

UPoB

Universal Power Bridge

User Manual



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Introduction

Intended use

The UPoB is an automotive universal power bridge that protects the connected system, such as a XORAYA data logger, against voltage fluctuations and power failures. The device is able to override the fluctuations for their duration of time. In case of a complete power failure, a minimal voltage level is maintained until the connected system is shut down safely.

The UPoB is designed for industrial areas and must not be used in residential areas.

You may only operate the UPoB within the scope of the technical specifications provided in this user manual. Additionally, the use in hazardous areas is not allowed.

Delivery contents

- UPoB (Universal Power Bridge)
- power cable
- COM breakout cable
- user manual
- USB driver

Check to ensure that the delivery is complete and all hardware components are in sound condition. If the delivery is incomplete or supplied components are damaged, contact X2E immediately. Do not use damaged components.

General safety instructions

The UPoB is only intended for use by qualified personnel. Read the user manual and especially this chapter thoroughly before operating.



CAUTION

Electric shock due to damaged components

Damages to the UPoB or the power cable can result in electric shock.

- ▶ Check all components regularly for damages.
- ▶ Only connect the UPoB if all components are undamaged.



CAUTION

Device damage due to vibrations, dirt or liquids

Excessive vibrations, dirt or liquids may result in malfunction or destruction of the UPoB.

- ▶ Avoid exposing the UPoB to excessive vibrations, dirt or liquids.
- ▶ Keep the UPoB clean, especially plugs and sockets to ensure a reliable contact.
- ▶ Never open the UPoB.



CAUTION

Device damage due to electrostatic discharge

Electronic components can be destroyed by electrostatic discharge.

- ▶ Avoid touching connectors and connector pins.
 - ▶ Ground yourself before carrying the UPoB in your hands.
 - ▶ Operate the UPoB in an ESD-compliant environment.
-

Product overview

Identification

The identification plate and the buffer capacity label are located on the bottom side of the UPoB.



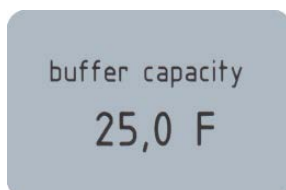
The identification plate contains information about:

- device type
- serial number
- configuration
- date of manufacture / last modification

Configuration consists of three blocks:

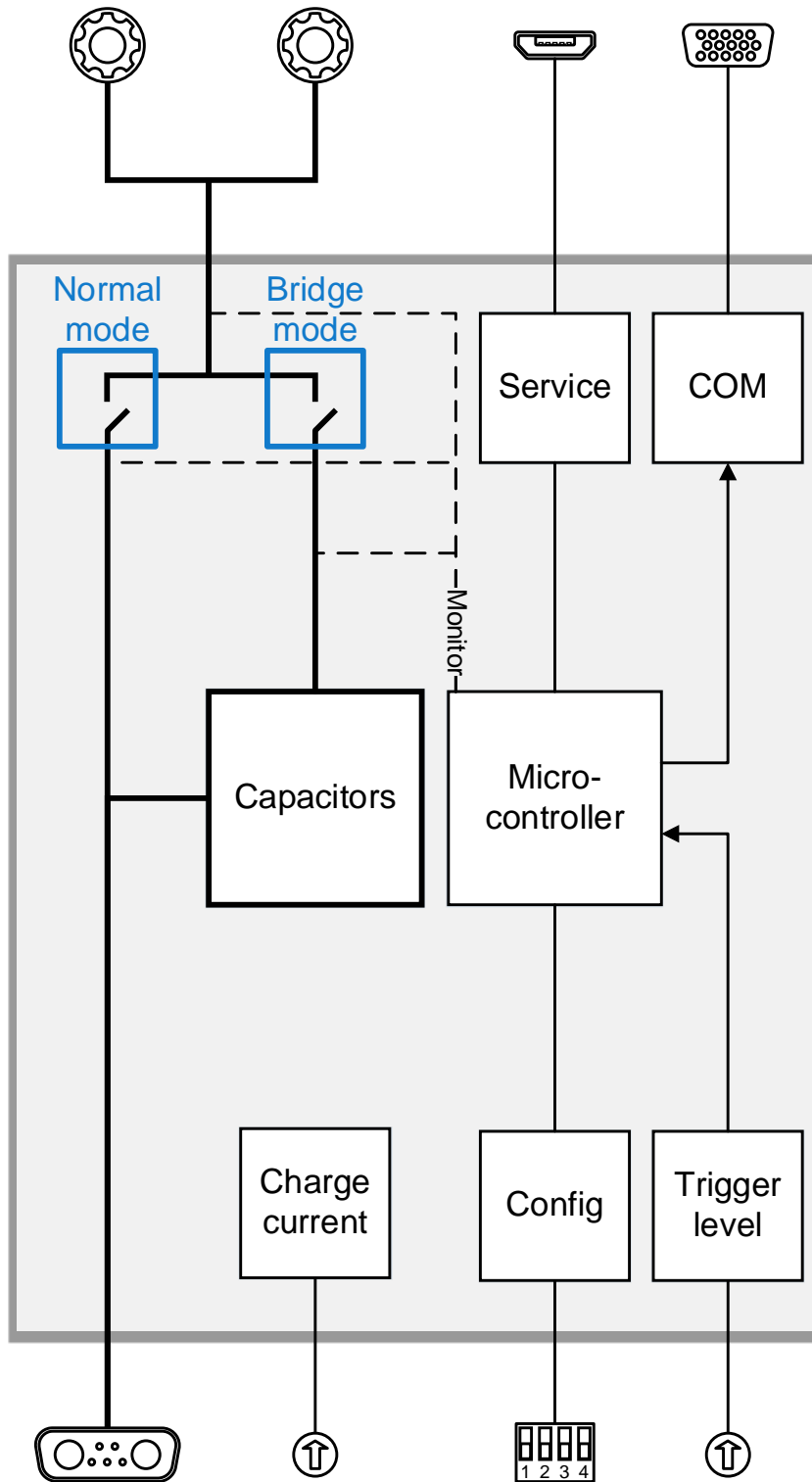
- product ID
- product variant
- hardware revision

This user manual applies to the Universal Power Bridge in hardware version 0302 and firmware version 000307.



This label indicates the total capacitance of the integrated capacitors.

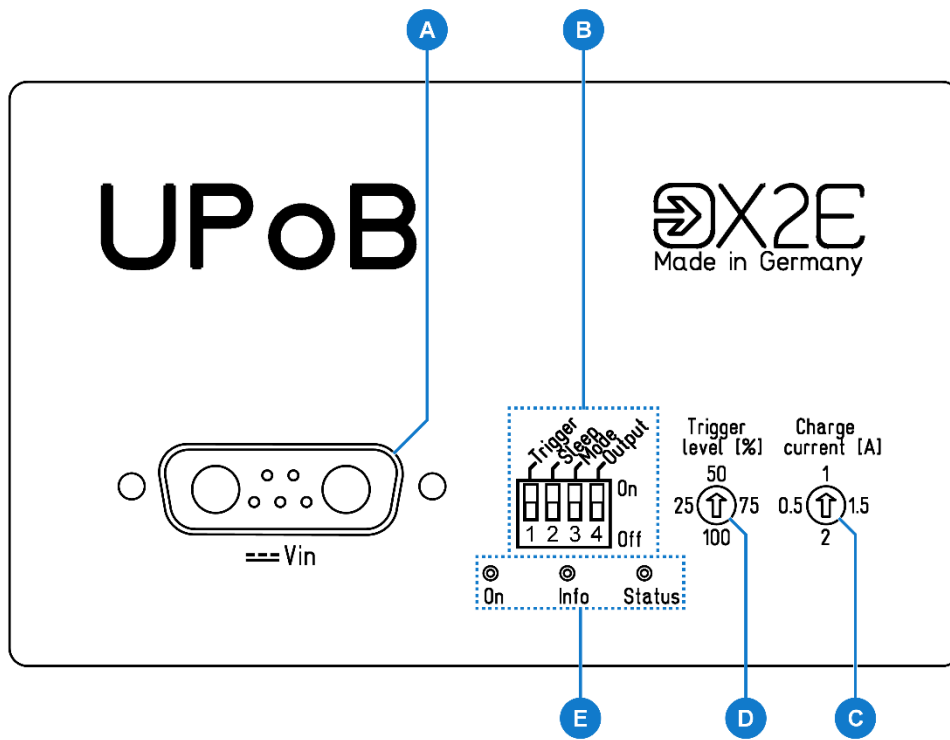
Block diagram



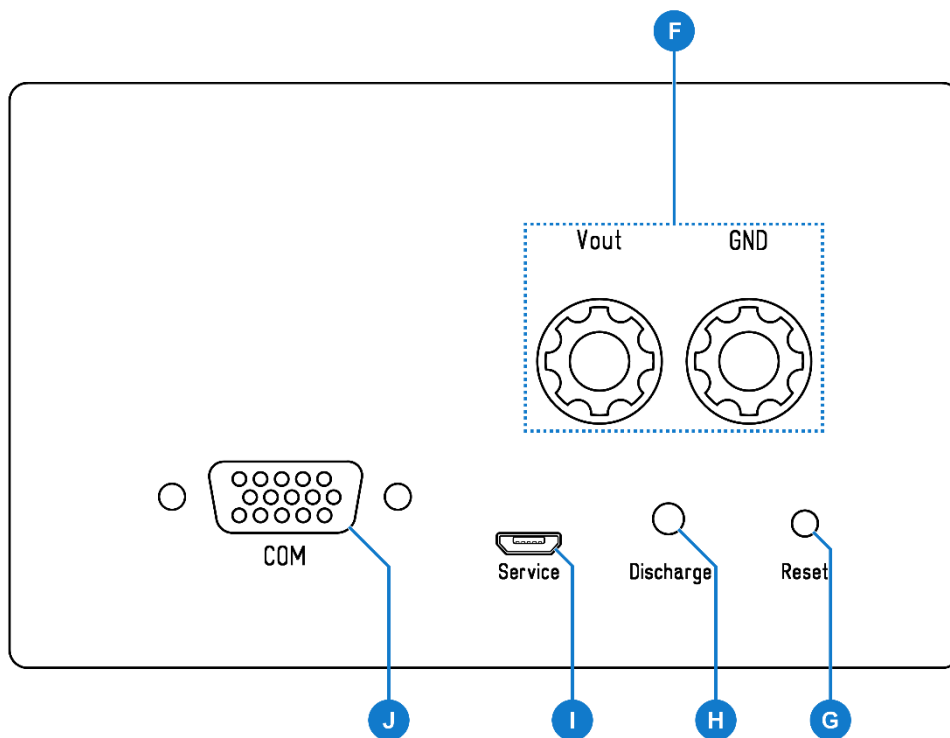
Acoustic signals on mode change

The UPoB indicates changes between normal mode and bridge mode by acoustic signals.

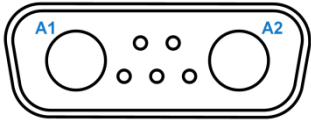
Connections and controls



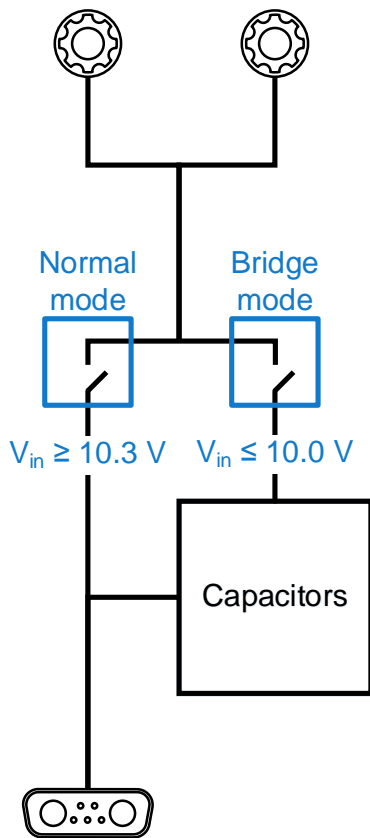
Front view



Back view

V_{in} (A)

| Pin | Function |
|-----|----------|
| A1 | KL31 |
| A2 | KL30 |



Switching on/off threshold

$V_{in} \geq 10.9$ V: UPoB switches on

$V_{in} \leq 10.0$ V: UPoB switches off (if capacitors completely discharged)

Charging threshold

$V_{in} \geq 11.3$ V: capacitors charging

$V_{in} \leq 11.0$ V: capacitors stop charging

The capacitors get their maximum charging voltage of 10.0 V if the input voltage is 12.0 V or higher.

Mode-changing thresholds

$V_{in} \leq 10.0$ V: UPoB switches into bridge mode

$V_{in} \geq 10.3$ V: UPoB switches back into normal mode

(All values stated here apply to 0 A output load current. Please refer to the appendix for thresholds of further currents.)

Configuration (B)

| Switch | Function when <i>On</i> |
|-------------|---|
| Trigger (1) | sends trigger signal if the capacitance drops below the configured trigger level (D) |
| Sleep (2) | UPoB switches into sleep mode, where it does not send via CAN and RS232, if: <ul style="list-style-type: none"> ▪ the output load current drops below approx. 70 mA UPoB wakes up if: <ul style="list-style-type: none"> ▪ (Mode is <i>On</i>) the output load current rises above approx. 80 mA ▪ (Mode is <i>Off</i>) the input voltage rises above 10.9 V |
| Mode (3) | mirrors the state of the input voltage at the output deactivates the voltage output if: <ul style="list-style-type: none"> ▪ the input voltage drops below 10.0 V activates the voltage output if: <ul style="list-style-type: none"> ▪ the input voltage rises above 10.9 V |
| Output (4) | voltage output (F) activated |

(All values stated here apply to 0 A output load current. Please refer to the appendix for thresholds of further currents.)

**Impact of the output switch on other modes**

In order for the sleep and mode switches to work as described, the output switch needs to be *On*. Otherwise, the UPoB cannot be woken up from sleep mode if the mode switch is *On*, for example.

Charge current (C)

The charge current is included in the maximum input current of the UPoB.

| Position | Charge current |
|----------|----------------|
| left | 0.5 A |
| up | 1 A |
| right | 1.5 A |
| down | 2 A |

Trigger level (D)

If the trigger switch **(1)** is *On* and the remaining capacitance drops below the configured level, the UPoB sends a trigger signal.

A trigger signal consists of:

- an RS232 command to shut down a connected XORAYA data logger safely; the data logger cannot be woken up by bus activity anymore
- an impulse on the 5 V digital output for 100 ms
- closing the relay output for 100 ms
- illuminating the Info-LED for 100 ms
- an acoustic signal

| Position | Trigger level |
|----------|-----------------|
| left | charge at 25 % |
| up | charge at 50 % |
| right | charge at 75 % |
| down | charge at 100 % |

LEDs (E)

| LED | Colour | Meaning |
|---------------|---------------------|--|
| On | yellow | input voltage invalid or no input voltage |
| | green | input voltage valid |
| | (off) | no input voltage and capacitors discharged |
| Info | yellow (blinking) | discharge button (H) pressed |
| | green (1x blinking) | trigger signal sent |
| Status | yellow | capacitors discharging, charge higher than trigger level |
| | yellow (blinking) | capacitors discharging, charge lower than trigger level |
| | green | capacitors completely charged |
| | green (blinking) | capacitors not charging and not discharging, charge higher than 5 % and lower than 98 % |
| | blue | capacitors charging, charge higher than trigger level |
| | blue (blinking) | capacitors charging, charge lower than trigger level |
| | (off) | capacitors not charging and not discharging, charge lower than 5 % |
| (all) | red | overcurrent |

V_{out} and GND (F)

Bridge mode:

$$V_{out} = 12 \text{ V}$$

Normal mode:

$$V_{out} \approx V_{in} - V_{drop}$$

V_{drop} depends on the output load current (max. 500 mV at 5 A)

**Overcurrent protection**

The UPoB is equipped with overcurrent protection that reacts within 500 ms if the output load current rises above 5 A.

Reset (G)

This button covers the following functions:

- restart the UPoB
- acknowledge overcurrent event and reactivate voltage output
- if connected via service interface (**I**), switch the UPoB into bootloader mode to perform a firmware update (further information in the corresponding chapter)



CAUTION

Device damage due to sudden voltage drop

Pressing the reset button deactivates the voltage output for a short period of time. The connected system can be damaged or destroyed due to the sudden voltage drop.

- ▶ Shut the connected system down safely before pressing the reset button.

Discharge (H)

This button discharges the capacitors. The Status-LED indicates the current status of the discharging process.



Discharge restriction

The discharge button is deactivated in sleep mode and when input voltage or output current is present. An already started discharge process stops when input voltage or output current is registered.



CAUTION

Device damage due to overheating

Discharging at high ambient temperatures can destroy the UPoB.

- ▶ Press the discharge button only at room temperature.
-

Service (I)

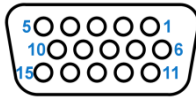
Use the Micro USB interface to update the firmware. For further information, refer to the corresponding chapter of this user manual.

The pin assignments conform to the USB standard.

COM (J)

The COM interface consists of:

- an RS232 interface to communicate with a XORAYA data logger
- a CAN interface to send status messages
- a 5 V digital output
- a relay output with opener, closer and voltage input



| Pin | Function |
|-----|---------------|
| 2 | COM_RS232_RXD |
| 4 | RELAIS_CLOSER |
| 5 | RELAIS_OPENER |
| 6 | STATUSCAN3_P |
| 7 | COM_RS232_TXD |
| 9 | 5V_DIGITAL_IO |
| 11 | STATUSCAN3_N |
| 13 | RS232_GNDIN |
| 15 | RELAIS_VCCIN |

Installation

Mounting

**CAUTION****Device damage due to overheating**

Overheating may result in malfunction or destruction of the UPoB.

- ▶ Do not operate the UPoB outside the specified temperature range.
 - ▶ Do not operate the UPoB in the vicinity of heat sources.
 - ▶ Ensure adequate air circulation.
 - ▶ Do not cover the UPoB with other objects.
-

- ▶ Mount the UPoB in such a way that it does not pose a hazard at any time.

Connecting

**DANGER****Electric shock due to improper connection**

Introducing the 4-mm plugs of the supplied power cable into low-voltage sockets can be fatal.

- ▶ Never introduce the 4-mm plug into low-voltage sockets.
-

**CAUTION****Device damage due to wrong power supply**

A wrong power supply can result in damage or destruction of the UPoB.

- ▶ Only connect the UPoB to power supplies that correspond to the technical specifications.
 - ▶ Pay attention to the correct polarity when connecting.
-

**Disconnect service interface during standard operating mode**

Make sure that the service interface (**I**) is disconnected in standard operating mode. Pull the plug if necessary and connect it again before updating the firmware.

COM interface

- ▶ Connect the COM breakout cable to COM **(J)**.
- ▶ Connect the desired connectors of the COM breakout cable to the corresponding devices.
- ▶ Tighten all connector screws.

Voltage output

- ▶ Connect V_{out} and GND **(F)** to the connected system, such as a XORAYA data logger.

Voltage input**Requirements for the DC power supply**

A 12 V DC power supply must provide a current of 6 A.

This applies to a charge current of 0.5 A. For a higher charge current, a more powerful power supply is required.

- ▶ Connect the power cable to V_{in} **(A)**.
- ▶ Tighten the connector screws.
- ▶ Connect the black connector of the power cable to 0 V or ground.
- ▶ Connect the red connector of the power cable to a DC power supply in the specified range.
- ▶ Turn on the power supply.

The UPoB indicates its readiness by illuminating the On-LED.

Firmware update

Firmware updates provide bug fixes and new features for the UPoB. For this, you need a PC which meets the following requirements.

Supported operating systems:

- Microsoft® Windows® 7/8/10 (32 Bit or 64 Bit)

Hardware requirements:

- Processor speed: at least 1 GHz
- RAM: at least 1 GB

Execute the firmware update

- ▶ Connect the UPoB to the power supply (see chapter *Connecting*).
- ▶ Turn on the power supply.
- ▶ Make sure the correct USB driver is installed.
- ▶ Connect the UPoB via service interface **(I)** to your PC.
- ▶ Press the reset button **(G)** on the UPoB.
- ▶ Navigate to the folder where the firmware archive is located.
- ▶ Unzip the archive.
- ▶ Execute the file *firmware_update_upob.bat*.

```
*****
***                               X2E GmbH UPoB Update Tool                               ***
*****
*** Needed steps for correct firmware update: ***
*** 1. Make sure you have installed the USB-Driver. ***
*** 2. Connect your UPoB device with your computer over an USB-Cable. ***
*** 3. Push the reset button on your UPoB device to enter update mode. ***
*** 4. Start "firmware_update_upob.bat" script from terminal. ***
*** 5. Follow the instructions. ***
*** 6. AFTER successful firmware update remove your UPoB from USB cable *
*** 7. Press reset on your UPoB device to leave update mode ***
*** 8. UPoB is now updated and again ready for usage ***
*****
*** Press any key to continue or Ctrl+C to abort.
Press any key to continue . . . _
```

- ▶ Follow the instructions on the screen.

Cleaning

**CAUTION****Device damage due to entering liquids**

Entering liquids may result in malfunction or destruction of the UPoB.

- ▶ Disconnect the UPoB from the power supply before cleaning.
 - ▶ Make sure that no liquids enter the UPoB.
-

- ▶ Clean the UPoB with a damp, soft cloth as needed.

Repair

**CAUTION****Device damage from opening the device**

Unauthorised opening may result in malfunction or destruction of the UPoB.

- ▶ Never open the UPoB.
 - ▶ Maintenance and repair must be carried out by X2E personnel only.
-

- ▶ In case of malfunctions or damages, please contact X2E via e-mail to get information about returning the UPoB: xoraya-return@x2e.de

Disposal



Within the European Union, the disposal of electrical devices is determined by national rules that are based on the directive 2012/19/EU of the European Parliament and of the Council on waste electrical and electronic equipment (WEEE). Accordingly, electrical and electronic equipment may not be disposed of in household waste.

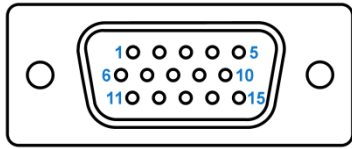
Outside the European Union, please contact your local authority so as to comply with the correct method of disposal for electrical devices.

Appendix

Technical specifications

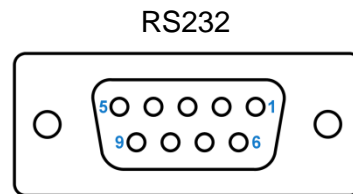
| General | |
|-------------------------------|---|
| Dimensions (H x W x D) | 64.4 mm x 105 mm x 164 mm |
| Input voltage | max. 28 V |
| | bridge mode: max. 10.0 V |
| | normal mode: min. 10.3 V |
| Output voltage | bridge mode: max. 11.9 V |
| | normal mode: max. $V_{in} - 0.8$ V (at room temperature) |
| Output load current | max. 4.8 A |
| Idle current | max. 200 mA |
| Quiescent current | max. 2 mA |
| DC voltage protection | max. 40 V |
| Temperature range | -40 °C to +85 °C |
| RS232 | |
| Baud rate | 115,2 kbit/s |
| Data bits | 8 |
| Parity bit | no |
| Stop bits | 1 |
| CAN | |
| Baud rate | 500 kbit/s |
| Termination | 120 Ω |
| 5 V digital output | |
| Drive current | max. 100 mA |
| Relay output | |
| Voltage input | 5 V to 48 V |
| Opener | 5 V to 48 V, 100 mA |
| Closer | 5 V to 48 V, 100 mA |

COM breakout cable

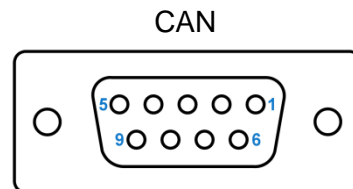


| Pin | Function |
|-----|-----------------|
| 2 | COM_RS232_RXD |
| 4 | RELAIS_CLOSER |
| 5 | RELAIS_OPENER |
| 6 | STATUS_CAN_ST_P |
| 7 | COM_RS232_TXD |
| 9 | 5V_DIGITAL_IO |
| 11 | STATUS_CAN_ST_N |
| 13 | RS232_GNDIN |
| 15 | RELAIS_VCCIN |

| Pin | Function |
|-----|---------------|
| 2 | COM_RS232_RXD |
| 3 | COM_RS232_TXD |
| 5 | RS232_GNDIN |

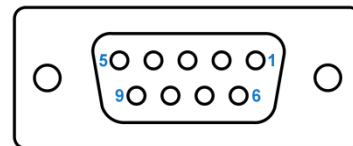


| Pin | Function |
|-----|-----------------|
| 2 | STATUS_CAN_ST_N |
| 7 | STATUS_CAN_ST_P |



| Pin | Function |
|-----|---------------|
| 2 | RS232_GNDIN |
| 7 | 5V_DIGITAL_IO |

5 V digital output (Digital_IO)



| Colour | Function |
|--------|---------------|
| red | RELAIS_VCCIN |
| yellow | RELAIS_OPENER |
| green | RELAIS_CLOSER |

Relay output



Discharge times

The following values apply to a UPoB with 12.5 F capacitance and 12 V input voltage.



Accuracy of values

Because the stated times are determined empirically, the values might deviate under certain circumstances.

| Output load | Bridging time |
|--|---------------|
| XORAYA Minilogger V5 Advanced (≈ 0.7 A) | 37 s |
| XORAYA V5+ C20 (≈ 0.9 A) | 28 s |
| XORAYA Minilogger Z7 R8C4Ge2 (≈ 1 A) | 26 s |
| XORAYA V5 C20L4B12FAS (≈ 1.6 A) | 16 s |
| 1 A | 26 s |
| 2 A | 13 s |
| 3 A | 9 s |
| 4 A | 6 s |
| 4.8 A | 6 s |

| Output load | Trigger time | | | |
|--|--------------|------|------|------|
| | 100 % | 75 % | 50 % | 25 % |
| XORAYA Minilogger V5 Advanced (≈ 0.7 A) | 1 s | 9 s | 18 s | 27 s |
| XORAYA V5+ C20 (≈ 0.9 A) | 1 s | 7 s | 14 s | 21 s |
| XORAYA Minilogger Z7 R8C4Ge2 (≈ 1 A) | 1 s | 6 s | 13 s | 19 s |
| XORAYA V5 C20L4B12FAS (≈ 1.6 A) | 1 s | 4 s | 8 s | 12 s |
| 1 A | 1 s | 6 s | 13 s | 19 s |
| 2 A | 1 s | 3 s | 6 s | 9 s |
| 3 A | 1 s | 2 s | 4 s | 6 s |
| 4 A | 1 s | 1 s | 3 s | 4 s |
| 4.8 A | 1 s | 1 s | 3 s | 4 s |

Thresholds

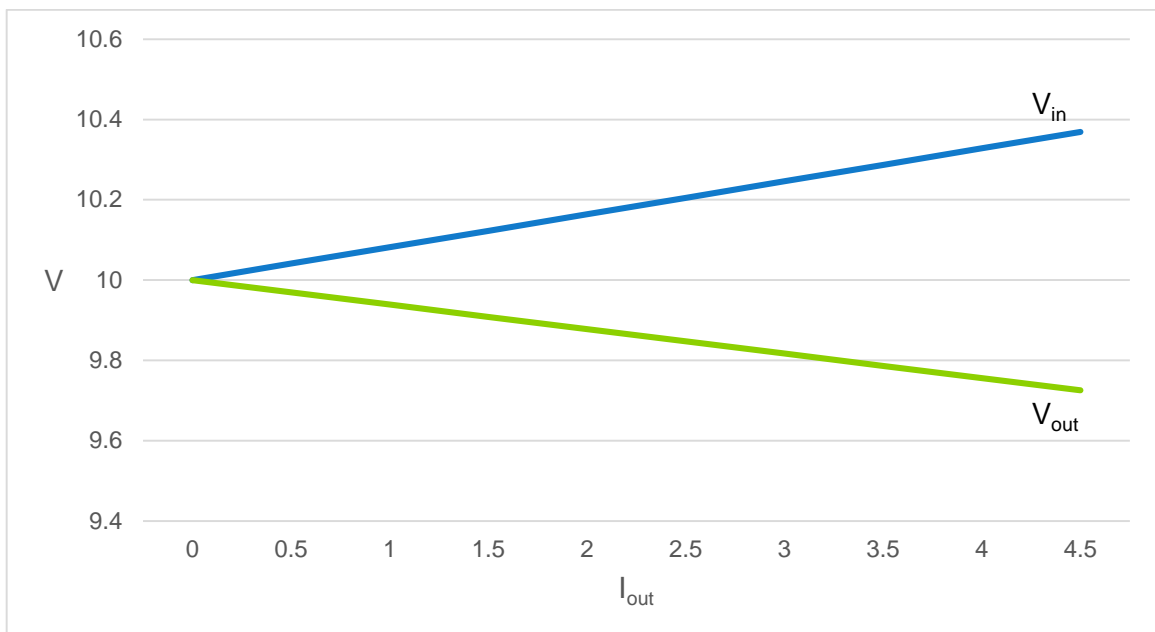
The following graphs show the different thresholds, each dependent on the output load current I_{out} .



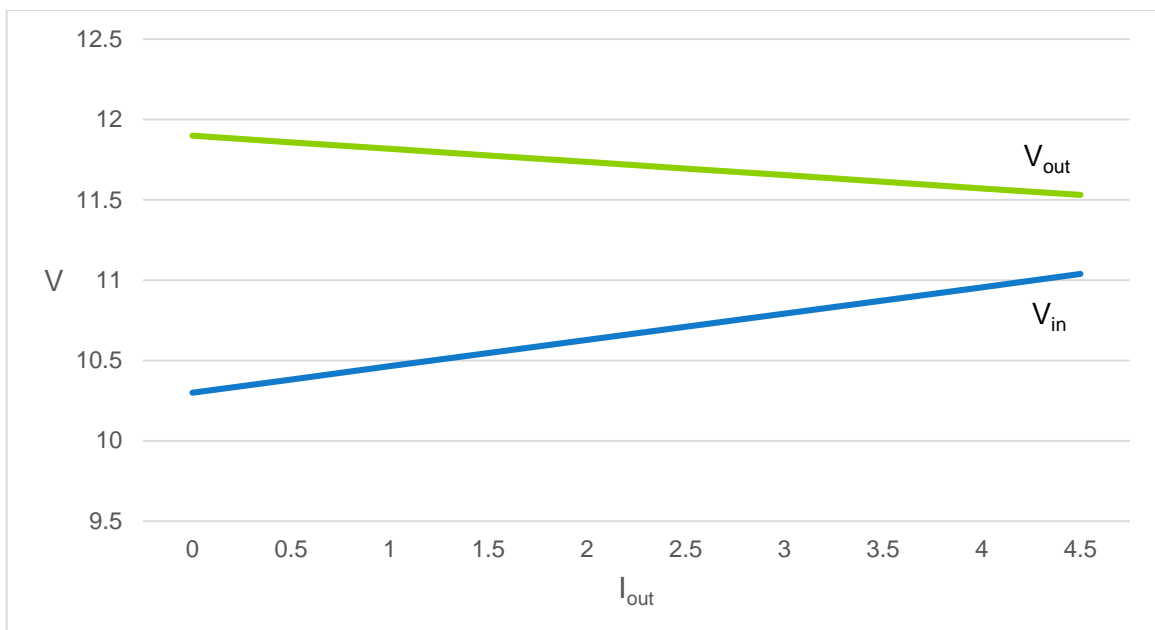
Accuracy of values

Because the stated voltages are determined empirically, the values might deviate under certain circumstances.

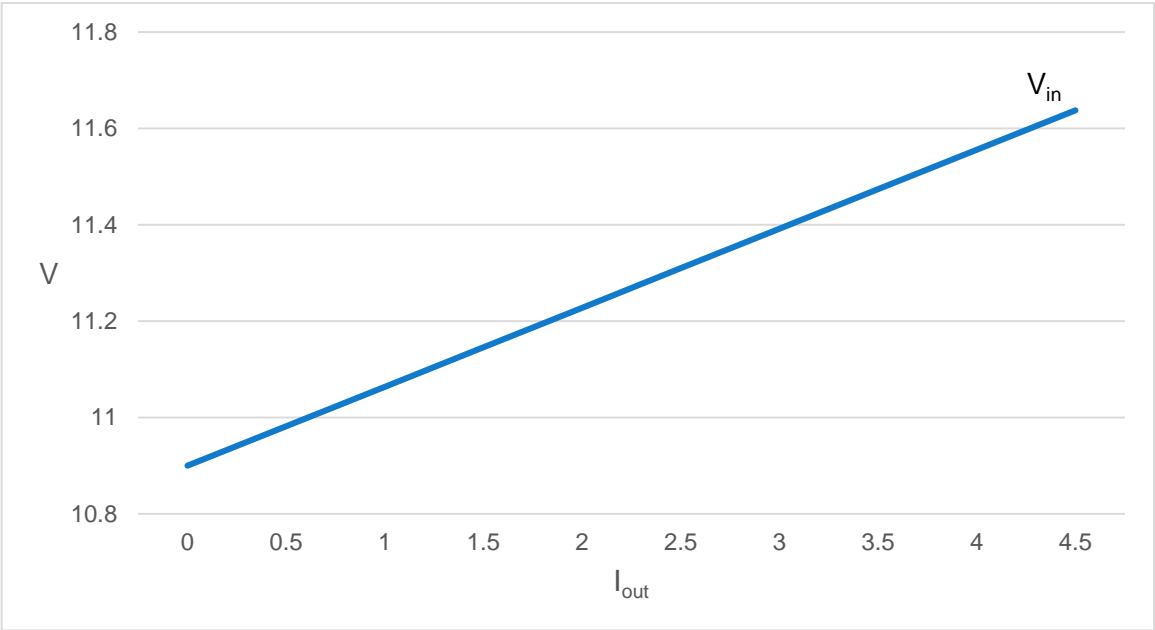
Normal mode to bridge mode:



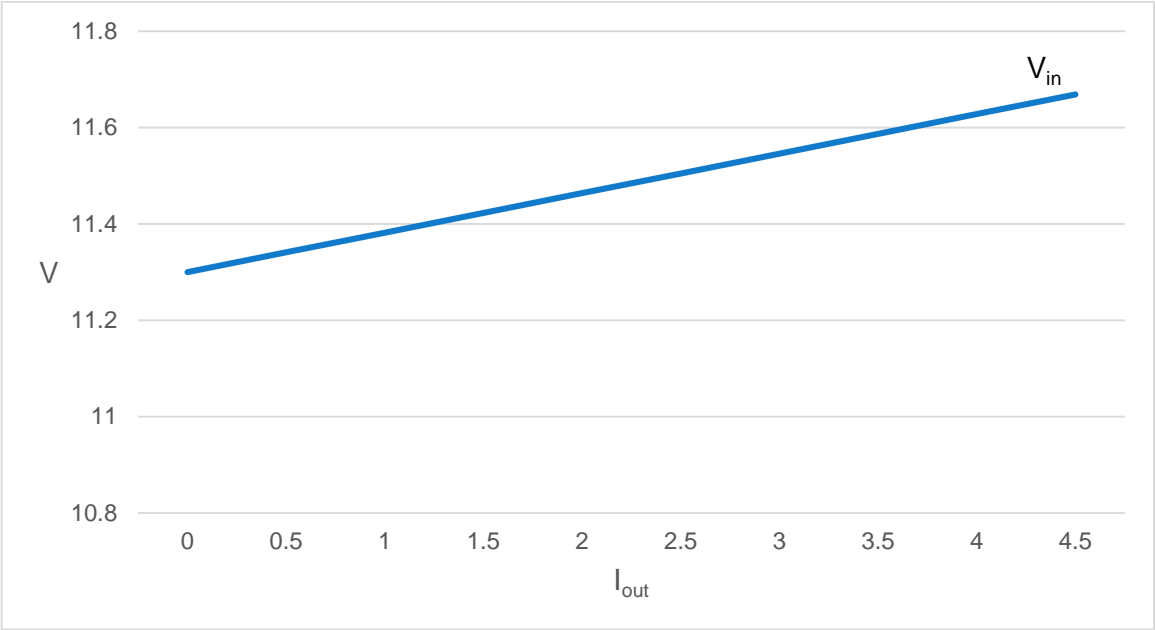
Bridge mode to normal mode:



Switch-on threshold:



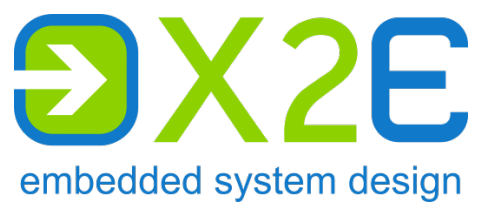
Charging threshold:



Status messages

The COM interface (**J**) sends the following CAN status messages cyclically.

| CAN ID | Content |
|--------|---|
| 0x120 | internal states (for example DIP switch positions) |
| 0x121 | output load current, output voltage, output power, input voltage |
| 0x122 | capacitor voltage, capacitor current, capacitor power, charge level |
| 0x123 | firmware version, hardware version, serial number |
| 0x124 | product ID, product variant, mount variant |



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