

SANTOKA SERIES

Embedded Computer Systems

Էմբեդդեդ Կոմպյուտեր շնչհամակարգեր



SANTOKA 10.1" Boxed RES IPS V1.2

Manual

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1 Introduction

Thank you very much for purchasing a Garz & Fricke product. Our products are dedicated to professional use and therefore we suppose extended technical knowledge and practice in working with such products.



The information in this manual is subject to technical changes, particularly as a result of continuous product upgrades. Thus this manual only reflects the technical status of the products at the time of printing. Before design-in the device into your or your customer's product, please verify that this document and the therein described specification is the latest revision and matches to the PCB version. We highly recommend contacting our technical sales team prior to any activity of that kind.

The attached documentation does not entail any guarantee on the part of Garz & Fricke GmbH with respect to technical processes described in the manual or any product characteristics set out in the manual. We do not accept any liability for any printing errors or other inaccuracies in the manual unless it can be proven that we are aware of such errors or inaccuracies or that we are unaware of these as a result of gross negligence and Garz & Fricke has failed to eliminate these errors or inaccuracies for this reason.

Garz & Fricke GmbH expressly informs that this manual only contains a general description of technical processes and instructions which may not be applicable in every individual case. In cases of doubt, please contact our technical sales team.

In no event, Garz & Fricke is liable for any direct, indirect, special, incidental or consequential damages arising out of use or resulting from non-compliance of therein conditions and precautions, even if advised of the possibility of such damages.



Before using a device covered by this document, please carefully read

- Annex **F-1 Warranty hints**
- Annex **G-2 Application notes**



Embedded systems are complex and sensitive electronic products. Please act carefully and ensure that only qualified personnel will handle and use the device at the stage of development. In the event of damage to the device caused by failure to observe the hints in this manual and on the device (especially the safety instructions), Garz & Fricke shall not be required to honour the warranty even during the warranty period and shall be exempted from the statutory accident liability obligation. Attempting to repair or modify the product also voids all warranty claims.

2 Safety Hints

Please read this section carefully and observe the instructions for your own safety and correct use of the device. Observe the warnings and instructions on the device and in the manual. Garz & Fricke embedded systems have been built and tested by us and left the company in a perfectly safe condition. In order to maintain this condition and ensure safe operation, the user must observe the instructions and warnings contained in this manual.



I. General handling

- Don't drop or strike the unit: The PCB, display and/or other parts might be damaged.
- Keep away from water and other liquids, the unit is not protected against.
- Operate the unit under electrical and environmental conditions according to the technical specification.
- The electrical installations in the room must correspond to the requirements of the local (country-specific) regulations.
- Take care that there are no cables, particularly power cables, in areas where persons can trip over them.
- Do not place the device in direct sunlight, near heat sources or in a damp place.
- All plugs on the connection cables must be screwed or locked to the housing.
- Repairs may only be carried out by qualified specialist personnel authorized by Garz & Fricke GmbH or their local distributors.
- Maintenance or repair on the open device may only be carried out by qualified personnel authorized by Garz & Fricke GmbH which is aware of with the associated dangers.



II. LCD and touch handling

- If equipped with, the soft surface of a resistive touch screen is not suitable for use with stencils and/or other devices for touch operation. There are special plastics pens available in commercial shops. A projective capacitive touch screen might be protected by a heat strengthened glass or acrylic or polycarbonate cover lens. These are dedicated for use with finger tips. There are very special pens available which might work with a PCT touch.
- Protect the LCD/touch/cover lens against scratches and sharp edges. The warranty does not cover pixel failures resulting from non-compliant handling.
- Clean the LCD/touch/cover lens with a soft cotton cloth with alcohol. Don't use organic solvents, acid or alkali solutions.
- Water drops, finger fat or any similar fouling should be removed immediately from the LCD, cover lens and metal frame to avoid any staining.



III. Electricity

- The embedded systems may only be opened in accordance with the description in this user's manual for
 - replacing of the (rechargeable, where applicable) lithium battery and/or
 - configuration of interfaces, where applicable
- These procedures have to be carried-out only by qualified specialist personnel.
- When accessing internal components the device must be switched off and disconnected from the power source.
- When purchased core or basic versions without protecting back cover, don't touch the PCB directly with your fingers. Especially these products need to be handled very carefully.
- Don't operate or handle the unit without typical ESD protection measures, such as ground earthing.
- Operate the unit according to the technical specification only.



IV. Damage or permanent malfunction

- It must be assumed that a safe operation is no longer possible, in case
 - the device has visible damage or
 - the display is dark or shows strange pattern for longer period
 - the device doesn't react after a reset
- In these cases the device must be shut down and secured against further use

**V. FCC**

- To comply with FCC and Industry Canada RF exposure limits for general population / uncontrolled exposure, the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and operating in conjunction with any other antenna or transmitter, except in accordance with FCC multi-transmitter product procedures
- Note: This equipment has been tested and found to comply with the limits for a **Class A digital device**, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against **harmful interference** when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate **radio frequency energy** and, if not installed and used in accordance with the instruction manual, may cause **harmful interference** to radio communications. **Operation** of this equipment in a residential area is likely to cause **harmful interference** in which case the user will be required to correct the interference at his own expense.

3 Product Introduction

This document is applicable for hardware revisions 1.1 or later of the SANTOKA SERIES.

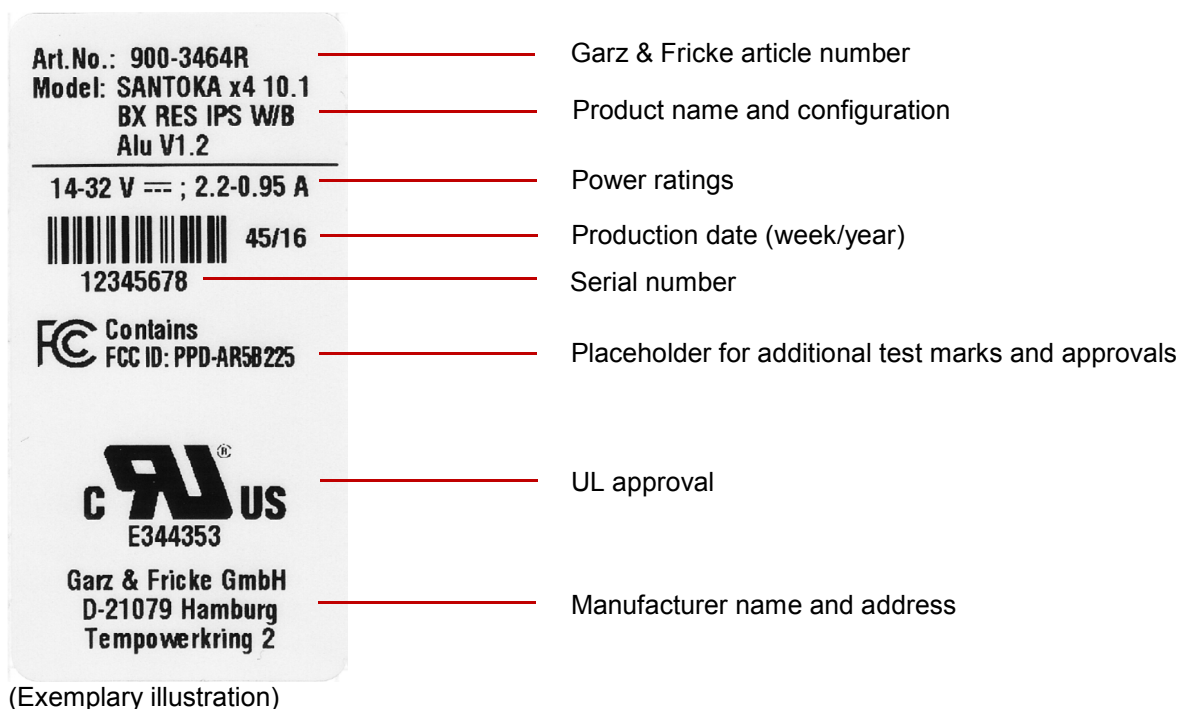
Please find the hardware version grid in [Annex A](#):

3.1 Product introduction

SANTOKA is an Embedded System to be used as human machine interface (HMI) in various applications. Please refer to Annex [F-2 Application notes](#) for further information. The system is equipped with a large number of industrial interfaces. A wide variety of options is available as well.

3.2 Type plate and device information

For service and later identification of the device, the type plate contains important information, such as article numbers (linked to the PCB rev.), the order code and model name (which is valid for all PCB rev.) and the serial number, that identifies the exact device.



3.3 Product names and variants

Product name definition:

SANTOKA <CPU> 10.1 BX RES IPS <additional description> V1.<x.y>

Explanation:

SANTOKA	Product family name (invariable)
<CPU> x1, x2, x2l, x4	(number of cores inside the i.MX6 processor)
10.1	Display size in inch (display model is invariable)
BX	mechanical design of enclosure (invariable)
RES	resistive touch
IPS	Display technology "in-plane switching", (display model is invariable)

<additional description>	contains variants which are important to sales product description, i.e. - without or with WLAN/Bluetooth module ("W/B") - untreated glass surface or including antiglare treatment ("AG") - front frame made from die-cast zinc or aluminium ("Alu") - different memory capacities for RAM and/or eMMC - customer-specific reduced assembly - etc.
<V1.x.y>	revision of PCB layout <x> describes variants that are different in PCB layout and could affect the list of critical components (UL LoCC). <y> describes minor changes to PCB layout due to production optimization like solder resist mask or drilling diameters. Also minor changes in assembly of PCB and/or device which do NOT affect the list of critical components (UL LoCC) due to unlisted components or declared "interchangeable".

3.4 Related documents and online support

This document contains product specific information. The following additional documentations are available:

Title	Link to Garz & Fricke Website	Description
Windows OS Manual	GF_WindowsCE_Manual_Vn.n.pdf	Contains information about Windows Embedded CE, the tool chain, the development environment Visual Studio, Garz & Fricke tools, etc.
Linux PTX OS Manual	GF_Linux_PTX_Manual_Vn.n.pdf	Contains information about Linux BSP with PTX distribution, the tool chain, Qt, etc.
Linux Yocto OS Manual	GF_Linux_Yocto_Manual_Vn.n.pdf	Contains information about Linux BSP with development environment Linux Embedded System Yocto includes first information about the bootloader Flash N Go
Flash N Go User Manual	Tbd.	Contains information about the usage of the Garz & Fricke Flash-N-Go solution which consists of three submodules: Flash-N-Go Boot, Flash-N-Go System, Flash-N-Go Update

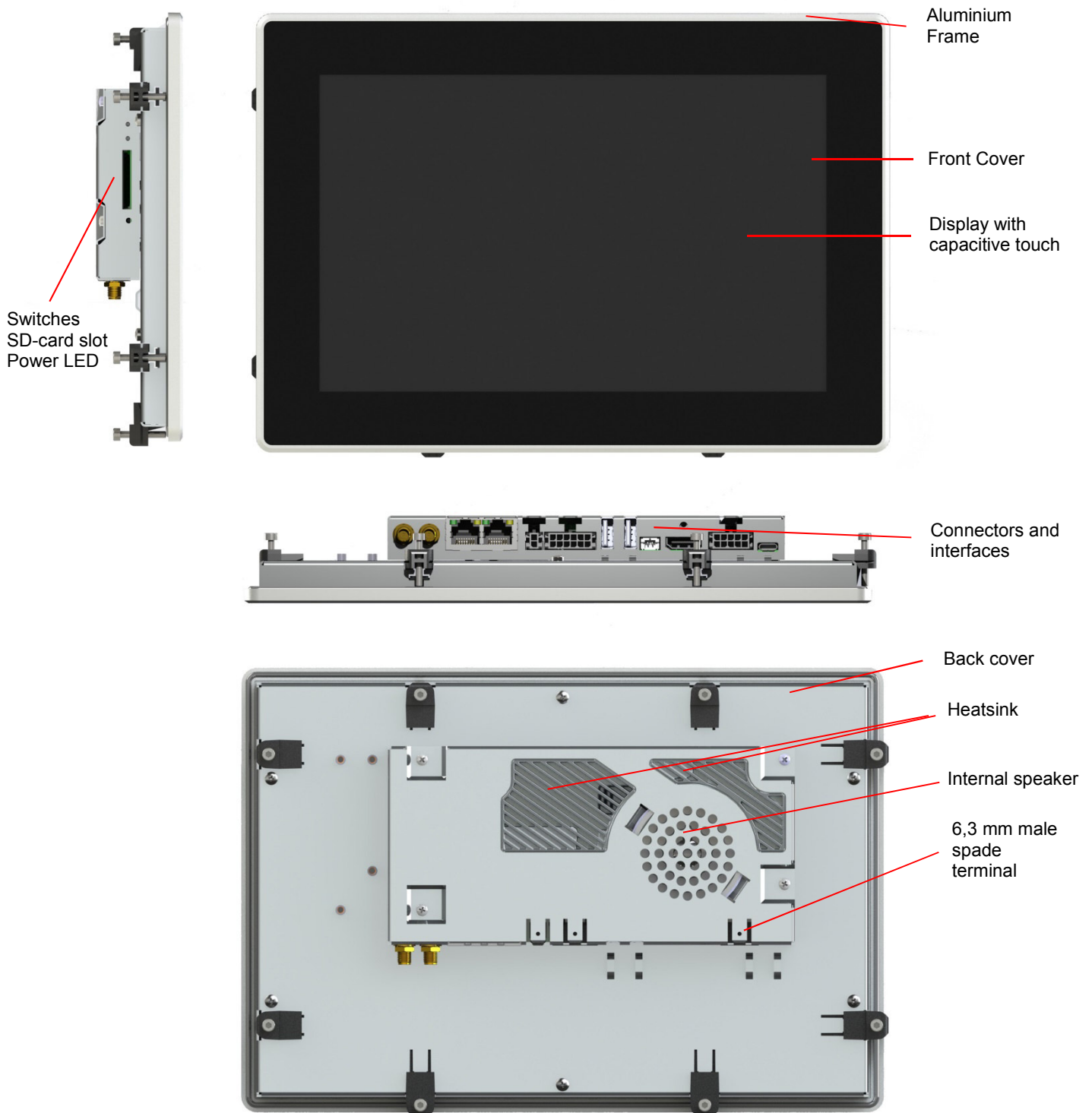
Support for your Garz & Fricke embedded device is available on the Garz & Fricke website. You may find a list of the documents available, as well as their latest revision and updates for your system:

Product	Link to Garz & Fricke Website
SANTOKA 10.1" Boxed PCT IPS	http://www.garz-fricke.de/santoka-101ips-boxed-pct_en.html?ptab=1

4 Product Description

This drawing is meant for your orientation. For drawing please refer to [Annex B:](#)

You will get 3 D model (CAD) Drawings after signed a NDA contract.



(Exemplary illustration)

4.1 Technical data

CPU	Singlecore M	Singlecore	Dualcore lite	Dualcore	Quadcore
Type	NXP i.MX6S		NXP i.MX6DL	NXP i.MX6D	NXP i.MX6Q
Cores	1		2	2	4
Frequency	800 MHz			1 GHz per core	
Features	NEON for SIMD media acceleration and VFP operations L1 cache, 32 KB for instruction, 32 KB for data 512 KB L2 cache (Singlecore and Dualcore lite) 1 MB L2 cache (Dualcore) Multi-format HD 1080p video decoder and HD 720p video encoder hardware engine				
HW Accelerators	OpenGL® ES 2.0				
	OpenVG™ 1.1 (emulated on 3D GPU)			OpenVG™ 1.1	
RTC	Depending on ambient temperature Standard time's deviation: +/- 30 ppm at 25°C				
Memory	Singlecore M	Singlecore	Dualcore lite	Dualcore	Quadcore
RAM Standard (DDR3)	512 MB 32-Bit	1 GB 32-Bit		1 GB 64-Bit	
RAM Maximum	Up to 2 GB (not tested, yet)				
eMMC-Flash	4 GB MLC eMMC				
SD Card Slot	4 bit MMC/SDIO/SD/SDHC				
Wireless Interfaces					
Wi-Fi	IEEE 802.11a/b/g/n; 64- and 128-bit hardware encryption AES engine; Access point up to 8 clients				
Bluetooth	On request available: Bluetooth Version 3.0 + HS and Version 2.1 + EDR				
Interfaces External	Singlecore M	Singlecore	Dualcore lite	Dualcore	Quadcore
Network	1x 10/100 Mbit/s Ethernet (RJ45)	2x 10/100 Mbit/s Ethernet (RJ45)			
Serial	2x RS-232 (RX/TX/CTS/RTS)				
	-	1x RS-485, nonisolated		1x RS-485, with galvanic isolation	
	MDB ¹ / 1x MDB (Master / Slave optional) ² instead of 2 nd external RS-232				
High-Speed USB 2.0	2x 480 Mbit/s Host (Type A) , max 500 mA output 1x 480 Mbit/s OTG (Type Micro-AB) ³ , max 100 mA output				
CAN Fieldbus	-	1x CAN (ISO /DIS 11898), nonisolated		1x CAN (ISO/DIS 11898), galv. isolated together with RS-485	
	-	CAN2* ¹ / 2nd CAN instead of RS-485			
Keypad/SPI/I ² C multiplexed ⁴	Default	1x 7x7 Keypad, 1x I ² C			
	Mode 1	1x 4x4 Keypad, 1x I ² C, 1x SPI			
	Mode 2	1x 8x8 Keypad			
	Mode 3	1x 5x5 Keypad, 1x SPI			
Speaker output	1x speaker (connector) 1.5W RMS (8Ω), 3W RMS (4Ω)				
HDMI	-			1	

¹ Option

² The selection of one variant eliminates the other.

³ Mechanically the Micro-USB interface has not been designed for frequent contact operations. Please use an adapter cable with a strain relief.

⁴ Option

LCD Display	Singlecore M	Singlecore	Dualcore lite	Dualcore	Quad
Size [inch/mm]	10.1 / 256.0				
Display Technology	TFT IPS				
Width x Height [pixel]	1280 x 800				
Colors [bit]	24 (16.7 M colors)				
Backlight Unit	LED				
Luminance ⁵ [cd/m²]	500 (Typ.)				
Active Area W x H [mm]	216.7 x 135.6				
Viewing Angle	85, 85, 85, 85 (u, d, l, r)				
Touch					
Type	5-wire resistive				
Input Type	Single Touch				
Resolution	≥ Display Resolution				
Surface Hardness	Tbd.				
Power Supply and Consumption					
Supply [V DC]	Nom. 24 Max. 14 ~ 32				
Consumption [W]	Typ. 7.4 Max. 30.8				
Internal Backup Battery (RTC)	3 V Li-Ion Type CR1220: Lifetime: Approximately 8 years, depending on application				
Housing					
Back Cover	1.4016 high quality steel, polished, 0.8mm				
Front	Frame: Light metall				
	Décor: black, heat strengthened safety glass				
IP Protection class	Front: 66				
	Back: 20				
Approximate Dimensions					
W x H x D [mm]	271.4 x 188.2 x 37.9				
Weight [g]	620				
Environment					
Humidity [%]	5 ~ 90 (non condensating)				
Operating Temperature [°C]	0 ~ +55				
Storage Temperature [°C]	-20 ~ +70				
Max. Operating Altitude [m]	3,000				
Max. Storage/Transit Altitude [m]	10,000				
Noise Level [db(A)] @ 1m	<<40 (fanless design)				

⁵ Luminance applies to the display without capacitive touch (with capacitive touch approx.85%)

Lifetime	
Backlight Lifetime ⁶ LCD Display [h]	50,000
MTBF ⁷ [h]	≥ 50,000

⁶ Backlight lifetime is dictated by the LCD manufacture's specification. Backlight lifetime is the approximate time at which the brightness decreases to half of its original brightness. Reduction of brightness due to backlight lifetime is not considered as failure. It is a natural aging of all electronic components.

⁷ Electrical products use the industrial standard term Mean Time between Failure (MTBF) as a statistical prediction of the elapsed time between failures in a large population of systems.

The MTBF of all Garz & Fricke HMI products shall be 50,000 hours

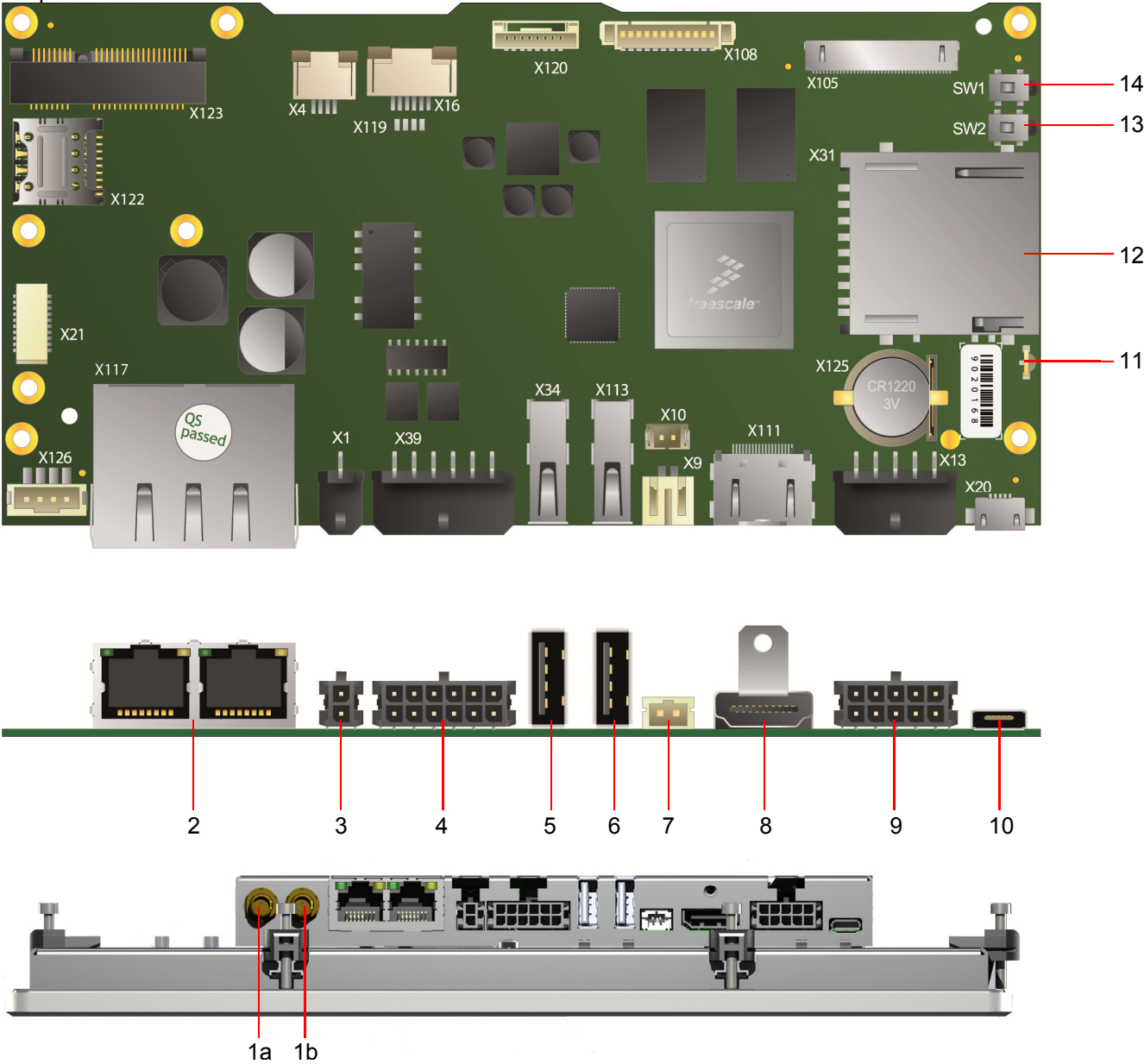
A failure is anything that causes the product not to function to its specifications

Reduction in brightness due to backlight lifetime is not a failure

If the LCD used in the system exceeds its pixel defect specification it is considered a failure.

4.2 PCB design and Pin assembly

As this manual describes a boxed version, only the external interfaces will be mentioned in the following chapter.



(Exemplary illustration: The illustration shows the fully equipped SANTOKA Dualcore. It shows no heatsink to provide a better overview.)

Pos.	Description
1a	SMA-Connector (X115) Bluetooth
1b	SMA-Connector (X115) WLAN
2	Ethernet (X117.1/X117.2)
3	Power (X1)
4	CAN/RS-485 Interface (X39)
5	USB - Host (X34)
6	USB - Host (X113)
7	Speaker (X9)

Pos.	Description
8	HDMI (X111)
9	RS-232/MDB (X13)
10	USB – OTG (X20)
11	Status LED (D30)
12	SD card reader (X31)
13	Boot-Select Switch (SW2) ⁸
14	Reset Switch (SW1)

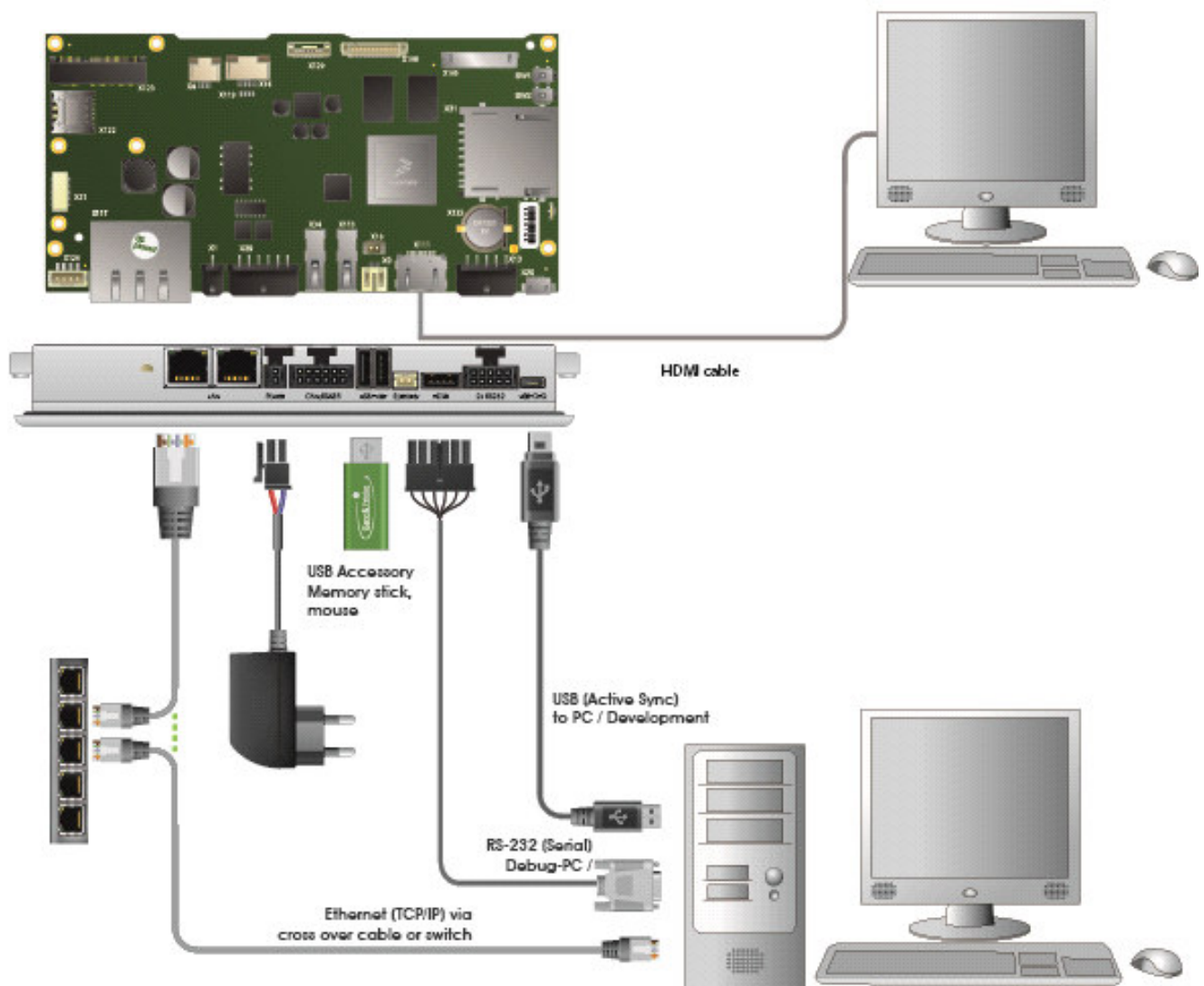
⁸ For the function of this switch please refer in the future to the Flash N Go User Manual.

5 Installation and start up

The content of this document is limited to explain the device connectors and how to access SANTOKA via FTP over your local area network (LAN) within a few seconds. For advanced hardware specifications and software support, please refer to chapter [3.4 Related documents and online support](#)

Product	Link to Garz & Fricke Website
SANTOKA 10.1" Boxed PCT	http://www.garz-fricke.de/santoka-101ips-boxed-pct_en.html?ptab=1

5.1 Connection Scheme



(Exemplary illustration)

6 External interfaces and Schematics

6.1 SMA-Connector (X115)



Pin	Name	Description	Information
1	Signal		
2	GND		

Wi-Fi is certified only with the delivered antenna. For further information please contact Garz & Fricke GmbH.

6.2 Ethernet (X117.1/X117.2)

X117.1



Pin	Name	Description	Information
1	Tx+		Rx/Tx might be swapped (Auto-MDIX) +/- might be swapped (Autom. polarity correction)
2	Tx-		
3	Rx+		
4	SPARE1		
5			
6	Rx-		
7	SPARE2		
8			

Header: RJ45

X117.2



Pin	Name	Description	Information
1	Tx+		Rx/Tx might be swapped (Auto-MDIX) +/- might be swapped (Autom. polarity correction)
2	Tx-		
3	Rx+		
4	SPARE1		
5			
6	Rx-		
7	SPARE2		
8			

Header: RJ45

6.3 Power (X1)



Pin	Name	Description	Level
1	GND	DC Ground	0V
2	Vcc_In	DC Input voltage	Nom. 24V $\pm$ 15% Max. 14~32

Header: Molex 43045-0200 Micro-Fit 2p

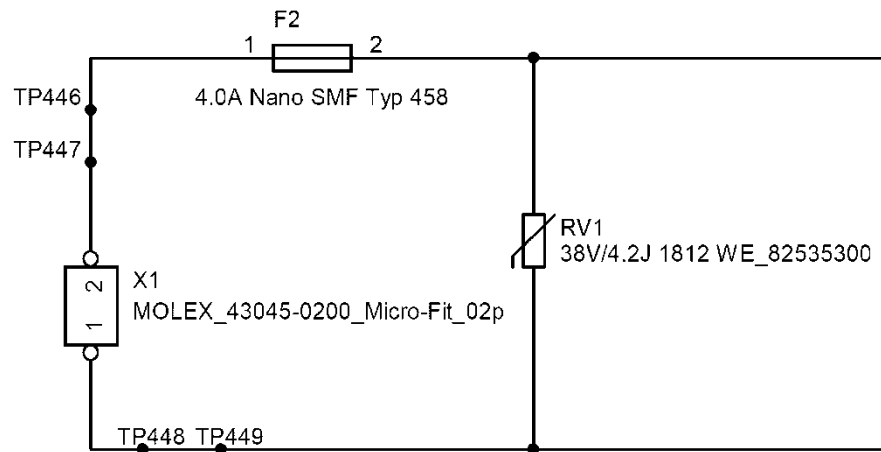
Plug: Molex 43025-0200 Micro-Fit 2p,
crimp contact Molex 43030-0007

Shielding with 6,3 mm male spade terminal connector

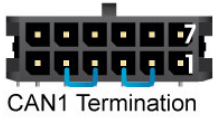
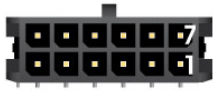
Pin 1 (GND) is connected to frame/housing. GND/Vcc_In is not galvanic isolated from System-GND



Caution: Power supplies connected to this device must be compliant to the requirements of “limited power sources” (LPS) to prevent the end-user from danger in case of a fault.



6.4 CAN/RS-485 Interface (X39)



Pin	Name	Description	Level
1	GND_CAN_RS485	Ground for CAN and RS485 group	
2	CAN1_TERM	To enable CAN1-Termination, bridge with CAN1_H	
3	CAN1_H	CAN bus 1 high	-24...+24 V
4	CAN1_L	CAN bus 1 low	-24...+24 V
5	CAN1_TERM	To enable CAN1-Termination, bridge with CAN1_L	
6	RS485_TERM	To enable RS485-Termination: bridge with RS485_A	
7	GND_CAN_RS485	Ground for CAN and RS485 group	
8	n.a.		
9	RS485_Y	TX+	-7...+12 V
10	RS485_Z	TX-	-7...+12 V
11	RS485_A	RX+, to enable Half-Duplex: bridge with RS485_Y	
12	RS485_B	RX-, to enable Half-Duplex: bridge with RS485_Z	

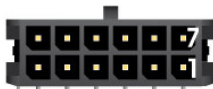
Header: Molex 43045-1200 Micro-Fit 12p

Plug: Molex 43025-1200 Micro-Fit 12p, crimp contact Molex 43030-0007

Shielding with 6,3 mm male spade terminal connector

CAN/RS-485 (X39) is not galvanic isolated from System-GND/Housing

CAN1/CAN2 *



Pin	Name	Description	Level
1-5		Identical to standard	
6	n.a.		
7	GND_CAN_RS485	Ground for CAN group	
8	CAN2_TERM	To enable CAN2-Termination, bridge with CAN2_H	
9	CAN2_H	CAN bus 2 high	-24...+24 V
10	CAN2_L	CAN bus 2 low	-24...+24 V
11	CAN2_TERM	To enable CAN2-Termination, bridge with CAN2_L	
12	n.a.		

6.5 Speaker (X9)



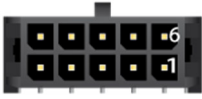
Pin	Name	Description	Level
1	Speaker +	Parallel to X10	1.5W RMS 8 Ohm
2	Speaker -		

Header: JST S2B-PH-SM3-TB

Plug: JST PHR-2 with crimp contacts SPH-002GW-P0.5L-ND

6.6 RS-232/MDB (X13)

RS-232/RS-232



Pin	Name	Description	Level
1	GND	Ground	
2	RS232_TXD1	Port#1: Transmit data (Output)	
3	RS232_RXD1	Port#1: Receive data (Input)	
4	RS232_RTS1	Port#1: Request-to-send (Output)	
5	RS232_CTS1	Port#1: Clear-to-send (Input)	
6	GND	Ground	
7	RS232_TXD2	Port#2: Transmit data (Output)	
8	RS232_RXD2	Port#2: Receive data (Input)	
9	RS232_RTS2	Port#2: Request-to-send (Output)	
10	RS232_CTS2	Port#2: Clear-to-send (Input)	

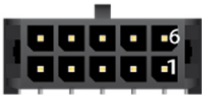
Header: Molex 43045-1000 Micro-Fit 10p

Plug: Molex 43025-1000 Micro-Fit 10p,
crimp contact Molex 43030-0007

Shielding with 6,3 mm male spade terminal connector

RS-232/MDB (X13) is not galvanic isolated from System-GND/Housing

RS-232/MDB



Pin	Name	Description	Level
1-6		Identical to standard (pls. see 0)	
7	MDB_TXD	MDB: Transmit data (Output)	
8	MDB_RXD2	MDB: Receive data (Input)	
9	MDB_WakeUp	MDB: WakeUp Signal (Output)	
10		MDB: WakeUp PullUp VCC	0...5 V

6.7 USB - Host (X34)



Pin	Name	Description	Level
1	USB_H1_VBUS	Power supply	+5 V DC max 500mA
2	USB_H1_DN	Data minus (D-)	
3	USB_H1_DP	Data plus (D+)	
4	GND	Ground	

Header: USB Type A

6.8 USB - Host (X113)



Pin	Name	Description	Level
1	USB_H1_VBUS	Power supply	+5 V DC max 500mA
2	USB_H1_DN	Data minus (D-)	
3	USB_H1_DP	Data plus (D+)	
4	GND	Ground	

Header: USB Type A

6.9 USB – OTG (X20)



Pin	Name	Description	Level
1	USB_OTG_VBUS	Power supply	+5 V DC max 100 mA
2	USB_OTG_DN	Data minus (D-)	
3	USB_OTG_DP	Data plus (D+)	
4	USB-OTG_ID	Device ID	
5	GND	Ground	

Header: Micro-USB Type AB

6.10 SD card reader (X31)



Pin	Name	Description	Level
1	DATA3		
2	CMD	Pullup	
3	GND		
4	VDD		3.3 V
5	CLK		
6	GND		
7	DATA0		
8	DATA1		
9	DATA2		
10	CD		
11	WP		
12	GND		

6.11 HDMI (X111)



Pin	Name	Description	Level
1	D2+	TMDS Data2+	
2	GND	TMDS Data2 shield	
3	D2-	TMDS Data2-	
4	D1+	TMDS Data1+	
5	GND	TMDS Data1 shield	
6	D1-	TMDS Data1-	
7	D0+	TMDS Data0+	
8	GND	TMDS Data0 shield	
9	D0-	TMDS Data0-	
10	CK+	TMDS Clock+	
11	GND	TMDS Clock Schirm	
12	CK-	TMDS Clock-	
13	CEC	CEC	
14	Utility	NC	
15	I2C_CLK	SCL (I ² C serial clock for DDC)	
16	I2C_Data	SDA (I ² C serial data for DDC)	
17	DDC/CEC_GND	DDC/CEC/HEC-Masse	
18	+5V	Supply	+5 V max. 55 mA
19	HOT_PLUG_DETECT	Hot-Plug-Detect	

Header: HDMI Type-A

6.12 Battery-Holder (X121)



Pin	Name	Description	Level
1	VCC	Supply	3 V
2	GND	Ground	

Header: AUK BH19VWG-R5H-H

Battery: CR1220

7 Document revision history

The information in this document is subject to change without prior notice in order to improve reliability, design and function and does not represent a commitment on the part of the manufacturer.

Revision	Date	Author	Description
V1.0	07.04.2015	LK	For PCB revision V1.0
V1.2	11.11.2016	MH	For PCB revision V1.2

8 Technical support

Before contacting the Garz & Fricke support team, please try to help yourself by the means of this manual or any other documentation provided by Garz & Fricke or the related websites.

If this does not help at all, please feel free to contact us.

Our technicians and engineers will be glad to support you. Please note that beyond the support hours included the Starter Kit, various support packages are available. To keep the pure product cost at a reasonable level, we have to charge support and consulting services per effort.

Shipping address:

Garz & Fricke GmbH
Tempowerkring 2
21079 Hamburg
Germany

Support contact:

Phone: +49 (0) 40 / 791 899-30
Fax: +49 (0) 40 / 791 899-39
E-Mail: support@garz-fricke.com
URL: www.garz-fricke.com



Technical Appendix

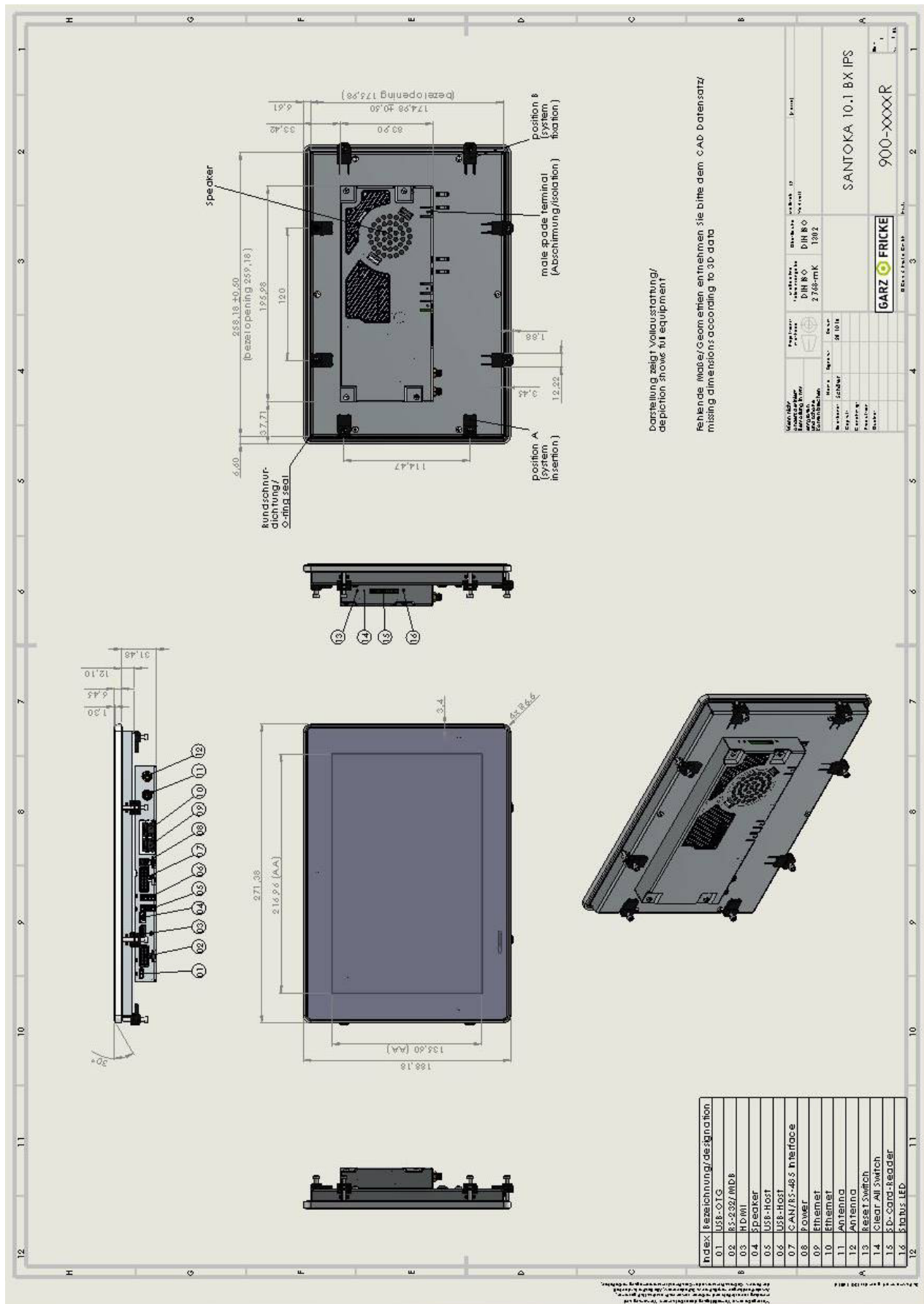
Annex A: Hardware revision information

This document is applicable for all products listed below. Please note that customized variants might possibly not support all features listed herein. Additional features are documented in specific attachments.

Platform	Article Number	Marking on PCB
SANTOKA x4 10.1 BX RES IPS W/B Alu V1.2	900-3464R	0567 SANTOKA V1.2
SANTOKA x4 10.1 BX RES IPS W/B V1.2	900-3453R	0567 SANTOKA V1.2

Annex B: Mechanical specifications

B-1 Mechanical Drawings



Annex C: Quality and Incoming Inspections

C-1 Display and Touch

Specification				Maximum amount display area	Maximum amount other area	Notes
Electrical defects (only displays)	Bright Dot	Minimum distance between dot and dot	$L \geq 5\text{mm}$	2	-	One dot = one sub-pixel One pixel consists of three sub-pixels (dots), R, G and B.
	Dark Dot			3		
	Total Dot Defect			5		
Visual defects	Dot shape	$D \leq 0.25\text{mm}$	ignored	ignored	$< 200\text{cm}^2:1$ $> 200\text{cm}^2:3$	Dot shape over all in display area and panel. It means Particle, Scratch, Bubble, Dent and others
		$0.25 < D \leq 0.5\text{mm}$	3			
		$D > 0.5\text{mm}$	0	0		
	Line or spiral shape	$W \leq 0.07\text{mm}$	ignored	ignored	$< 200\text{cm}^2:1$ $> 200\text{cm}^2:3$	Line shape over all in display area and panel. It means Particle, Scratch, Bubble, Dent and others
		$0.07 < W \leq 0.1\text{mm}, L \leq 5\text{mm}$	3			
		$W > 0.1\text{mm}, D > 0.5\text{mm}$	0	0		
	Chipped panel edges	$\leq 0.7\text{mm} \times \leq 0.7\text{mm}$	1			$\text{area} \leq 0.49\text{mm}^2$
	Panel Crack		0			
	Bezel Deformation		0			not allowed if Deformation is obvious
	Bezel Oxidation		0			
	Bezel Scratch	$L \leq 10\text{mm}, W \leq 0.1\text{mm}$	3			
	Metal Squash Dent / Front Side		0			

C-2 Evaluation criteria of standard display module

Evaluated Zone 1:

Areas in the immediate viewing area: dirt and dust enclosures / stains / striae / scratches from max. 500 μm (diameter) or 0.02 mm^2 (surface), 5 pcs. per dm^2 are permitted, but no clustering.

Evaluated Zone 2:

Surfaces that are concealed after installation: Dirt and dust enclosures / stains / striae / scratches from max. 2 mm (diameter) or 3 mm^2 (surface), 10 pcs per dm^2 are permitted.

Assessor:

trained, normal-sighted person

Viewing angle:

90 degrees to test object, no reflection

Lighting condition:

1000 LUX on test object

Viewing time:

max. 10 sec / dm^2

Annex D: Battery

D-1 Battery Specifications

The internal baseboard is equipped with a Lithium battery (CMOS battery, type CR1220), which has a typical lifetime longer than 8 years.

Typically we assemble one of the following batteries:

Manufacturer	Model	Article Number
Varta	CR1220	010-0091R



Danger of explosion when replaced with wrong type of battery.
Replace the battery only with a Lithium battery that has the same or equivalent type recommended by Garz & Fricke GmbH.



Do not dispose of used CMOS batteries in domestic waste.
Dispose of the battery according to the local regulations dealing with the disposal of these special materials (e. g. to the collecting points for disposal of batteries).

D-2 Replacement of the internal battery

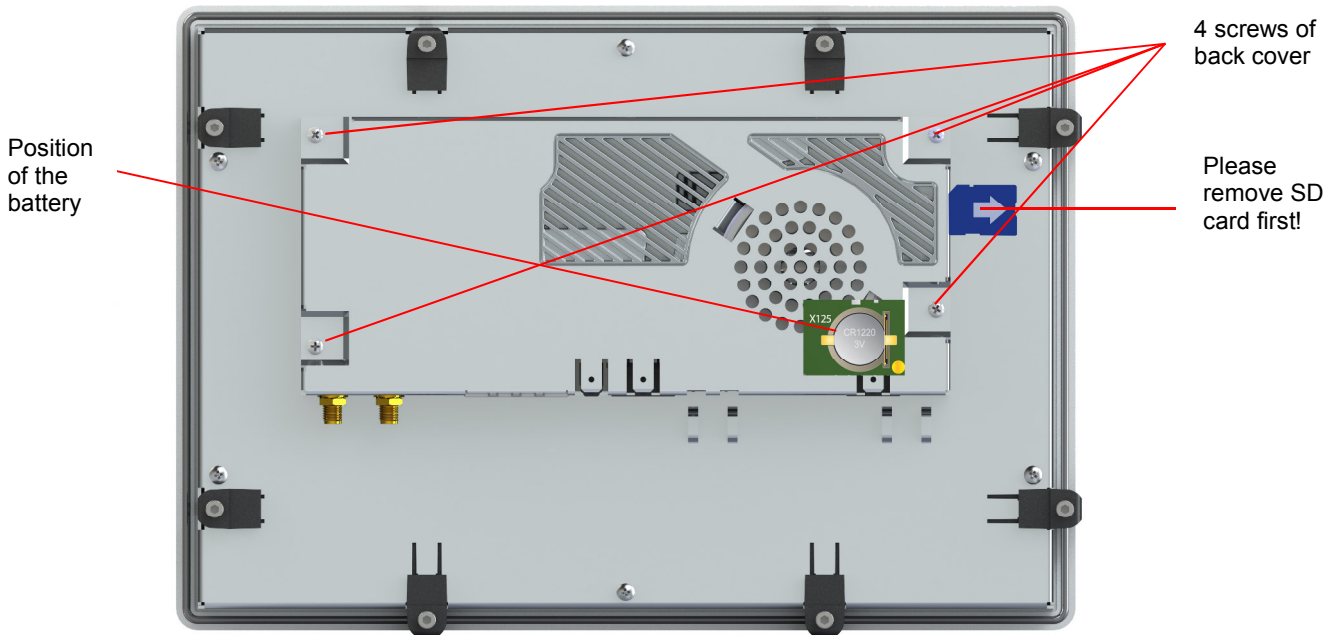
The internal battery is placed as per figure below.

For replacement, the SD-card and the back cover have to be removed.

The device shall be opened by authorized and skilled personnel only.

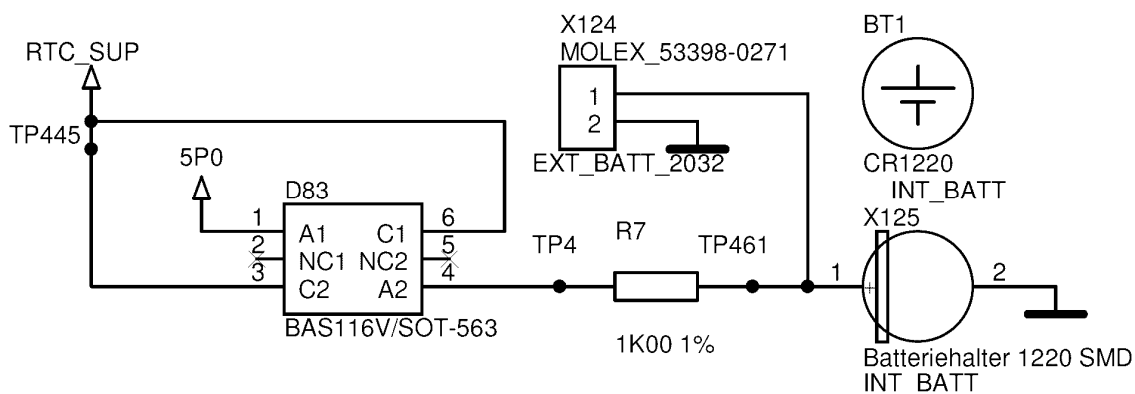


Danger of electric hazard! First before opening, please make sure that the unit is completely disconnected from any power supply, direct or indirect. In order to remove the back cover all other connectors must be removed as well. Please make sure that the SD-card has been removed as it blocks the cover. Furthermore take care about the socket and connectors. Especially the micro-USB connector might be damaged easily.



(Exemplary illustration)

D-3 Battery protection circuit



Annex E: Guidelines and Standards

E-1 RoHS Declaration

Devices comply with the requirements of Directive 2011/65/EU of the European Parliament and of the Council of 8th June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

E-2 UL Certification

SANTOKA 10.1 BX IPS Series is approved to UL 60950-1 as "Information Technology Equipment including Electrical Business Equipment – Component" (category NWGQ2/8) under file number E344353.

Please find more details on UL's Online Certification Directory:

<http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.html>

Annex F: Common documentation

F-1 Warranty hints



Garz & Fricke embedded systems are subject to manufacturer's guarantee as long as the products are handled with adequate care and caution and in accordance to this manual.

The period of guarantee starts from the date of shipment

The products are warranted against defects in material, quality and functionality within the guaranteed period.

During this period, the repair of the products is free of charge.

Garz & Fricke will decide for repair or replacement at their own discretion.

If the product has been returned with or without prior notice and no failure or malfunction can be detected or the failure or malfunction is caused by inappropriate handling or the device has been returned after expiry of warranty period, Garz & Fricke reserve the right to charge the user for repair or replacement.



The warranty does not cover defects caused by improper or inadequate installation, maintenance or handling by the user, unauthorized modification or misuse, operation outside the specification or non-compliance of this manual. In case of doubt, please contact the technical sales team prior to intended activity.

The warranty does also not cover any defects or damages of other equipment connected to the Garz & Fricke product, faulty or not.

For warranty or repair service, please contact the technical sales team.

F-2 Application notes

The products covered by this document are designed and manufactured for the following applications (I). If you intend to use these products in applications as quoted in (II) or (III) we highly recommend a personal contact with our consultants and/or technical sales team.



(I) Recommended application areas for Garz & Fricke embedded systems

Even for these applications, we recommend to get in contact with our technical sales team. We offer a wide range of support, even at an early stage of evaluation and/or design-in phase.

- Vending machines and gastronomy devices
- Industrial controllers and HMI systems
- Home automation and facility management
- Audiovisual equipment
- Instrumentation and measuring equipment

(II) Advanced applications areas, prior consultation is recommended

These applications require a responsibility for fail-safe operation, redundancy and other measures for ensuring reliability and safety of the equipment and the overall system.

- Gas leak detectors
- Rescue and security equipment
- Safety devices
- Control and safety devices for airplanes, trains, automobiles and other transportation equipment
- Mainframe computers
- Traffic control systems

(III) Restricted application areas, prior consultation is mandatory

The following appliances demand extremely high performance in terms of functionality, reliability and/or accuracy. We do not recommend the products covered herein for the following:

- Aerospace equipment
- Control equipment for nuclear power industry
- Medical equipment related to life support etc.
- Gasoline stations and oil refineries

F-3 Trademarks and service marks

There are a number of proprietary logos, service marks, trademarks, slogans and product designations ("Marks") used in this document. By making the Marks available in this document, Garz & Fricke GmbH is not granting you a license to use them in any fashion.

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All other product or service names are the property of their respective owners.

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