

Specification OPUS A3 STANDARD Basic



Design Sample

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2 Scope

This Specification is meant to describe the OPUS A3 STANDARD Basic with the following part numbers:

- OPUSA3SL1CANB000
- OPUSA3SP1CANB000
- OPUSA3SL1CDSB000
- OPUSA3SP1CDSB000

3 General Description

The OPUS A3 is an operator panel. It is used to operate and monitor vehicles and work machines.

Application examples include display of service reports, error reports, and statistical entry of data for work processes via the device's control elements, visual and acoustic warning in the event of critical operating conditions, visualization of process sequences.

The OPUS A3 is particularly characterized by its robust construction, and it has been developed especially for harsh use conditions in mobile work machines.

4 Hardware

4.1 Housing

- Plastic housing, coloured light grey (RAL 7035) with black rubber frame, erosion structure according to VDI3400, Ref 30-33
- Material of housing: PC/ABS or PA6
- Material of rubber frame: TPU
- Material of key pads: silicone, painted
- Front glass: antireflective float glass, 1 mm thickness

4.2 Mounting

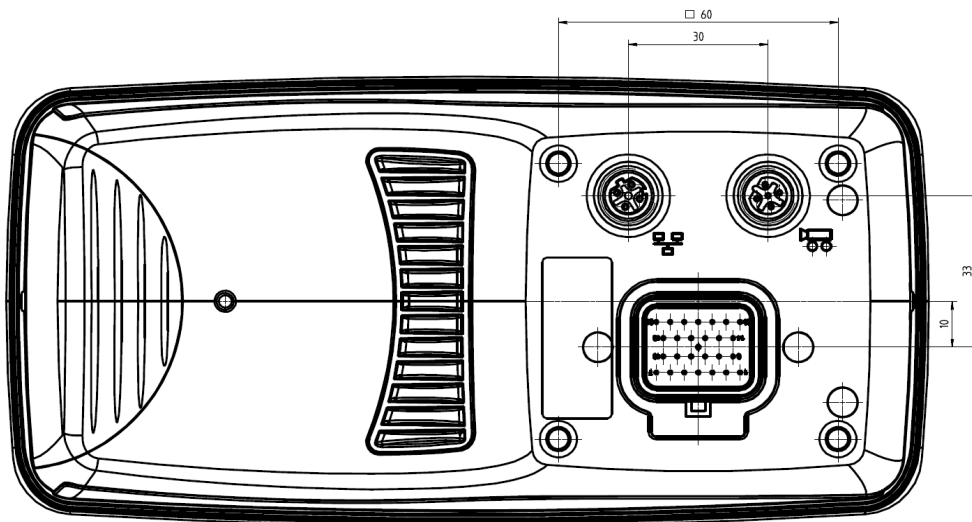
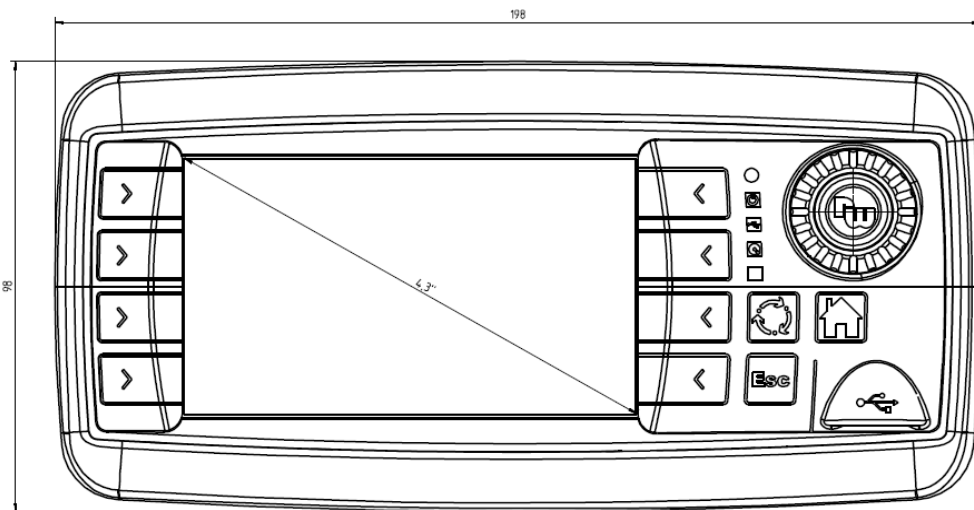
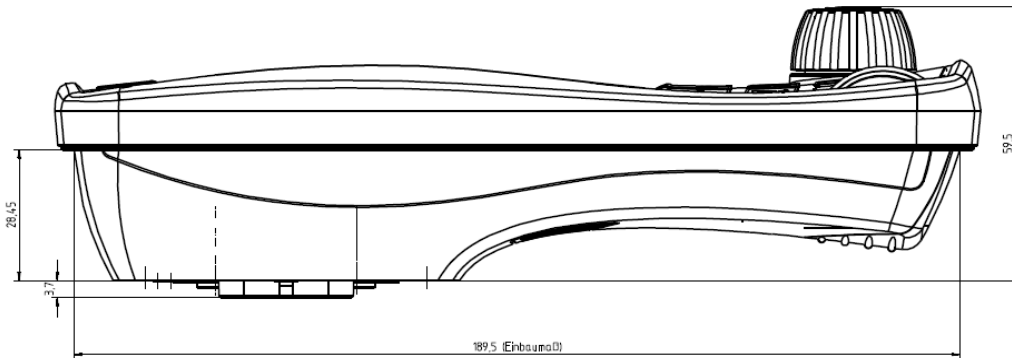
- OPUSA3 can be mounted in landscape or portrait mode
- OPUSA3 can be mounted standalone by using the 4 bushing M5 of the rear panel with the A3 adapter cover (OPUSA3ZBAH001)
- OPUSA3 can be mounted in dash by using a separate mounting frame (OPUSA3ZBEB001)

Mounting accessories:

- In-Dash-Mounting frame for standard housing
- On-Dash-Mounting arm for eco/standard/extended housing

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4.3 Dimensions

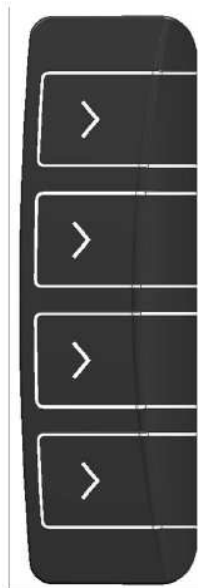


4.4 LCD

- Type: TFT Color Graphic LCD, automotive
- Size: 4.3"
- Resolution: 480 x 272 px
- Active Area: ~ 95 (W) x 53 mm (H)
- Backlight Type: LED, dimmable 0...100% in steps
- Internal Interface: RGB
- Colours: 65k
- Brightness: typ. 400 cd/m²
- Contrast Ratio: typ. 400:1
- Viewing angles: min. +/- 50° from all directions
- Mounting: Display embedded in shock absorbing suspension

4.5 Left keypad

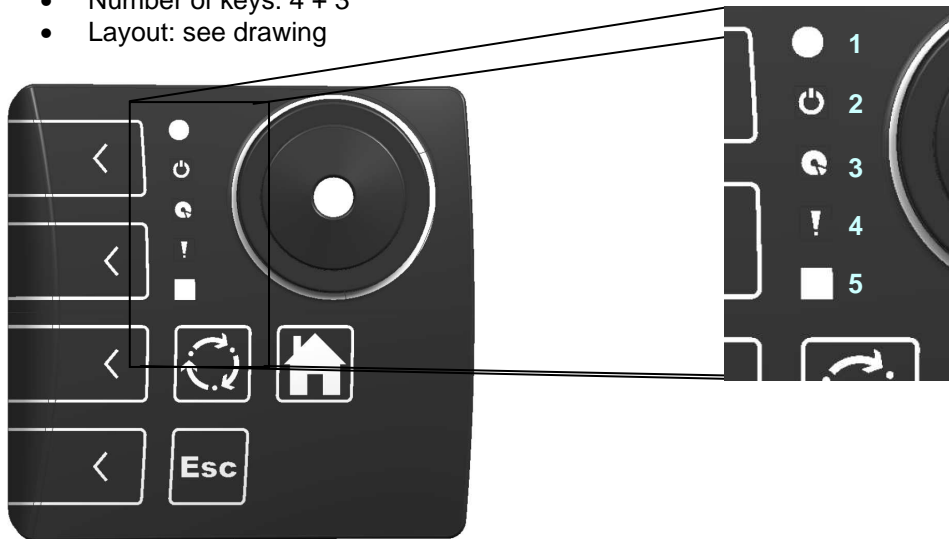
- Number of keys: 4
- Layout: see drawing



- Printing: arrow symbols towards the display, base color is black (RAL 9005), color of symbols is white (RAL 9003)
- Lightning: illuminated by LED's, colour of backlight is blue
- Lifetime of keys: 1.000.000 strikes

4.6 Right keypad

- Number of keys: 4 + 3
- Layout: see drawing



- Printing: arrow symbols towards the display, base color is black (RAL 9005), color of symbols is white (RAL 9003)
- Printing of hardkeys: hardkey symbols are "ESC", "home" and "settings" (see design sample), base colour is black (RAL 9005), colour of symbols is white (RAL 9003)
- Lighting: illuminated by LED's, colour of backlight is blue
- Lifetime of keys: 1.000.000 strikes
- Light sensor [1] embedded in keypad for automatic adaption of display-backlight and key-backlight to ambient light intensity
- 1 Multicolour-LED [5], embedded in keypad
- 3 Status-LED's, embedded in keypad
 - green [2]: operation mode
 - yellow [3]: NAND memory read/write
 - red [4]: Warning

4.7 Encoder

- Number of encoders: 1
- Type of Encoder: electromechanical encoder with mechanical detents
- Number of pulses/rev: 16
- Rotational force: 3 +/- 1 Ncm
- Minimum rotation lifetime: 1 million single full rotations and return without electronic failure. Rotational force will decrease during lifetime.
- Push mechanism: yes
- Type of push-mechanism: electromechanical switch dome
- Actuation force: 3 N +/- 1N
- Actuation travel: 0,5 mm
- Minimum pushbutton lifetime: 1 million actuations without electronic failure

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4.8 Processor platform

- CPU: Freescale I.MX35 with ARM-11-Core, 532 MHz, 32Bit
- EEPROM: 32 Kbyte
- Flash: 512MB NAND
- RAM: 64 MByte
- RTC: accuracy 6 ppm (< 0,6sec./day), buffered by Gold-Cap, working without power for min. 2 weeks

4.9 Interfaces on Mainconnector

- Power supply and ignition input
- 2 x CAN-Interfaces: According to ISO/DIS 11898, CAN-specification 2.0 B active, up to 1 Mbit, EMC optimized, with transceiver for hardware filtering, non isolated, short circuit protected against VCC and Ground.
- 1 x RS232-Interface: Type EIA232 (only RxD, TxD, GND), Speed max. 115 Kbps
- 1 x USB, Host 2.0, full speed

4.10 Electrical connections

- Main connector, Tyco-AMP 1437288-6
 - Mating connector (customer) Tyco-AMP 3-1437290-7
 - Mating crimp contact (customer) Tyco AMP 3-1447221-4

Connector pinout: see chap. 7.

4.11 Power Supply

4.11.1 General specifications

- Designed for 12 V and for 24-Volt battery system
- Operating voltage range: 8-36 VDC
- Overvoltage resistance 48V for 2 minutes
- Inverse-polarity protection up to -48 V DC

Note:

CarGND (pin no. 4 on main connector) has to be connected to the chassis by a conductor as short as possible. Even if there is no conductive chassis available (eg. in E-vehicles) the pin has to be connected to the negative pole of the battery. Otherwise there will be no protection against over voltage, shot cut or ESD.

4.11.2 Current consumption

Measurement settings

- Display Backlight: 100%
- Keypad Backlight: 0%
- Multicolor LED: 0%
- Console: not connected
- CAN1: off
- CAN2: off

Power Mode	current at 12 V DC	current at 24 V
On	310 mA	180 mA
Low-power	120 mA	70 mA
Sleep	80 mA	50 mA
Off	0 mA	0 mA

4.12 Further features

- Gore-Tex-Membrane in back housing for venting
- Temperature sensor and input voltage control inside for internal health management

4.13 Restrictions and design limitations

The following restrictions are caused in physical effects or restrictions of used components and have to be considered by using the OPUS A3 in series applications:

Display, indicators, key illumination and encoder illumination are using LEDs, which are limited in lifetime. The lifetime of LEDs is 30.000h at room temperature and medium LED brightness.

The lifetime is defined as the time, when brightness of 50% of its original value is reached.

Operating the OPUS A3 at high temperature and/or with full LED-brightness will derate the lifetime of LED. Hence the lifetime of LEDs depends on the user profile.

The specified optical characteristics of LCD are valid at room temperature and normal humidity. Changes in color chromaticity, brightness, contrast ratio, response time, starting time, viewing angle or other optical characteristics may occur at lower or higher temperature and humidity.

Sensation of color and contrast will change in dependence of the viewing angle

The LCD is allowed to have up to 3 defective pixel. This is not a reason for rejection.

Keeping the same pattern in a long period of time may cause image sticking on LCD.

Automotive LCDs are limited in operation temperature. A protection circuit is dimming the backlight of the LCD, if the temperature inside the OPUS A3 housing rises up. The LCD can also be switched off by the system if a critical temperature is reached. In particular exposure to direct sunlight may cause to rising temperatures at the LCD surface. The OPUS A3 has to be protected from direct sunlight.

Damage of the LCD may occur if the LCD is exposed permanently to UV radiation. The LCD has to be protected from direct sunlight.

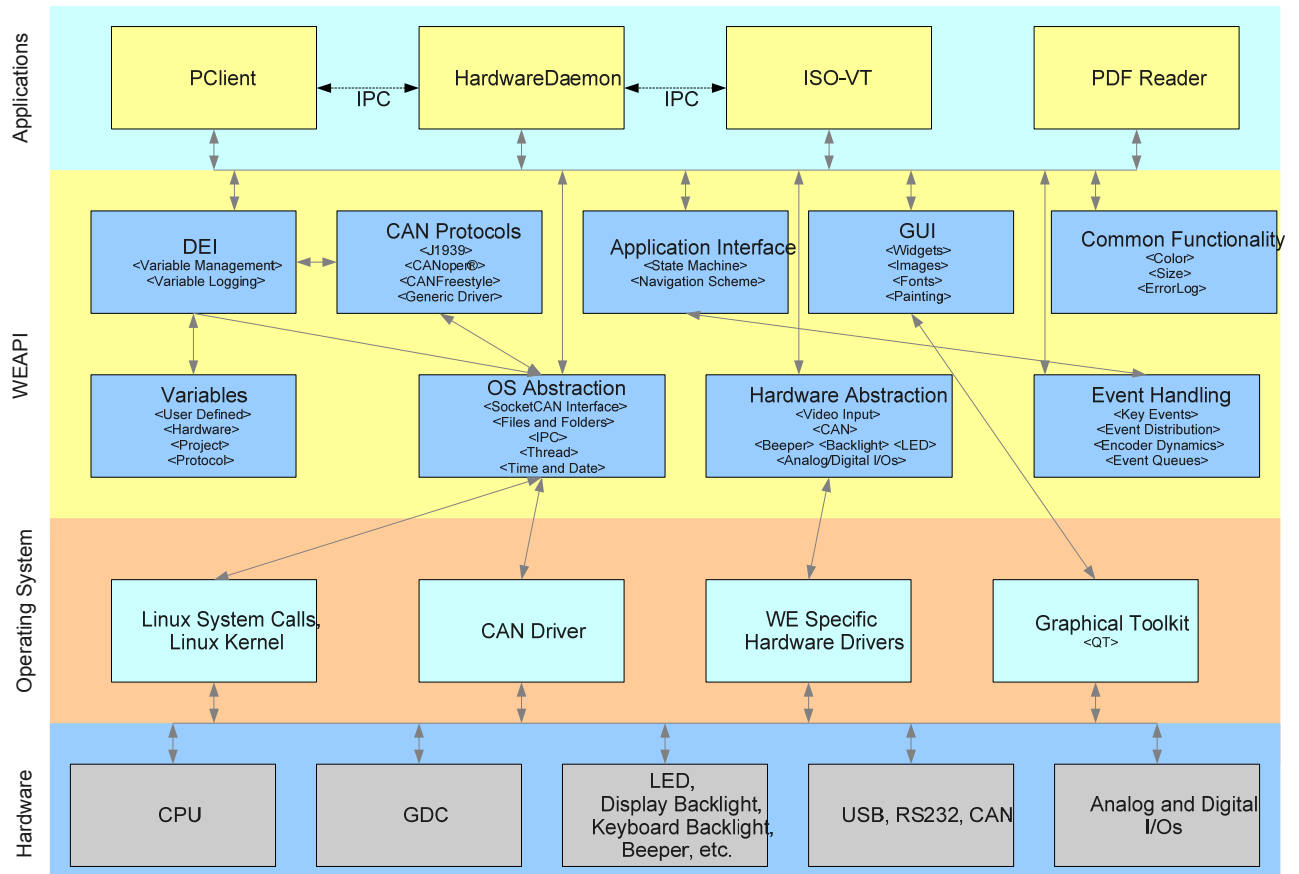
Do not operate or store the OPUS A3 permanently exposed to strong vibrations and/or shocks. The specified vibration limits are valid only for a defined time. Permanently exposure to vibration and shocks may damage the OPUS A3.

The OPUS A3 is not designed for cleaning with a high pressure cleaner. Using a high pressure cleaner may damage sealings and can lead to damages caused by water inside the housing.

The surfaces, particularly the front glass is scratch sensitive. Scratches may occur if using unsuitable cleaning clothes.

5 Software

5.1 Software Architecture (with example applications)



5.2 Operating System

- Linux 2.6.x
- Support of Low-Power-Mode and Sleep-Mode

5.3 Applications

- WE-API: Wachendorff Application Interface for C++
- Self Diagnostics: Wachendorff Application for easy diagnostics
- Projektor-Client: Wachendorff Client executing the Code of the Projektor-Tool
- Optional: Codesys-Client (3.4)

5.4 Application Programming

- Programmable with Wachendorff - Projektor-Tool
- Programmable in C++
- Optional: Programmable with Codesys-Tools (3.4)

6 Testing and Verification

6.1 CE-Compliance

EU Directive 2004/108/EC (EMC) according to

- EN 12895: Industrial Trucks – Electromagnetic compatibility
- 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 55022: Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement
- EN 55024: Information technology equipment - Immunity characteristics - Limits and methods of measurement
- EN 61000-6-2: Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments
- EN 61000-6-4: Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments
- EN 60945: Maritime navigation and radiocommunication equipment and systems - General requirements - Methods of testing and required test results

6.2 e1 - Type approval

EU Directive 72/245/EWG including changes up to 2009/19/EG

6.3 Protection Level (IP Code)

IP 6k5 and 6k7 according to ISO 20653: Road Vehicles – Degrees of protection (IP-Code) – Protection of electrical equipment against foreign objects, water and access.

6.4 Electrical Requirements

12 and 24V-Systems according to:

- ISO 16750-2: Road Vehicles – Environmental conditions and testing for electrical and electronic equipment – Electrical loads
- ISO 15003: Agricultural Engineering – Electrical and electronic equipment – Testing resistance to environmental conditions

6.5 Mechanical Requirements

- According to ISO 16750-3: Road Vehicles – Environmental conditions and testing for electrical and electronic equipment – Mechanical loads, Code L
- ISO 15003: Agricultural Engineering – Electrical and electronic equipment – Testing resistance to environmental conditions
 - Mechanical Shock: Level 2
 - Random Vibration: Level 2
 - Sinusoidal Vibration: Level 2

6.6 Climate Requirements

- According to ISO 16750-4: Road Vehicles – Environmental conditions and testing for electrical and electronic equipment – Climatic Loads
 - Operating Temperature Range: Code E: -40 ... +75°C
 - Storage Temperature Range: -40 ... +85°C
 - Climatic Loads: Code C

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- ISO 15003: Agricultural Engineering – Electrical and electronic equipment – Testing resistance to environmental conditions

6.7 Chemical Requirements

- According to ISO 16750-5: Road Vehicles – Environmental conditions and testing for electrical and electronic equipment – Chemical Loads Mounting Location: B
- ISO 15003: Agricultural Engineering – Electrical and electronic equipment – Testing resistance to environmental conditions

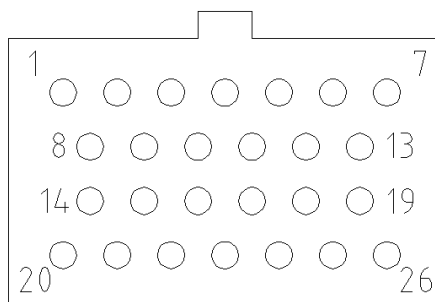
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7 Pinout

Mainconnector pinout OPUS A3

pin no.	assignment	description
1	VCC	supply voltage +; terminal 30
2	Ignition Input	ignition input; terminal 15
3	GND	supply voltage - ;terminal 31
4	CarGND	car ground; has to be connected, otherwise there will be no protection against overvoltage, shortcut or ESD
5	n. c.	not connected
6	n. c.	not connected
7	n. c.	not connected
8	CAN1H	CAN bus 1 high signal
9	CAN1L	CAN bus 1 low signal
10	CAN2H	CAN bus 2 high signal
11	CAN2L	CAN bus 2 low signal
12	USB_VCC	full speed USB, + 5 V DC
13	USB_GND	full speed USB, 0 V
14	USB_D-	full speed USB, data line (-)
15	USB_D+	full speed USB, data line (+)
16	RS232: RxD	RS232: RxD
17	RS232: TxD	RS232: TxD
18	RS232: GND	RS232: GND
19	n. c.	not connected
20	n. c.	not connected
21	n. c.	not connected
22	n. c.	not connected
23	SERV_EN	service enable; to be connected while power-on for updating
24	n. c.	not connected
25	n. c.	not connected
26	n. c.	not connected

seen from the back side of the unit



8 Revisions

Revision	Date	Author	Comment
1.0	23.02.2010	PG	First Draft
1.1	20.09.2010	PG	Base color of housing
1.2	09.11.2010	PG	RTC: buffering and accuracy changed
1.3	04.01.2011	PG	Power Supply: Current consumption added, update: electrical connections, restrictions, key pads and mounting, pin assignment changed. CarGND, SERV_EN, an/dig. inputs and dig. outputs Scope, General Description, Dimensions and Software Architecture added
2.0	07.04.2011	PG	Approved