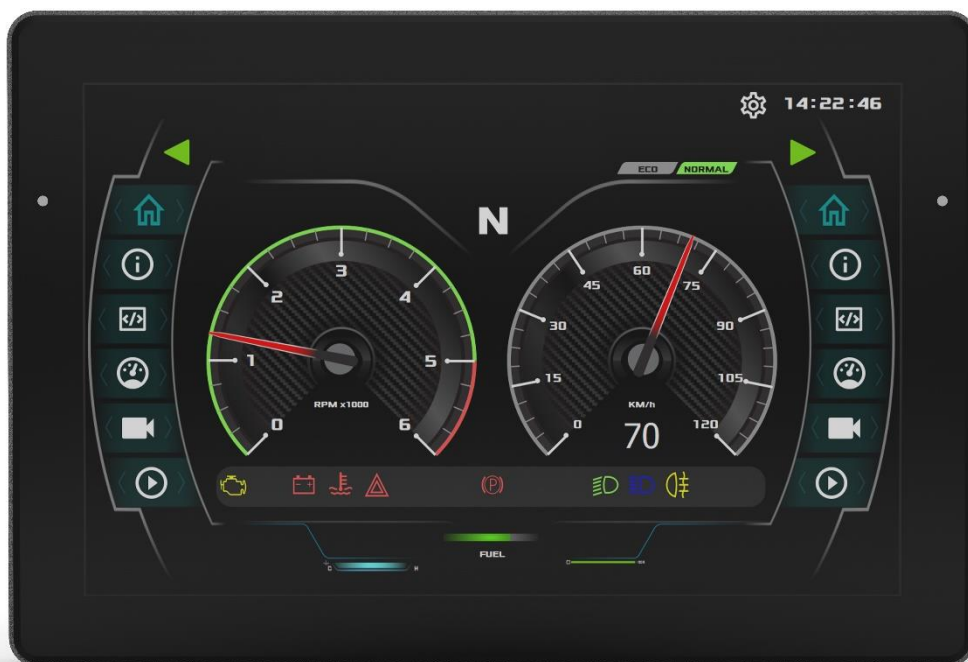


# Technical Data Sheet

## OPUS B6 ECO Full



## 1 Notes and Warnings

### Attention!

This description is not a substitution for the concerned product's documentation. Please do read the documentation including the manuals carefully before dealing with this product. If the safety instructions in the documentation are not followed dangerous situation can occur that can result in damages, injuries and/or death by high voltage or wrong handling. In case you do not have the correct documentation, you can order it by contacting **opus-support@topcon.com**. Only properly trained personnel with the correct qualification is allowed to handle the device.

### Attention!

Do not open the housing to avoid danger to high voltage. Before touching the electric assemblies make sure that the electricity is switched off completely. If the front panel is broken the device needs to be taken out of service due to risk of injury. If perceivable damages on the device exist that can compromise the functionality, it must be taken out of service due to the danger of malfunctions. These particularly include damages to the LCD display, damages to the keyboard, damages that compromise the protection level and damages to the encoder knobs.

### Please note:

All content is subject to change without notice. Errors and omissions excepted.

### Mounting and Handling

- Do not use the cable as a handle to carry the device.
- Mounting in clean working environment only.
- Do not mount the device under the use of violence because it can cause damage.
- The device must be mounted by trained personnel only into especially designed and tested system.
- The device may not be opened or disassembled.
- The device is to be cleaned with a moist fuzz free cotton cloth. If necessary, a mild cleaning agent may be used. Do not use acid or abrasive cleaning agents.
- The device is to be stored in a cool and dry environment and to be protected against sunshine.
- If the environmental temperature is beneath 10°C the reaction time of the display increases.

## 2 General Information

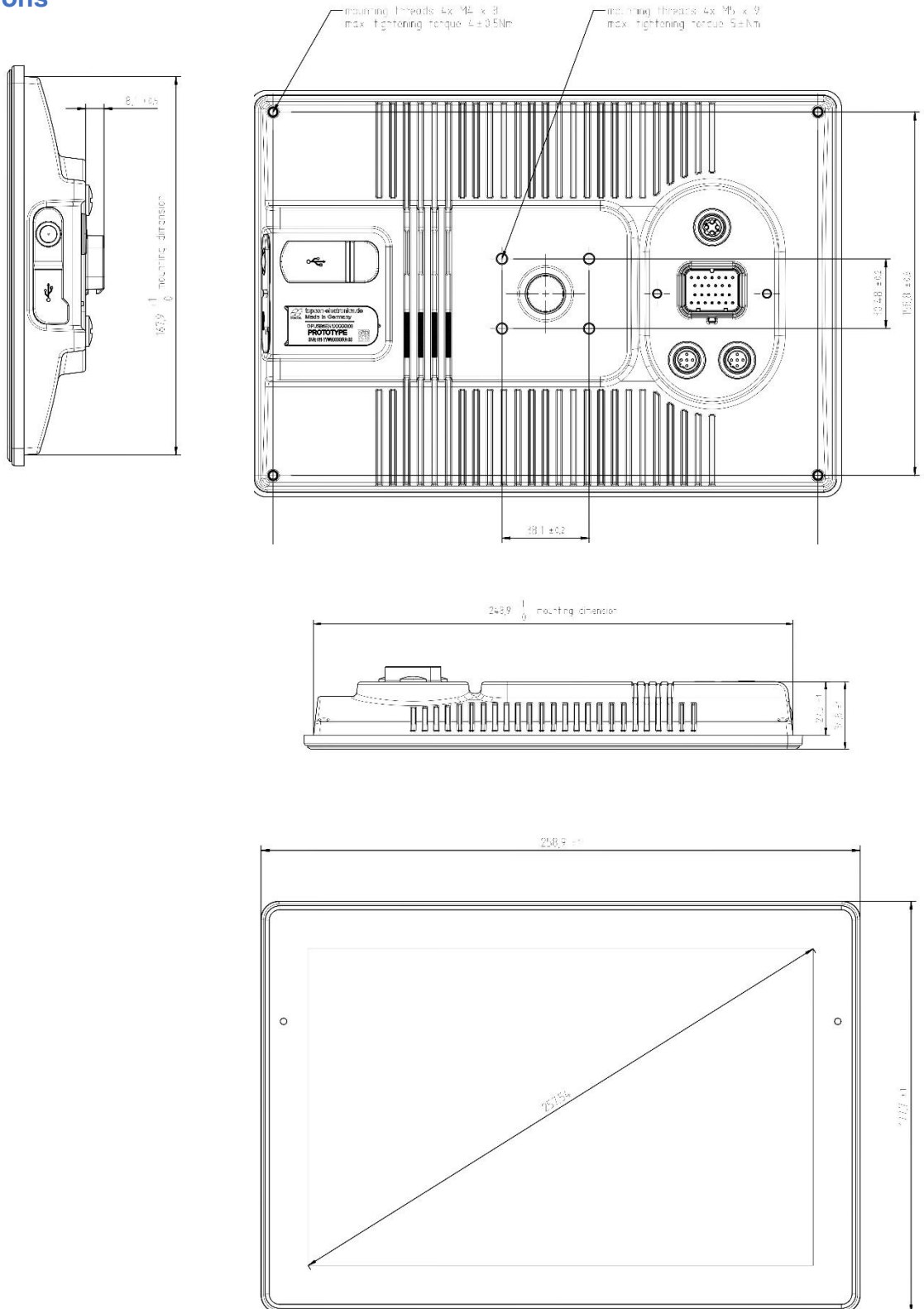
### Order numbers

This documentation is valid for **OPUS B6** order numbers as follows:

|                       | OPUSB6EN1CANF000<br>OPUSB6EN1CANA000 | OPUSB6EN1CDSF000<br>OPUSB6EN1CDSA000 | OPUSB6EN1UTSF000<br>OPUSB6EN1UTSA000 | OPUSB6EN1UTMF000<br>OPUSB6EN1UTMA000 | OPUSB6EN1UTLF000<br>OPUSB6EN1UTLA000 |
|-----------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
| <b>OPUS Projektor</b> | •                                    |                                      |                                      |                                      |                                      |
| <b>CODESYS®</b>       |                                      | •                                    |                                      |                                      |                                      |
| <b>ISO-Horizon</b>    |                                      |                                      | •                                    | •                                    | •                                    |

The neutral version (**N**) will substitute the portrait (**P**) and landscape (**L**) versions.

## Dimensions



## Housing

Aluminium die cast  
 Powder coated

## Mounting

- Landscape or portrait
- Standalone
- In-dash

### 3 Display

|             |  |                 |                             |
|-------------|--|-----------------|-----------------------------|
| Type:       | TFT Color Graphic LCD with LED backlight | Colors:         | 16.7 Mio.                   |
| Size:       | 10,1", 259 mm (W) x 175 mm (H)           | Brightness:     | typ. 1000 cd/m <sup>2</sup> |
| Resolution: | 1280 x 800 px (WQVGA), 15:9              | Contrast Ratio: | typ. 800:1                  |

### 4 Input Devices

Touch Capacitive Touch

Indicators and Sensors Light sensor  
1 Multicolor LED

### 5 Electronics

#### Processor platform

CPU: Freescale I.MX6®, Quad, 1000 MHz  
Mass storage: 8 GByte (minus space for OS & application)  
RAM: 2 GByte  
RTC: Buffered by gold cap  
Buffered for 2 weeks at Tambien  
Deviation max. 1 s/day

Speaker Up to 90 dB @ 10 cm distance  
(max. @ ~8kHz)

Audio 1 x Audio output (left, right, GND)  
AC97 compatible  
Output power: approx. 50mW

#### Silent Wake-Input

Input which can be used for Silent-Wake-On of the OPUS to reduce visible boot-time  
Active on positive edge

#### Current consumption (without external load), max

| Power Mode | Current at 13,5 V DC | Current At 27 V |
|------------|----------------------|-----------------|
| On         | TBD                  | TBD             |
| Low-power  | TBD                  | TBD             |
| Sleep      | TBD                  | TBD             |
| Off        | TBD                  | TBD             |

## Power supply

System supplied through terminal 30 (battery +, see pinout) and 31 (battery -, see pinout).  
Terminal 15 (ignition) to be used to switch on/off.  
Operating voltage range: 8 ... 36 V DC.  
Short circuit protection.  
Over-voltage protection up to 48 V for max. 5 min.  
Inverse polarity protection up to -48 V DC for max. 5 min.

## 6 Interfaces

### CAN Bus

4 x CAN-Interface according to ISO 11898,  
CAN-specification 2.0 B active, up to 1 Mbit/s  
(default 250 Kbit/s, possible 10Kbit/s, 20Kbit/s,  
50Kbit/s, 83.3Kbit/s, 111.1Kbit/s, 250Kbit/s,  
500Kbit/s, 800Kbit/s, 1 Mbit/s)

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### RS232

1 x RS232-Interface  
Type: EIA232 (only RXD, TXD, GND)  
Speed: max. 115.200 Kbps

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### USB

Host 2.0  
Side connector: 1 x Type A High speed  
Guaranteed 900 mA @ 5V  
Back connector: 1 x Type A High speed  
Guaranteed 900 mA @ 5V

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### Wireless-Interface

Via the USB Back connector, a wireless interface can  
be optional added.  
E.g. LM816 for WIFI

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### Ethernet-Interface

1 x 10/100 Mbit/s Base T

Alternative:  
1 x Automotive Ethernet Interface

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### Video-Interface

2 x analog video input, 1Vss  
Camera control output (open drain) for special  
functionality (mirror, shutter, heating etc.)  
Camera supply output guaranteed 300mA @ 12VDC

## 7 Connectors

### Connectors

|             |   |
|-------------|---|
| <b>Main</b> | Tyco-AMP 6437288-6                                      |
|             | Mating connector (customer)<br>Tyco-AMP 3-1437290-7     |
|             | Mating crimp contact (customer)<br>Tyco-AMP 3-1447221-4 |
|             | Dummy Plug (customer)<br>Tyco-AMP 4-1437284-3           |

OPUS displays in the industrial sector are only intended to use with cable length less than 30 meters.

|                           |  |
|---------------------------|--|
| <b>Video-Connector</b>    | M12 round connector, female, 5-pole,<br>B-coded acc. to EN 61076-2-101 |
| <b>Ethernet-Connector</b> | M12 round connector, female, 4-pole,<br>D-coded acc. to EN 61076-2-101 |

## 8 Software

|                         |                               |
|-------------------------|-------------------------------|
| <b>Operating System</b> | Linux Kernel 4.14.0 or higher |
|-------------------------|-------------------------------|

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|                                |   |
|--------------------------------|---|
| <b>Application Programming</b> | <ul style="list-style-type: none"><li>• OPUS Projektor</li><li>• COESYS 3.x</li><li>• C/C++</li><li>• ISO-Horizon</li></ul> |
|--------------------------------|---|

## 9 Testing and Verification

### CE-Compliance

EU Directive 2014/30/EU (EMC) according to

- EN 13309: Construction machinery – Electromagnetic compatibility of machines with internal electrical power supply
- EN ISO 14982: Agricultural and forestry machinery – Electromagnetic compatibility – Test methods and acceptance criteria
- EN 50498: Electromagnetic compatibility (EMC). Product family standard for aftermarket electronic equipment in vehicles.
- EN 61000-6-2: Electromagnetic compatibility (EMC). Generic standards – Immunity for industrial environment
- EN 61000-6-4: Electromagnetic compatibility (EMC). Generic standards – Emission standard for industrial environment.

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### EMC Emission radiated

|               |                                    |
|---------------|------------------------------------|
| 30-75 MHz     | 62-521dB( $\mu$ V/m) – QP – 120kHz |
|               | 52-421dB( $\mu$ V/m) – AV – 120kHz |
| 75-400 MHz    | 52-632dB( $\mu$ V/m) – QP – 120kHz |
|               | 42-532dB( $\mu$ V/m) – AV – 120kHz |
| 400-1000 MHz  | 63dB( $\mu$ V/m) – QP – 120kHz     |
|               | 53dB( $\mu$ V/m) – AV – 120kHz     |
| 1000-2500 MHz | 73dB( $\mu$ V/m) – P – 120kHz      |
|               | 53dB( $\mu$ V/m) – AV – 120kHz     |
| 2500-6000 MHz | 80dB( $\mu$ V/m) – P – 1000kHz     |
|               | 60dB( $\mu$ V/m) – AV – 1000kHz    |

QP: Quasi-Peak

AV: Average

P: Peak

1: Value decreases linearly with the logarithm of the frequency.

2: Value increases linearly with the logarithm of the frequency.

### EMC Immunity radiated

20MHz to 800MHz with amplitude modulation 800MHz to 6GHz with pulse modulation.

30V/m for the radiated field (absorber lined chamber) testing method (ISO 11452-2) in vertical and horizontal polarization.

OR/AND

60mA for the Bulk Current Injection (BCI) testing method (ISO 11452-4)

**EMC Emission conducted**

|                    | <b>12V-System</b> (Maximum values)  | <b>24V-System</b> (Maximum values) |
|--------------------|-------------------------------------|------------------------------------|
|                    | Positive slow pulses: +37V          | Positive slow pulses: +37V         |
|                    | Negative slow pulses: -75V          | Negative slow pulses: -150V        |
|                    | Positive fast pulses: +75V          | Positive fast pulses: +150V        |
|                    | Negative fast pulses: -112V         | Negative fast pulses: -150V        |
|                    | <b>12 V-System</b>                  | <b>24 V- System</b>                |
| Test Pulse 1       | Us = 112 V; FS: C                   | Us=-450V; FS: C                    |
| Test Pulse 2a      | Us=+55V; FS: B                      | Us=+55V; FS: B                     |
| Test Pulse 2b      | Us=+10V; FS: C                      | Us=+20V; FS: C                     |
| Test Pulse 3a      | Us=-165V; FS: A                     | Us=-220V; FS: A                    |
| Test Pulse 3b      | Us=+112V; FS: A                     | Us=+220V; FS: A                    |
| Test Pulse 4       | Us <sub>6</sub> =6V; Us=6.5 V FS: B | Us <sub>6</sub> =6V; Us=10V FS: B  |
| (Starting profile) |                                     |                                    |
| Load Dump          | Us=+79V; FS: C                      | Us=+151V; FS: C                    |

FS: Function Status

**Electrostatic Discharge**

+/- 8kV contact discharge; FS: A

+/- 15kV air discharge; FS: A

**EMV Susceptibility Conducted**

Frequency: 150kHz–80MHz; U=10V; AM: 1kHz, 80%; FS: A

**Burst**

tr=5ns; td=50ns; Burst duration: 15ms;

Period: 300ms; t=5min; FS: B

Power-lines: US=+/-2kV

Signal-lines: US=+/-1kV

**Surge**

tr=1.2us; td=50us; Amount: 5; Wait-time: 60s; FS: B

Power-lines: US=+/-0.5kV

**E1 – Type approval**

EU Directive ECE R 10.4

**Protection Level (IP Code)**

IP 66 according to *ISO 20653*: Road Vehicles – Degrees of protection (IP-Code) – Protection of electrical equipment against foreign objects, water and access



## Electrical

12 and 24V-Systems according to:

### Inverse Polarity resistance

5min @ -48V (no defect)

### Over voltage resistance

5min @ +48V (no defect)

### Start behavior

Start over Temperature

Start at TRoom; decrease in 5°steps to TMin; go to TRoom; increase in 5°steps to THigh; Start DUT at each T;

Successful start expected

### Short circuit strength

Connect each Pin of Main-, Video- and Ethernet-Connector for 5 Min to GND and for 5 Min to 36V; FS: C

### Superimposed alternating voltage

Triangle signal, frequency sweep: 50Hz-25kHz-50Hz inside 60s; FS: A

| Level                | 12 V | 24 V  |
|----------------------|------|-------|
| AC peak-to-peak UPP1 | 1VAC | 4VAC  |
| AC peak-to-peak UPP2 | 2VAC | 4VAC  |
| AC peak-to-peak UPP3 | 4VAC | 10VAC |

### De-/Increase Supply Voltage

Sweep Voltage UMin-0V-UMin with 0.5V/min; FS: D

### Drop in Supply Voltage

| 12 V System                             | 24 V System                           |
|---|---------------------------------------|
| UStart=UMin; US=4.5V<br>td=100ms; FS: B | UStart=UMin; US=9V<br>td=100ms; FS: B |

### Battery less Operation

| 12 V System                      | 24 V System                      |
|----------------------------------|----------------------------------|
| U1=10V; U2=18V;<br>t=5min; FS: A | U1=20V; U2=38V;<br>t=5min; FS: A |

## Mechanical

### Vibration, noise

| Frequency [Hz] | PSD [(m/s <sup>2</sup> )/Hz] |
|----------------|------------------------------|
| 10             | 20                           |
| 20             | 36                           |
| 30             | 36                           |
| 139            | 1.69                         |
| 200            | 2                            |
| 300            | 1                            |
| 2000           | 1                            |

32h per Axis; FS: A

### Vibration, sinusoidal

Resonance sweep

| Frequency | Displacement           | Acceleration |
|-----------|------------------------|--------------|
| 2 Hz      | +/- 1 mm<br>(2 mm PtP) | (0.016 g)    |
| 10 Hz     | -                      | 2 g          |
| 2000 Hz   | -                      | 2 g          |

1 Octave/minute, 30min per resonance

### Endurance Test:

| Frequency | Displacement                | Acceleration |
|-----------|-----------------------------|--------------|
| 5 Hz      | +/- 0.75 mm<br>(1.5 mm PtP) | (0.075 g)    |
| 57.5 Hz   | -                           | 5 g          |
| 2000 Hz   | -                           | 5 g          |

0.5 Octave/minute, 8 h per resonance. FS: A

### Mechanical shock

Part 1: 300m/s<sup>2</sup>, 18ms, 10 times per axis/direction; FS: A

Part 2: 500m/s<sup>2</sup>, 11ms, 3 times per axis/direction; FS: A

Part 3: 500m/s<sup>2</sup>, 6ms, 10 times per axis/direction; FS: A

Part 4: 400m/s<sup>2</sup>, 6ms, 4000 times per axis/direction; FS: A

### Drop Test

Drop the DUT on each side and each edge from a high of 1m on a concrete floor.

No damage or visible damage.

### Package

Drop Test

Drop the DUT inside the package on each side and each edge from a high of 1m on a concrete floor.

No damage of the DUT

No cracks to the package

## Climate

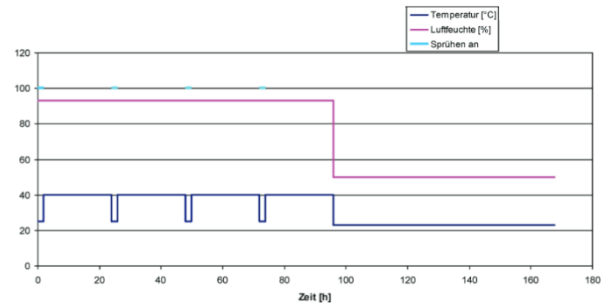
### Start spray resistance

Part 1:

7 cycles at 24h (8h spraying; 16h rest)  
salt concentration: 5%

Part 2:

4 cycles at 168H; 1 cycle:



### Chemical resistance

Apply once a day, for three days, the following chemicals with a brush over the exposed surface. Inspect without rinsing immediately after-wards and after 100h.

Alcohol, Antifreeze liquid (Ethyl-glycol), Diesel oil, Domestic Ammonia, Gasoline, Hydraulic oil 10W40, Liquid lime, Motor oil, NPK Chemical fertilizers 20 10 20, Windscreen cleaning mixture, Ammonium Nitrate and Ammonium Phosphate fertilizers, Bovine Effluent - (up to 5% propionic acid), Diesel fuel, STOU (Super Tractor Universal Oil) lubricating oil.

### Damp heat steady

21days @ +40°C and 93%r.H.; FS: C

### Damp heat cyclic

6 cycles (each 24h); TLow=+25°C; THigh=+55°C  
Humidity: >= 93%r.H.; FS: A

### Temperature/Humidity cyclic

10 cycles (each 24h); TLow=-10°C; THigh=+65°C  
Humidity: = 80-96%r.H or uncontrolled.; FS: A

### Operating temperature

24h @ -30°C; FS: A  
96h @ +75°C; FS: A

### Storage temperature

24h @ -40°C; FS: C  
48h @ +85°C; FS: C

Max. value with reduced backlight brightness

### Temperature cycling

30 cycles (each 8h); TLow=-30°C; THigh=+75°C; FS: A

### Temperature shock

100 cycles (each 2h); TLow=-30°C; THigh=+75°C; Tchange: <30s; FS: C

### UV resistance

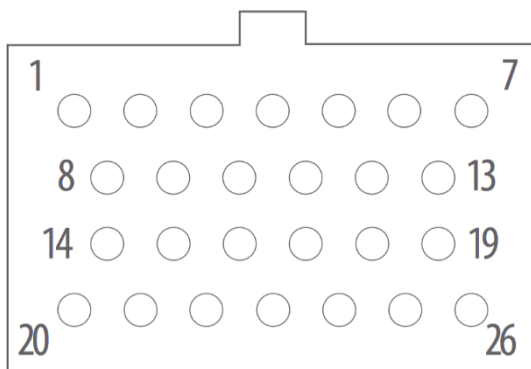
Over-all time: 1500h  
Cycle: 8h UV at +60°C, 4h 95%r.H.  
No material damage, No visible change

## 10 Pinout

### Main connector pinout

| Pin No. | Assignment     | Description                   |
|---------|----------------|-------------------------------|
| 1       | VCC            | supply voltage +; terminal 30 |
| 2       | Ignition Input | ignition input; terminal 15   |
| 3       | GND            | supply voltage -; terminal 31 |
| 4       | Wake           | Wake Input, "Doorswitch"      |
| 5       | Audio Out L    | Audio line out, Stereo        |
| 6       | Audio Out R    | Audio line out, Stereo        |
| 7       | Audio GND      | Audio line out, Ground        |
| 8       | CAN1H          | CAN 1 high                    |
| 9       | CAN1L          | CAN 1 low                     |
| 10      | CAN2H          | CAN 2 high                    |
| 11      | CAN2L          | CAN 2 low                     |
| 12      | CAN3H          | CAN 3 high                    |
| 13      | CAN3L          | CAN 3 low                     |
| 14      | CAN4H          | CAN 4 high                    |
| 15      | CAN4L          | CAN 4 low                     |
| 16      | RS232 RxD      | RS232 receive data            |
| 17      | RS232 TxD      | RS232 transmit data           |
| 18      | RS232 GND      | RS232 GND                     |
| 19      | -              | Not connected                 |
| 20      | -              | Not connected                 |
| 21      | -              | Not connected                 |
| 22      | -              | Not connected                 |
| 23      | SERV_EN        | service enable                |
| 24      | -              | Not connected                 |
| 25      | -              | Not connected                 |
| 26      | -              | Not connected                 |

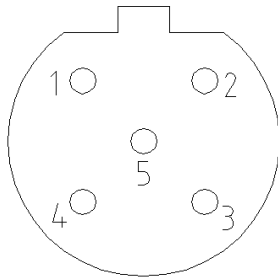
View on rear side of the OPUS B6



Video connector pinout

| <b>Round connector, 5 pins, M12</b> |            |
|-------------------------------------|------------|
| <b>1</b>                            | VidSig+    |
| <b>2</b>                            | Switch     |
| <b>3</b>                            | Power 12V  |
| <b>4</b>                            | Power GND  |
| <b>5</b>                            | VidSig GND |

Video-Connector, M12, female, 5 pins, b-coded,  
 View on rear side of the OPUS B6-Eco



Ethernet connector pinout

| <b>100Base-Tx</b>                   |     |
|-------------------------------------|-----|
| <b>Round connector, 4 pins, M12</b> |     |
| <b>1</b>                            | TD+ |
| <b>2</b>                            | RD+ |
| <b>3</b>                            | TD- |
| <b>4</b>                            | RD- |

| <b>Automotive Ethernet</b>          |      |
|-------------------------------------|------|
| <b>Round connector, 4 pins, M12</b> |      |
| <b>1</b>                            | D+   |
| <b>2</b>                            | n.c. |
| <b>3</b>                            | D-   |
| <b>4</b>                            | n.c. |

Video-Connector, M12, female, 4 pins, d-coded,  
 View on rear side of the OPUS B6-Eco

