GARZ FRICKE

SANTARO SERIES

Embedded Computer Systems

SANTARO 8.4" Open Frame Manual

Content

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-compliancy 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 **G-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

3 Product Introduction

This document is applicable for hardware revisions 1.0 or later of the SANTARO SERIES.

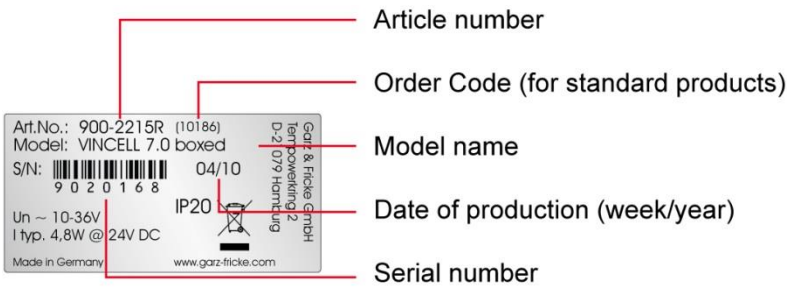
Please find the hardware version grid in **Annex B:**

3.1 Product introduction

SANTARO is an Embedded System to be used as human machine interface (HMI) in various applications. Please refer to Annex **G-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.



(Exemplary illustration)

3.3 Related documents and online support

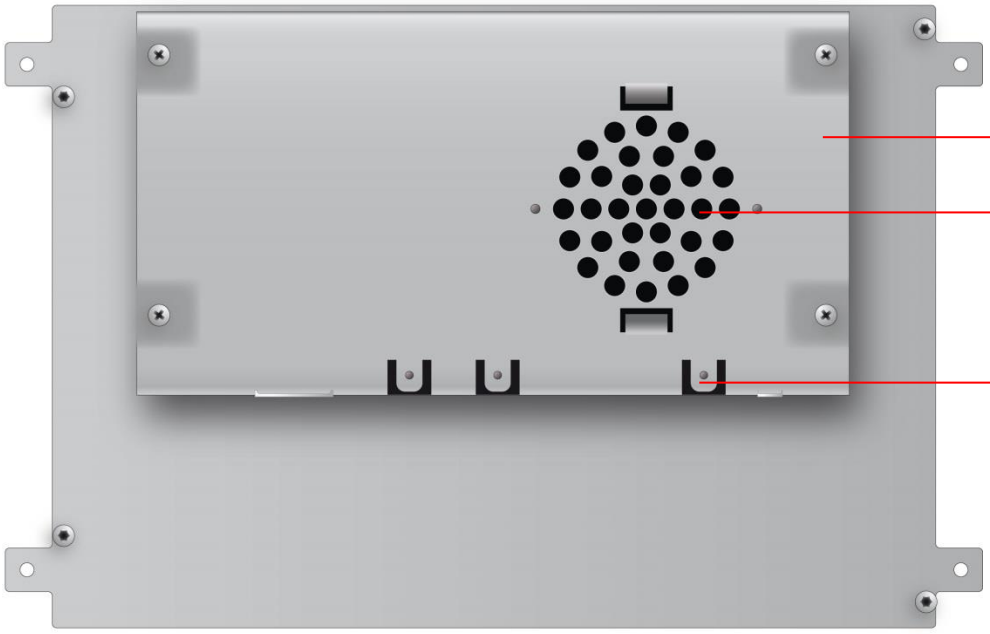
This document contains product specific information. The following additional documentations are available:

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_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.	

4 Product Description

This drawing is meant for your orientation. For drawing please refer to **Annex C:**

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



4.1 Technical data

CPU		Singlecore	Dualcore	Quadcore
Type		CPU Freescale ARM®-Cortex™-A9 i.MX6S/D/Q		
Cores[1]		1	2	4
Clock/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) 1 MB L2 cache (Dualcore and Quadcore) Multi-format HD 1080p video decoder and HD 720p video encoder hardware engine		
HW Accelerators		OpenGL® ES 2.0, OpenVG™ 1.1		
RTC		Depending on ambient temperature Standard time´s deviation: +/- 30 ppm at 25°C		
Memory				
RAM	Standard	512 MB	1 GB	
	Maximum	Up to 2 GB		
SRAM				512 KB
eMMC-Flash		4 GB eMMC		
SD Card Slot		4 bit MMC/SDIO/SD/SDHC		
Interfaces External		**Singlecore**	**Dualcore**	**Quadcore**
Network		1x 10/100 Mbit/s Ethernet (RJ45)		
Serial		2x RS-232 (RX/TX/CTS/RTS)	2x RS-232 (RX/TX/CTS/RTS) 1x RS-485, with galvanic isolation	
		MDB*[2] /1x MDB (Master / Slave optional)[3] instead of 2nd external RS-232		
High-Speed USB 2.0		2x 480 Mbit/s Host (Type A) 2x 480 Mbit/s OTG (Type Micro-AB)[4]		
CAN Fieldbus			1x CAN (ISO/DIS 11898), with galvanic isolation	
Keypad/SPI/I²C multiplexed			Default	1x 7x7 Keypad, 1x I²C
			Mode 1	1x 4x4 Keypad, 1x I²C, 1x SPI
			Mode 2	1x 8x8 Keypad
			Mode 3	1x 5x5 Keypad, 1x SPI
Speaker		2x speaker (connector) 1,5W RMS (8Ω)		
Speaker output		Output sound pressure level (S.P.L.) 85 +-3 db/0,3 W @ 0,5m		
Digital I/O			2x Input, 2x Output (0.7A)	

[1] The variants of core 4 are listed below
[2] Option
[3] The selection of a variant eliminates the other.
[4] Mechanically the Micro-USB interface has not been designed for frequent contact operations. Please use an adapter cable with a strain relief.

LCD Display	**Singlecore**	**Dualcore**	**Quadcore**
Size [inch/mm]	8.4 / 213.4		
Display Technology	TFT TN		
Width x Height [pixel]	800 x 600		
Colours [bit]	24 (16.2M)		
Backlight Unit	LED		
Luminance[5] [cd/m²]	450 (Typ.)		
Active Area W x H [mm]	211.2 x 158.4		
Viewing Angle	Typ. 80 / 80 / 80 / 60 (L/ R/ U/ D)/ Center CR>10		
Resistive Touch			
Type	4-wire analog resistive		
Linearity (typically)	<=+-1.0%		
Resolution	800 x 600		
Surface Treatment	>2H		
Power Supply and Consumption			
Supply [V DC]	Nom. 12 ~ 24 Max. 9 ~ 30		
Consumption [W]	Typ. 10		
Internal Backup Battery (RTC)	Type: 3 V Li-Ion Type CR1220: Lifetime (RTC only): Approximately 8 years, depending on application		
			Type: 3 V Li-Ion Type CR 2032: Lifetime (RTC+SRAM): tbd.
Housing			
Back Cover	1.4016 high quality steel, polished, 0.8mm		
Installation Frame	Conductive Coated ABS-PC		
Approximate Dimensions			
W x H x D [mm]	234.0 x 142.50 x 34.99		
Weight [g]	Tbd.	Tbd.	Tbd.
Environment			
Humidity [%]	5 ~ 95 (non condensating)		
Ingress Protection	IP 20		
Operating Temperature[°C]	0 ~ +60		
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 resistive touch (with resistive touch approx.80%)

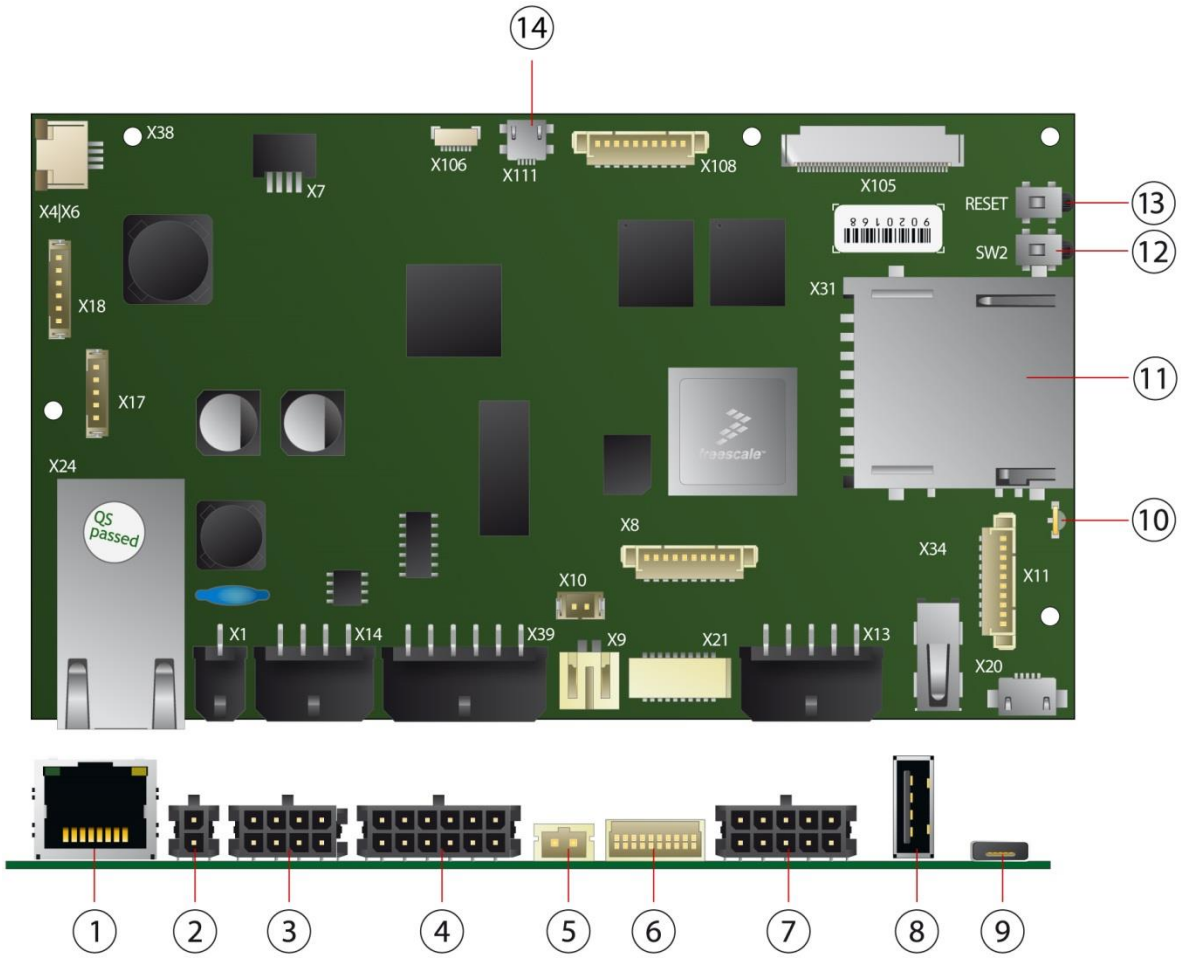
Lifetime	
Backlight Lifetime[6] LCD Display [h]	30,000
Operating Lifetime Touch	100,000 (by pen), 1,000,000 (by finger)
MTBF[7] [h]	≥ 50,000

[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 an open frame version, only the external interfaces will be mentioned in the following chapter.



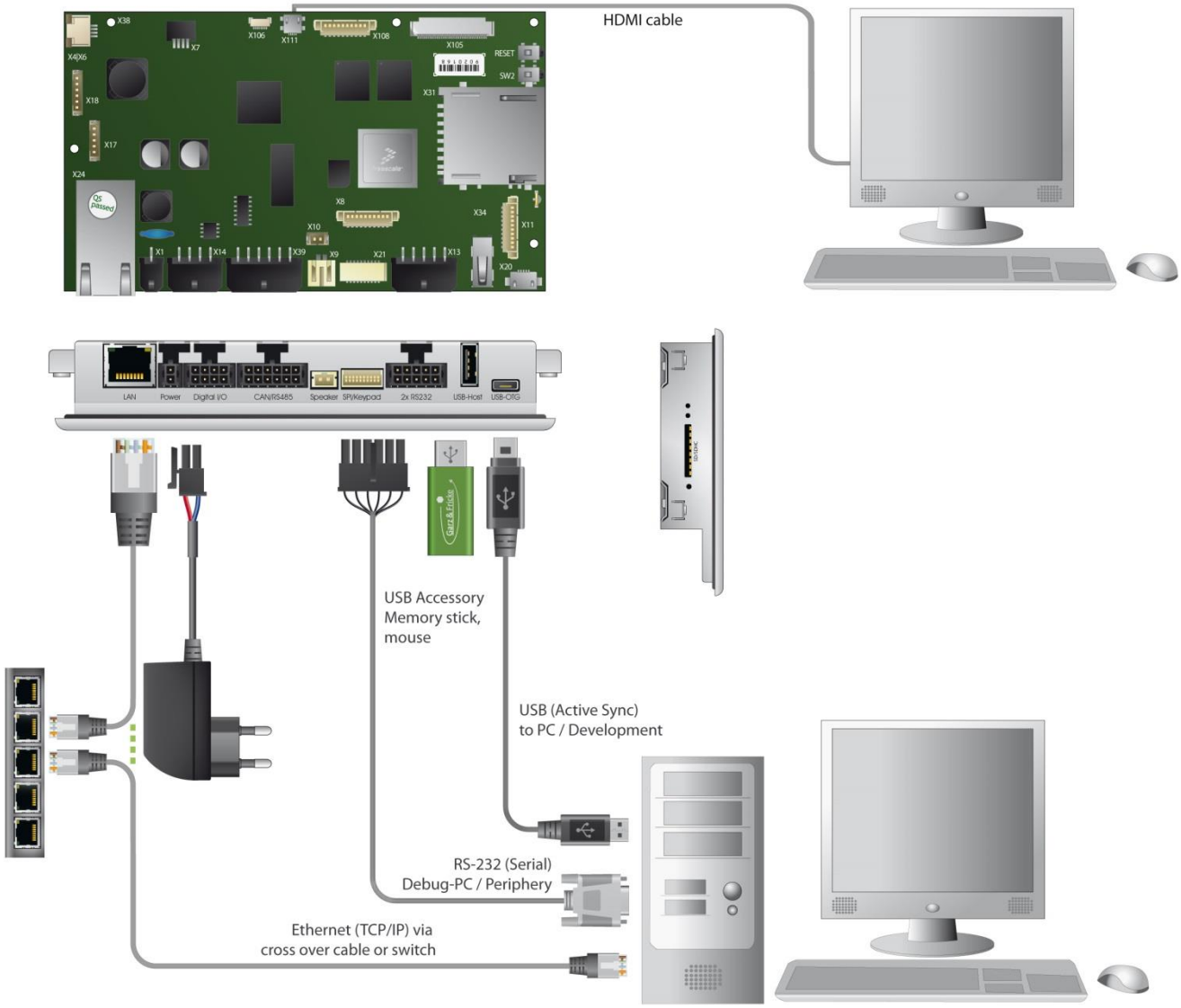
Pos.	Description
1	Ethernet (X24)
2	Power (X1)
3	Digital I/O (X14)
4	CAN/RS-485 Interface (X39)
5	Speaker (X9)
6	Keypad/SPI (X21)
7	RS-232/MDB (X13)

Pos.	Description
8	USB - Host (X34)
9	USB - OTG (X20)
10	Status LED (D30)
11	SD card reader (X31)
12	Clear all Switch (SW2)
13	Reset Switch (SW1)
14	HDMI Type-D (X111)

5 Installation and start up

The content of this document is limited to explain the device connectors and how to access SANTARO via FTP over your local area network (LAN) within a few seconds. For advanced hardware specifications and software support, please refer to chapter **3.3 Related documents and online support**

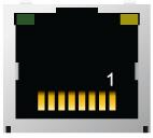
5.1 Connection Scheme



(Exemplary illustration)

6 External interfaces and Schematics

6.1 Ethernet (X24)



Pin	Name	Description	Information
1	Tx+		Rx/Tx might be swapped (Auto-MDIX) +/- might be swapped (Autom. polarity correction) PoE might also be injected via Rx/Tx lines.
2	Tx-		
3	Rx+		
4	SPARE1	Power Supply (PoE)[8]	
5			
6	Rx-		
7	SPARE2	Power Supply (PoE)[8]	
8			

Header: RJ45

Green LED (link) is default on and turns of when link is detected.

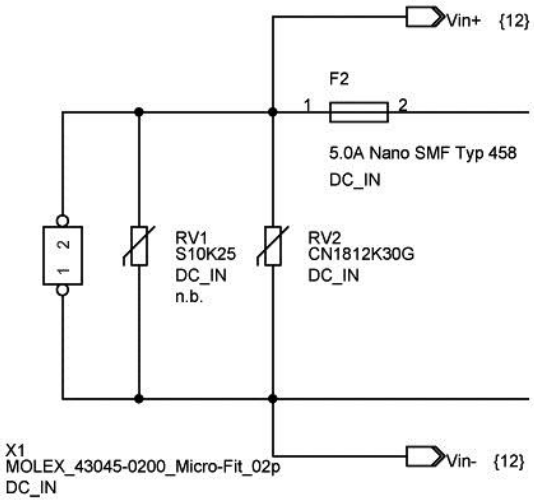
Yellow LED (act) flashes during sending/receiving packets.

[8] Optional

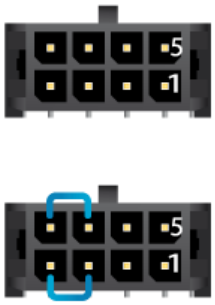
6.2 Power (X1)

Pin	Name	Description	Level
1	GND	DC Ground	0V
2	Vcc_In	DC Input voltage	Nom. 24 ± 15% Max. 16~36

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



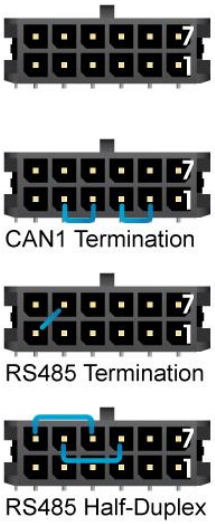
6.3 Digital I/O (X14)



Pin	Name	Description	Level		
1	DIG_IN1	Input 1	0V 3-36V	Low High	Typ. 8,3 mA / 24 V
2	DIG_IN2	Input 2			
3	GND_DIO	Ground for digital IO group			
4	GND	Common ground, can be bridged with GND_DIO, when galvanic isolation is not required			
5	DIG_OUT1	Output 1	0V Vcc_DI O	Low High	Max. 800 mA / 24 V
6	DIG_OUT2	Output 2			
7	Vcc_DIO	Supply input for digital IO group	<36 V		
8	Vcc	Supply output, can be bridged with Vcc_DIO, when galvanic isolation is not required ⚠ Directly connected to the supply (x1) without fuses or surge protection!	Vcc_In		

Header: Molex 43045-0800 Micro-Fit 8p
Plug: Molex 43025-0800 Micro-Fit 8p, crimp contact Molex 43030-0007
Shielding with 6,3 mm male spade terminal connector
Digital I/O (X14) is not galvanic isolated from System-GND/Housing

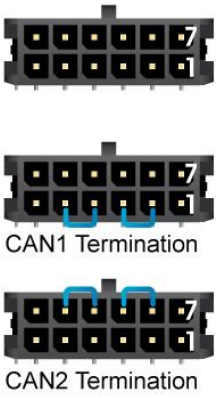
6.4 CAN/RS-485 Interface (X39)



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	VO+	Speaker out +	Max. 1,5 W @ 8 Ω or 3 W @ 4 Ω
2	VO-	Speaker out -	

Header: Header: JST S2B-PH-SM3-TB
Plug: JST PHR-2 with crimp contacts SPH-002GW-P0.5L-ND

6.6 Keypad/SPI (X21)

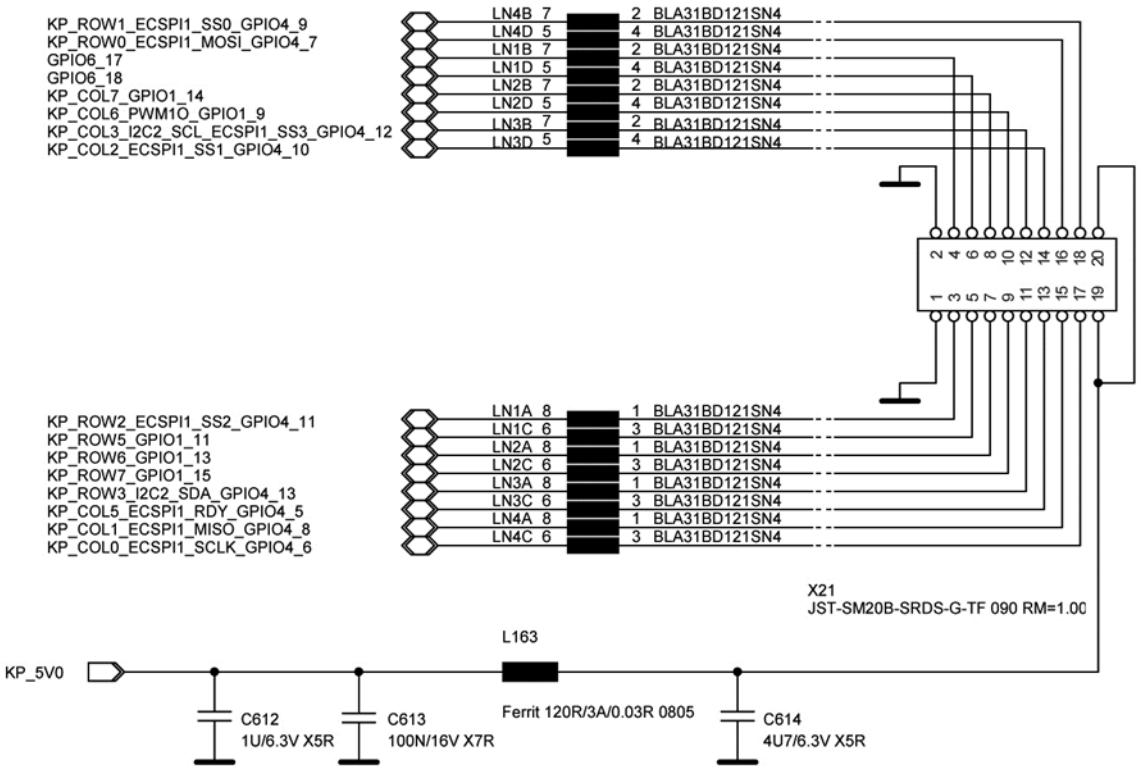
Keypad/SPI/I²C, multiplexed

Pin	Name	Description		Level
		Default mode	Mode 1	
1	GND	Ground	Ground	3,3 V
2	GND	Ground	Ground	
3	KP_ROW0	Keypad row 0	Keypad row 0	
4	KP_COL0	Keypad column 0	Keypad column 0	
5	KP_ROW1	Keypad row 1	Keypad row 1	
6	KP_COL1	Keypad column 1	Keypad column 1	
7	KP_ROW2	Keypad row 2	Keypad row 2	
8	KP_COL2	Keypad column 2	Keypad column 2	
9	KP_ROW3	Keypad row 3	Keypad row 3	
10	KP_COL3	Keypad column 3	Keypad column 3	
11	KP_ROW4	I²C2 SDA	I²C2 SDA	
12	KP_COL4	I²C2 SCL	I²C2 SCL	
13	KP_ROW5_DMA	Keypad row 5	SPI Interrupt Request	
14	KP_COL5_SS1	Keypad column 5	SPI Slave Select 1	
15	KP_ROW6_MISO	Keypad row 6	SPI Master in Slave out	
16	KP_COL6_MOSI	Keypad column 6	SPI Master out Slave in	
17	KP_ROW7_SLK	Keypad row 7	SPI Serial Clock	
18	KP_COL7_SS0	Keypad column 7	SPI Slave Select 0	
19	Aux_Out	500 mA (can be controlled by software)		5,0 V
20				

Header: JST SM20B-SRDS-G-TF, side entry, RM = 1.00
Plug: JST SHDR-20V-S-B, crimp contact: SSH-003GA-P0.2

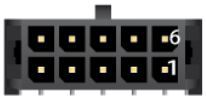
Keypad/SPI/I²C, multiplexed 1*

Pin	Name	Description		Level
		Mode 2	Mode 3	
1-10		Identical to standard		3,3 V
11	KP_ROW4	Keypad row 4	Keypad row 4	
12	KP_COL4	Keypad column 4	Keypad column 4	
13	KP_ROW5_DMA	Keypad row 5	SPI Interrupt Request	
14	KP_COL5_SS1	Keypad column 5	SPI Slave Select 1	
15	KP_ROW6_MISO	Keypad row 6	SPI Master in Slave out	
16	KP_COL6_MOSI	Keypad column 6	SPI Master out Slave in	
17	KP_ROW7_SLK	Keypad row 7	SPI Serial Clock	
18	KP_COL7_SS0	Keypad column 7	SPI Slave Select 0	
19 20	Aux_Out	500 mA (can be controlled by software)		5,0 V



6.7 RS-232/MDB (X13)

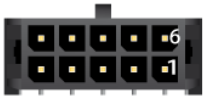
RS-232/RS-232



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

6.8 USB - Host (X34)

Pin	Name	Description	Level
1	USB_H1_VBUS	Power supply	5V/500mA (max)
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)

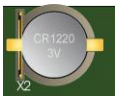
Pin	Name	Description	Level
1	USB_OTG_VBUS	Power supply	5V/500mA (max)
2	USB_OTG_DN	Data minus (D-)	
3	USB_OTG_DP	Data plus (D+)	
4	USB-OTG_ID	Device ID	
5	GND	Ground	

Header: Micro-USB Type AB

6.10 Battery

Battery SANTARO Open Frame Singlecore, Dualcore

Battery holder X2



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

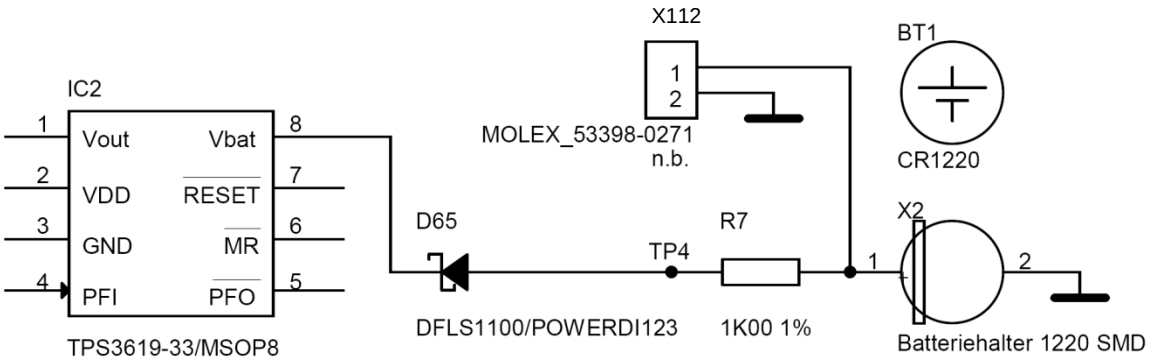
Header: Keystone 1056
Battery: CR1220

Battery SANTARO Open Frame Quadcore

Connector X112

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

Header: Molex 53398_0271
Plug: Molex 51021_0200



6.11 HDMI Type-D (X111)

Pin	Name	Description	Level
1	HOT_PLUG_DETECT	Hot plug detection	
2	Utility	not connected	
3	D2+	TMDS Data2+	
4	GND	TMDS Data2 Schirm	
5	D2-	TMDS Data2-	
6	D1+	TMDS Data1+	
7	GND	TMDS Data1 Schirm	
8	D1-	TMDS Data1-	
9	D0+	TMDS Data0+	
10	GND	TMDS Data0 Schirm	
11	D0-	TMDS Data0-	
12	CK+	TMDS Clock+	
13	GND	TMDS Clock Schirm	
14	CK-	TMDS Clock-	
15	CEC	CEC	
16	DDC/CEC_GND	DDC/CEC/HEC-Mass	
17	I^2C_CLK	SCL (I^2C serial clock for DDC)	
18	I^2C_Data	SDA (I^2C serial data line for DDC)	
19	+5V	+5 V Supply voltage (max. 55 mA)	

Header: HDMI Type-D

Using the HDMI Port might change the EMI behaviour. An additional EMI messurement is necessary.

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
V.1.0	19.11.2014	LK	For PCB revision 1.1.1

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 technicans and engineers will be glad to support you. Please note that beyond the support hours included the Starter Kit, various support packages are availabe. 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:

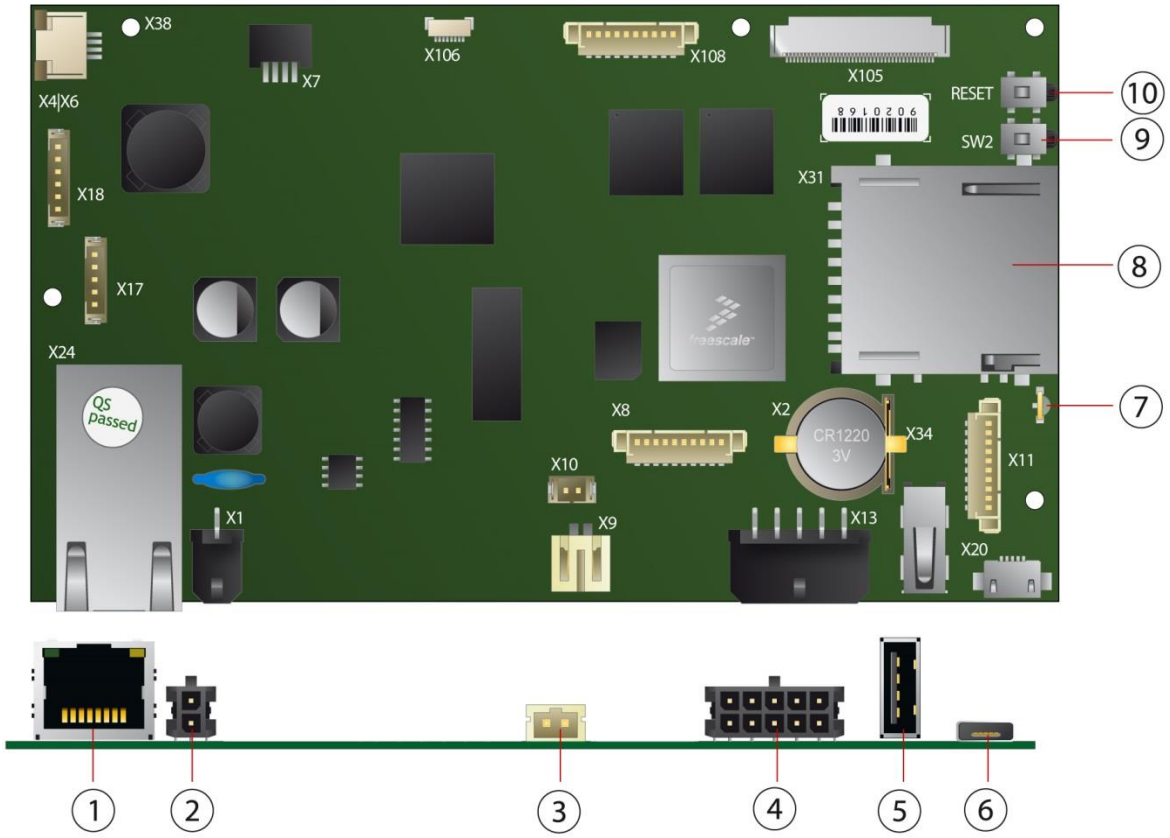
Phone: +49 (0) 40 / 791 899-30
Fax: +49 (0) 40 / 791 899-39
E-Mail: support@garz-fricke.com
URL: www.garz-fricke.com

Technical Appendix

Annex A: Assembly options

A-1 SANTARO Open Frame Singlecore

SANTARO is also available as Singlecore version.
For the details of the external connectors please use the main part on **page 13**

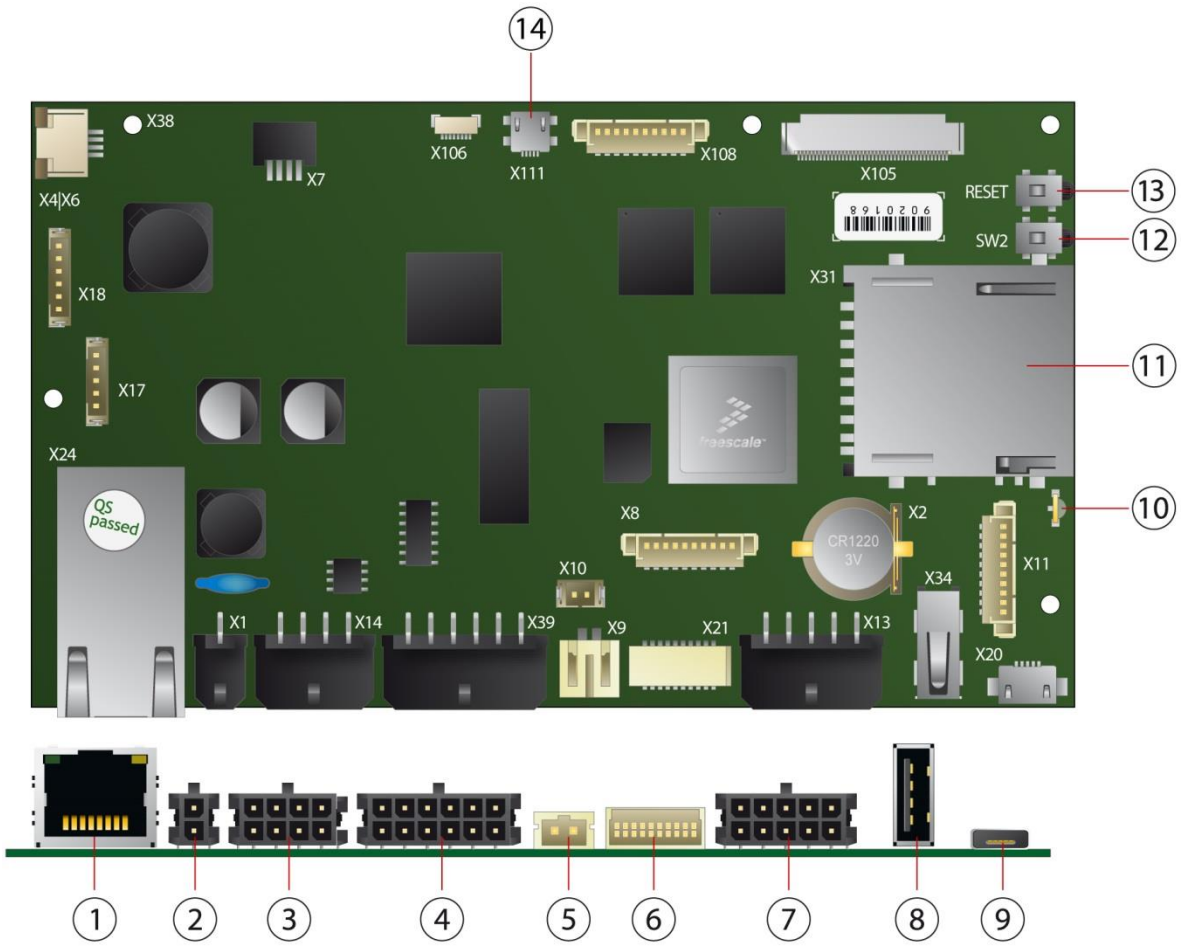


Pos.	Description
1	Ethernet (X24)
2	Power (X1)
3	Speaker (X9)
4	RS-232/MDB (X13)
5	USB - Host (X34)

Pos.	Description
6	USB - OTG (X20)
7	Status LED (D30)
8	SD card reader (X31)
9	Clear all Switch (SW2)
10	Reset Switch (SW1)

A-2 SANTARO Open Frame Dualcore

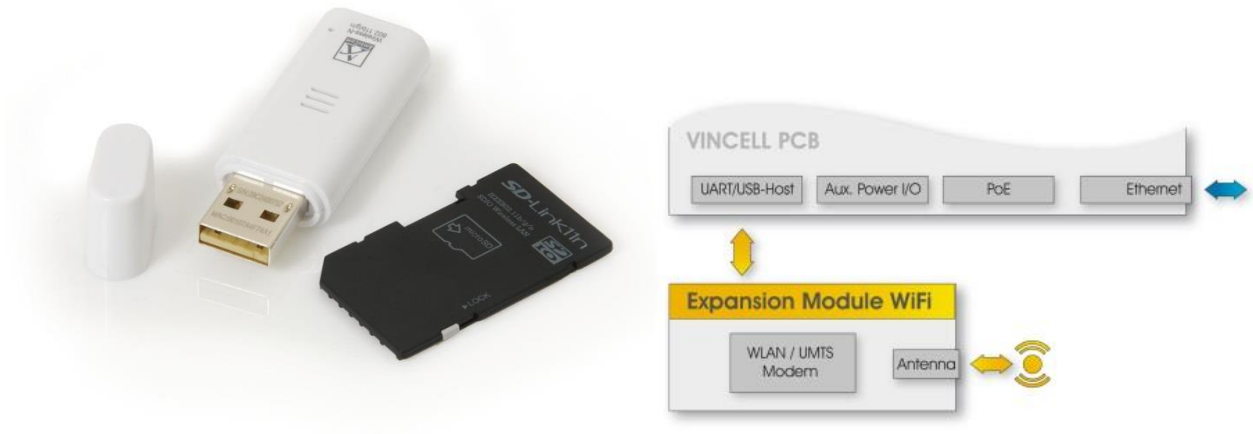
SANTARO is also available as Dualcore version.
For the details of the external connectors please use the main part on page 13



Pos.	Description
1	Ethernet (X24)
2	Power (X1)
3	Digital I/O (X14)
4	CAN/RS-485 Interface (X39)
5	Speaker (X9)
6	Keypad/SPI (X21)
7	RS-232/MDB (X13)

Pos.	Description
8	USB - Host (X34)
9	USB - OTG (X20)
10	Status LED (D30)
11	SD card reader (X31)
12	Clear all Switch (SW2)
13	Reset Switch (SW1)
14	HDMI Type-D (X111)

A-3 WIFI (USB)



Some appliances require a wireless network connectivity. To be more flexible in regard of upcoming WiFi Standard and approbations, we decided not to place the functionality on board. Therefore we recommend an external USB (WL250N). Drivers will be included into the related operating system.

- Supports 2.4 GHz 802.11 g/b/n standards
- Up to 150Mbps high-speed data rate
- Supports 64/128-bit WEP Encrytion, WPA, WPA2 and CISCO CCX security
- Supports WMM (QoS) function
- Software based WiFi-Protected Setup (WPS)
- Supports USB 2.0/1.1 Interface
- Portable and mini-size design

Type	Article Number
WLAN Modul USB WL250N	090-0408R

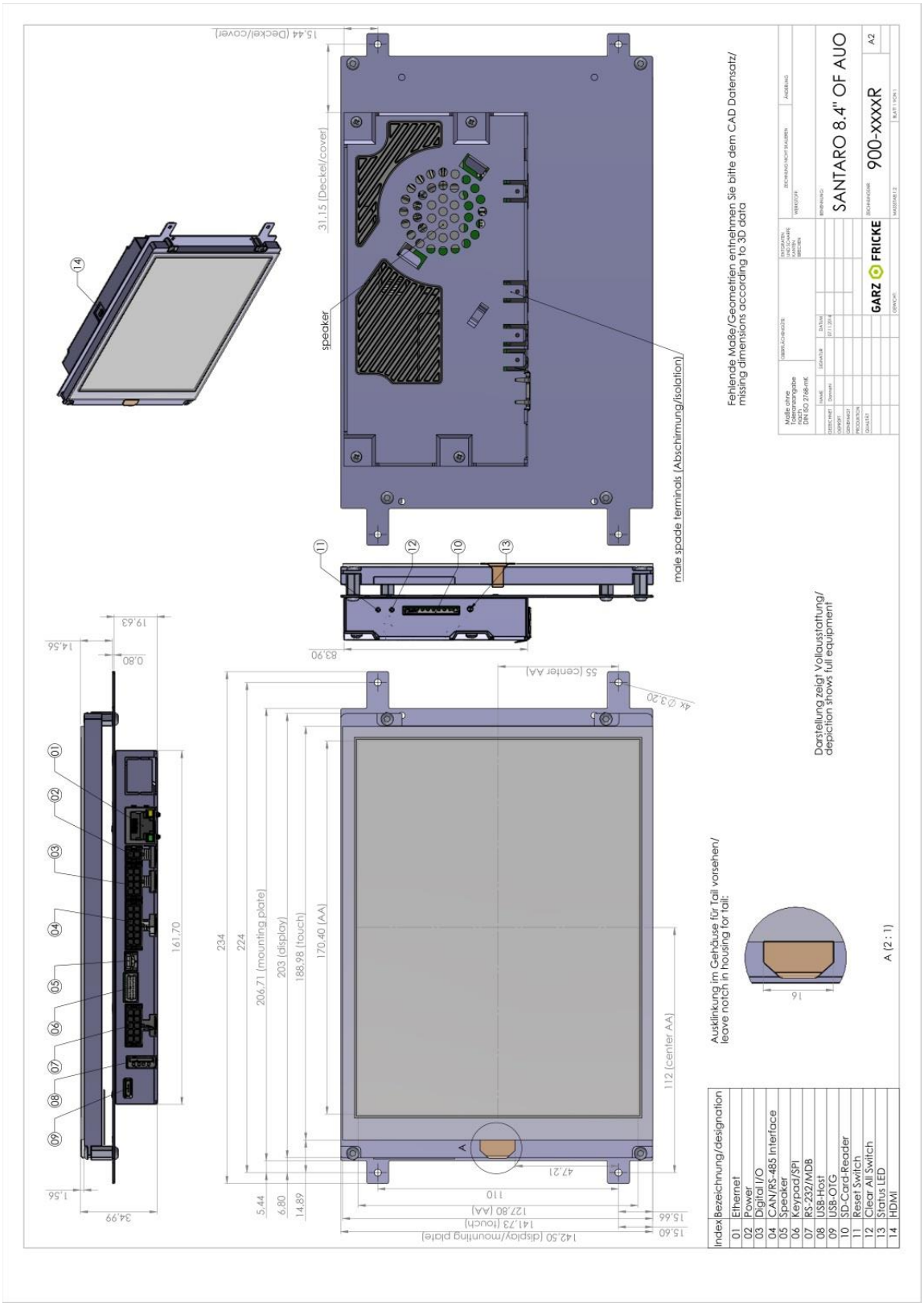
Annex B: Hardware revision information

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
SANTARO x 2 8.4 OF V1.1.1	900-2819R	0473 SANTARO x 2 V1.1.1

Annex C: Mechanical specifications

C-1 Mechanical Drawings



Annex D: Quality and Incoming Inspections

D-1 Display

Reliability Test Criteria

Items	Required Condition	Note
Temperature Humidity Bias	40^0C/90%,300 hours	
High Temperature Operation	85^0C,300 hours	
Low Temperature Operation	-30^0C,300 hours	
Hot Storage	85^0C,300 hours	
Cold Storage	-30^0C,300 hours	
Thermal Shock Test	-20^0C/30 min ,600C/30 min ,100cycles	
Shock Test (Non-Operating)	50G,20ms,Half-sine wave,(±X, ±Y, ±Z)	
Vibration Test (Non-Operating)	1.5G, (10~200Hz, P-P) 30 mins/axis (X, Y, Z)	
On/off test	On/10 sec, Off/10 sec, 30,000 cycles	
ESD	Contact Discharge: ± 8KV, 150pF(330Ω) 1sec, 8 points, 25 times/ point Air Discharge: ± 15KV, 150pF(330Ω) 1sec, 8 points, 25 times/ point	Note 1

Note1: According to EN61000-4-2, ESD class B: Some performance degradation allowed. No data lost

. Self-recoverable. No hardware failures.

Optical Characteristics

The optical characteristics are measured under stable conditions at 250C (Room Temperature):

Item	Unit	Conditions	Min.	Typ.	Max.	Note
White Luminance	[cd/m2]	I_F= 80mA (center point)	TBD	450	-	1
Uniformity	%	9 Points	TBD	75	-	1, 2, 3
Contrast Ratio			TBD	600	-	4
Response Time	[msec]	Rising	-	TBD	TBD	5
	[msec]	Falling	-	TBD	TBD	
	[msec]	Raising + Falling	-	30	TBD	
Viewing Angle	[degree] [degree]	Horizontal (Right) CR ≧ 10 (Left)	TBD	80 80	- -	6
	[degree] [degree]	Vertical (Upper) CR ≧ 10 (Lower)	TBD	80 60	- -	
Color / Chromaticity Coordinates (CIE 1931)		Red x	TBD	TBD	TBD	1
		Red y	TBD	TBD	TBD	
		Green x	TBD	TBD	TBD	
		Green y	TBD	TBD	TBD	
		Blue x	TBD	TBD	TBD	
		Blue y	TBD	TBD	TBD	
		White x	0.26	0.31	0.36	
		White y	0.28	0.33	0.38	
Color Gamut	%			45	-	1

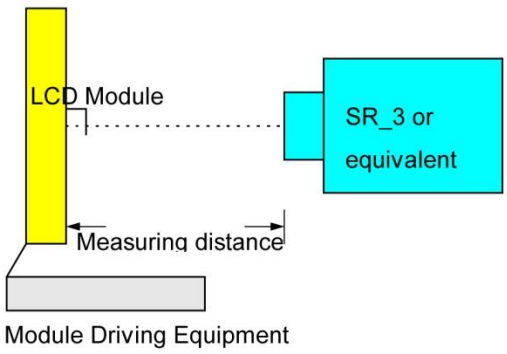
Note 1: Measurement method

Equipment : Pattern Generator, Power Supply, Digital Voltmeter, Luminance meter (SR_3 or equivalent)

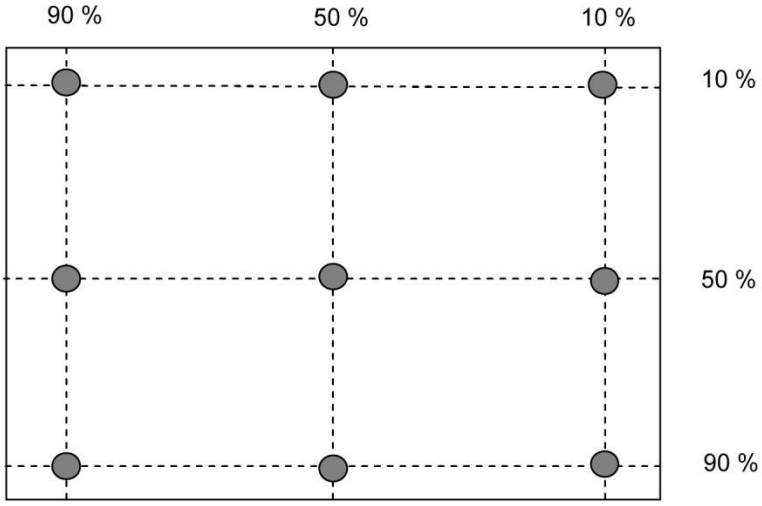
Aperture 1° with 50cm viewing distance

Test Point Center

Environment *< 1 lux*



Note 2: Definition of 9 points position (Display active area : 170.4(H) x 127.8(V))



Note 3: The luminance uniformity of 9 points is defined by dividing the minimum luminance value by the maximum test point luminance

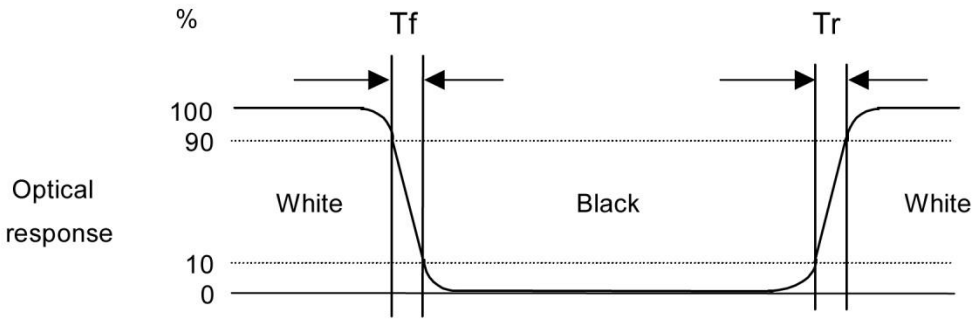
$$\delta_{W9} = \frac{\text{Minimum Brightness of nine points}}{\text{Maximum Brightness of nine points}}$$

Note 4： Definition of contrast ratio (CR):

$$\text{Contrast ratio (CR)} = \frac{\text{Brightness on the “White” state}}{\text{Brightness on the “Black” state}}$$

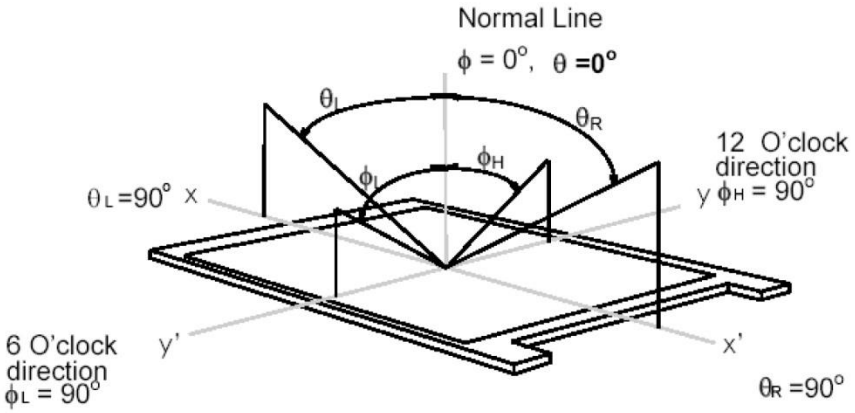
Note 5: Definition of response time:

The output signals of photo detector are measured when the input signals are changed from “White” to “Black” (falling time) and from “Black” to “White” (rising time), respectively. The response time interval is between 10% and 90% of amplitudes. Please refer to the figure as below.



Note 6: Definition of viewing angle

Viewing angle is the measurement of contrast ratio ≧10, at the screen center, over a 180° horizontal and 180° vertical range (off-normal viewing angles). The 180° viewing angle range is broken down as below: 90° (θ) horizontal left and right, and 90° (Φ) vertical high (up) and low (down). The measurement direction is typically perpendicular to the display surface with the screen rotated to its center to develop the desired measurement viewing angle.



D-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 mm2 (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 E: Battery

E-1 Battery Specifications

SANTARO Open Frame Singlecore, Dualcore

The internal baseboard is equipped with a Primary Lithium battery (type CR1220), which has a typical lifetime of 8 years. In case of presence of SRAM, battery has lifetime of about 2 years. (75% power down).

SANTARO Open Frame Quadcore

The internal baseboard is equipped with a Lithium battery (CMOS battery, type CR2032), which has a typical lifetime longer than 10 years. Typically we assemble one of the following batteries:

Manufacturer	Model
Varta	CR2032B
Toshiba	CR2032
Panasonic	CR2032BE

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.

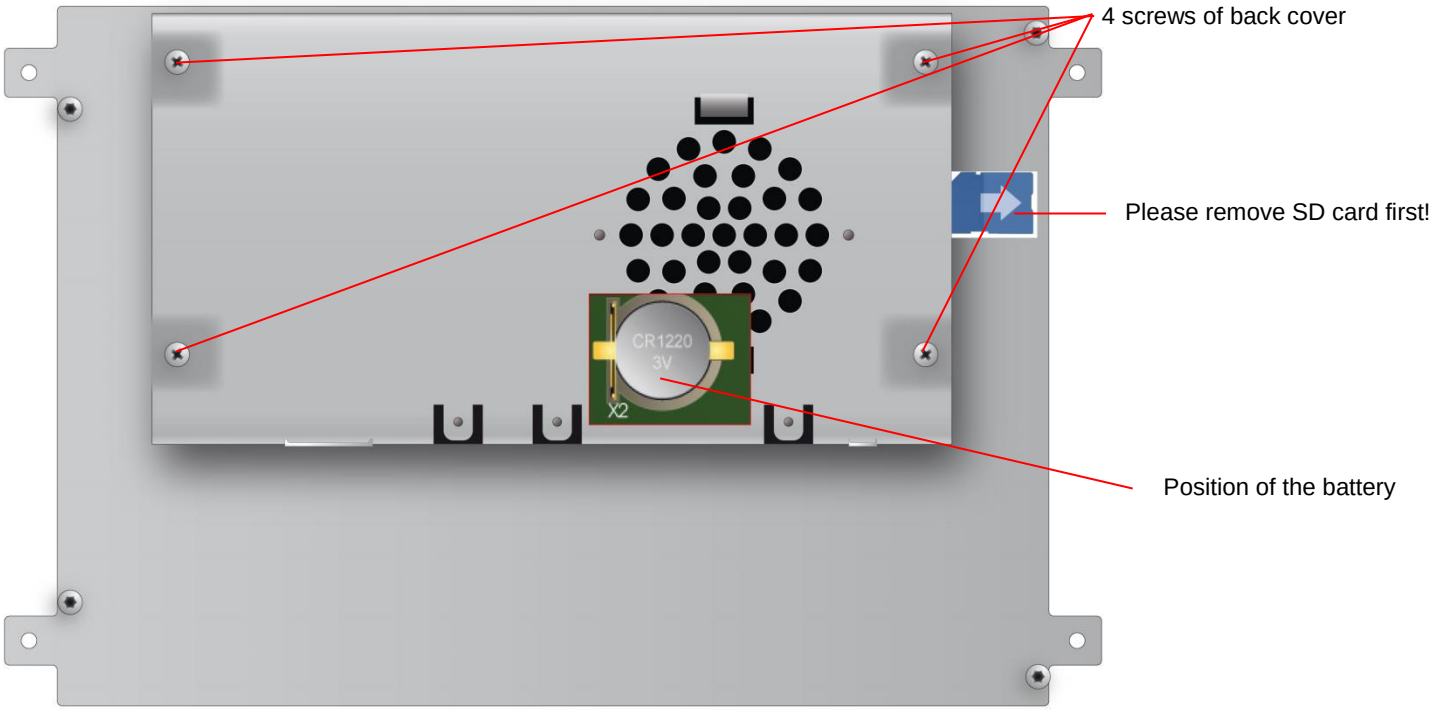
Do not dispose of used CMOS batteries in domestic waste.
Dispose of the battery according to the local regulations dealing with the disposal of these special materials (e. g. to the collecting points for disposal of batteries).

E-2 Replacement of the internal battery

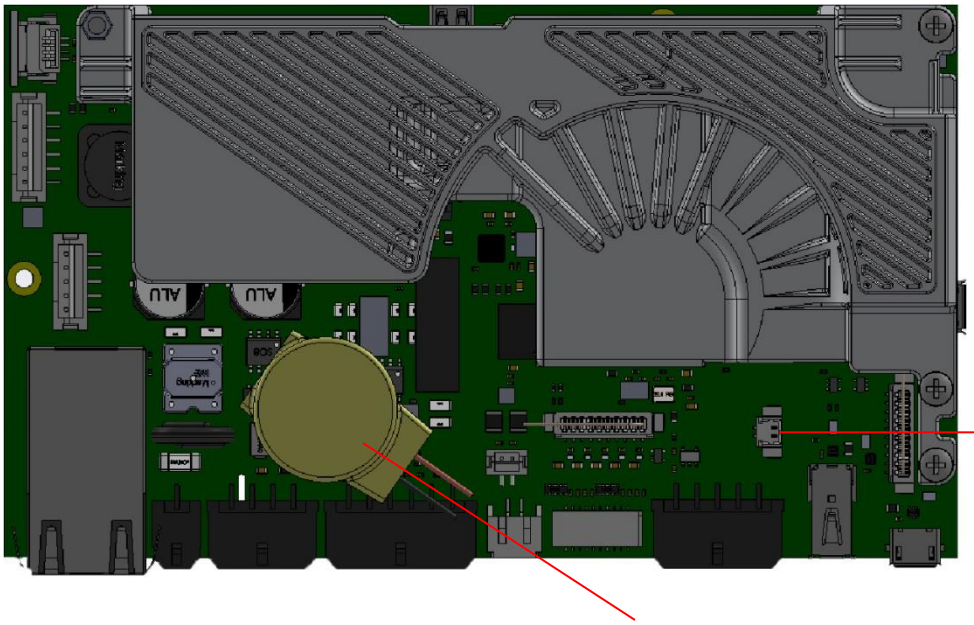
The internal battery is placed as per figure below.
For replacement, the SD-card and the back cover have to be removed.
The device shall be opened by authorized and skilled personnel only.

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.

SANTARO Open Frame Singlecore, Dualcore



SANTARO Open Frame Quadcore



Connector (X112)
for the batterycable

Battery is fixed with cable
ties at the cover

Annex F: Guidelines and Standards

F-1 EMC Test

The Garz & Fricke open frame products are OEM-products, which are intended for the integration in customer housings. Therefore regulations and requirements are subjected to different markets.
As result we do EMC tests only with our boxed versions.

F-2 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.

F-3 UL Certification

Customers of Garz & Fricke are attending on different markets. These markets are subjected to different UL certifications. Therefore Garz & Fricke have no UL certification for their products.
To obtain UL certifications the product is designed to respect the following constraints:

- All electronic printed circuit boards are conform to UL standard
- Battery schematics meets the requirements of UL standard (please refer to chapter 6.10). All wirings are designed with UL components
- The selected components on the markets are UL
  (List of UL relevant components is available at Garz & Fricke (on request))

Garz & Fricke do not guarantee to obtain UL certifications.

Annex G: Common documentation

G-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 a 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.

G-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 raffineries

G-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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