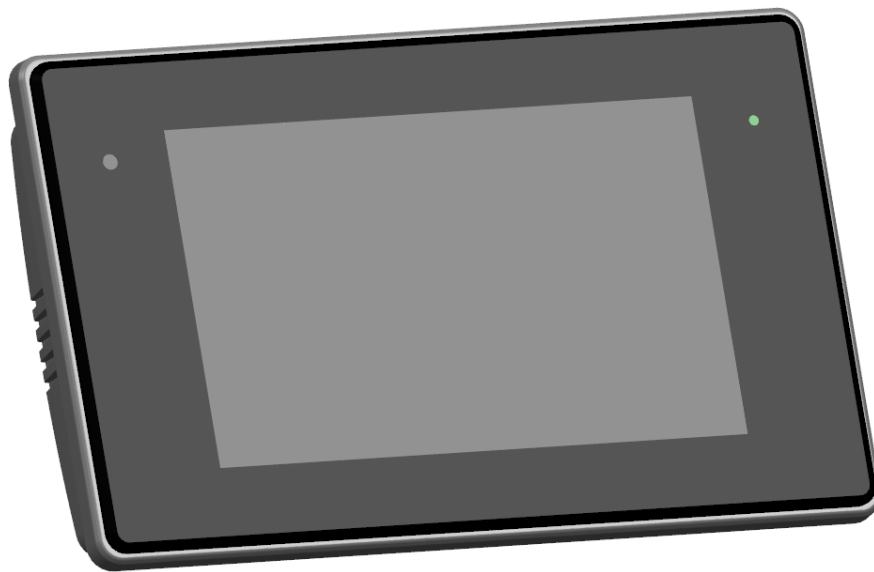


## TDS OPUS B3-Eco

TDS OPUS B3-Eco, 14.10.2019



**OPUS B3-Eco**

1 Order Numbers	OPUS B3-Eco Full
<b>OPUS Projektor</b>	
	OPUSB3EN1CANF000
	OPUSB3EN1CANA000 (Automotive Ethernet)
<b>Codesys</b>	
	OPUSB3EN1CDSF000
	OPUSB3EN1CDSA000 (Automotive Ethernet)
<b>ISO-Horizon</b>	
	OPUSB3EN1UTSF000 (Small)
	OPUSB3EN1UTSA000 (Automotive Ethernet)
	<b>OPUS B3-Eco Basic (grey colored function not available)</b>
<b>OPUS Projektor</b>	
	OPUSB3EN1CANB000
	OPUSB3EN1CANT000 (Touch)
<b>Codesys</b>	
	OPUSB3EN1CDSB000
	OPUSB3EN1CDST000 (Touch)
<b>ISO-Horizon</b>	
	OPUSB3EN1UTST000 (Small, Touch)

<b>2 Mechanical</b>			
<b>2.1 Dimensions</b>	Width: 163mm		
	Height: 99.7mm		
	Depth: 40.8mm		
<b>2.2 Housing</b>	Aluminum die cast Powder coated Front-glass or Touchscreen		
<b>2.3 Mounting</b>	landscape or portrait standalone in-dash		
<b>2.4 Temperature</b>	Operating Temperature: -30°C to +75°C		
	Storage Temperature: -40°C to +85°C		
<b>3 Display</b>			
Type	TFT Color Graphic LCD with LED backlight		
Size	5", 108mm (W) x 64.8mm (H)		
Resolution	800 x 480px (WVGA), 15:9		
Colors	16.7Mio		
Brightness	typ. 800cd/m <sup>2</sup>		
Contrast Ratio	typ. 700:1		
Bonding	The display is either bonded to the touch-screen or the glass		
<b>4 Input Devices</b>			
<b>4.1 Touch</b>	Projected Capacitive Touch (Multitouch)		
<b>4.2 Sensor</b>	1 Light sensor		
<b>5 Electronics</b>			
<b>5.1 Processor platform</b>			
CPU	Freescale i.MX6®, Solo, 800MHz		
Mass storage	Full: 4 GByte (approx. 1400MB for customer use) Basic: 2 GByte (approx. 700MB for customer use)		
RAM	512Mbyte		
<b>5.2 Power Supply</b>			
Concept	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		
Protection	Short-circuit, overvoltage, inverse polarity		
Max. current consumption (without external load)	<b>Power Mode</b>	<b>current at 13,5 V</b>	<b>current at 27 V</b>
	On	TBD	TBD
	Low-power	TBD	TBD
	Sleep	TBD	TBD
	Off	TBD	TBD
<b>5.3 Indicators</b>			
	1 Multi-Color LED (free programmable)		

<b>5.4 Speaker</b>	Up to 90dB @ 10cm distance (max. @ ~8kHz)
<b>5.5 Audio</b>	1 x Audio output (left, right, GND) AC97 compatible Output power: approx. 50mW
<b>5.6 RTC</b>	Buffered by gold cap Buffered for 2 weeks at $T_{ambient}$ Deviation: max. 1s/day
<b>5.7 Silent-Wake-Input</b>	Input which can be used for Silent-Wake-On of the OPUS to reduce visible boot-time
	Active on positive edge
<b>5.8 Interfaces</b>	
<b>5.8.1 Can Interface</b>	2 x CAN-Interface (including CAN-Wake)
Type	ISO 11898, CAN-specification 2.0 B active
Speed	Default: 250kbit/s Possible: 10kbit/s, 20kbit/s, 50kbit/s, 83.3kbit/s, 111.11kbit/s, 250kbit/s, 500kbit/s, 800kbit/s and 1Mbit/s
<b>5.8.2 RS232</b>	1 x RS232-Interface
Type	EIA232 (only Rx, Tx, GND)
Speed	max. 115.200baud
<b>5.8.3 USB</b>	Host 2.0
Side connector	1 x Type A Connector High Speed Guaranteed 900mA @ 5V
Back connector	1 x Type A Connector High Speed Guaranteed 900mA @ 5V
<b>5.9.4 Wireless-Interface</b>	Via the USB Back connector, a wireless interface can be optional added. E.g. LM816 for WIFI
<b>5.9.5 Ethernet-Interface</b>	1 x 10/100 Mbit/s Base T  Alternative: 1 x Automotive Ethernet Interface
<b>5.9.6 Video-Interface</b>	1 x analog video input, 1V <sub>ss</sub> Camera control output (open drain) for special functionality (mirror, shutter, heating etc.) Camera supply output guaranteed 300mA @ 12VDC

<b>6 Connections</b>	
Main connector	Tyco-AMP 1437288-6 Mating connector (customer) Tyco-AMP 3-1437290-7 Mating crimp contact (customer) Tyco AMP 3-1447221-4 For industrial use cable length should be less than 30m
Video connector	M12 round connector, female, 5-pole, B-coded acc. to EN 61076-2-101
Ethernet connector	M12 round connector, female, 4-pole, D-coded acc. to EN 61076-2-101
Connector pinout	See chap. 9.
<b>7 Software</b>	
7.1 Operating System	Linux, kernel 4.14.0 or higher
7.2 Application Programming	OPUS Projektor Tool Optional: Codesys Tool Optional: C/C++ Optional: ISO-Horizon

## 8 Testing and Verification

### 8.1 CE-Compliance

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

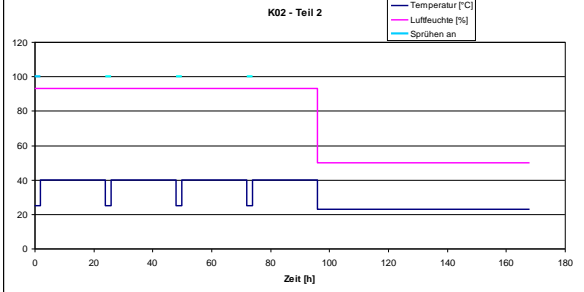
- EN 13309: Construction machinery – Electromagnetic compatibility of machines with internal electrical power supply
- EN ISO 14982: Agricultural and forestry machinery - Electromagnetic compatibility - Test methods and acceptance criteria
- EN 50498: Electromagnetic compatibility (EMC). Product family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

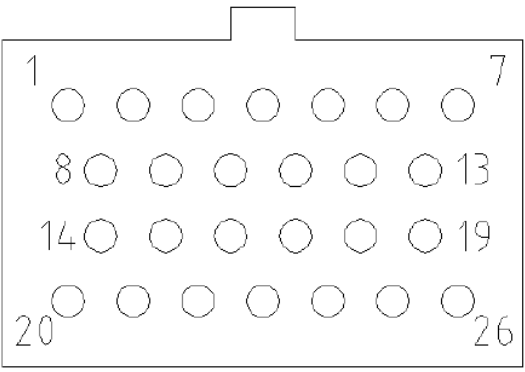
EMC Emission radiated	<p>30–75MHz: 62-52<sup>1</sup>dB(μV/m) – QP – 120kHz  52-42<sup>1</sup>dB(μV/m) – AV – 120kHz  75-400MHz: 52-63<sup>2</sup>dB(μV/m) – QP – 120kHz  42-53<sup>2</sup>dB(μV/m) – AV – 120kHz  400-1000MHz: 63dB(μV/m) – QP – 120kHz  53dB(μV/m) – AV – 120kHz  1000-2500MHz: 73dB(μV/m) – P – 120kHz  53dB(μV/m) – AV – 120kHz  2500-6000MHz: 80dB(μV/m) – P – 1000kHz  60dB(μV/m) – AV – 1000kHz</p> <p>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.</p>
EMC Immunity radiated	<p>20MHz to 800MHz with amplitude modulation  800MHz to 6GHz with pulse modulation</p> <p>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)</p>
EMC Emission conducted	<p>12V-System (Maximum values):  Positive slow pulses: +37V  Negative slow pulses: -75V  Positive fast pulses: +75V  Negative fast pulses: -112V  24V-System (Maximum values):  Positive slow pulses: +37V  Negative slow pulses: -150V  Positive fast pulses: +150V  Negative fast pulses: -150V</p>
Test Pulse 1	<p>12V-System: 24V-System:  Us=-112V; FS: C Us=-450V; FS: C</p>
Test Pulse 2a	<p>12V-System: 24V-System:  Us=+55V; FS: B Us=+55V; FS: B</p>
Test Pulse 2b	<p>12V-System: 24V-System:  Us=+10V; FS: C Us=+20V; FS: C</p>
Test Pulse 3a	<p>12V-System: 24V-System:</p>

	Us=-165V; FS: A	Us=-220V; FS: A
Test Pulse 3b	12V-System: Us=+112V; FS: A	24V-System: Us=+220V; FS: A
Test Pulse 4 (Starting profile)	12V-System: Us <sub>6</sub> =6V; Us=6.5V; FS: B	24V-System: Us <sub>6</sub> =6V; Us=10V; FS: B
Load Dump	12V-System: Us=+79V; FS: C	24V-System: Us=+151V; FS: C
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	t <sub>r</sub> =5ns; t <sub>d</sub> =50ns; Burst duration: 15ms; Period: 300ms; t=5min; FS: B Power-lines: U <sub>S</sub> =+/-2kV Signal-lines: U <sub>S</sub> =+/-1kV	
Surge	t <sub>r</sub> =1.2us; t <sub>d</sub> =50us; Amount: 5; Wait-time: 60s; FS: B Power-lines: U <sub>S</sub> =+/-0.5kV	
8.2 E1 Type approval	EU Directive ECE R 10	
8.3 Protection Level (IP Code)	IP6k6 according to ISO 20653: Road Vehicles – Degrees of protection (IP-Code) – Protection of electrical equipment against foreign objects, water and access	
8.4 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 T <sub>Room</sub> ; decrease in 5°steps to T <sub>Min</sub> ; go to T <sub>Room</sub> ; increase in 5°steps to T <sub>High</sub> ; 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	12V      24V
	AC peak-to-peak U <sub>PP1</sub>	1VAC      4VAC
	AC peak-to-peak U <sub>PP2</sub>	2VAC      4VAC
	AC peak-to-peak U <sub>PP3</sub>	4VAC      10VAC
De-/Increase Supply Voltage	Sweep Voltage U <sub>Min</sub> -0V-U <sub>Min</sub> with 0.5V/min; FS: D	
Drop in Supply Voltage	12V-System: U <sub>Start</sub> =U <sub>Min</sub> ; U <sub>S</sub> =4.5V t <sub>d</sub> =100ms; FS: B	24V-System: U <sub>Start</sub> =U <sub>Min</sub> ; U <sub>S</sub> =9V t <sub>d</sub> =100ms; FS: B
Battery less Operation	12V-System: U <sub>1</sub> =10V; U <sub>2</sub> =18V; t=5min; FS: A	24V-System: U <sub>1</sub> =20V; U <sub>2</sub> =38V; t=5min; FS: A

8.5 Mechanical	Vibration, noise	<table border="1"> <thead> <tr> <th>Frequency [Hz]</th> <th>PSD [(m/s<sup>2</sup>)<sup>2</sup>/Hz]</th> </tr> </thead> <tbody> <tr> <td>10</td> <td>20</td> </tr> <tr> <td>20</td> <td>36</td> </tr> <tr> <td>30</td> <td>36</td> </tr> <tr> <td>141</td> <td>1.64</td> </tr> <tr> <td>200</td> <td>1.93</td> </tr> <tr> <td>300</td> <td>1</td> </tr> <tr> <td>2000</td> <td>1</td> </tr> </tbody> </table> <p>32h per axis; FS: A</p>	Frequency [Hz]	PSD [(m/s <sup>2</sup> ) <sup>2</sup> /Hz]	10	20	20	36	30	36	141	1.64	200	1.93	300	1	2000	1							
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Vibration, sinusoidal	<p>Resonance sweep:</p> <table border="1"> <thead> <tr> <th>Frequency</th> <th>Displacement</th> <th>Acceleration</th> </tr> </thead> <tbody> <tr> <td>2Hz</td> <td>+/- 1mm (2mm PtP)</td> <td>(0.016g)</td> </tr> <tr> <td>10Hz</td> <td>-</td> <td>2g</td> </tr> <tr> <td>2000Hz</td> <td>-</td> <td>2g</td> </tr> </tbody> </table> <p>1 Octave/minute, 30min per resonance</p> <p>Endurance test:</p> <table border="1"> <thead> <tr> <th>Frequency</th> <th>Displacement</th> <th>Acceleration</th> </tr> </thead> <tbody> <tr> <td>5Hz</td> <td>+/- 0.75mm (1.5mm PtP)</td> <td>(0.075g)</td> </tr> <tr> <td>57.5Hz</td> <td>-</td> <td>5g</td> </tr> <tr> <td>2000Hz</td> <td>-</td> <td>5g</td> </tr> </tbody> </table> <p>0.5 Octave/minute, 8h per axis, FS: A</p>	Frequency	Displacement	Acceleration	2Hz	+/- 1mm (2mm PtP)	(0.016g)	10Hz	-	2g	2000Hz	-	2g	Frequency	Displacement	Acceleration	5Hz	+/- 0.75mm (1.5mm PtP)	(0.075g)	57.5Hz	-	5g	2000Hz	-	5g
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Mechanical shock	<p>Part 1: 300m/s<sup>2</sup>, 18ms, 10 times per axis/direction; FS: A</p> <p>Part 2: 500m/s<sup>2</sup>, 11ms, 3 times per axis/direction; FS: A</p> <p>Part 3: 500m/s<sup>2</sup>, 6ms, 10 times per axis/direction; FS: A</p> <p>Part 4: 400m/s<sup>2</sup>, 6ms, 4000 times per axis/direction; FS: A</p>																								
Drop test	<p>Drop the DUT on each side and each edge from a high of 1m on a concrete floor. No damage or visible damage</p>																								
Package drop test	<p>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</p>																								



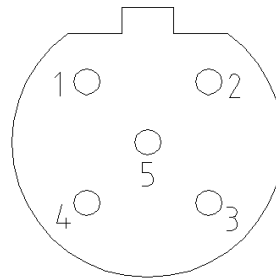
8.6 Climate	Salt spray resistance	<p>Part 1: 7 cycles at 24h (8h spraying; 16h rest) salt concentration: 5%</p> <p>Part 2: 4 cycles at 168H; 1 cycle:</p> 
	Chemical resistance	<p>Apply once a day, for three days, the following chemicals with a brush over the exposed surface. Inspect without rinsing immediately afterwards 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), Brake fluid - both mineral and vegetable types, Diesel fuel, STOU (Super Tractor Universal Oil) lubricating oil</p>
	Damp heat steady	21days @+40°C and 93%r.H.; FS: C
	Damp heat cyclic	6 cycles (each 24h); T <sub>Low</sub> =+25°C; T <sub>High</sub> =+55°C Humidity: >= 93%r.H.; FS: A
	Temperature/Humidity cyclic	10 cycles (each 24h); T <sub>Low</sub> =-10°C; T <sub>High</sub> =+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
	Temperature cycling	30 cycles (each 8h); T <sub>Low</sub> =-30°C; T <sub>High</sub> =+75°C; FS: A
	Temperature shock	100 cycles (each 2h); T <sub>Low</sub> =-30°C; T <sub>High</sub> =+75°C; T <sub>change</sub> : <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
FS: Function Status		

9 Pinout																																																																																		
<b>9.1 Main connector pinout</b>	<table border="1"> <thead> <tr> <th>pin no.</th> <th>assignment</th> <th>description</th> </tr> </thead> <tbody> <tr><td>1</td><td>VCC</td><td>Supply, Clamp 30</td></tr> <tr><td>2</td><td>Ignition</td><td>Wake-Input, Clamp 15</td></tr> <tr><td>3</td><td>GND</td><td>Supply, Clamp 31</td></tr> <tr><td>4</td><td>Wake</td><td>Wake Input, "Doorswitch"</td></tr> <tr><td>5</td><td>Audio Out_L</td><td>Audio line out, Stereo</td></tr> <tr><td>6</td><td>Audio Out_R</td><td>Audio line out, Stereo</td></tr> <tr><td>7</td><td>Audio GND</td><td>Audio line out, Ground</td></tr> <tr><td>8</td><td>CAN1H</td><td>CAN 1 - High</td></tr> <tr><td>9</td><td>CAN1L</td><td>CAN 1 - Low</td></tr> <tr><td>10</td><td>CAN2H</td><td>CAN 2 - High</td></tr> <tr><td>11</td><td>CAN2L</td><td>CAN 2 - Low</td></tr> <tr><td>12</td><td>-</td><td>Not Connected</td></tr> <tr><td>13</td><td>-</td><td>Not Connected</td></tr> <tr><td>14</td><td>-</td><td>Not Connected</td></tr> <tr><td>15</td><td>-</td><td>Not Connected</td></tr> <tr><td>16</td><td>RS232 RxD</td><td>RS232 Receive data</td></tr> <tr><td>17</td><td>RS232 TxD</td><td>RS232 Transmit data</td></tr> <tr><td>18</td><td>RS232 GND</td><td>RS232 Ground</td></tr> <tr><td>19</td><td>-</td><td>Not Connected</td></tr> <tr><td>20</td><td>-</td><td>Not Connected</td></tr> <tr><td>21</td><td>-</td><td>Not Connected</td></tr> <tr><td>22</td><td>-</td><td>Not Connected</td></tr> <tr><td>23</td><td>ENA</td><td>Service-Enable</td></tr> <tr><td>24</td><td>-</td><td>Not Connected</td></tr> <tr><td>25</td><td>-</td><td>Not Connected</td></tr> <tr><td>26</td><td>-</td><td>Not Connected</td></tr> </tbody> </table>	pin no.	assignment	description	1	VCC	Supply, Clamp 30	2	Ignition	Wake-Input, Clamp 15	3	GND	Supply, Clamp 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	-	Not Connected	13	-	Not Connected	14	-	Not Connected	15	-	Not Connected	16	RS232 RxD	RS232 Receive data	17	RS232 TxD	RS232 Transmit data	18	RS232 GND	RS232 Ground	19	-	Not Connected	20	-	Not Connected	21	-	Not Connected	22	-	Not Connected	23	ENA	Service-Enable	24	-	Not Connected	25	-	Not Connected	26	-	Not Connected
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9.2 Video connector  
pinout

	Round Connector, 5 pins, M12
1	VidSig +
2	Switch
3	Power 12V
4	Power GND
5	VidSig GND

Video- Connector, M12, female, 5 pins, b-coded,  
view on rear side of the OPUS B3-Eco



9.3 Ethernet connector  
pinout

**100Base-Tx**

	Round Connector, 4 pins, M12
1	TD+
2	RD+
3	TD-
4	RD-

**Automotive Ethernet**

	Round Connector, 4 pins, M12
1	D+
2	n.c.
3	D-
4	n.c.

Ethernet Connector, M12, female, 4 pins, d-coded,  
view on rear side of the OPUS B3-Eco

