSE, but with improved CP driver to support all vehicles, new software and AC/DC + relay integration. Solderable terminals instead of plugs keep it smaller. It can be mounted in many kinds of small boxes including Type1 or Type2 female connectors.

EVSE-W16 rev3 (May 2020) is upgraded version with following advantages:

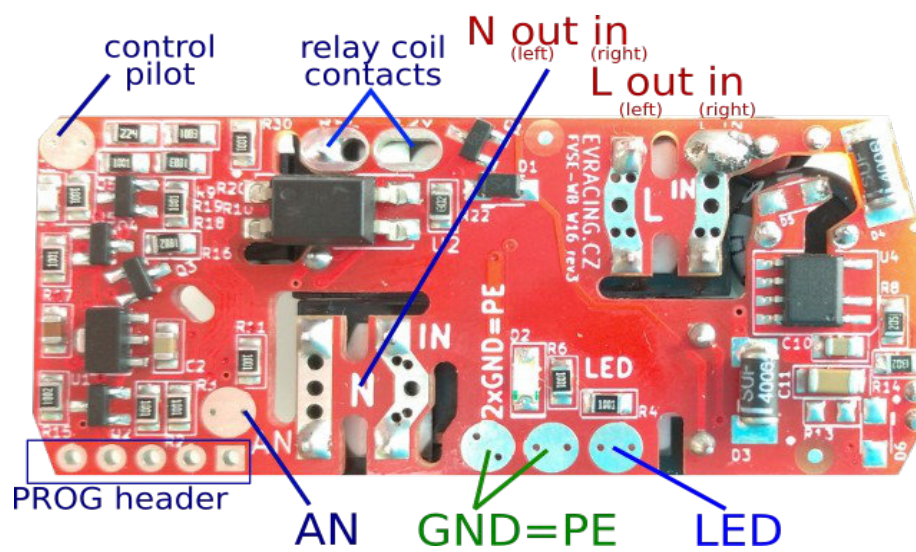
- better surge rating and optimized component layout
- integrated fuse and inrush current limiter
- option for 32A relay (one phase type1/type2 ~7kW charger)



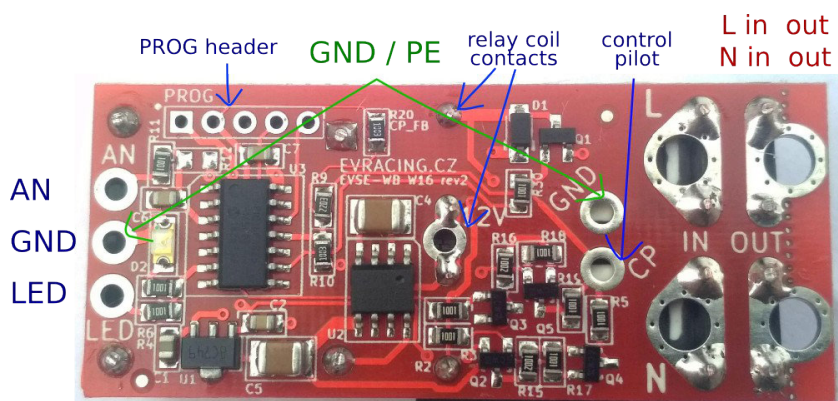
Picture 4: EVSE W16 rev2 board



Picture 5: EVSE W16 rev3 board



Picture 6: EVSE W16 rev3 wiring details



Picture 7: EVSE W16 rev2 wiring details

pins overview		
pin	name	description
L in	phase	230V power supply for EVSE board + power input
N in	neutral	
L out	phase	switched power output for the EV connector
N out	neutral	
PE	protection-earth	= GND
CP	control pilot	To vehicle connector (Type1 or Type2)
LED	external LED	Includes 1k resistor onboard, connects to LED anode against ground
AN	analog input	Used for button or current sensor input
GND	ground	Ground reference (+ second GND between AN and LED), this is also PE reference
12V, -	relay coil contacts	can be used for adding relays for 3phase charger

PROG connector = 5pin header (OPTION)
same function as EVSE WB

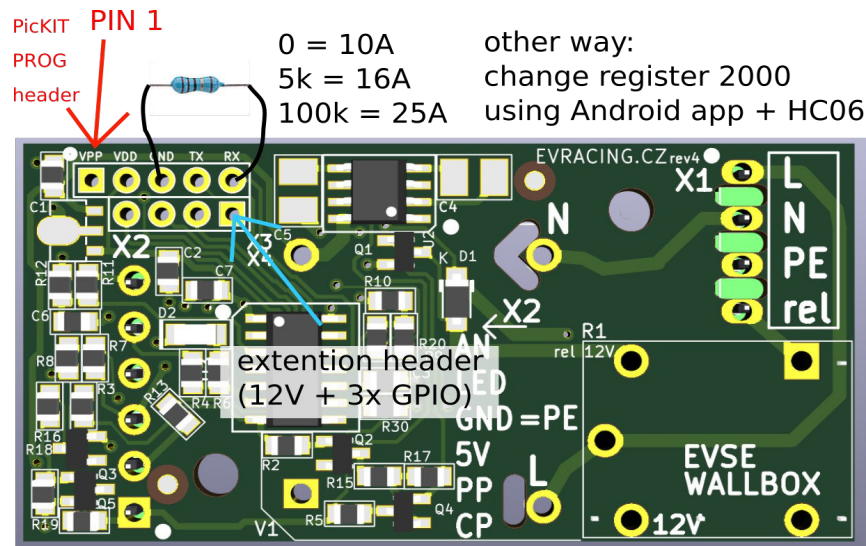
Customizations

Current limitation A – using PROG pin 5

Check the table for details of how you can set the maximum current. This settings will override PIN 4 settings.

PROG connector	connection	current limit
pin5 > 4.5 V	open (internal pull-up only)	32 A [default]
2.5 V < pin5 < 4.5 V	100-200k* resistor to GND	25 A
0.2 V < pin5 < 2.5 V	~3-20k* resistor to GND	16 A
pin5 < 0.2 V	tied to GND	10 A

* resistor value may differ since internal pull-up has no defined value from production (~50k supposed), in most cases 100k for 25A and 5k for 16A is recommended



Picture 8: PROG header location on EVSE-WB board

Current limitation B – using PROG pin 4

Check the table for details of how you can set the maximum current.

PROG connector	connection	current limit
pin4 > 4.5 V	open (internal pull-up only)	32 A [default]
2.5 V < pin4 < 4.5 V	100-200k* resistor to GND	48 A
0.2 V < pin4 < 2.5 V	~3-20k* resistor to GND	63 A
pin4 < 0.2 V	tied to GND	80 A

* resistor value may differ since internal pull-up has no defined value from production (~50k supposed), in most cases 5k for 63A and 100k for 48A is recommended

Precise current setting with Analog Input

Press and hold button connected to Analog input AN of for a few seconds until LED starts to blink rapidly. Then count LED blinks which correspond to number of ampers. Please note that this limit will be set until you reboot the EVSE (make a power cycle). Button is connected the way that it pulls the signal down to ground (level <1V).

Current limitation based on PV production

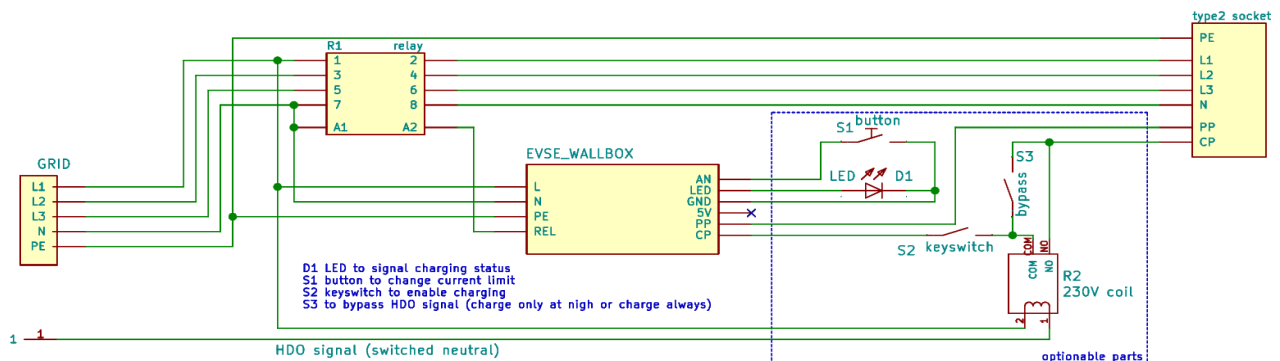
We recommend to use any kind of control system (smart home PLC, Beaglebone with RS485 and SDM630 electricity meter, SDS micro...) and control the EVSE current continuously either by voltage input AN, via data communication (UART/RS485), or simply in 2 or more steps by relay outputs (EVSE is off, EVSE current low, EVSE current high). Each system is different as well as customer needs.

Application examples

In these application examples we suppose that customer uses appropriate contactor with 230V coil. Please check section "Recommended contactors".

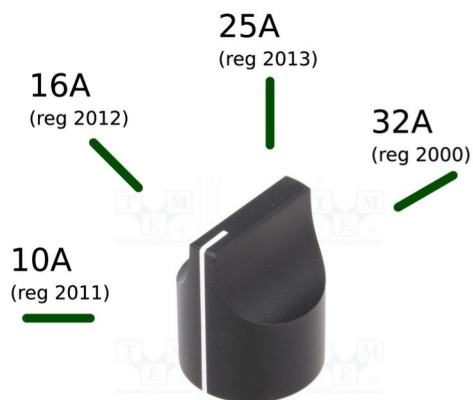
3phase wallbox with keyswitch and low tarif signal input

Keyswitch can be used to lock (disable) / unlock (enable) wallbox (access control).



4position rotary switch details

Values 10/16/25/32 [A] can be customized.



using PicKIT "PROG" HEADER
EVSE-WB, EVSE-DIN, EVSE-W16, EVSE-W50...

