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Technical Data Sheet

OPUS C-Series



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 specially 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.
- Picture sticking is possible at higher temperatures if no screensaver is used
- Pressurized air must not be used to clean the device to prevent damage of the internal microphone.

2. General Information

	OPUS C7	OPUS C10	OPUS C12	OPUS C15
Order Number CAN=C++/Projektor CDS=Codesys+WebVisu	OPUSC07EN1CAN000 OPUSC07EN1CDS000	OPUSC10EN1CAN000 OPUSC10EN1CDS000	OPUSC12EN1CAN000 OPUSC12EN1CDS000	OPUSC15EN1CAN000 OPUSC15EN1CDS000
Dimensions	201 x 138 x 42 mm	248 x 180 x 50 mm	299 x 210 x 54 mm	388,5 x 181,3 x 50 mm
Weight	~1169g	~1770g	~2605g	~2366g
Housing	Front cover: aluminum die cast, colored black (Pantone Black C) without printing Rear cover: aluminum die cast, colored black (Pantone Black C)			
Mounting	landscape or portrait standalone			

3. Display

	OPUS C7	OPUS C10	OPUS C12	OPUS C15
Type	TFT Color Graphic LCD with LED backlight			
Size	7”, 152.4 x 91.4 mm	10.1", 217.0 x 136.6 mm	12.1", 261.1 x 163.2 mm	15", 355.7 x 133.4 mm
Resolution	800 x 480 px (WVGA), 15:9	1280 x 800 px (WXGA), 16:10		1920 x 720 px, 24:9
Colors	16.7 Mio.			
Brightness	typ. 800 cd/m2	typ. 900 cd/m2	typ. 1100 cd/m2	typ. 900 cd/m2
Contrast Ratio	typ. 1000:1	typ. 800:1	typ. 1000:1	typ. 1300:1
Optical Bonding	yes			
Polarization	Circular. Visible with polarized sunglasses in each direction			

4. Input Devices

	OPUS C7	OPUS C10	OPUS C12	OPUS C15
Touch	PCT			
Indicators and Sensors	Light sensor Proximity sensor Acceleration sensor Microphone 1 Multicolor LED			

5. Electronics

	OPUS C7	OPUS C10	OPUS C12	OPUS C15
CPU	NXP i.MX8®QuadPlus, 1600 MHz, 64-bit			
Mass storage	10.6 GByte pSLC SSD (minus space for OS & application)			
RAM	4 GByte LPDDR4			
EEPROM	32.768 Byte, 28.672 Byte available for user			
RTC	Buffered by gold cap (2 weeks at $T_{ambient}$, Deviation max. 1 s/day)			
Speaker	typ. 90 dB @ 0.1m distance, peak at 3 kHz			
Frequency range (operating)	840 Hz to 6 kHz			
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: 9 … 36 V DC. Short circuit protection. Over-voltage protection up to 48 V for max. 2 min. Inverse polarity protection up to -48 V DC for max. 5 min.			
Silent-Wake Input	Input which can be used for Silent-Wake-On of the OPUS C-Device to reduce visible boot-time			

Current consumption (without external load), max

Power Mode	Current at 13,5 V DC	Current at 27 V DC
On 7“	≤ 1000 mA	≤ 600 mA
On 10“	≤ 1300 mA	≤ 700 mA
On 12“	≤ 2000 mA	≤ 1100 mA
On 15“	TBD	TBD
Low	Depending on configuration	Depending on configuration
Sleep	≤ 180 mA	≤ 95 mA
Off	≤ 8 mA	≤ 8 mA

6. Interfaces

	OPUS C7	OPUS C10	OPUS C12	OPUS C15
CAN Bus	3 x CAN-Interface according to ISO 11898, CAN-specification 2.0 B active, up to 1 Mbit/s (default 250 Kbit/s, 500 Kbit/s, 750 Kbit/s, 1 Mbit/s) All interfaces are CAN-FD tolerant.			
RS232	2 x RS232-Interface Type: EIA232 (only RXD, TXD, GND) Speed: max. 250 Kbps			
USB	Left side: 1x USB Type C Super Speed 5 Gbit/s, Guaranteed 1.5A @5V Rear side: 1x USB Type A High Speed 480 Mbit/s, Guaranteed 1.5A @5V			
Ethernet Interface	2 x 100Base-T1 Automotive Ethernet Supply output at each channel: Guaranteed 500mA @ 12V			
Inputs	4 configurable digital/frequency inputs Input impedance: > 10 kΩ Frequency: up to 10 kHz 1 analog voltage input			

	Resolution: 10 bit (1024 digits, 1 digit 9,76 mV) Voltage range: 0 … 10 V Protection for digital/frequency and analog inputs: Over-voltage protection: Up to 36 VDC Short circuit protection: Up to 36 VDC
Outputs	3 digital Low-Side outputs (switches to GND) Imax 300 mA open drain RDS,on < 1 Ω RDS,off > 100 kΩ
Outputs (digital High-Side)	1 digital High-Side output (switches to battery voltage) I_{max} 500 mA Short circuit protection up to 36 V
Outputs (frequncy Low-Side)	1 frequency Low-Side output (switches to GND) I_{max} 500 mA Switching frequency up to 10 kHz

7. Connectors

	OPUS C7	OPUS C10	OPUS C12	OPUS C15
Main	TE AMP Superseal 1437288-6 Mating types: Connector: TE-AMP 3-1437290-7 Crimp contact: TE-AMP 3-1447221-4 Crimp contact for power supply pins (KL30 and KL31): TE-AMP 3-1447221-3 Dummy Plug: TE-AMP 4-1437284-3 Hint: For supply pins (Pin 1 and Pin 3) a cable with cross section of 1.25mm shall be used. Mating types: Connector: TE-AMP 3-1437290-7 Crimp contact: TE-AMP 3-1447221-4 Dummy Plug: TE-AMP 4-1437284-3			
Ethernet	Rosenberger-HSD D4S24D-400A5, 4-pole, Z-coded Mating type connector: Unshielded cable (HSDe): Rosenberger E4K15A-1AKX5-y Shielded cable(HSD): Rosenberger D4K10A-1D5A5-y Hint: A cable of quad star type (i.e. Leonie Dacar 625-3) shall be used.			

8. Software

	OPUS C7	OPUS C10	OPUS C12	OPUS C15
Operating System	Linux Kernel 6.1.22 or higher			
Application Programming	OPUS Projektor Tool CODESYS 3.x C/C++			

9. Testing and Verification

E1 – Type approval

EU Directive ECE R 10.6

FCC Compliance (USA)

Suppliers Declaration of Conformity (SDoC) acc. to Subpart B of Part 15 of the FCC rules (CFR Title 47)

ISED Compliance (Canada)

Suppliers Declaration of Conformity (SDoC) acc. to ICES-Gen 3.3, Class A device

ACMA Compliance (Australia)

The product complies with the requirements of the relevant ACMA Standards made unter the Radiocummincations Act 1992 and the Telecommunications Act 1997.

CE-Compliance

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

- EN ISO 14982: Agricultural and forestry machinery - Electromagnetic compatibility - Test methods and acceptance criteria
- EN ISO 13766-1: Earth-moving and building construction machinery
- EN 50498: Electromagnetic compatibility (EMC). Product family standard for aftermarket electronic equipment in vehicles

EMC Emission radiated

Frequency	Limit
30 - 75 MHz	62-52[1]dB(µV/m)-QP-120kHz 52-42[1]dB(µV/m)-AV-120kHz
75 - 400 MHz	52-63[2]dB(µV/m)-QP-120kHz 42-53[3]dB(µV/m)-AV-120kHz
400 - 1000 MHz	63 dB(µV/m) - QP - 120 kHz 53 dB(µV/m) - AV - 120 kHz
1000 - 2500 MHz	73 dB(µV/m) - P - 120 kHz 53 dB(µV/m) - AV - 120 kHz
2500 MHz - 6000 MHz	80 dB(µV/m) - P - 1000 kHz 63 dB(µV/m) - QP - 120 kHz

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

Frequency	Limit / Modulation	Standard
20 - 200 MHz	60 mA / AM	Bulk current injection (ISO 11452-4)
200 - 800 MHz	30 V/m / AM	Absorber lined shielded enclosure (ISO 11452-2)
800 MHz - 1000 MHz	30 V/m / PM	Absorber lined shielded enclosure (ISO 11452-2)
1000 MHz - 2000 MHz	30 V/m / PM	Absorber lined shielded enclosure (ISO 11452-2)

EMC Emission conducted

Frequency	Limit Average	Limit Peak
0,15 - 0,30 MHz	66 dBµV, BW=9kHz	79 dBµV, BW=9kHz
0,30 - 0,53 MHz	60 dBµV, BW=9kHz	73 dBµV, BW=9kHz
0,53 - 5,9 MHz	50 dBµV, BW=9kHz	70 dBµV, BW=9kHz
5,9 - 26 MHz	45 dBµV, BW=9kHz	65 dBµV, BW=9kHz
26 - 68 MHz	30 dBµV, BW=9kHz	
26 - 41 MHz		56 dBµV, BW=9kHz
41 - 88 MHz		46 dBµV, BW=120kHz
68 - 100 MHz	30 dBµV, BW=120kHz	
88 - 100 MHz		50 dBµV, BW=120kHz

EMC transient emissions

	12V-System	24V-System
Positive slow pulses:	< +25V	< +25V
Negative slow pulses:	< -50V	< -100V
Positive fast pulses:	< +50V	< +100V
Negative fast pulses:	< -75V	< -100V

Pulse tests

	12 V-System	24 V-System
Test Pulse 1	U_S = -112V; FS: C	U_S = -600V; FS: C
Test Pulse 2a	U_S = +55V; FS: A	U_S = +55V; FS: A
Test Pulse 2b	U_S = +10V; FS: C	U_S = +20V; FS: C
Test Pulse 3a	U_S = -165V; FS: A	U_S = -300V; FS: A
Test Pulse 3b	U_S = +112V; FS: A	U_S = +300V; FS: A
Test Pulse 4 (Starting profile)	U_{S1} = 6V; U_S = 6.5 V FS: B	U_{S1} = 6V; U_S = 10V FS: B
Load Dump	U_s = +79V; FS: C	U_s = +151V; FS: C

Electrostatic Discharge

Packaging and handling test	2kΩ / 150pF Direct discharge: ±8kV, FS=A Air discharge: ±15kV, FS=A
Powered-up test, direct discharge	2kΩ / 330pF Direct discharge: ±8kV, FS=A Air discharge: ±15kV, FS=A
Powered-up test, indirect discharge	330pF / 330Ω; Indirect discharge: ±8kV, FS=A

Protection Level (IP Code)

IP 6k6 according to ISO 20653: Road Vehicles – Degrees of protection (IP-Code) – Protection of electrical equipment against foreign objects, water and access

Electrical

Inverse Polarity resistance

5 min @ -48V

Over voltage resistance

5 min @ +48V

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 120s; FS: A

Level	12V	24V
AC peak-to-peak U_{PP1}	$1V_{AC}$	$1V_{AC}$
AC peak-to-peak U_{PP2}	$2V_{AC}$	$4V_{AC}$
AC peak-to-peak U_{PP3}	$4V_{AC}$	$10V_{AC}$

De-/Increase Supply Voltage

Starting with 9V, linear reduction of voltage with 0.5V/min until 0V is reached.

After that linear increase with 0.5V/min till Umin is reached again.

FS:A @ U > 6V, FS:C otherwise

Drop in Supply Voltage

12V System	24V System
$U_{Start}=U_{Min}$; $U_S=4.5V$ $t_d=100ms$; FS: B	$U_{Start}=U_{Min}$; $U_S=9V$ $t_d=100ms$; FS: B

Operating voltage

Test Voltages: 9V, 13.5V, 27V, 36V

Test Time: 8h per Voltage

Batteryless operation

12V System	24V System
U_1=10V; U_2=18V; t=5min; FS: A	U_1=20V; U_2=38V; t=5min; FS: A

ISO-VT power discontinuity

2 ms interruption of 12V power supply

No loss of normal network communications or in-process messages, no processor reset, no loss of volatile data

Mechanical

Vibration, noise

Frequency [Hz]	PSD [(m/s^2)/Hz]
10	18
20	36
30	36
139	1.69
200	2
300	1
2000	1

32h per Axis; FS: A

Vibration, sinusoidal

Frequency	Resonance search	Resonance test
fStart = 10 Hz fStop = 2000 Hz	a = 10 m/s² Δf = 0.5 octave/min	a = 50 m/s² t = 30 min for each resonance

Mechanical shock

Part 1: 300m/s², 18ms, 3 times per axis/direction; 36.2 mm displacement

Part 2: 500m/s², 6ms, 10 times per axis/direction; 6.7 mm displacement

Part 3: 400m/s², 6ms, 4000 times per axis/direction; 5.4 mm displacement

Drop Test

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

No damage or visible damage

Package Drop

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

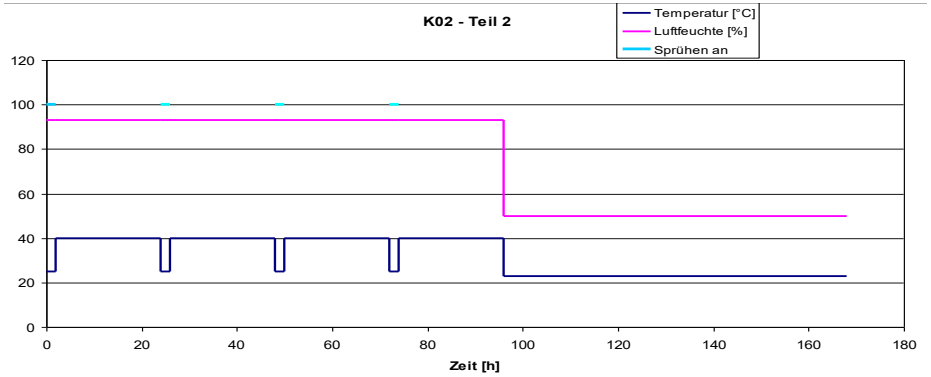
No damage of the DUT / No cracks to the package

Climate

Salt spray resistance

Part 1: 7 cycles, 24h each (8h spraying; 16h rest) salt concentration: 5%

Part 2: 4 cycles at 168h as seen in diagram



Chemical resistance

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.

Diesel fuel	Motor oil	Gasoline
Hydraulic oil	Anitfreeze liquid (Ethyl-glycol)	Ammonium Phosphate fertilizer
Windscreen cleaning mixture	NPK Chemical fertilizers 20 10 20	Brake fluid
Ammonium Nitrate fertilizer	Diesel oil	Bovine Effluent (> 5% propionic acid)
STOU (Super Tractor Universal Oil) lubricating oil	Domestic Ammonia	

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	**Storage temperature**
24h @ -30°C; FS: A	24h @ -30°C; FS: C
96h @ +75°C; FS: A	48h @ +80°C; FS: C

Temperature cycling

30 cycles (each 8h); T_{Low}=-30°C; T_{High}=+75°C; FS: A

Temperature shock

10 cycles (each 2h); T_{Low}=-30°C; T_{High}=+70°C; T_{change}: <30s; FS: C

UV resistance

Over-all time: 1500h

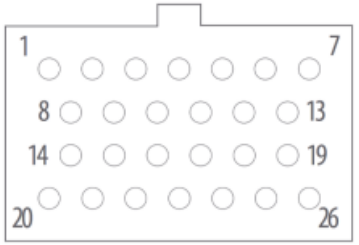
Cycle: 8h UV at +60°C, 4h 95%r.H.

No material damage, No visible change

10. Pinout

Pin Number	Pin Assignment	Description
1	KL30	supply voltage +; terminal 30
2	KL15	ignition input; terminal 15
3	KL31	supply voltage -; terminal 31
4	Wake_In	Wake Input, “Doorswitch”
5	Freq_Out	Frequency Output
6	D_IN_4	Digital Input 4 / Frequency Input 4
7	D_OUT_H	Digital Highside Output
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	RS232_RxD2	RS232-2 – Receive Data input
15	RS232_TxD2	RS232-2 – Transmit Data output
16	RS232_RxD1	RS232-1 – Receive Data input
17	RS232_TxD1	RS232-1 – Transmit Data output
18	RS232_GND	RS232 GND
19	D_IN_1	Digital Input 1 / Frequency Input 1
20	A_IN	Analog Input
21	D_OUT_L1	Digital Output Lowside 1
22	D_OUT_L2	Digital Output Lowside 2
23	SERV_EN	Service enable
24	D_OUT_L3	Digital Output Lowside 3
25	D_IN_2	Digital Input 2 / Frequency Input 2
26	D_IN_3	Digital Input 3 / Frequency Input 3

View on the rear side of the C-Series



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

Automotive ethernet connector pinout

Pin Number	Assignment
1	D+
2	12V Power Supply
3	D-
4	Power GND

