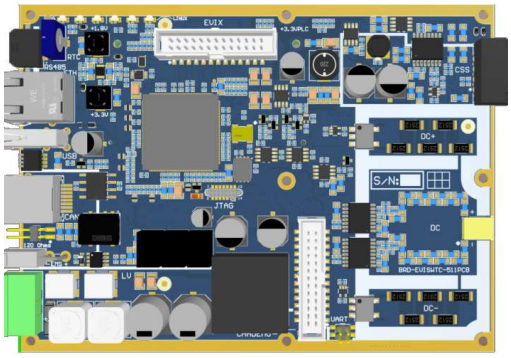
Watt&Well
CONVERTING POWER INTO CONFIDENCE
E-MOBILITY

SECC SERIES

Electrical Vehicle Interface

COMMUNICATION | E-MOBILITY | EV CHARGERS



OVERVIEW

EVI is a dual standard Supply Equipment Communication Controller (SECC) with required signals for CCS2/Combo (DIN SPEC70121, ISO15118-2, ISO15118-20) and CHAdeMO communications.

It is compliant with IEC 61851-23 and IEC 61851-1 requirements subsets for SECC.

EVI can act as a main controller of an EVSE and is readily compatible with:

- Power Units for DC charging (MPU-R3 25kW)
- Bidirectional Power Units (BMPU-R2 11kW)

An optional extension board (EVIX) can add additional functions such as:

- Addressing of 6 or 14 power units
- CHAdeMO HW interface
- Peripheral expander board

EVI manages V2G charging modes:

- CHAdeMO BPT
- CCS V2G (via ISO15118-20)

FEATURES

- Communications ports
  - Ethernet 100Mbit
  - USB 2.0 (up to 480Mbps)
  - CAN, RS485 ports
- External interfaces
  - OCPP 1.6J, OCPP 2.0.1 (soon) interface
  - Modbus TCP interface
  - Web-App Monitoring (soon)
  - OTA firmware update
- Integrated 920V Insulation Measurement Device (IMD)
- Smart Charging with:
  - 2 charge points managed independently.
  - Up to 30 simultaneous power units management (14 MPU and 16 BMPU)
  - Dynamic Power allocation between charge points
  - Serial & Parallel operations of MPU for 920V charging.
- Powerful & safe computing capabilities
  - SoC with ARM® Dual Cortex-A7 & ARM® Cortex-M4
  - 1 GB of RAM, 8 GB eMMC Flash
  - Secure Element embedded, for PnC
  - Ability to run customer applications

The given values are susceptible to change without prior notice.

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WARNING

This equipment operates at voltages and currents that can result in electrical shock, fire hazard and/or personal injury if not properly handled or applied. Equipment must be used with necessary caution and appropriate safeguards employed to avoid personal injury or property damage.

This board must be used only by qualified engineers and technicians' familiar with risks associated with handling high voltage electrical and mechanical components, systems and subsystems.

Disclaimer

It should be noted that the codes and diagrams provided in this datasheet are presented for illustrative purposes only. The given values are susceptible to change without prior notice. The manufacturer of the charging station remains responsible for defining and ensuring compliance with the station's specifications. Watt & Well assumes no liability for any inaccuracies or discrepancies in the provided examples.

Contents

1 Absolute maximum ratings

Table 1: Absolute maximum ratings

Parameter	Condition	Min	Max	Units
LV Input Voltage (all versions)		0	30	V
DC side voltage		0	930	V
Operating Temperature		-5	50	°C
Long term storage Temperature		-40	85	°C
Temperature change rate			5	°C/min

2 Electrical Characteristics

Table 2: Electrical characteristics

Parameter	Condition	Value			Units
		Min	Typ	Max	
DC Side					
Voltage measurement range				920	V
Voltage measurement accuracy	Full range		5	10	V
CAN communication					
CAN baud rate			500		Kbps
CAN common mode range		-7		7	V
LV Input					
Supply voltage	Without EVIX-AD6-CHA With EVIX-AD6_CHA	9 11	24 24	29 29	V
Input current	Without EVIX-AD6-CHA With EVIX-AD6_CHA		0.25 0.5	0.5 2.5	A
Under Voltage Shutdown			9		V
Power		10	12	30	W
Insulation Measurement Device (IMD)					
Operational voltage range		110		920	V
Impedance measurement Relative uncertainty			3%	10%	%
Fault threshold			100		Ω/V
Warning threshold			500		Ω/V
Response time			18	36	s
Emergency Shutdown (EMS)					
Voltage			24	30	V
Current			2		mA

All specifications are given for the full temperature range unless otherwise noted.

3 Introduction

EVI is a dual standard Supply Equipment Communication Controller (SECC) that includes the required signals for CCS/Combo (DIN70121, ISO15118-2 and ISO15118-20) and CHAdeMO (via Extension Board) to interface an EV.

A powerful processor run the EV communications stack and other demanding applications (OCPP, EVSE master, etc).

In addition, EVI can act as a main controller for the charging process. It is readily compatible with:

- Power Units for DC charging
  - MPU-R3 (unidirectional charging)
  - BMPU-R2 (bidirectional charging)

Optional extension board (EVIX) can add additional functions such as:

- Hardware for addressing of 6 power units
- Hardware for addressing of 6 power units and CHAdeMO protocol compatibility
- Hardware-based addressing of 14 power units
- Peripheral expander (Digital IO and Analog inputs)

Designed for smart charging / smart grid applications, it features a modular conception capable of independent multi-charge point (CHAdeMO and Combo) and can control up to 14 MPU-25 power units in a high-power system up 350 kW and 16 BMPU for bidirectional charging.

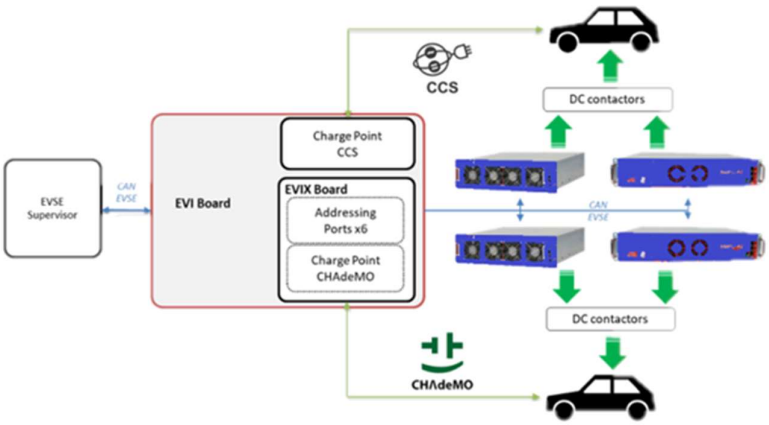


Figure 1: EVI, EVIX, MPU and BMPU in EVSE architecture

4 Hardware specification

4.1 EVI theory of operation

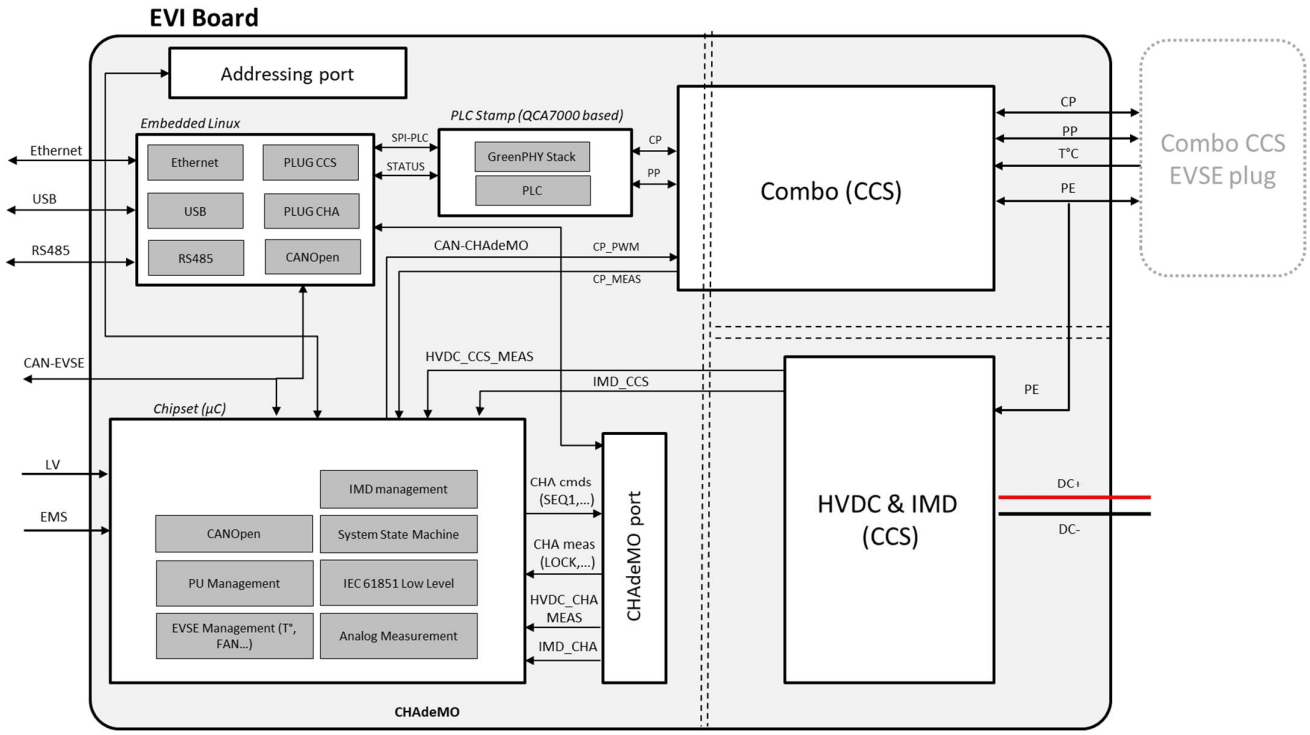
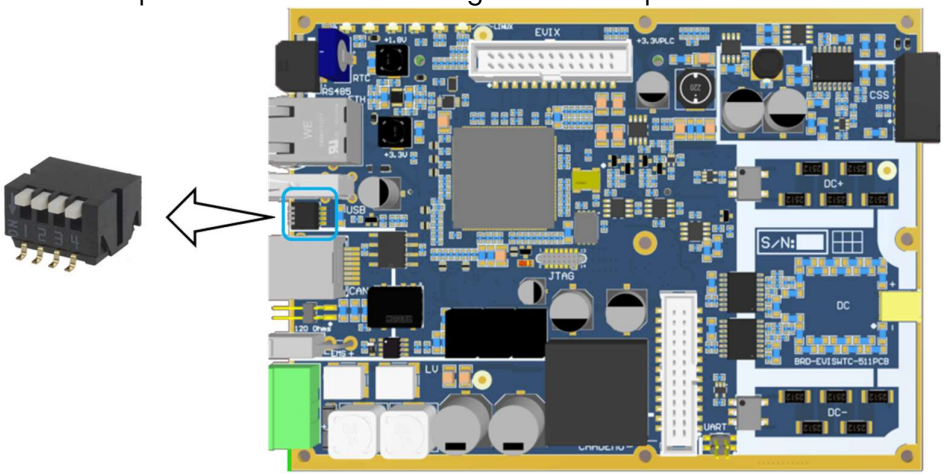


Figure 2: EVI block diagram

4.2 EVI board configuration (A, B, C or D)

To allow having several EVI on same Charging Station and on same CAN EVSE bus, it is needed to configure them with different CAN ID and then different CAN frame associated (see **5.3 System communication**) using a 4 positions dipswitch.

Each switch corresponds to a EVI board configuration as explain hereafter:



EVIS	Switch 1	Switch 2	Switch 3	Switch 4
EVIS A	1	0	0	0
EVIS B	0	1	0	0
EVIS C	0	0	1	0
EVIS D	0	0	0	1
Not allowed	Other switches combination (LEDs blinking)			

4.3 HV DC voltage measurements

EVI features an input port for isolated CCS HV DC voltage measurements.
These measurements allow the charge protocol software to ensure that output DC voltage is as requested by the EV and is also used in Insulation measurement feature.

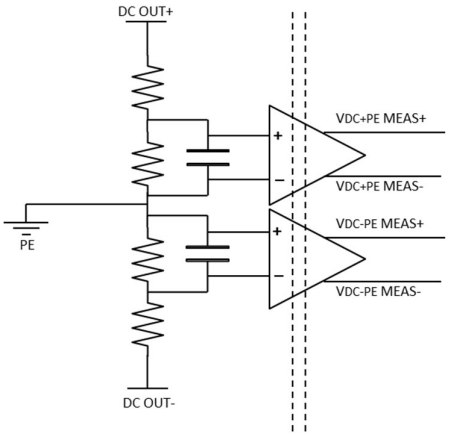


Figure 3: HV DC voltage isolated measurement

4.4 EMS – Emergency Shutdown

EVI provide an Emergency input port that can be used to trigger an unconditional shutdown of the EVI operation. See Table 5 for the pinout of EmShut within the EMS and COM connector.

EmShut logic is active low:

- '0' (0mA or unconnected) Emergency Shutdown triggered.
- '1'(≥2mA): normal operation

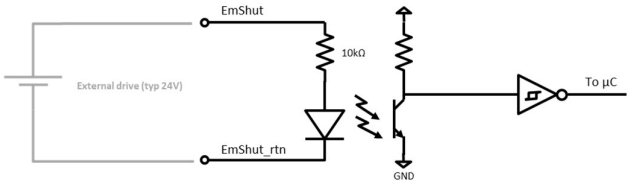


Figure 4: Typical EMS schematics

4.5 IMD - Insulation monitoring device

Mandatory for EVSE product, EVI features an Insulation Monitoring Device (IMD) that monitors continuously the insulation between DC+ and PE and between DC- and PE.
As requested by IEC61557-8 standard, this EVI feature handles detection of symmetrical and asymmetrical default between DC+/- and PE.

Through this document the term IMD is used but on some standards is referred as Ground fault detector (CHAdeMO), Earth leakage current measuring devices (IEC 61851-23 System AA). They all refer to the same circuit.

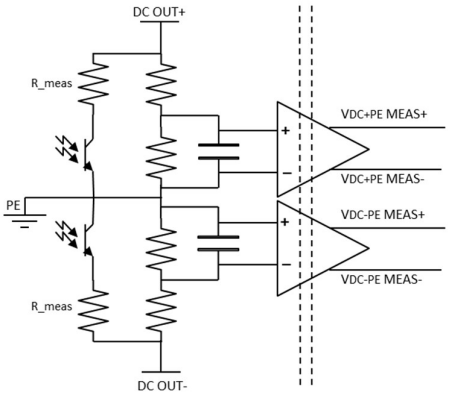


Figure 5:Insulation DC+ to PE and DC- to PE monitoring

- The IMD feature monitors the insulation resistance between the active HV PINS of the battery (BAT+ and BAT-) and the chassis ground (chassis ground) up to 920VDC.
- It complies with IEC 61557-8 standard (**see 7.5 Normative compliance**)
- The IMD feature includes:
  - A device self-test
  - Local insulation warning (Blink of Yellow LED in case of a warning, permanently ON in case of an insulation fault)
  - Remote insulation warning sent to supervisor by CAN.
  - Detection of symmetric and asymmetric insulation faults
  - Continuous measurement of the insulation resistance 0…10 MΩ
  - Response time < 35s
  - Operation on DC bus voltage of up to 920 V (min. 110V)
  - Detection of ground faults and lost ground line
  - Resistance measurement relative uncertainty <10%

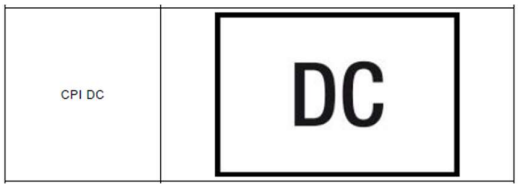


Figure 6 : DC IMD pictogram

4.6 CCS communication & interfaces

The communication between the EVI module and the Electrical Vehicle is compliant with the ISO 15118 and DIN 70121 standards for DC charge.

4.6.1 Interoperability

The EVI module is following the ISO 15118 and DIN 70121 standards and is aimed to work with all EVs supporting these standards.
It has been validated with the following EVs: BMW i3, Renault Zoé2, Jaguar I-Pace, Hyunday Ioniq, Kia e-Niro, Tesla model S 2013, PSA DS3 crossback e-tense, Dacia Spring, Porsche 800V, Ioniq 5 800V, Nissan Leaf, Nissan NV200, Volkswagen ID3 and the Volkswagen e-Up, Audi e-Tron, Ford Mustang Mach-E.
It has also been validated with the ComboCS testing tool. See ComboCS datasheet: www.trialog.com/wp-content/uploads/2020/05/ComboCS_CCS-EV-Tester_Datasheet_v2.pdf.

4.6.2 Control Pilot

Implemented as specified in "IEC61851-1 A.2 Control pilot".

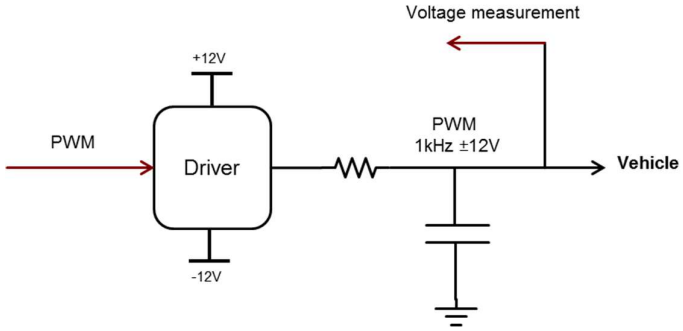


Figure 7: Control pilot

4.6.3 Proximity pilot

Proximity Pilot is used to detect the presence of a connector in the vehicle in the inlet. EVSE connector.
In Combo 1 (configuration EE, mostly used in the US and Japan), it includes an optional Switch S3 for prevention of unintentional live disconnect.

In Combo 2 (configuration FF, mostly used in Europe), the resistor of the connector can be used for current coding the cable.

In both cases, proximity pilot **is not** a seen by a SECC (EVSE side controller).

4.6.4 Temperature monitoring

Two temperature measurements channels for Pt1000 for CCS and NTC 50k for CHAdeMO types of thermistors are available. CCS temperature measurement are done with a Wheatstone bridge as show below:

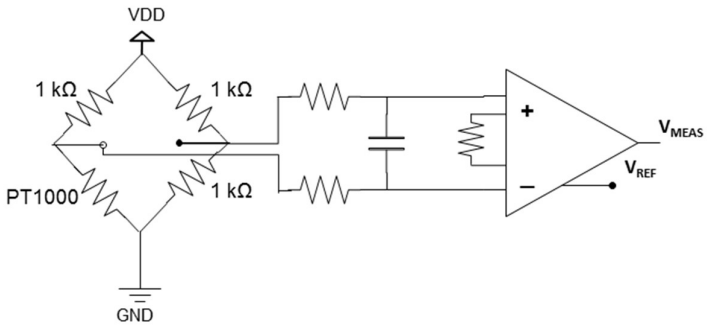


Figure 8: Wheatstone bridge for Pt1000 temperature measurement

EVI has no protection against Plug overtemperature, the temperature is measured and sent through CAN bus. It is the responsibility of EVSE to implement this overtemperature protection.

4.7 EVI interfaces

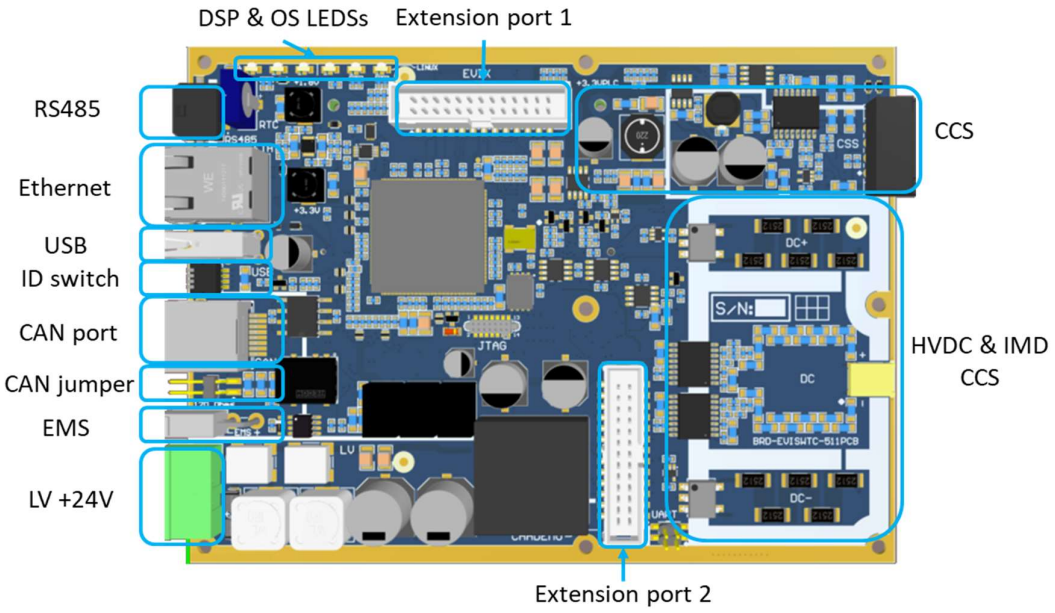


Figure 9: EVI connections

4.8 Connectors

4.8.1 LV - Low voltage connector

LV connector is used to supply power to EVI board and EVIX if installed.
Connector Reference (converter side): Phoenix Contact MSTBA 2,5/ 2-G-5,08 1757242.
Recommended mating connector (wire harness side):

- FKC 2,5/ 2-ST-5,08 1873058 (Push-in spring connection)
- MSTBP 2,5/ 2-ST-5,08 – 1769010 (Screw connection)

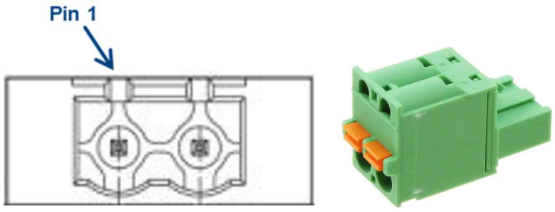


Figure 10: Low voltage connector

PIN	FUNCTION	DESCRIPTION	Preferred wiring color
1	LV_IN-	Low Voltage supply return (0V typ)	Black
2	LV_IN+	Low Voltage supply (14V typ)	Red

4.8.2 Ethernet port

An Ethernet 100Mbit RJ45 port connected to embedded Linux is available on EVI.

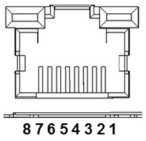


Figure 11 : Ethernet connector

Table 3: Ethernet connector pinout

PIN	FUNCTION	DESCRIPTION
1	ETH1_TX_P	Ethernet TX Differential Output (plus)
2	ETH1_TX_N	Ethernet TX Differential Output (minus)
3	ETH1_RX_P	Ethernet RX Differential Input (plus)
4	ETH1_VIO_SWITCHED	Analogue power supply output to magnetics
5	ETH1_VIO_SWITCHED	
6	ETH1_RX_N	Ethernet RX Differential Input (Minus)
7	Unused	-
8	Shield = PE	Shield is connected to PE

4.8.3 RS485 port

EVI provide RS485 half-duplex port for interface with external devices.
Connector Reference (board side): Molex 436500312

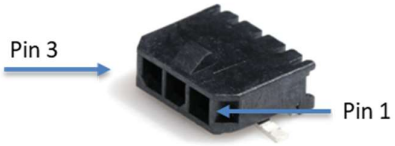


Figure 12: Molex – 436500312

Table 4: RS485 connector pinout

PIN	FUNCTION	DESCRIPTION
1	RS485_A	Half duplex RS485, Signal A
2	GND	Ground
3	RS485_B	Half duplex RS485, Signal A

Recommended mating connector: Molex 1718500300

Figure 13: 1718500300

4.8.4 USB port

USB port is an USB A standard type.

They are not designed to handle any mechanical effort, and any force exerted on them beyond their designed limits can result in damage to the device.
To avoid damaging USB connectors, please:

- Do not force the connector into the port. Make sure it is aligned correctly before plugging it in.
- Keep your USB cables organized and avoid tangling them to prevent unnecessary stress on the connector.
- Avoid exposing the connector to extreme temperatures, water, dust, or other contaminants.

4.8.5 COM connector

EVI features a galvanically isolated CAN bus for digital communications with other boards.

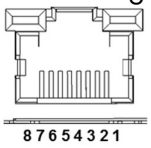


Figure 14 : COM connector (simple RJ45) front view

Table 5: COM connector pinout

PIN	FUNCTION	DESCRIPTION
1	CANA H	CAN differential +
2	CANA L	CAN differential -
3	CAN_GND	Ground reference for CAN
4	EmShut_Rtn	Emergency Shutdown return line (negative)
5	EmShut	Emergency Shutdown (positive)
6	Not Used	
7	Not Used	
8	Not Used	

4.8.6 CAN 120Ω jumper

CAN bus is expected to be terminated at each bus end with a 120 Ω resistance. Wiring should be selected to have an intrinsic impedance of the line that match this 120 Ω.
EVI includes a 120Ω resistor in series with a 2.54mm jumper allowing the user to adapt if needed the bus with termination resistor:

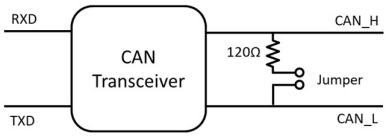


Figure 15: CAN transceiver simplified diagram

Figure 16: CAN jumper (2.54mm)

Note on CAN bus shield: Although ISO-11898-2 does not specify the wires type or the need for a shield, a shielded cable is recommended for electronically harsh environments. It is recommended to ground the shield at a single point on the dedicated Shield pin of the COM connector to avoid ground loops.
Also, remember that the CAN bus being isolated, the CAN_GND should be wired between nodes (preferred) or connected to Protective Earth (less recommended for long distances).

Recommended connection for CAN bus: EVI uses a common CAN pinout for RJ45 connectors. Some commercial CAN transceiver uses a 9 pin Sub-D socket connector (also known as female DB9 header) as interface. The recommended adaptor pinout is as follows:

Table 6: Recommended pinout for a CAN RJ45 to DB9 adaptor

Signal Name	Pin in EVI COM connector	Pin in DB9 (female)
CAN_H	1	7
CAN_L	2	2
CAN_Ref	3	3
CAN_Shield	6	5

4.8.7 EMS - Emergency Shutdown

The COM connector also transmits an optional **Emergency Shutdown** (EmShut) signal. This signal can be used to trigger an unconditional shutdown of the EVI operation. See Table 5 for the pinout of EmShut within the COM connector.

EmShut logic is active low

- '0' (0mA or unconnected) Emergency Shutdown triggered.
- '1'(≥2mA): normal operation

Connector Reference (board side): Molex 026013127

Figure 17: Molex – 026013127

Table 7: Emergency Shutdown connector description

PIN	FUNCTION	DESCRIPTION
1	EMS_SHUT -	EMS negative polarity
2	EMS_SHUT +	EMS positive polarity

Recommended mating connector (wire harness side): 39012020 (housing[1]) and 39000207 (Crimp Terminal 18-24 AWG / 0.82-0.2mm²)

4.8.8 CCS port

Two connectors are required for CCS charging: one for communication signals (CCS port) and another for battery voltage measurement and IMD (see HVDC connector)
Connector Reference (converter side): DEGSON 15EDGRHCM-THR-3.5-08P
Recommended mating connector (wire harness side): DEGSON 15EDGKNHM-3.5-08P

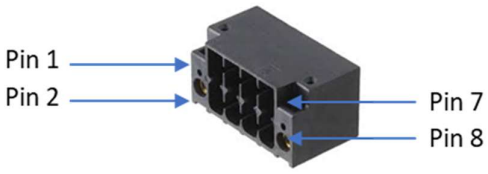


Figure 18: Combo connector (Phoenix Contact 1787030)

[1] Housing with UL 94 V-2 rating. If V-0 rating is required, use 39012025

Table 8: COMBO main connector pin description

PIN	FUNCTION	DESCRIPTION
1	RFU	Reserved for Future Use
2	PE	Protective Earth
3	Temp 1 +	Temperature 1+ - DC connector
4	Temp 1 -	Temperature 1- - DC connector
5	Temp 2-	Temperature 2- - DC connector
6	Temp 2+	Temperature 2+ - DC connector
7	PP	Proximity pilot
8	CP	Control Pilot

4.8.9 HVDC CCS connector

Connector reference: SM02B-BHSS-1-TB from JST
Recommended mating connector: BHSR-02VS-1(N) (Housing) + SBHS-002T-P0.5A (Contact)

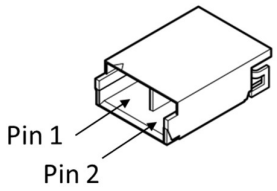


Figure 19: HVDC CCS connector (reference SM02B-BHSS-1-TB)

Table 9: HVDC CCS connector description

PIN	FUNCTION	DESCRIPTION
1	HVDC_CCS-	HV DC negative polarity
2	HVDC_CCS +	HV DC positive polarity

4.9 EVIX-AD6 – Addressing extension board

EVIX-AD6 provides 6 addressing connector on RJ45 format compatible with MPU-R3 power unit.

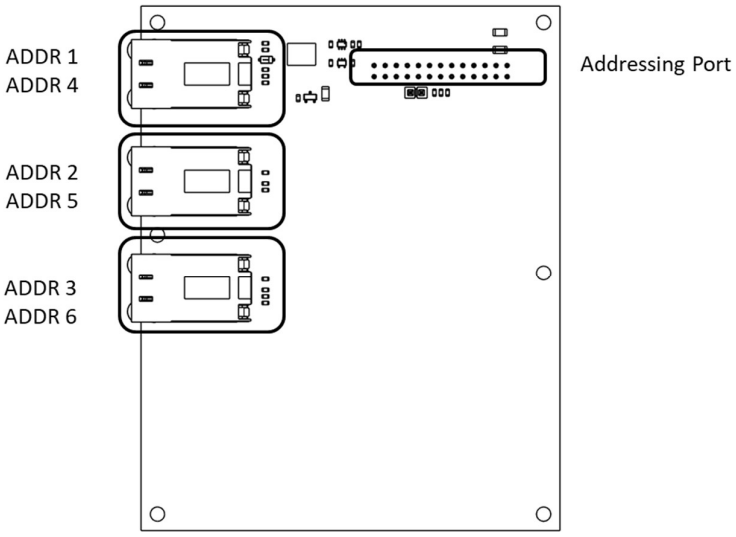


Figure 20: EVIX-AD6 board

4.9.1 Installation

Please ensure mechanical and grounding connection by connecting fixation holes to chassis.

4.9.2 Address selector and Charge Permission.

For better understanding the following part, please make sure to have read the MPU-25 datasheet here: MPU-R3-500-63-FD-datasheet.pdf

Each MPU-25 takes its CAN **address** at boot based on the Addressing connector on the front panel.

Table 10: MPU addresses when connected to EVIX

Address	CAN ID
0 (000)	86
1 (001)	80
2 (010)	81
3 (011)	82
4 (100)	83
5 (101)	84
6 (110)	85
7 (111) or unconnected	86

Up to 7 units can be addressed with 3 DSI (digital signal inputs). Default value of each unconnected line is logic '1'.
To address automatically MPU-25 at power boot, EVIX board proposes 6 addresses RJ45 output compatible with MPU-25 standard (address 1 to 6).

The addressing connector also transmits an optional DSI (digital signal input) "**Charge Permission"** meant for CHAdeMO compatibility. This extension board is designed to work with CCS Charge points, therefore it's permanently set to 1 to disable the Charge Permission Feature.

4.9.3 Addressing interfaces

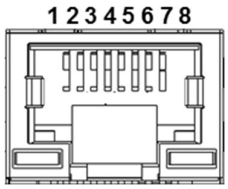


Figure 21: Addressing connector (RJ45) front view

Table 11: Addressing connector pinout

PIN	FUNCTION	DESCRIPTION
1	ADDR bit 0 signal	Address bit 0 (positive)
2	ADDR bit 0 return	Address bit 0 return (negative)
3	ADDR bit 1 signal	Address bit 1 (positive)
4	ADDR bit 1 return	Address bit 1 return (negative)
5	ADDR bit 2 signal	Address bit 2 (positive)
6	ChargePerm_RTN	Charge Permission return (negative)
7	ChargePerm	Charge Permission (positive)
8	ADDR bit 2 return	Address bit 2 return (negative)

EVIX-AD6 extension board contains 6 RJ45 ports used to address Power Unit with different addresses.
The port are numerated from ADDR1 to ADDR6 and place as below:

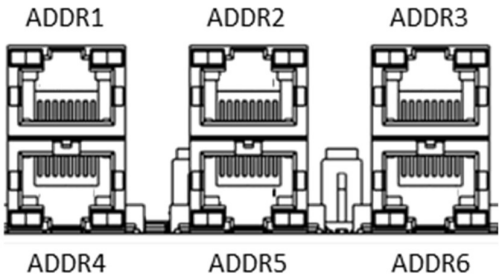


Figure 22: Addressing ports ADDR1 to ADDR6

The bit allocation is the following:

PORT \ PIN	ADDR0	ADDR0_RTN	ADDR1	ADDR1_RTN	ADDR2	ADDR2_RTN
ADDR1	**5V**	GND	GND	GND	GND	GND
ADDR2	GND	GND	**5V**	GND	GND	GND
ADDR3	**5V**	GND	**5V**	GND	GND	GND
ADDR4	GND	GND	GND	GND	**5V**	GND
ADDR5	**5V**	GND	GND	GND	**5V**	GND
ADDR6	GND	GND	**5V**	GND	**5V**	GND

4.10 EVIX-AD14 – Addressing extension board

EVIX-AD14 provides 14 addressing connectors in RJ45 format compatible with MPU-R3 & MPU-R2 power units.

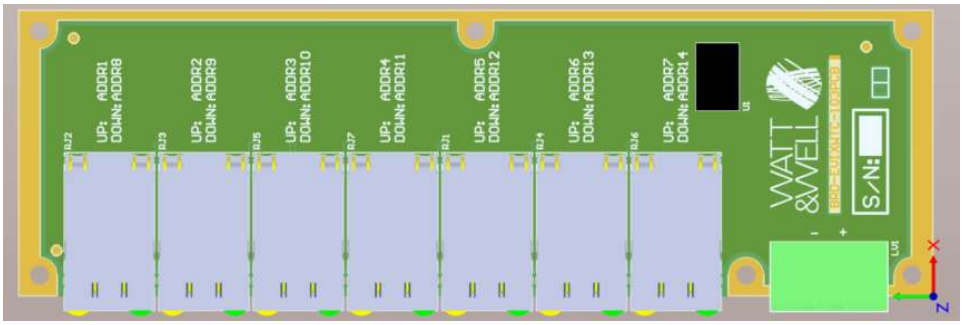


Figure 23: EVIX-AD14 board.

4.10.1 Installation

Please ensure mechanical and grounding connection by connecting fixation holes to chassis.

4.10.2 Address selector and Charge Permission.

For better understanding and more information about this section please make sure to read the MPU-R3 (MPU-R3-500-63-FD-datasheet.pdf) and MPU-R2 (MPU-R2-920-100-FD-datasheet.pdf) datasheets.

Each MPU-Rx takes its CAN address at boot based on the Addressing connector on the front panel.

Up to 14 units can be addressed with 3 DSI (digital signal inputs) and duty-cycles values.
To address automatically MPU-Rx at power boot, EVIX-AD14 board proposes 14 addresses RJ45 output compatible with MPU-Rx standard.

The addressing connector also transmits an optional DSI (digital signal input) "**Charge Permission"** meant for CHAdeMO compatibility. This extension board is designed to work with CCS Charge points only, therefore it's permanently set to 1 to disable the Charge Permission Feature.

Table 12: MPU addresses when connected to EVIX-AD14

Address	ADDR Bit 2	ADDR Bit 1	ADDR Bit 0	CAN ID
Not connected	0%	0%	0%	111
ADDR1	0%	0%	100%	80
ADDR2	0%	100%	0%	81
ADDR3	0%	100%	100%	82
ADDR4	100%	0%	0%	83
ADDR5	100%	0%	100%	84
ADDR6	100%	100%	0%	85
ADDR7	100%	100%	100%	86
ADDR8	0%	0%	50%	87
ADDR9	0%	50%	0%	88
ADDR10	0%	50%	50%	89
ADDR11	50%	0%	0%	90
ADDR12	50%	0%	50%	91
ADDR13	50%	50%	0%	92
ADDR14	50%	50%	50%	93

4.10.3 Addressing interfaces

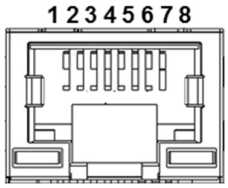


Figure 24: Addressing connector (RJ45) front view

Table 13: Addressing connector pinout

PIN	FUNCTION	DESCRIPTION
1	ADDR bit 0 signal	Address bit 0 (positive)
2	ADDR bit 0 return	Address bit 0 return (negative)
3	ADDR bit 1 signal	Address bit 1 (positive)
4	ADDR bit 1 return	Address bit 1 return (negative)
5	ADDR bit 2 signal	Address bit 2 (positive)
6	ChargePerm_RTN	Charge Permission return (negative)
7	ChargePerm	Charge Permission (positive)
8	ADDR bit 2 return	Address bit 2 return (negative)

EVIX-AD6 extension board contains 14 RJ45 ports used to address Power Unit with different addresses. The ports are numerated from ADDR1 to ADDR14 and place as below:

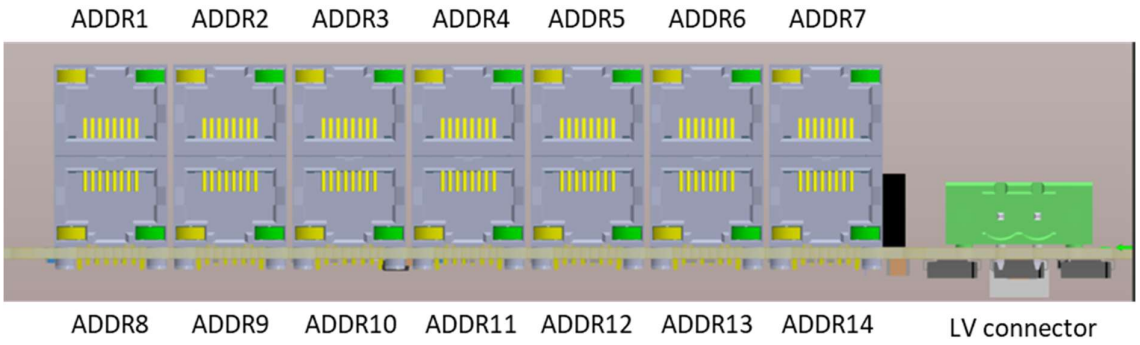


Figure 25: Addressing ports ADDR1 to ADD14 + LV connector

4.11 EVIX-AD6-CHA – Addressing and CHAdeMO extension board

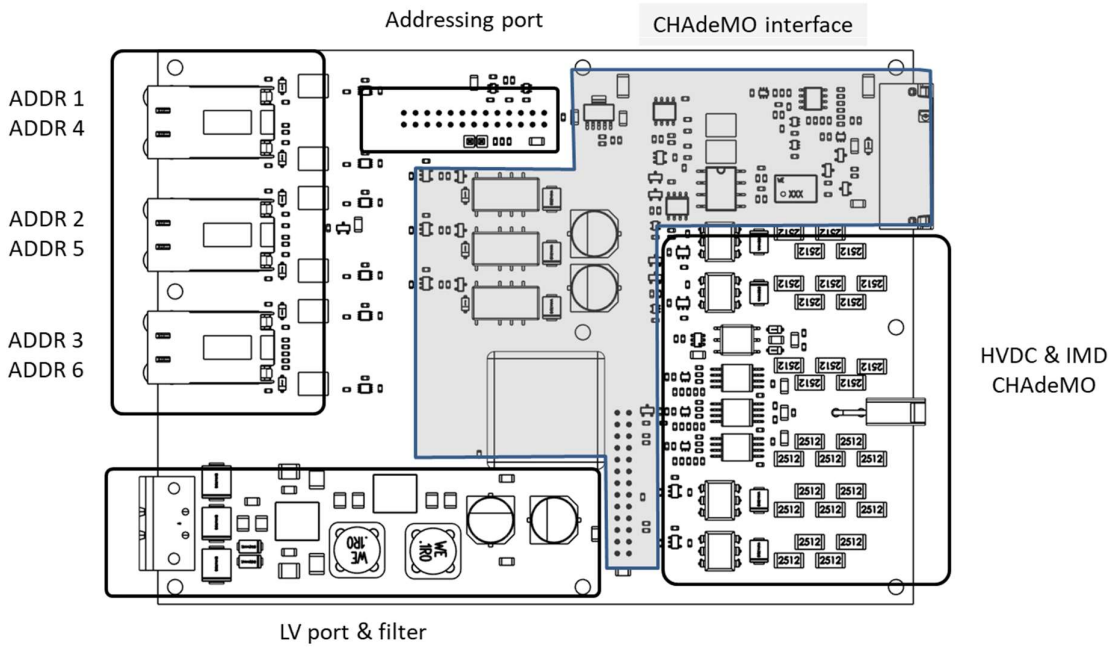


Figure 26: CHAdeMO extension board

4.11.1 Installation

Please ensure mechanical and grounding connection by connecting fixation holes to chassis.

4.11.2 Communication

The communication between the EVI module and the EV is compatible with CHAdeMO normative specifications from versions 0.9 to 1.2.
The CAN bus is galvanically isolated for enhanced EMC and resilience. It complies with

- Standard: ISO11898-1, ISO11898-2
- Protocol: CAN 2.0B Active
- Baud-rate: 500kbps
- Bit sample point: 72.5% to 87.5%

4.11.3 Interoperability

The EVI module is compatible with the CHAdeMO standard and is working will all EVs supporting this standard.
It has been validated with the following EVs: Tesla model S 2013, Nissan Leaf, Nissan NV200.

4.11.4 Addressing interfaces

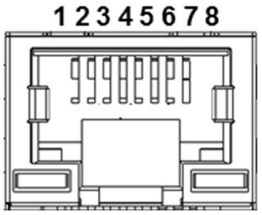


Figure 27: Addressing connector (RJ45) front view

Table 14: Addressing connector pinout

PIN	FUNCTION	DESCRIPTION
1	ADDR bit 0 signal	Address bit 0 (positive)
2	ADDR bit 0 return	Address bit 0 return (negative)
3	ADDR bit 1 signal	Address bit 1 (positive)
4	ADDR bit 1 return	Address bit 1 return (negative)
5	ADDR bit 2 signal	Address bit 2 (positive)
6	ChargePerm_RTN	Charge Permission return (negative)
7	ChargePerm	Charge Permission (positive)
8	ADDR bit 2 return	Address bit 2 return (negative)

Since this part of the extension board is dedicated to addressing, it can also address Combo systems on top of CHAdeMO systems. On Combo systems, Charge Permission output is emulated by an "always enabled" level. This allows the support of systems with dual CHAdeMO and Combo outlets. Optionally, the charge permission functionality can be used for a secure Emergency Shutdown propagation in systems with multiple outputs to avoid shutting down the whole installation.

EVIX-AD6-CHA extension board contains 6 RJ45 ports used to address Power Unit with different addresses.
The ports are numerated from ADDR1 to ADDR6 and place as below:

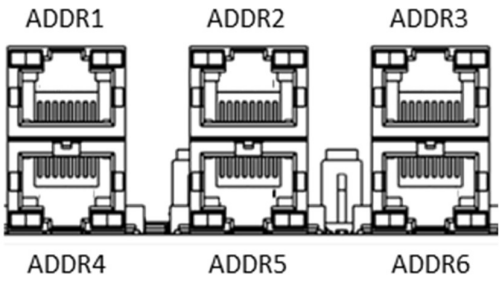


Figure 28: Addressing ports ADDR1 to ADDR6

The bit allocation is the following:

PORT \ PIN	ADDR bit 0 signal	ADDR bit 0 return	ADDR bit 1 signal	ADDR bit 1 return	ADDR bit 2 signal	ADDR bit 2 return
ADDR1	**5V**	GND	GND	GND	GND	GND
ADDR2	GND	GND	**5V**	GND	GND	GND
ADDR3	**5V**	GND	**5V**	GND	GND	GND
ADDR4	GND	GND	GND	GND	**5V**	GND
ADDR5	**5V**	GND	GND	GND	**5V**	GND
ADDR6	GND	GND	**5V**	GND	**5V**	GND

4.11.5 Charge Permission - Switch K

Charge Permission is a mandatory safety function for CHAdeMO systems (System A in IEC 61851-23) also known as Charging Enable/Disable or CP3.
It is required that the charger shall stop charging when it receives a stop instruction by either 'control signal' or 'CAN communication'. To process the stop instruction without fail, the 'vehicle charge permission' line of the control signal circuit shall directly be connected to the inverter circuit of the charger, and charging shall be securely stopped by terminating the inverter circuit compulsorily without interposing process of any circuit medium such as CPU if the 'vehicle charge permission' line is changed to OFF.

As such, EVI board transmits the Charge Permission signal sent by the vehicle to the charger rectifier

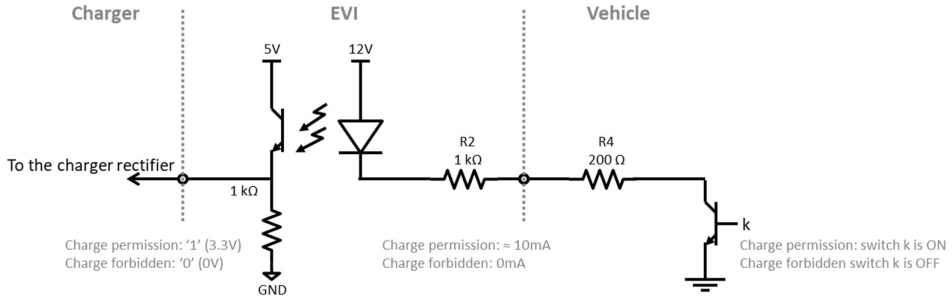


Figure 29: Charge Permission acquisition from EV and transfer to charger

In systems with multiple charging points (or 'outlets') and multiple charging rectifiers, transfer of the charger permission to correct rectifier (the one powering the active outlet) is supported with the extension board. Without CPU intervention (DSP software), EVIX propagates the Charger Permission signal based on the state of the switches.

4.11.6 Plug Lock feature.

Lock signal is used to lock/unlock Power connector of Vehicle to Charger mechanically. Lock monitoring of connector is done by measuring current going through Lock + and Lock-.

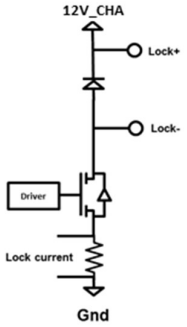


Figure 30: Lock control and monitoring

Lock current is monitored and depending on its value the lock flag wil have the following value:

To determine if EVSE CHAdeMO plug is well locked in EV , the lock current measurement shall be between 0.25A and 0.5A (EV Lock Flag = 1) , otherwise, plug is not well locked and EV Lock Flag will have 0 value.
Please note that HW compatibility tests have been done with CHAdeMO plug reference JAE KW1CGY10PDL0500E.

4.11.7 Proximity detection

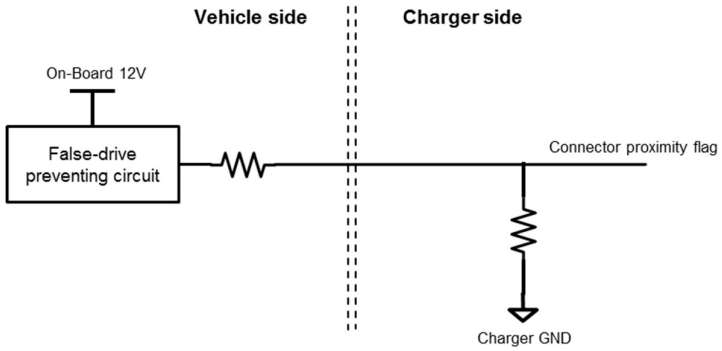


Figure 31: Proximity detection principle

4.11.8 Temperature monitoring

Two temperature measurements channels for NTC type thermistors are available.
The expected NTC thermistors shall have following characteristics:

- R25: 50000Ω
- B: 3760

NTC reference example: "B57861S0503+040" from TDK

4.11.9 CHAdeMO interfaces

Two connectors are required: one for communication signals (main connector) and another for battery voltage measurement and IMD (HV DC connector)

4.11.9.1 Main connector:

Connector Reference (converter side): DEGSON 15EDGRHCM-THR-3.5-14P
Recommended mating connector (wire harness side): DEGSON 15EDGKNHM-3.5-14P

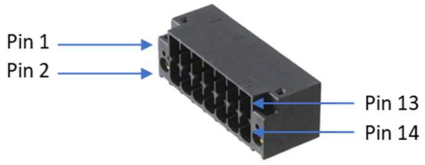


Figure 32: CHAdeMO connector (Phoenix Contact 1787069)

Table 15: CHAdeMO main connector description

PIN	FUNCTION	DESCRIPTION
1	CAN_CHA_H	CAN High signal
2	+12V_ISO	+12V Isolated
3	CHARGE PERM	Charge Permission
4	CAN_CHA_L	CAN Low signal
5	CHARGE_SEQ1	Charge Sequence 1
6	PROX_DET_CHA	Proximity Detection
7	CHARGE_SEQ2	Charge Sequence 2
8	LOCK+	Plug Lock+
9	LOCK-	Plug Lock -
10	Temp 1 -	Temperature 1- - DC connector
11	Temp 1 +	Temperature 1+ - DC connector
12	Temp 2+	Temperature 2+ - DC connector
13	Temp 2-	Temperature 2- - DC connector
14	PE	Protective Earth

4.11.9.2 HV DC voltage measurements connector:

Table 16: CHAdeMO HVDC connector description

PIN	FUNCTION	DESCRIPTION
1	HV_DC_CHA+	HV DC positive polarity
2	HV_DC_CHA-	HV DC negative polarity

Connector Reference (board side): Molex 026013127
Recommended mating connectors (wire harness side): 39012020 (housing[1]) and 39000207 (Crimp Terminal 18-24 AWG / 0.82-0.2mm²)

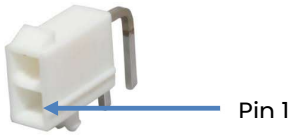


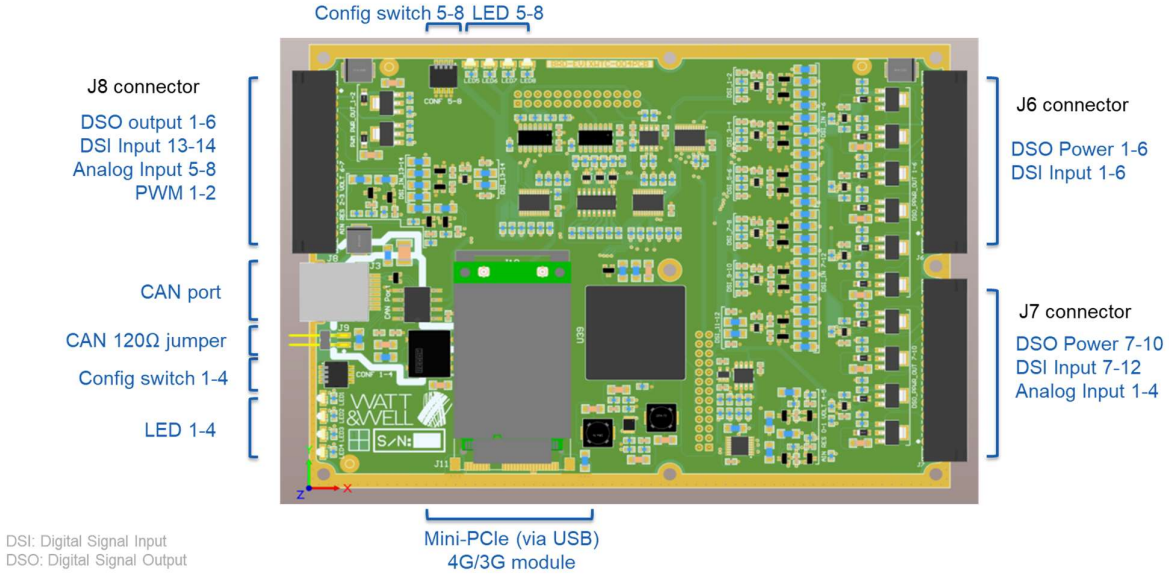
Figure 33: Molex – 026013127

4.12 EVIX-IO – Peripheral expander extension

EVIX-IO is an extension board that can be plugged into EVI boards (EVI v3 and after) to extend the peripheral with additional GPIOs, analog inputs, 4G access, PWM outputs, LEDs and an extra CAN bus.

Some of these peripheral needs external power supply that can be provided by dedicated pins on J6,J7 and J8 connectors having the same return named GND:

- V_DSO_PWR: external supply for digital outputs where power is requested (i.e. relay drive).
- V_PWM_PWR: external supply for output PWM type with potential power needed (i.e. FAN).
- V_DSO: external supply for digital outputs.



Name	Type	Application	Quantity
DSO Power	High current digital output	Relay or contactor coil drive	10
DSI Input	Pulled-up digital input	Reading of button state or contactor auxiliary contact state	14
PWM	High current PWM output	FAN drive	2
DSO Output	Digital output	Logic signal output	6
Analog Input - Resistor	Input for resistor value measurement	Resistor meas. (thermistors for ex.)	4
Analog Input - Voltage	Input for voltage value measurement	Voltage measurement	4
LED	Output LEDS	Visual signals	3 red, 3 blue, 2 yellow
Config switch	Configuration switch (piano)	System configuration	8

For access to these peripherals of EVIX-IO through Embedded Linux, please refer to “EVI-AN005-Technical Reference Manual” document.

4.12.1 Electrical Characteristics

All specifications are given for the full temperature range unless otherwise noted.

Table 17: Electrical characteristics

Parameter	Condition	Value			Units
		Min	Typ	Max	
DSO Power					
V_DSO_PWR voltage		0	24	30	V
V_DSO_PWR current			2	4	A
DSI Inputs					
Input voltage range		0	24	30	V
Low Input threshold		1.25	1.5	2.25	V
High Input threshold		2.05	2.8	3.4	V
DSO Outputs					
V_DSO voltage		0	24	30	V
V_DSO current	Single output used. Several outputs used.			0.5 0.1	A
PWM outputs					
V_PWM_PWR voltage		0	24	30	V
V_PWM_PWR current				4	A
PWM frequency		0	10	30	kHz
Analog inputs					
AIN_RES input voltage range	Polarized by 4.096V Vref and 11kΩ resistor			4.096	V
AIN_RES Cutoff frequency			10		Hz
AIN_VOLT input voltage range		0		30	V
AIN_VOLT Cutoff frequency			10		Hz
CAN port					
CAN baud rate		0	500	1000	Kbps
CAN common mode range		-7		7	V

4.12.2 Installation

Please ensure mechanical and grounding connection by connecting fixation holes to chassis.

4.12.3 DSO Power

DSO Power outputs are designed for driving components that require driving voltage between [0-30V] and driving current capability up to 4A, such as relays or contactors.

DSO_PWR_CMD_# are accessible on EVI embedded Linux as GPIO and can then be set High or Low. As indicated on EVIX-IO introduction, V_DSO_PWR must be provided by external means.

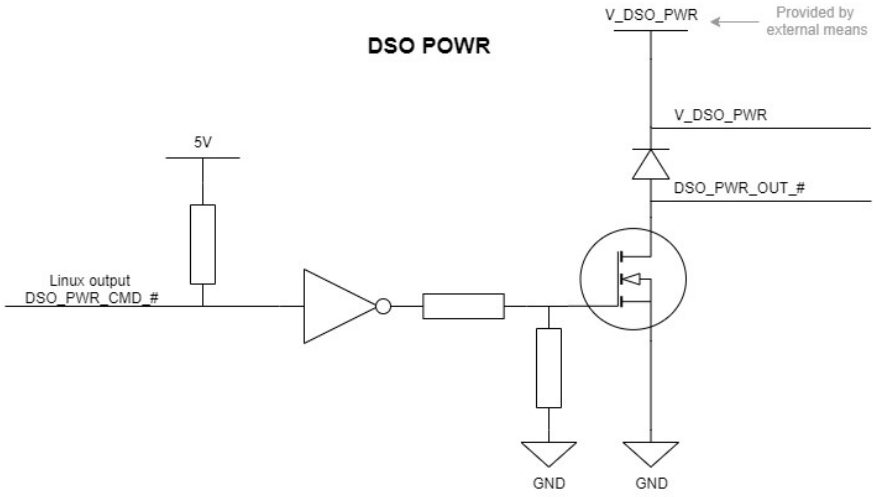


Figure 34: DSO PWR block diagram

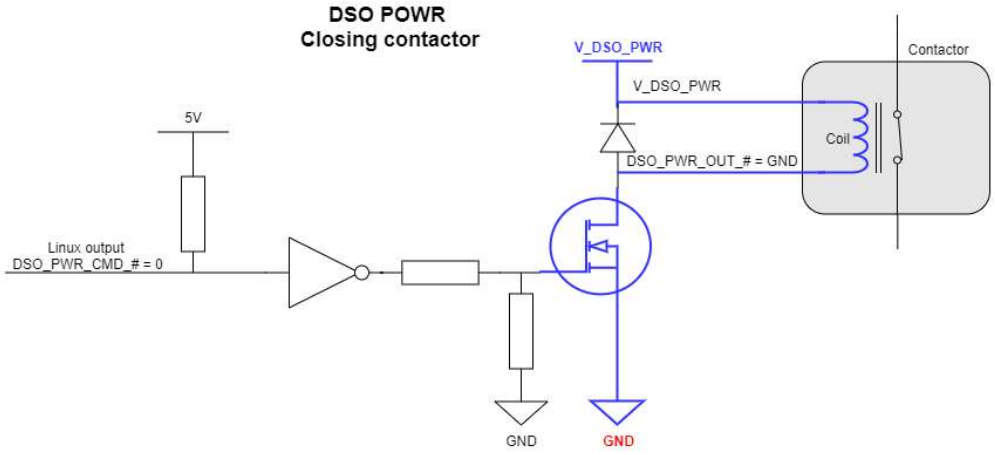


Figure 35: Driving contactor by setting GPIO to Low

4.12.4 DSI Inputs

EVIX-IO board provides 14 Digital Signal Inputs with input voltage range up to 30V.
Low Input threshold is 1.5V and High input threshold is 2.8V.
DSI input value can be read as GPIO on Embedded Linux.

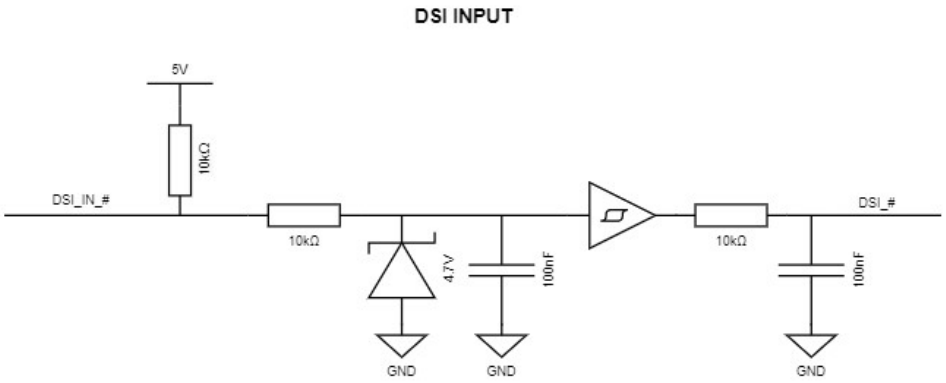
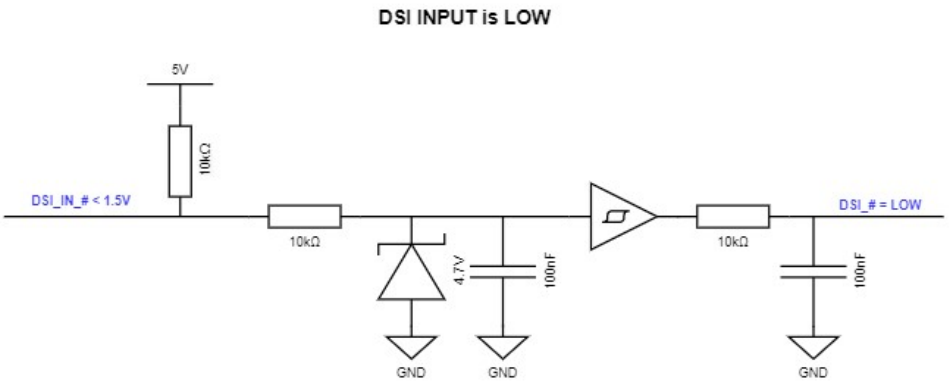
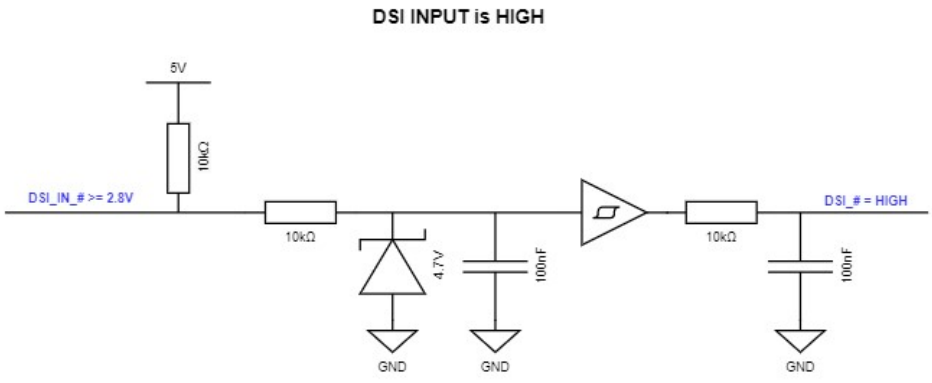


Figure 36: DSI input block diagram





4.12.5 DSO Outputs

DSO outputs are designed for driving components that require driving voltage between [0-30V] and driving current capability up to 0.1A, such as button, LEDS and other low power.

DSO_CMD_# are accessible on EVI embedded Linux as GPIO and can then be set High or Low. As indicated on EVIX-IO introduction, V_DSO must be provided by external means.

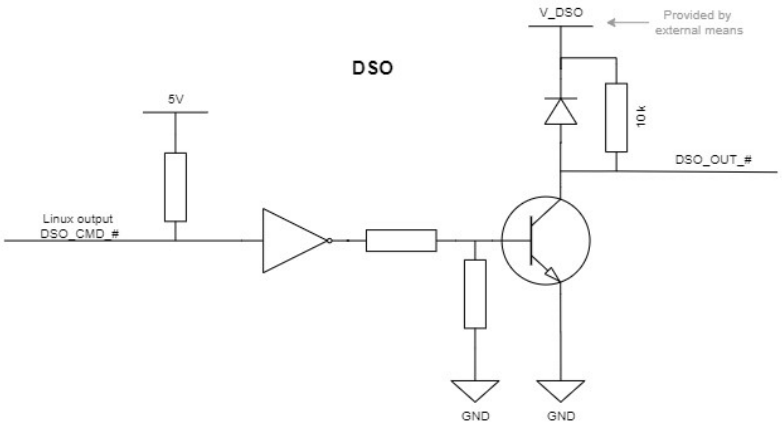
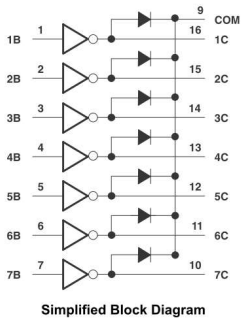


Figure 37: DSO outputs block diagram.

Please refer to ULN2003AI component datasheet for further information about maximum collector current.



Simplified Block Diagram

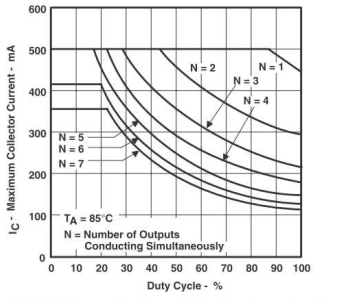
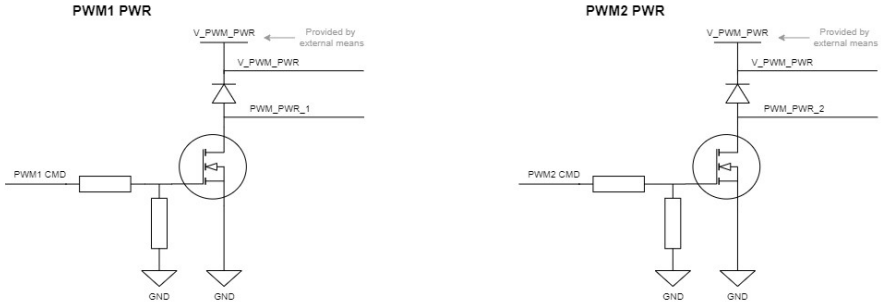


Figure 6-5. N Package Maximum Collector Current vs Duty Cycle

4.12.6 PWM Outputs

EVIX-IO offers 2 PWM outputs with maximum frequency of 30kHz.
These outputs can be used for example for driving FAN.



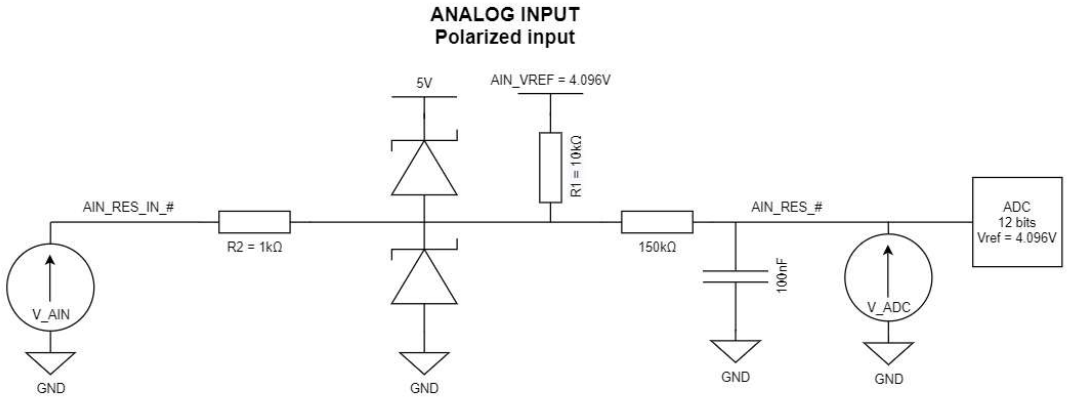
4.12.7 Analog Inputs

EVIX-IO provides 2 types of analog inputs:

- Analog Input – Resistor: analog inputs that are polarized.
- Analog Input – Voltage: analog inputs that are not polarized and have a resistor voltage divider.

These analog measurements are available on Embedded Linux. For further details, please refer to "EVI-AN005-Technical Reference Manual" document.

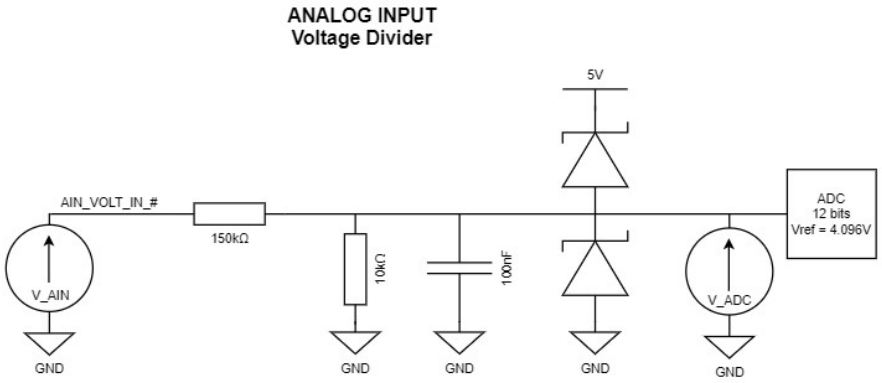
4.12.7.1 Analog Input – Resistor



By providing polarization to analog input with AIN_VREF=4.096V, this block allows measurement of passive components as resistors.
Formula to calculate analog input VAIN from ADC input VADC:

$$V_{AIN\_RES\_IN[V]} = \frac{VADC[V] * (R1 + R2) - R2 * AIN\_VREF[V]}{R1} = \frac{VADC[V] * (11) - AIN\_VREF[V]}{10}$$

4.12.7.2 Analog input - Voltage



Contrary to the polarized analog inputs, these inputs must external polarization and cannot measure passive components.

$$V_{AIN\_VOLT\_IN[V]} = VADC[V] * 16$$

4.12.8 CAN port

Please refer to the section **4.8.5 COM connector.**
This port is mounted as "can1" interface on Embedded Linux.
For further details, please refer to "EVI-AN005-Technical Reference Manual" document.

4.12.9 Mini-PCIe port

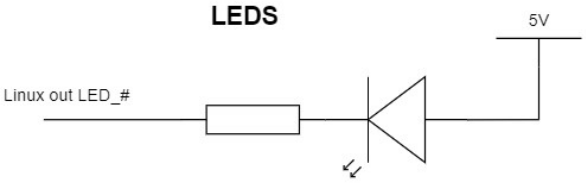
EVIX-IO provides a Mini-PCIe connector with USB connection to Embedded Linux.
This port is mounted as "wwan0" interface on Embedded Linux.
This allows the user to connect to an LTE module (as EC21 series from Quectel) and have a 3G or 4G wireless access.

Figure 38: Mini PCIe connector

Figure 39: EC21 Mini-PCIe Series

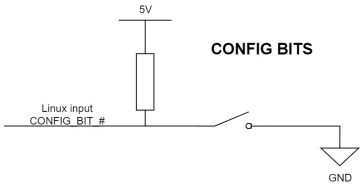
4.12.10 LEDs

EVIX-IO provides 8 LEDS placed on edge of the board (see 4.12EVIX-IO – Peripheral expander extension). For further details, please refer to "EVI-AN005-Technical Reference Manual" document.
.



4.12.11 DSI Configuration switch

EVIX-IO provides 8 DSI Configuration bits placed on edge of the board (see 4.12EVIX-IO – Peripheral expander extension). These inputs are accessible on Embedded Linux, for further details, please refer to "EVI-AN005-Technical Reference Manual" document.



4.12.12 Interfaces & Connectors

Three connectors are dedicated to external access of inputs and outputs of the board.
Connector Reference (converter side): DEGSON 15EDGRHCM-THR-3.5-24P
Recommended mating connector (wire harness side): DEGSON 15EDGKNHM-3.5-24P

Figure 40: J6, J7 and J8 connectors

Table 18: EVIX-IO J6 connector pinout

PIN	FUNCTION	DESCRIPTION
1	GND	Ground reference for DSI
2	DSI_IN_6	DSI Input 6
3	DSI_IN_5	DSI Input 5
4	GND	Ground reference for DSI
5	DSI_IN_4	DSI Input 4
6	DSI_IN_3	DSI Input 3
7	GND	Ground reference for DSI
8	DSI_IN_2	DSI Input 2
9	DSI_IN_1	DSI Input 1
10	V_DSO_PWR	Power Input for DSO PWR
11	DSO_PWR_OUT_6	DSO PWR output 6
12	DSO_PWR_OUT_5	DSO PWR output 5
13	V_DSO_PWR	Power Input for DSO PWR
14	DSO_PWR_OUT_4	DSO PWR output 4
15	DSO_PWR_OUT_3	DSO PWR output 3
16	V_DSO_PWR	Power Input for DSO PWR
17	DSO_PWR_OUT_2	DSO PWR output 2
18	DSO_PWR_OUT_1	DSO PWR output 1
19	GND	Ground reference for DSO PWR
20	V_DSO_PWR	Power Input for DSO PWR
21	GND	Ground reference for DSO PWR
22	V_DSO_PWR	Power Input for DSO PWR
23	GND	Ground reference for DSO PWR
24	V_DSO_PWR	Power Input for DSO PWR

Table 19: EVIX-IO J7 connector pinout

PIN	FUNCTION	DESCRIPTION
1	AIN_COM	Analog input common reference (Ground)
2	AIN_VOLT_IN_5	Analog input 5 - Voltage type
3	AIN_VOLT_IN_4	Analog input 4 - Voltage type
4	AIN_RES_IN_1	Analog input 1 - Resistor type
5	AIN_RES_IN_0	Analog input 0 - Resistor type
6	GND	Ground reference for DSI
7	DSI_IN_12	DSI Input 12
8	DSI_IN_11	DSI Input 11
9	GND	Ground reference for DSI
10	DSI_IN_10	DSI Input 10
11	DSI_IN_9	DSI Input 9
12	GND	Ground reference for DSI
13	DSI_IN_8	DSI Input 8
14	DSI_IN_7	DSI Input 7
15	V_DSO_PWR	Power Input for DSO PWR
16	DSO_PWR_OUT_10	DSO PWR output 10
17	DSO_PWR_OUT_9	DSO PWR output 9
18	V_DSO_PWR	Power Input for DSO PWR
19	DSO_PWR_OUT_8	DSO PWR output 8
20	DSO_PWR_OUT_7	DSO PWR output 7
21	GND	Ground reference for DSO PWR
22	V_DSO_PWR	Power Input for DSO PWR
23	GND	Ground reference for DSO PWR
24	V_DSO_PWR	Power Input for DSO PWR

Table 20: EVIX-IO J8 connector pinout

PIN	FUNCTION	DESCRIPTION
1	V_PWM_PWR	Power Input for PWM PWR
2	GND	Ground reference for PWM PWR
3	PWM_PWR_OUT_1	PWM PWR output 1
4	PWM_PWR_OUT_2	PWM PWR output 2
5	V_PWM_PWR	Power Input for PWM PWR
6	GND	Ground reference for PWM PWR
7	V_DSO_OC	Power Input for DSO
8	DSO_OUT_1	DSO Output 1
9	DSO_OUT_2	DSO Output 2
10	V_DSO_OC	Power Input for DSO
11	DSO_OUT_3	DSO Output 3
12	DSO_OUT_4	DSO Output 4
13	V_DSO_OC	Power Input for DSO
14	DSO_OUT_5	DSO Output 5
15	DSO_OUT_6	DSO Output 6
16	V_DSO_OC	Power Input for DSO
17	DSI_IN_13	DSI Input 13
18	DSI_IN_14	DSI Input 14
19	GND	Ground reference for DSI
20	AIN_RES_IN_2	Analog input 2 - Resistor type
21	AIN_RES_IN_3	Analog input 3 - Resistor type
22	AIN_VOLT_IN_6	Analog input 6 - Voltage type
23	AIN_VOLT_IN_7	Analog input 7 - Voltage type
24	AIN_COM	Analog input common reference (Ground)

5 Software specifications

The following paragraphs explain the overall architecture and communication of an EVI. A step-by-step example as well as all the CAN Bus interfacing information can be found inside "EVI-AN005-Technical Reference Manual" document.

5.1 System architecture

System architecture is designed to be composed of:

- Up to **14** MPU-R3 power units (25kW)
- Up to **16** BMPU-R2 power units (bidirectional – 11kW)
- Up to **4** EVIS boards (EVIS-A, EVIS-B, EVIS-C, EVIS-D)
- 1 EVIX board extension (per EVIS)

5.2 Multi EVI configuration

EVI can operate in single configuration for 1 Combo and 1 CHAdeMO communication port. Multiple EVI's on the same CAN bus (to increase the number of ports) are limited to 4 for both hardware and software limitations.

Please consult the engineering team (engineering@wattandwell.com) for details on how to operate more than one EVI on the same CAN bus.

5.3 System communication

5.3.1 Communication Characteristics

Communication between devices of the system is based on CAN communication following the CAN open protocol with the following characteristics:

5.3.1.1 CAN configuration

- CAN 2.0A
- 500 kbit/s
- Little endian byte order

5.3.1.2 Node IDs and heartbeats

Each node has a unique Node ID and Heartbeat ID. It automatically transmits its communication state at regular intervals as evidence of its communication ability.

All CAN the can devices in the system have a specific Node ID with respect to the following table:

Board	Description	CAN ID (base 10)	CAN ID (base 16)	Heartbeat ID (base 16)
Diag GUI	**Diag GUI**	**1**	0x1	0x701
Supervisor#1	Supervisor#1	2	0x2	0x702
Supervisor#2	Supervisor#2	3	0x3	0x703
EVIS A	Charge point manager on side A	16	0x10	0x710
EVIS A	ISO15118 & DIN70121 stack manager on side A	17	0x11	0x711
EVIS A	CHADeMO stack manager on side A	19	0x13	0x713
EVIS B	Charge point manager on side B	32	0x20	0x720
EVIS B	ISO15118 & DIN70121 stack manager on side B	33	0x21	0x721
EVIS B	CHADeMO stack manager on side B	35	0x23	0x723
EVIS C	Charge point manager on side C	24	0x18	0x718
EVIS C	ISO15118 & DIN70121 stack manager on side C	25	0x19	0x719
EVIS C	CHADeMO stack manager on side C	27	0x1B	0x71B
EVIS D	Charge point manager on side D	40	0x28	0x728
EVIS D	ISO15118 & DIN70121 stack manager on side D	41	0x29	0x729
EVIS D	CHADeMO stack manager on side D	43	0x2B	0x72B

MPU 0	Power unit 1	80	0x50	0x750
MPU 1	Power unit 2	81	0x51	0x751
MPU 2	Power unit 3	82	0x52	0x752
MPU 3	Power unit 4	83	0x53	0x753
MPU 4	Power unit 5	84	0x54	0x754
MPU 5	Power unit 6	85	0x55	0x755
MPU 6	Power unit 7	86	0x56	0x756
MPU 7	Power unit 8	87	0x57	0x757
MPU 8	Power unit 9	88	0x58	0x758
MPU 9	Power unit 10	89	0x59	0x759
MPU 10	Power unit 11	90	0x5A	0x75A
MPU 11	Power unit 12	91	0x5B	0x75B
MPU 12	Power unit 13	92	0x5C	0x75C
MPU 13	Power unit 14	93	0x5D	0x75D
BMPU 0	Bi-directional power unit 1	94	0x5E	0x75E
BMPU 1	Bi-directional power unit 2	95	0x5F	0x75F
BMPU 2	Bi-directional power unit 3	96	0x60	0x760
BMPU 3	Bi-directional power unit 4	97	0x61	0x761
BMPU 4	Bi-directional power unit 5	98	0x62	0x762
BMPU 5	Bi-directional power unit 6	99	0x63	0x763
BMPU 6	Bi-directional power unit 7	100	0x64	0x764
BMPU 7	Bi-directional power unit 8	101	0x65	0x765
BMPU 8	Bi-directional power unit 9	102	0x66	0x766
BMPU 9	Bi-directional power unit 10	103	0x67	0x767
BMPU 10	Bi-directional power unit 11	104	0x68	0x768
BMPU 11	Bi-directional power unit 12	105	0x69	0x769
BMPU 12	Bi-directional power unit 13	106	0x6A	0x76A
BMPU 13	Bi-directional power unit 14	107	0x6B	0x76B
BMPU 14	Bi-directional power unit 15	108	0x6C	0x76C
BMPU 15	Bi-directional power unit 16	109	0x6D	0x76D

SYNC frame

To trigger synchronous sending of frames, CAN devices are sensitive to a SYNC message.

Frame ID	DLC
x80	0

EVIS-A Chipset (Node ID 16) is the SYNC producer of the hole system meaning that there should always be one EVIS-A on the bus.

5.4 Software API for EVIX-IO

Please refer to document "EVI-AN005-Technical Reference Manual".

6 Mechanical specifications

6.1 EVI dimensions

- Length: 170 mm
- Width: 120 mm
- Height: total height is 30mm
    - Top component height: 20mm
    - Bottom component height:8mm
- Weight: 206 gr

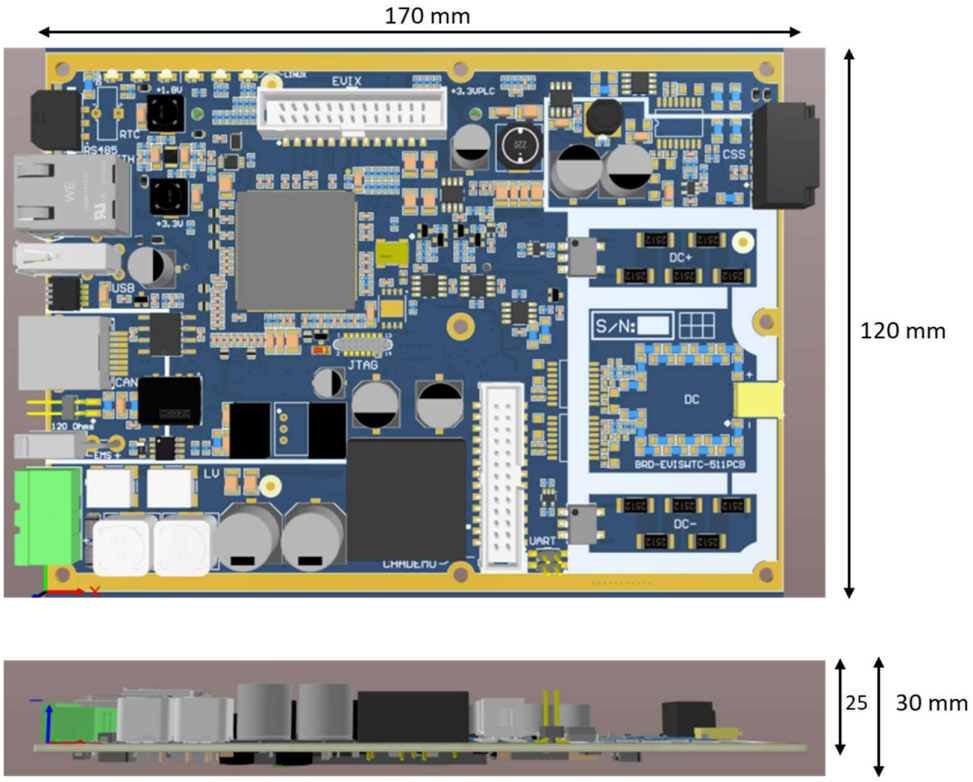


Figure 41: EVI dimensions

6.2 EVIX-AD6 dimensions

- Length: 100 mm
- Width: 120 mm
- Height:
  - Total Height: 46 mm
  - Top component height: 25mm
  - Bottom Component Height: 21mm
- Weight: 90 gr

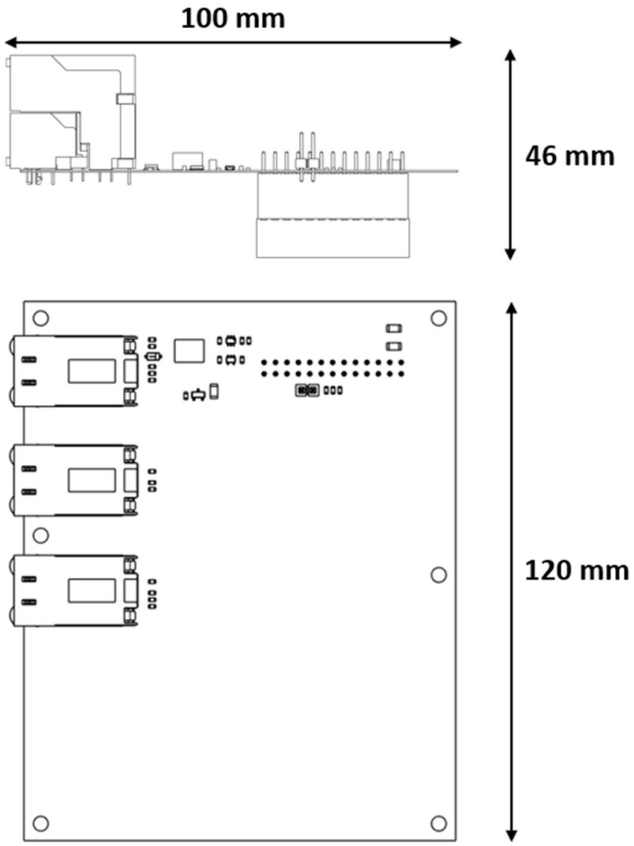


Figure 42: EVIX-AD6 dimensions

6.3 EVIX-AD6-CHA dimensions

- Length: 170 mm
- Width: 120 mm
- Height:
  - Total Height: 46 mm
  - Top component height: 25mm
  - Bottom Component Height: 21mm
- Weight: 156 gr

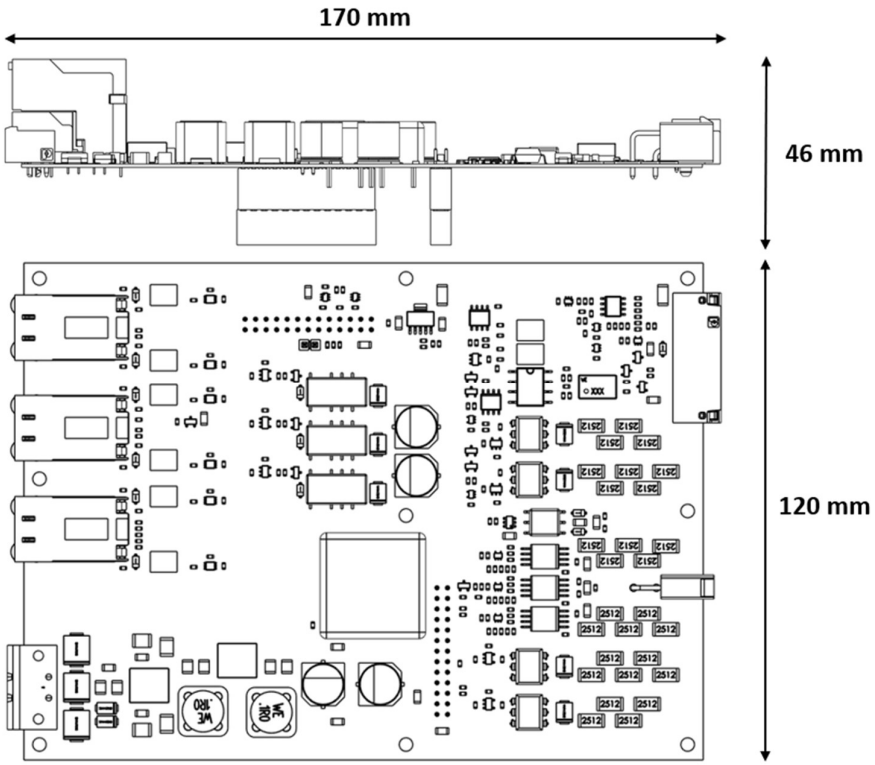
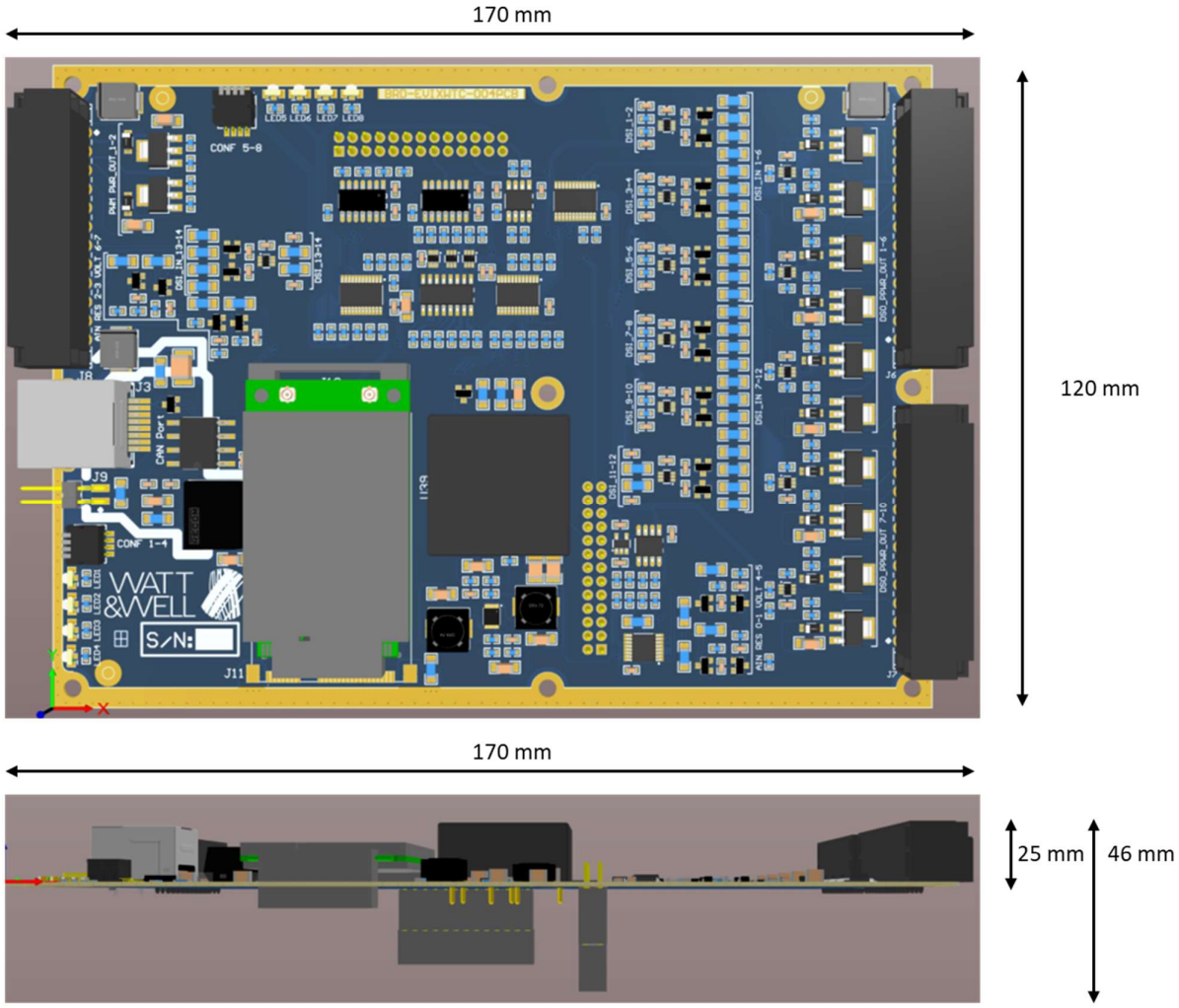


Figure 43: EVIX-AD6-CHA dimensions

6.4 EVIX-IO dimensions

- Length: 170 mm
- Width: 120 mm
- Height:
  - Total Height: 46 mm
  - Top component height: 25mm
  - Bottom Component Height: 21mm
- Weight: 156 gr



7 Safety instructions

7.1 Preventing Electrostatic Discharge (ESD)

Electrostatic discharge (ESD) is a common occurrence and can cause significant damage to sensitive electronic components.

To prevent ESD, the following steps can help reduce the risk of ESD:

- **Grounding:** Ensure that all equipment and personnel are properly grounded to prevent the buildup of static electricity.
- **Control humidity:** Keep the workplace environment at a moderate level of humidity to reduce the buildup of static electricity.
- **Use ESD-safe equipment**: Use ESD-safe equipment and tools, including mats, wrist straps, and packaging materials.
- **Handling practices:** Implement proper handling practices for electronic components, such as avoiding direct contact and using protective packaging.
- **Training**: Train personnel on the risks and prevention of ESD and make sure they understand the importance of following ESD guidelines.

7.2 Installation

EVI is delivered as an open frame board, that is, without protective enclosure or chassis. It shall be integrated into an EVSE enclosure. This board contains live circuits involving high voltage that can result in electrical shock, fire hazard and/or personal injury if not properly handled or applied. If not enclosed, it must be used only by qualified engineers and technicians' familiar with risks associated with handling high voltage electrical and mechanical components, systems and subsystems.

To avoid injuries, always disconnect power and remove external voltage sources before touching components.

The protective earth terminal must be connected to the safety electrical ground before another connection is made. Product fixation holes must be connected to EVSE protective earth.

Any interruption of the protective ground conductor, or disconnection of the protective earth terminal will cause a potential shock hazard that might cause personal injury.

7.3 Parts substitution and modifications

Parts substitutions and modifications are allowed by authorized WATT & WELL service personnel only. For repairs or modification, the unit must be returned to WATT & WELL's After Sale Service. Contact After Sale Service (aftersaleservice@wattandwell.com) to obtain RMA number.

WATT & WELL
After Sale Service
121 Rue Louis Lumière
84120 PERTUIS
FRANCE

7.4 Environmental condition

EVI device safety approval applies to the following operating conditions:

- Maximum relative humidity : 95% at 30°C
  : 23% at 60°C non-condensing
- Altitude : up to 2000m
- Pollution degree : 2[2]

Protective ground conductor terminal

[2] Attention should be paid to avoid ingress of water, metallic or conductive particles, dust or corrosive atmospheric that may cause early failures of equipment.

7.5 Normative compliance

EVI is compliant with European directives:

CE

Norm reference	Norm title	Topic
ROHS Directive 2011/65/UE	Restriction of hazardous substances in electrical and electronic equipment	Limits the number of toxic materials used in the product.
WEEE Directive 2012/19/UE	Waste electrical and electronic equipment directive	Sets collection, recycling and recovery targets for all types of electrical products.
IEC 61557-8	Electrical safety in low voltage distribution systems up to 1000V a.c and 1500V d.c. – Equipment for testing, measuring or monitoring of protective measures – Part 8: Insulation monitoring devices for IT systems.	Requirements for the IMD feature. Excluding shock/vibration (chapter 4.8).
EN 61000-6-2	Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments -Surge immunity (CEI 61000-4-5 : 2014). -Electrical fast transient/burst immunity (CEI 61000-4-4 : 2012). -Radiated, radio-frequency, electromagnetic field immunity (CEI 61000-4-3 : 2006). -Electrostatic to discharge immunity test (CEI 61000-4-2)	EMC requirements for industrial environments.
EN 61000-6-3	Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments	EMC requirements for residential environments. Conducted emission on LV port : Class B Radiated emission on enclosure[1] : Class A

NF EN 61010-1	Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1 : general requirements	Surge tension of 2.5 kV [2] 1.2/50us (up to 5000m of altitude).
IEC 60664-1	Insulation coordination for equipment within low-voltage supply systems – Part 1: Principles, requirements, and tests	Surge tension of 2.5 kV [2] 1.2/50us (up to 5000m of altitude).

1 : an optional casing can be designed as option by Watt And Well to achieve class B limits
2 : The power unit that supplies HVDC voltage to EVI shall reduce a surge seen in its input to less than 2.5 KV in its output (Cf 11.4.101 of IEC 61851-23:2014)

EVI have been designed to be compatible with the following norms and charging protocols:

Protocol	**Title**	**Topic**
IEC 61851-1: SECC Subset	Electric vehicle conductive charging system – Part 1: General requirements	General requirements for EV charging devices.
IEC 61851-23: SECC Subset	Electric vehicle conductive charging system – Part 23: DC electric vehicle charging station	Requirements for DC EV charging devices.
DIN SPEC 70121	Electromobility - Digital communication between a d.c. EV charging station and an electric vehicle for control of d.c. charging in the Combined Charging System	Specifies the DC specific communication between EV and EVSE.
CHAdeMO 1.2 ed2	CHAdeMO 1.2 ed2	Requirements for CHAdeMO 1.2 compatibility of EVSE.
ISO 15118	Road vehicles -- Vehicle to grid communication interface	Defines vehicle to grid communication interface for bi-directional charging/ discharging of EVSE.

It is the user's responsibility to ensure that EVI is installed and used in compliance with all local country laws and regulations.

7.6 Disposal

(Mandatory application within the European Union)
Do not dispose of electronic tools tighter with household waste material. In accordance with WEEE European Directive (2012/19/UE), Electric material that have reach the end of their life must be collected separately and return to an environmentally compatible recycling facility. Please contact WATT & WELL for any questions about WEEE

7.7 Security Disclaimer

This product is designed to be connected to and to communicate information and data via a network
interface. It is Customer's sole responsibility to provide and continuously ensure a secure connection between the product and Customer network or any other network (as the case may be). Customer shall establish and maintain any appropriate measures (such as but not limited to the installation of firewalls, application of authentication measures, encryption of data, installation of antivirus programs, etc) to protect the product, the network, its system and the interface against any kind of security breaches, unauthorized access, interference, intrusion, leakage and/or theft of data or information.
In particular, the default password should be changed on first use by the Customer.

8 Installation

Do not use or install product in case of visible physical damage.

8.1 Mechanical installation

Refer to section 0 for the dimensions of the product.

8.2 Electrical installation

Never invert polarity of the connectors. Never force to place a connector. Use only approved manufacturer parts for electrical or mechanical connection.
It is strongly recommended to fix the cables to avoid any stress on connection. All high-power connectors must be screwed to avoid any disconnection.
Be careful if other devices are connected, risk of electrical charge transfer.

Wait two minutes before touching the device after complete suppression of input voltage. Check for lack of voltage, on all access, with the correct equipment.

8.3 Protective earth installation

Electrical installation shall comply with the international standards such as IEC or the requirements in national standards of each country.
The protective earth (PE) terminal must be connected to the safety electrical ground before another connection is made. Any interruption of the protective ground conductor, or disconnection of the protective earth terminal will cause a potential shock hazard that might cause personal injury. Protective earth connection is made through mechanical screw fixtures of the board (e.g. stand-offs). Use conductive material and/or ensure that chassis where EVI is installed is grounded to ensure correct connection.

8.4 LV input

An auxiliary LV input must be connected to a 12 or 24 Vdc bus. This input must be protected against short-circuit and over-current. Electrical system around must be selected in accordance with protection rating.
This bus should have minimal characteristics:

- Maximum input overvoltage 33 V (line to line)
- Maximum input overvoltage 33 V (line to PE)

This cable must be shorter than 3m.

9 Maintenance

No Hardware maintenance is required on this product
Early based maintenance packages are recommended to provide software updates, engineering support, SLA, and interoperability tests.
For further details, please contact contact@wattandwell.com

9.1 Cleaning

Do not use cleaning agent.
Dust can be removed with dry air cleaning.

10 Ordering information

10.1 Products References

EVI product:

Ordering Configuration: **EVI-Cx-[Ax][-O][-W][-P]**

Ordering	Configuration
Cx	CCS communication stack included C1: CCS stack with DIN SPEC70121 and 15118-2 C2: CCS stack with DIN SPEC70121, 15118-2 and 15118-20 with BPT

Options

Option	Configuration
Ax	EVIX-AD6-CHA CHAdeMO extension board included A1: CHAdeMO stack without BPT A2: CHAdeMO stack with BPT
O	OCCP stack included
P	Plug & Charge included (requires OCPP option)
W	Wireless communication – WiFi & Bluetooth

Example of possible ordering configuration:

Order code	Configuration
EVI-C1-00	*Basic* version EVI board with CCS charging (without 15118-20)
EVI-C1-A1	*Basic* version with CHAdeMO option EVI board with CCS (without 15118-20) & CHAdeMO charging (without BPT)
EVI-C2-O	*Standard* version EVI board with CCS (including 15118-20 with BPT) & OCPP feature enabled.
EVI-C2-O-P	*PnC* version EVI board with CCS (including 15118-20 with BPT) & OCPP feature enabled & Plug & Charge enabled
EVI-C2-A2-O	*Standard* version with CHAdeMO option EVI board with CCS (including 15118-20), & CHAdeMO (with BPT) charging, & OCPP feature enabled.

For other combinations, please contact us.

EVIX product

Ordering Configuration: EVIX-[…]

Ordering	Configuration
ADx	AD6: 6 addressing ports AD14: 14 addressing ports
IO	Peripheral extension board

10.2 Product accessories

WA043 EVI Connectors kit including: - 1 meter LV port harness (outputs 4mm banana plugs) - 1 meter Emergency Shutdown port harness (outputs free wires) - 1 meter HVDC port harness to free wires (outputs free wires) - CCS port connector (DEGSON 15EDGKNHM-3.5-08P) - CAN bus adaptor from RJ45 to DB9 (WA007)	
WA007 – CAN bus adaptor from RJ45 to DB9 Including: - 120 Ω termination resistance	
WA009 – USB to CAN transceiver (Kvaser) Compatible with MPU Monitor (versions from 2019 onwards)	

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