Garz & Fricke

Embedded Systems

NESO SERIES

Embedded Computer System

NESO SERIES · Manual

For PCB revision 1.2 or later

freescale™ Enabled

Windows® Embedded Silver Partner

Zuverlässige Qualität Made in Germany

1 Important hints

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 the

- **Warranty hints in Annex A**,
- **Application notes in Annex B** and finally the
- **Safety instructions in Annex C**

at the end of the document and the important hints outlined on this page.

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

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 or our partners as listed below.
Our technicians and engineers will be glad to support you. Please note that beyond the support hours included in 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
Email ▶ support@garz-fricke.com
URL ▶ www.garz-fricke.com

Content

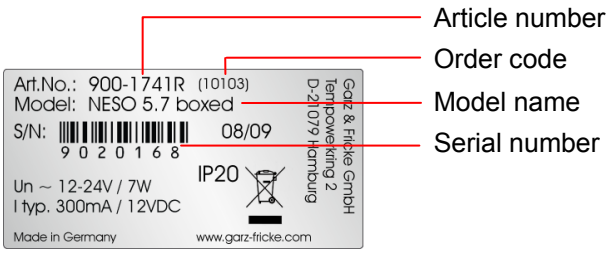
2 Introduction

This document is valid for all versions of the **NESO SERIES** and thereon based customized variants, with **PCB Rev. 1.2** or later.

NESO Product Name	Order Codes		Article Number(s)
	Starter Kit	Product	
NESO core	-	10114	900-1716R
NESO 5.7 basic	-	10112	NA
NESO 5.7 open frame	10109	10100	900-1704R, 900-1739R
NESO 5.7 boxed	10102	10103	900-1706R, 900-1741R
NESO 7.0 basic	-	10113	NA
NESO 7.0 open frame	10110	10101	900-1705R, 900-1740R
NESO 7.0 boxed	10108	10105	900-1707R, 900-1742R

2.1 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.



2.2 Related documents and online support

This document contains product specific information. Additional documentation is available for the use of embedded operating systems and the related tool chain and the RedBoot BIOS.

Title	File Name	Description
RedBoot User Manual	GF_RedBoot_User_Manual_Rnn.pdf	Contains relevant information about BIOS, boot logo, display settings, etc.
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 OS Manual	GF_Linux_Manual_Vn.n.pdf	Contains information about Linux BSP, the tool chain, Qt, etc.

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:

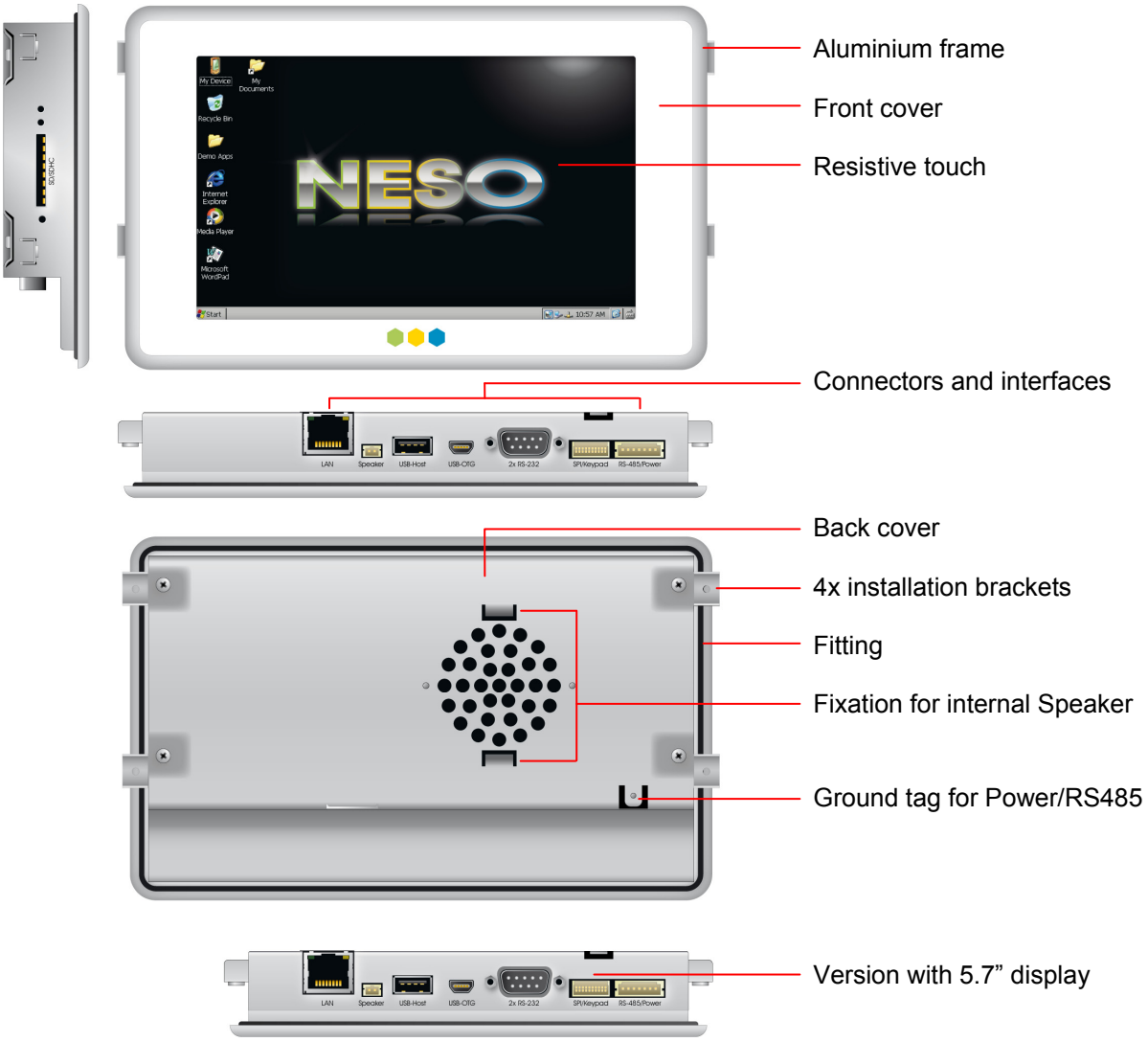
Product	Link to Garz & Fricke website	
NESO SERIES	▶ http://www.garz-fricke.com/NESO-download	

3 Product description

NESO is an Embedded System used as human machine interface (HMI) in various applications. Please refer to [► Annex B: 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.

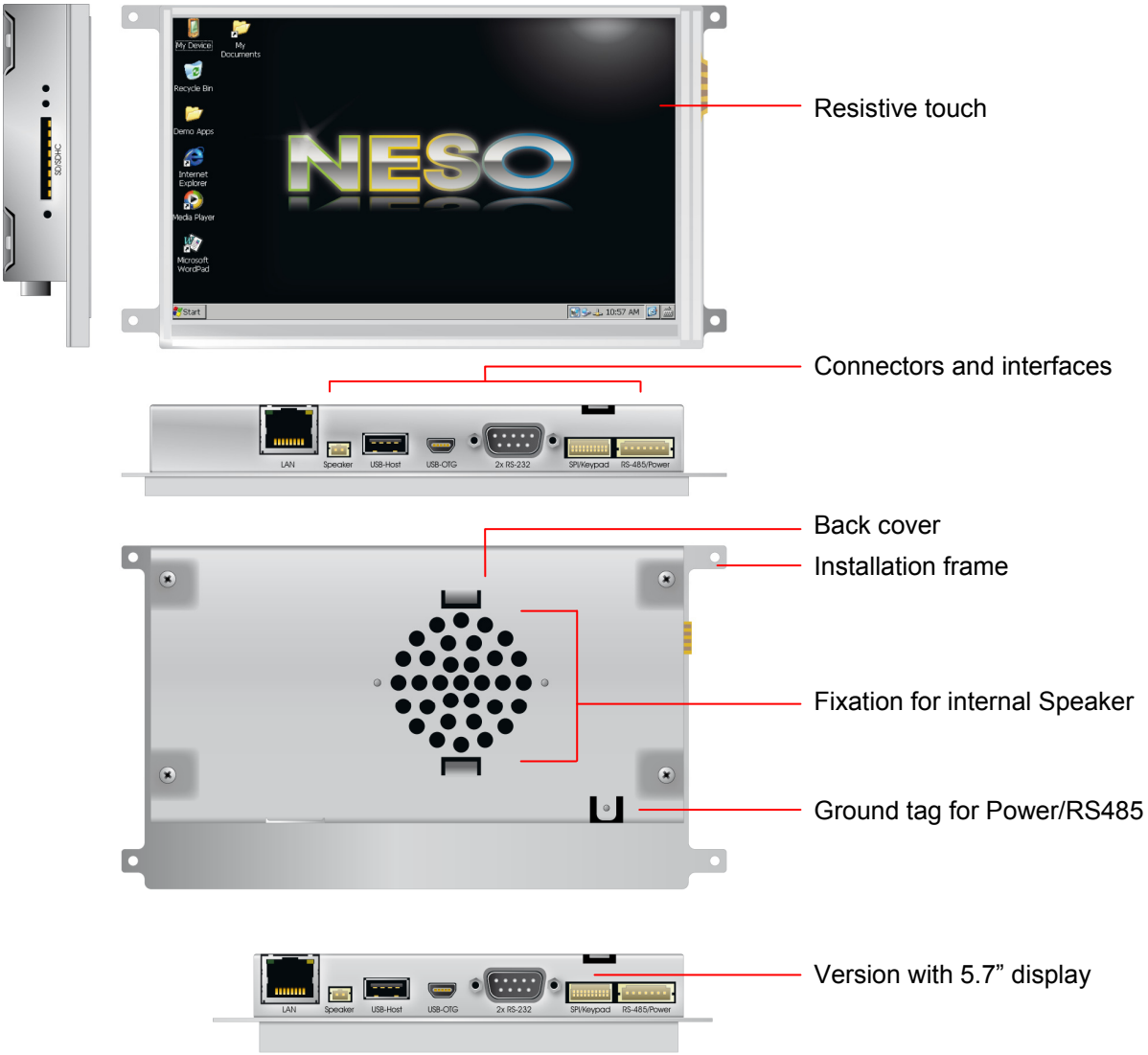
3.1 Boxed design

The following illustration shows the boxed version with 7” display and is meant for your orientation.
For drawings, please refer to chapter [► 5 Product geometry].



3.2 Open frame design

The following illustration shows the open frame version with 7” display and is meant for your orientation. For drawings, please refer to chapter [► 5 Product geometry].



3.3 Technical data (options are greyed out)

CPU			
Type	Freescale ARM926EJ-S™ i.MX27		
Clock/Frequency	400 MHz		
Specifications	32 Bit with MMU 16 KB L1 I-Cache and D-Cache 16-channel DMA Smart speed switch		
Memory			
ROM	256 MB NAND-Flash		
RAM	128 MB DDR-SDRAM		
Storage Card Slot	4 Bit MMC/SDIO/SD/SDHC up to 4 GB		
Graphics			
Controller	Programmable LCD controller		
Resolution	Up to 800 x 600 pixel		
Colours	16-bit (65,536 colours)		
Supported Orientation	Horizontal/vertical		
Video Decoder	Hardware decoder for MPEG-4 H.263/H.264 D1		
LCD Display and Resistive Touch[1]			
Size (inch / mm)	5.7 / 144	7.0 / 178	
Width x Height (pixels)	640 x 480 (VGA)	800 x 480 (WVGA)	
Colours	262,144		
Backlight Unit	LED		
Luminance	400 cd/m²	250 cd/m²	
Active Area W x H (mm)	115.2 x 86.4	152.4 x 91.44	
Viewing Direction	12 o'clock		
Viewing Angle (Typ.)	100° (V) / 140° (H)	120° (V) / 140° (H)	
Lifetime Backlight	20,000 h	30,000 h	
Lifetime Touch	1,000,000 (finger) touches		
Surface Properties	Anti-glare		
Surface Hardness	3H		
Touch Technology	Standard	4 wire resistive analogue	
	PCT Option	Projective Capacitive for 7" only	
Interfaces			
Network		1x 10/100 Mbit/s Ethernet (RJ45)	
Audio		16-bit 48 kHz, 1x1 Watt RMS (8Ω)	
Serial Interfaces		Standard Multiplex mode 1	1x RS-232 (full) 2x RS-232 (dedicated)
		1x RS-485	
	MDB Option	1x MDB instead of RS-485, max. output ~2mA @ 3.0 V	
USB 2.0		1x 480 Mbit/s Host (Type A) 1x 480 Mbit/s OTG (Type Mini-AB) Max. output 500 mA	
Keypad/SPI/I²C		Standard Multiplex mode 1	1x 8x8 1x 5x5 Keypad, 1x SPI
Speaker	Speaker Option	1x 300 mW (max. 600 mW) RMS (8Ω) on internal connector X604	
Power Supply and Consumption			
Supply	Nom. 9-42 V DC wide range		
Consumption	t.b.d.	t.b.d.	
	t.b.d.	t.b.d.	
	t.b.d.	t.b.d.	
Internal Backup Battery (RTC)	Type	3 V Li-Ion Type CR2032	
	Lifetime	>10 years, depending on application	

[1] Display specification may vary due to customization. For further questions, please contact technical support.

3.4 Mechanical properties

Housing					
Metal parts	1.4016 high quality steel				
Thickness	0.75 mm				
Surface treatment	Polished				
Front (boxed versions only)					
Frame	Material	4 mm $AlMg_3$			
	Surface treatment	Natural anodized, E6/EV1			
Décor cover	Material	Polyester film with antiglare coating 4C silk screen printing from behind Structured front coating			
	Thickness	180 µ			
	Chemical Resistance	Resistant to alcohols, dilute acids, dilute alkalis, esters, hydrocarbons, ketones, household cleaning agents			
	Dielectric strength	125 µ: 125 kV/mm (15.6 kV) / 175 µ: 105 kV/mm (18.4 kV)			
	Surface resistivity	$>10^{13}$ Ω/sq 500 Vd.c			
	Switch life	>5 million flexes			
	Pencil hardness	3H			
	Maximum long term use temperature	@ low humidity (<10% RH): 85° C @ high humidity (10 ~ 95% RH): ≤60° C			
	Min. use temperature	-40° C			
Protection Class	IP64 (according to supplier's statement, not yet approved)				
Projective Capacitive Touch (Option)					
	T.b.d.				
Environmental Conditions					
Storage Temperature	-20 ~ +70° C				
Operating Temperature	0° ~ +60° C				
Relative Humidity	95% (non condensating)				
Dimensions					
NESO Type/Display size	-	5.7	7.0	5.7	7.0
Model	core	open frame		boxed	
Width (mm)	127.0	151.5	183.5	165.5	202.0
Height (mm)	approx.17.0	98.6	104.0	120.0	126.2
Depth (mm)	84.0	29.5	27.0	29.5	29.5
Weight (g)	220	420	480	500	570

For drawings, please refer to chapter [► 5 Product geometry].

3.5 BIOS and operation systems

Software	
BIOS	RedBoot BIOS
Operating System	Windows Embedded CE 6.0
	Linux

For more software information, please refer to [► 2.1 Related documents and online support].

3.6 Internal battery

The internal baseboard is equipped with a Lithium battery (CMOS battery, type CR2032), which has a typical lifetime longer than 10 years.

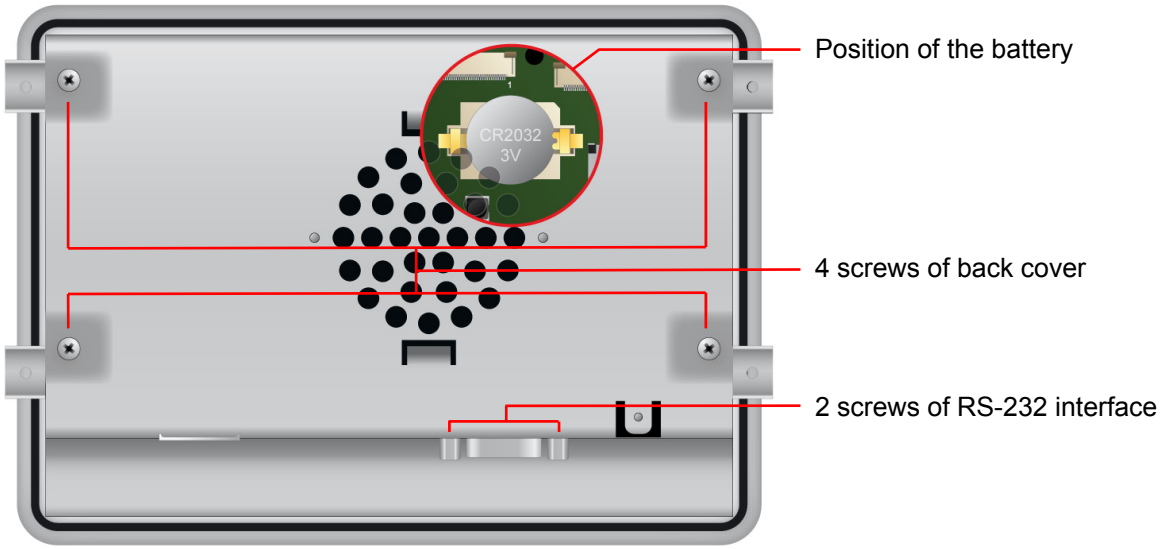
Danger of explosion when replaced with wrong type of battery.
Replace the battery only with a Lithium battery that has the same or equivalent type recommended by Garz & Fricke GmbH.

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).

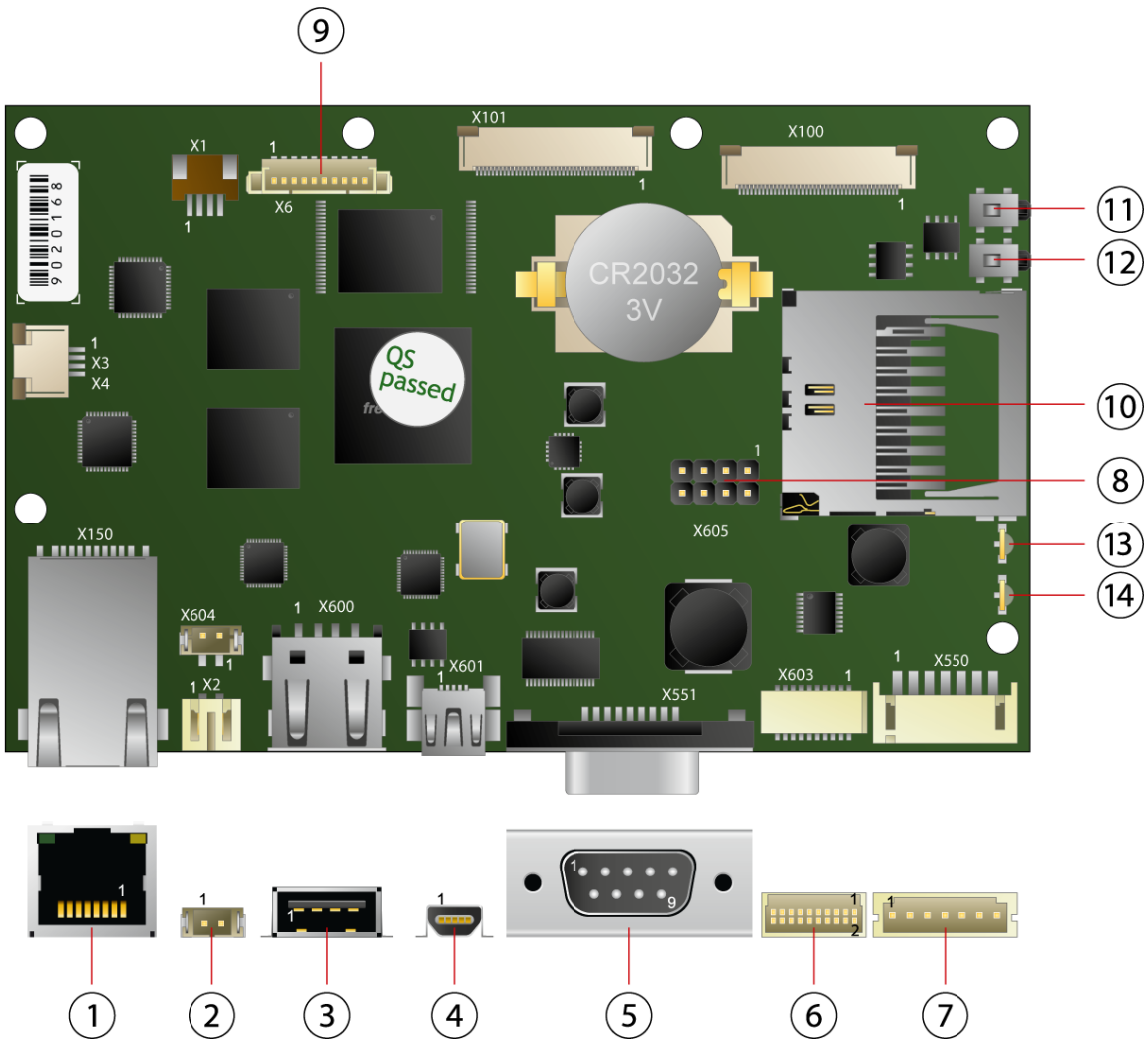
3.6.1 Replacement of the internal battery

- The internal battery is placed as per figure below.
- For replacement, the back cover has 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 mini-USB connector might be damaged easily.



3.7 PCB design and connectors



Pos.	Description
1	Ethernet (X150)
2	Speaker (X2/X604)
3	USB - Host (X600)
4	USB - OTG (X601)
5	RS-232 (X551)
6	Keypad/SPI (X603)
7	RS-485/MDB/Power (X550)

Pos.	Description
8	RS-485 jumpers (X605)
9	Internal audio (X6)
10	SD card reader
11	Reset
12	Clear all
13	Status LED1
14	Status LED2 (power)

4 Pin assignment and description

4.1 Ethernet (X150)

Pin	Name	Description	Level
1	Tx+		
2	Tx-		
3	Rx+		
4	NC		
5	NC		
6	Rx-		
7	NC		
8	NC		

Header: RJ45

4.2 Speaker (X2/X604)

external (X2)

Pin	Name	Description	Level
1	VO+	Speaker out +	
2	VO-	Speaker out -	

Header: JST PH-SM3-TB, side entry, RM = 2.0, 2-pin
Plug: JST PHR-2, crimp contact BPH-002T-P0.5S

internal (X604)

Pin	Name	Description	Level
1	VO-	Speaker out -	
2	VO+	Speaker out +	

Header: JST B2B-ZR-SM4-TF, top entry, RM = 1.5, 2-pin
Plug: JST ZHR-2, crimp contact SZH-002T-P0.5

For drawings, please refer to [▶ 4.8 Internal Audio (X6)].

4.3 USB - Host (X600)

Pin	Name	Description	Level
1	Vcc	Power supply	5 V
2	D-	Data minus	
3	D+	Data plus	
4	GND	Ground	

Header: USB Type A

4.4 USB - OTG (X601)

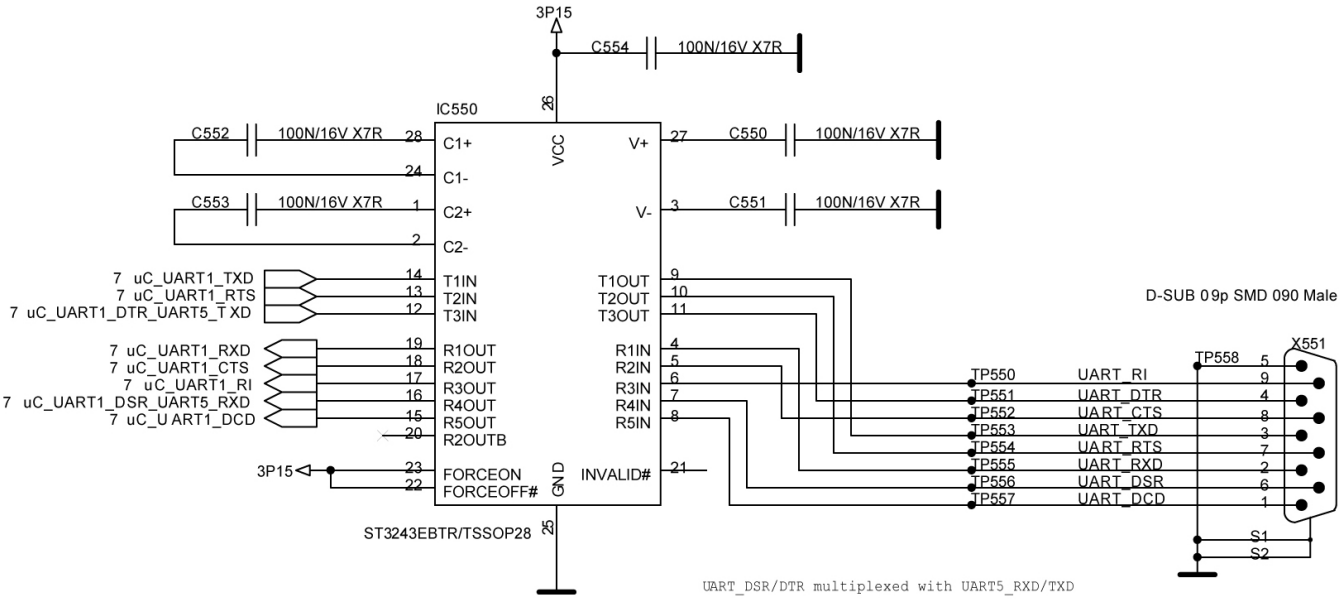
Pin	Name	Description	Level
1	Vcc	Power supply	5 V
2	D-	Data minus	
3	D+	Data plus	
4	ID	Device ID	
5	GND	Ground	

Header: Mini-USB Type AB

4.5 Serial Interface RS-232 (X551)

Pin	Name	Description		Level
		Standard mode	Multiplexed mode	
1	UART_DCD	Data carrier detect	Data carrier detect_1	
2	UART_RxD	Receive data	Receive data RS232_1	
3	UART_TxD	Transmit data	Transmit data RS232_1	
4	UART_DTR	Data terminal ready	Transmit data RS232_2	
5	UART_GND	Ground	Ground	
6	UART_DSR	Data set ready	Receive data RS232_2	
7	UART_RTS	Request to send	Request to send_1	
8	UART_CTS	Clear to send	Clear to send_1	
9	UART_RI	Ring indicator	Ring indicator_1	

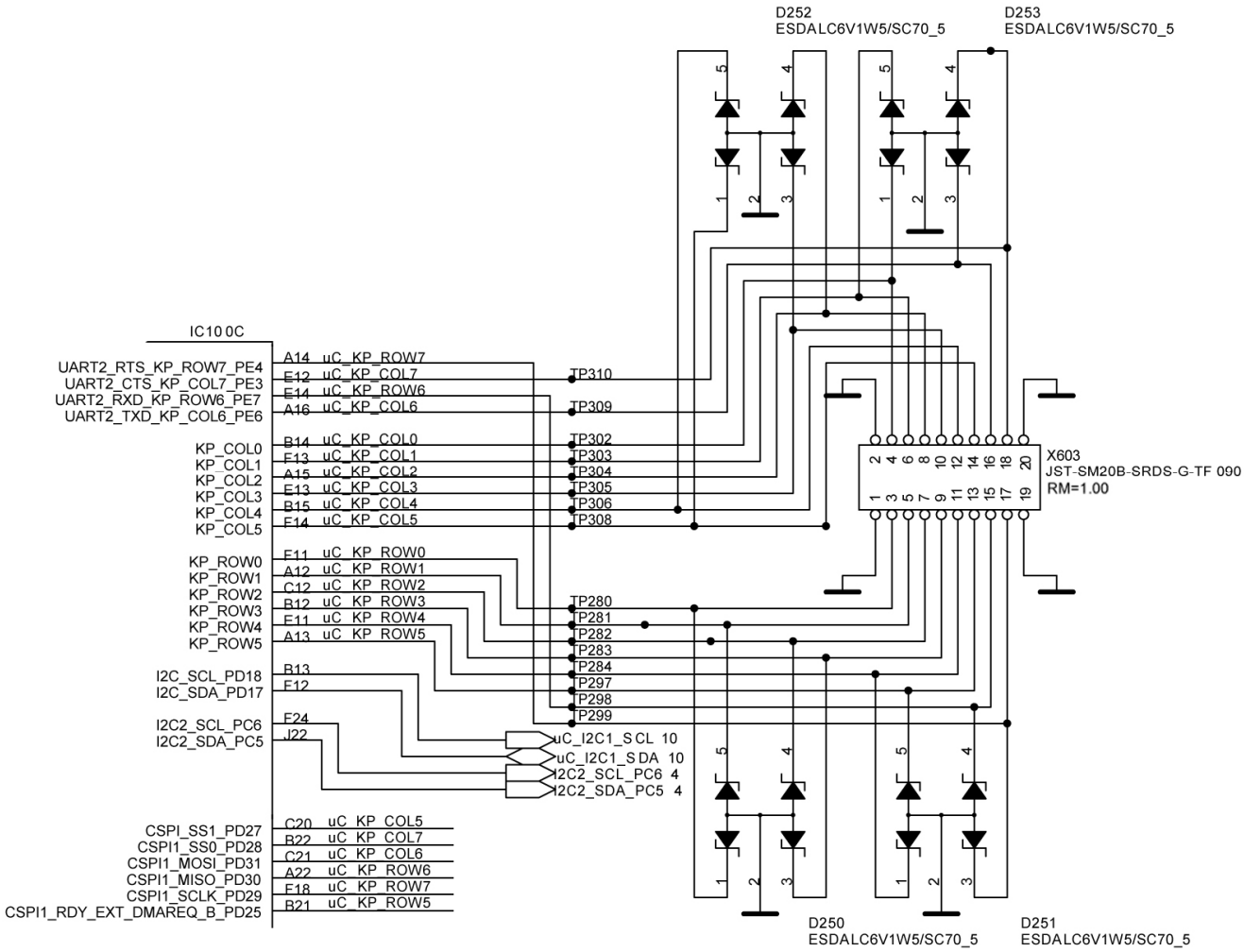
Header: D-SUB, 9-pin, male



4.6 Keypad/SPI (X603)

Pin	Name	Description		Level
		Standard mode	Multiplexed mode	
1	GND	Ground	Ground	
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	Keypad row 4	Keypad row 4	
12	KP_COL4	Keypad column 4	Keypad column 4	
13	KP_ROW5_DMA	Keypad row 5	Interrupt Request	
14	KP_COL5_SS1	Keypad column 5	Slave Select 1	
15	KP_ROW6_MISO	Keypad row 6	Master in Slave out	
16	KP_COL6_MOSI	Keypad column 6	Master out Slave in	
17	KP_ROW7_SLK	Keypad row 7	Serial Clock	
18	KP_COL7_SS0	Keypad column 7	Slave Select 0	
19	GND	Ground	Ground	
20	GND	Ground	Ground	

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



4.7 RS-485/MDB/Power (X550)

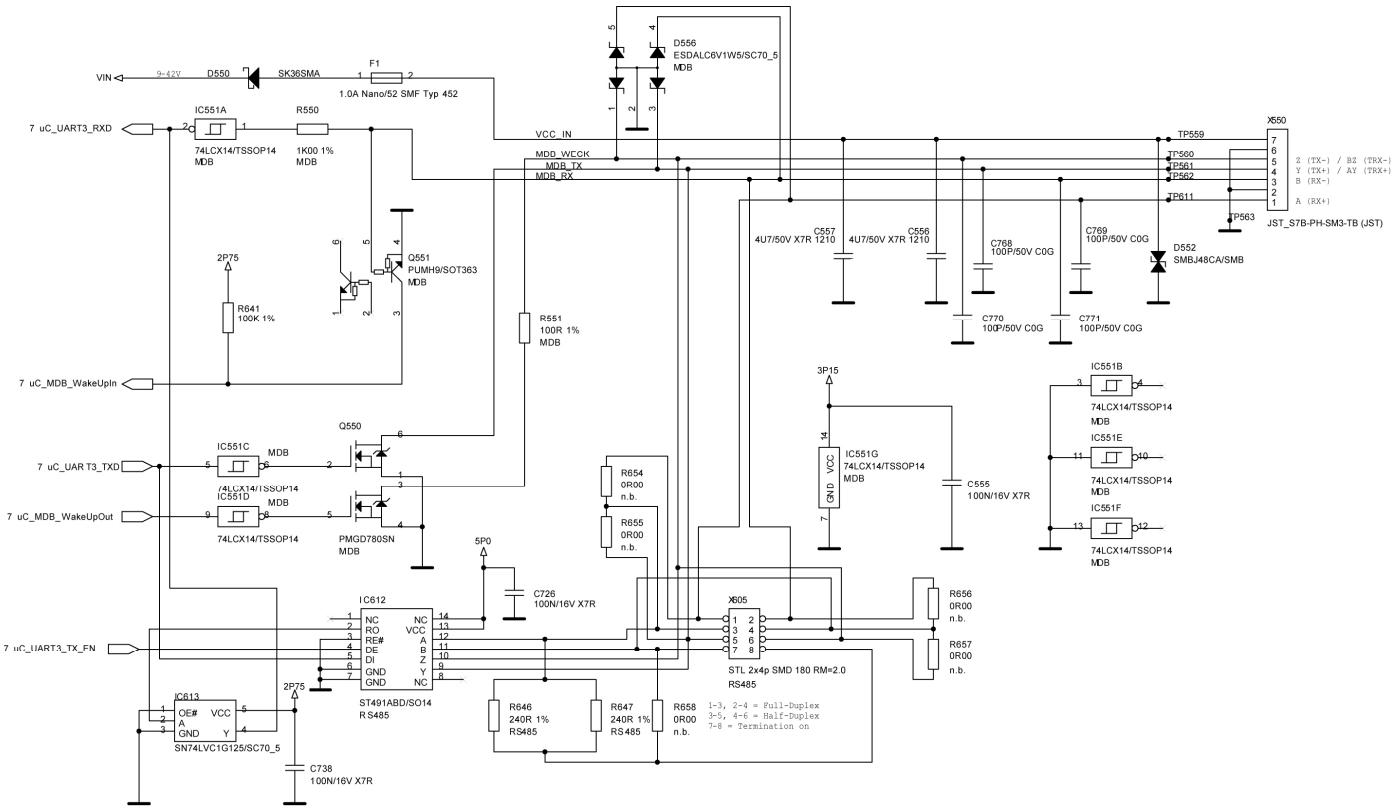
4.7.1 Standard: RS-485/Power

Pin	Name	Description RS-485	Level
1	A	RX+	
2	GND	Ground	
3	B	RX-	
4	Y/AY	TX+ (half-duplex: TRX+)	
5	Z/BZ	TX- (half-duplex: TRX-)	
6	GND	Ground	
7	Vcc_In	Input voltage	9~42V

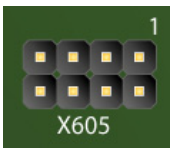
Header: JST S7B-PH-SM3-TB, side entry, RM = 2.00
Plug: JST PHR-7, crimp contact BPH-002T-P0.5S

4.7.2 Optional: MDB/Power

Pin	Name	Description Optional MDB	Level
1	A	Not connected	
2	GND	Ground	
3	B	MDB receive data	
4	Y/AY	MDB transmit data	
5	Z/BZ	MDB wakeup	
6	GND	Ground	
7	Vcc_In	Input voltage	9~42V



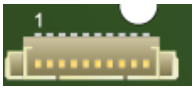
4.7.3 RS-485 Jumper Settings



Jumper	Description	Pin Bridge
	Full-duplex mode	1-3 & 2-4
	Half-duplex mode	3-5 & 4-6
	Terminator on	7-8

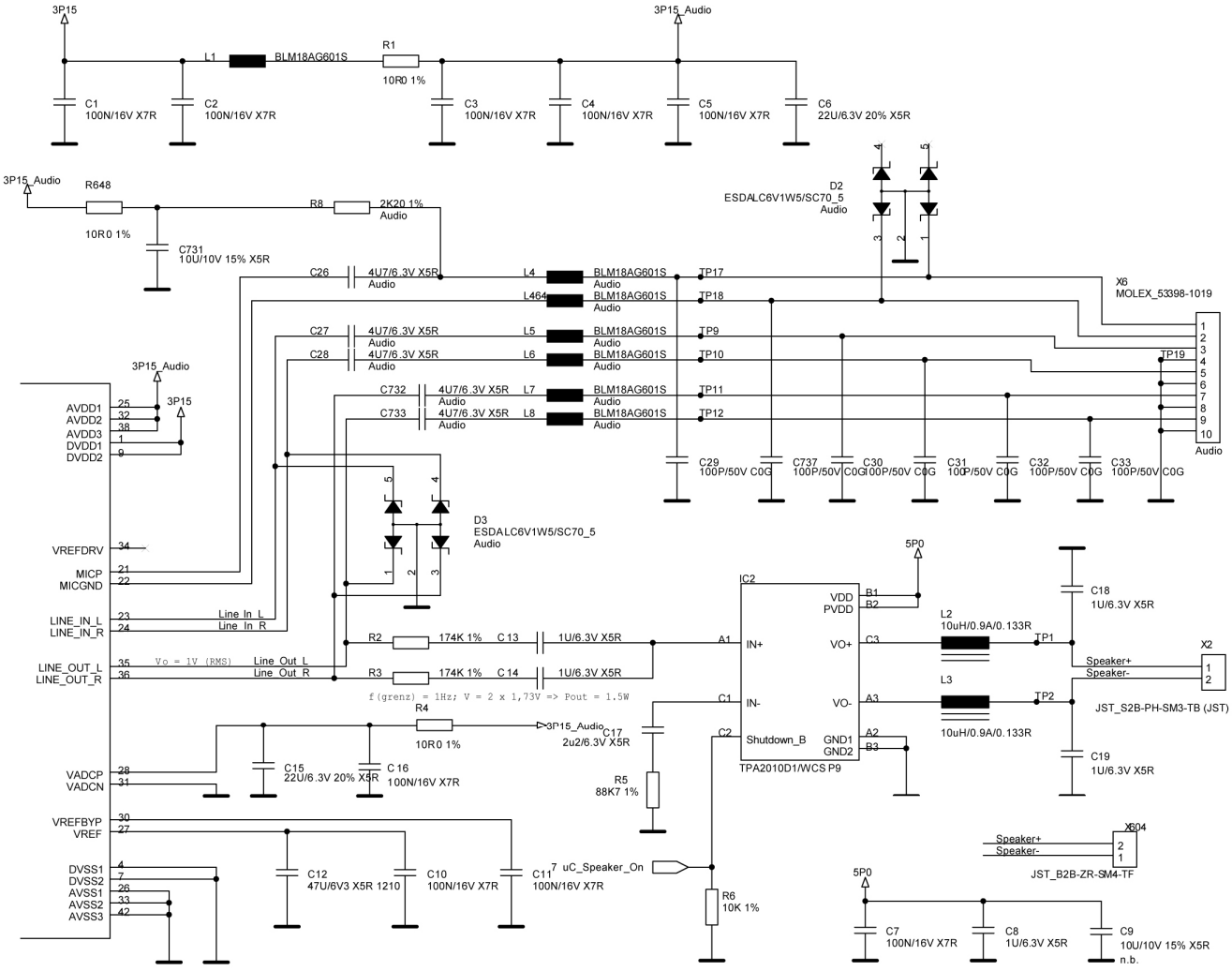
Jumper: RM = 2.0, 2-pin

4.8 Internal Audio (X6)



Pin	Name	Description	Level
1	MICP	Microphone signal	
2	MICGND	Microphone ground	
3	LINE_IN_L	Line in, left channel	
4	GND	Ground shielding	
5	LINE_IN_R	Line in, right channel	
6	GND	Ground shielding	
7	LINE_OUT_R	Line out, right channel	
8	GND	Ground shielding	
9	LINE_OUT_L	Line out, left channel	
10	GND	Ground shielding	

Header: Molex 53398-1071, top entry, RM = 1.25
Plug: Molex 51021-1000, cable crimp/open wire 06-66-0015



4.9 Suppliers and sources

Models and types of connectors respectively plugs related to NESO are listed in [► 3.7 PCB design and connectors].

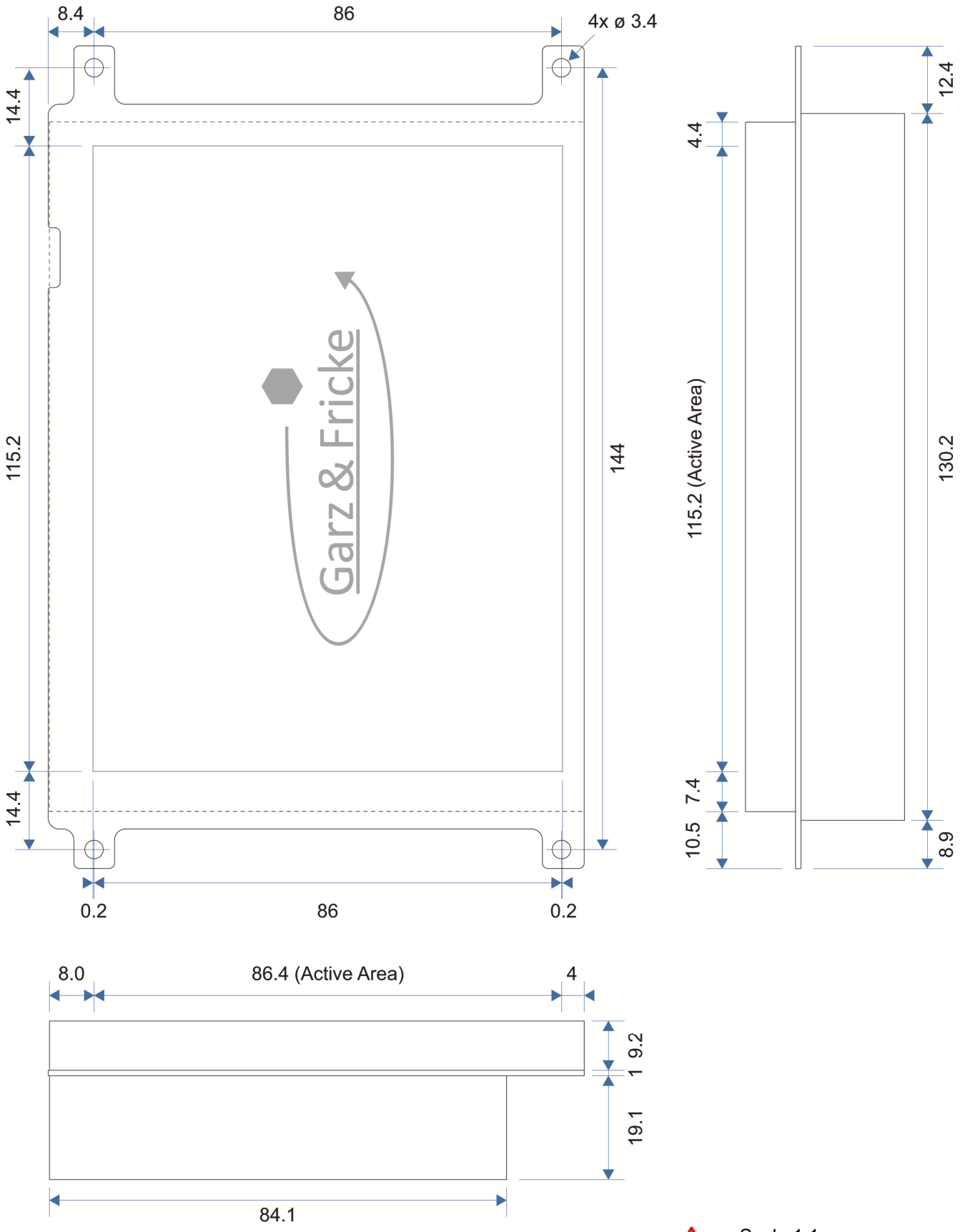
For purchasing these parts, we recommend the following suppliers:

- http://de.farnell.com
- http://de.digikey.com

5 Product geometry

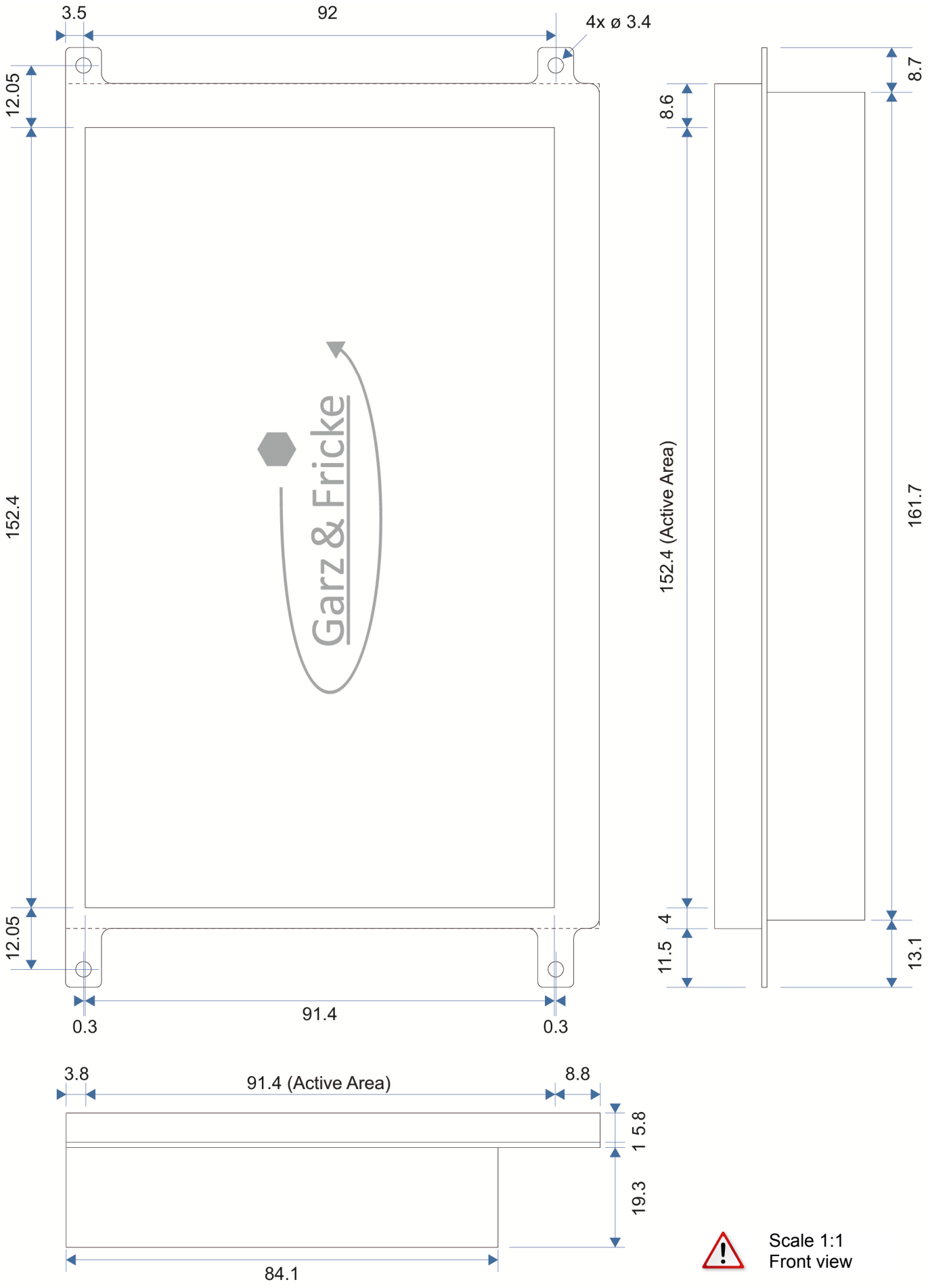
The drawings on the following pages are non-binding and shall provide a first impression of the original size and construction of the products. For all products we provide 3D CAD models on our website as well as per email upon request. Please also refer to [► 2.1 Related documents and online support].

5.1 NESO 5.7 open frame

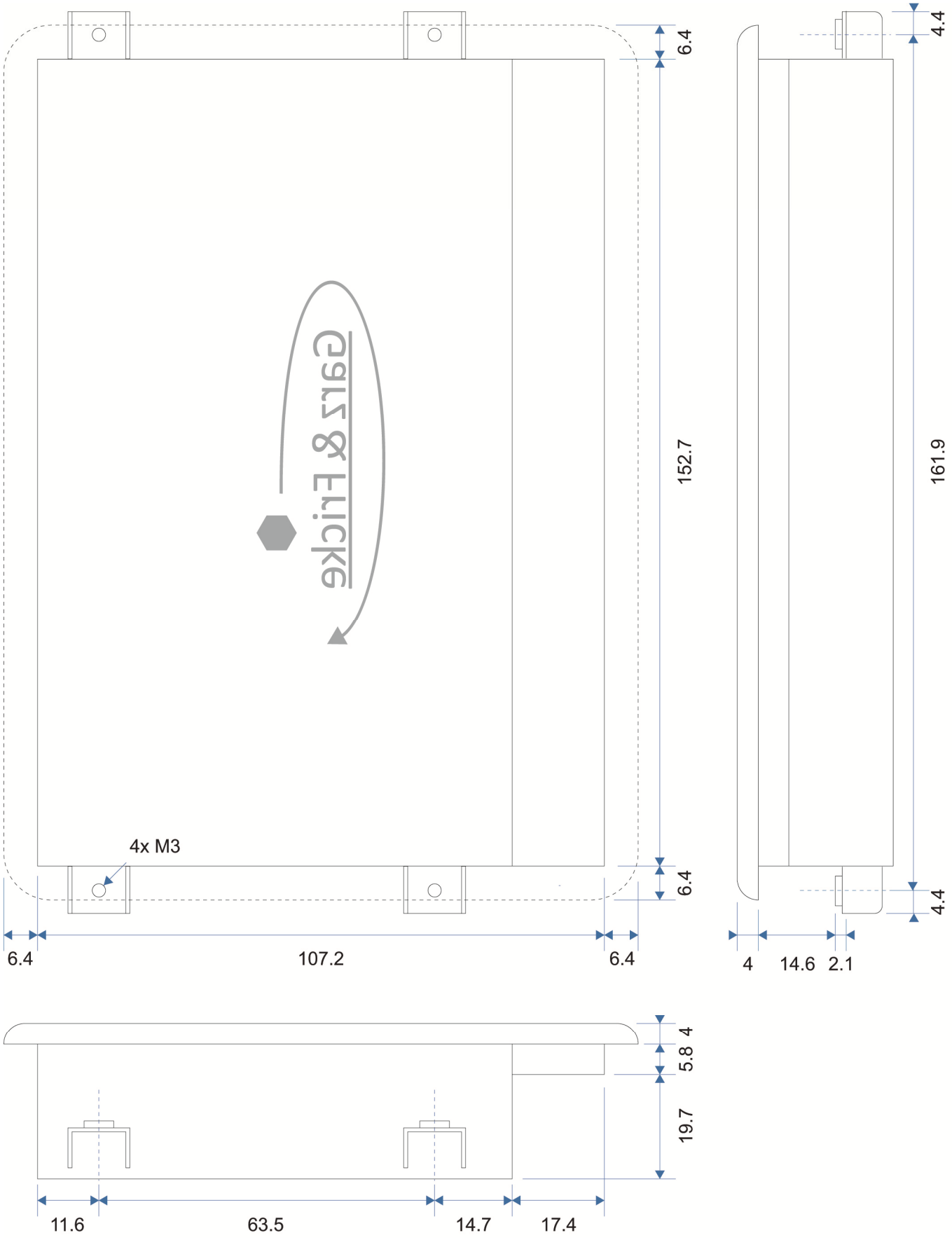


Scale 1:1
Front view

5.2 NESO 7.0 open frame

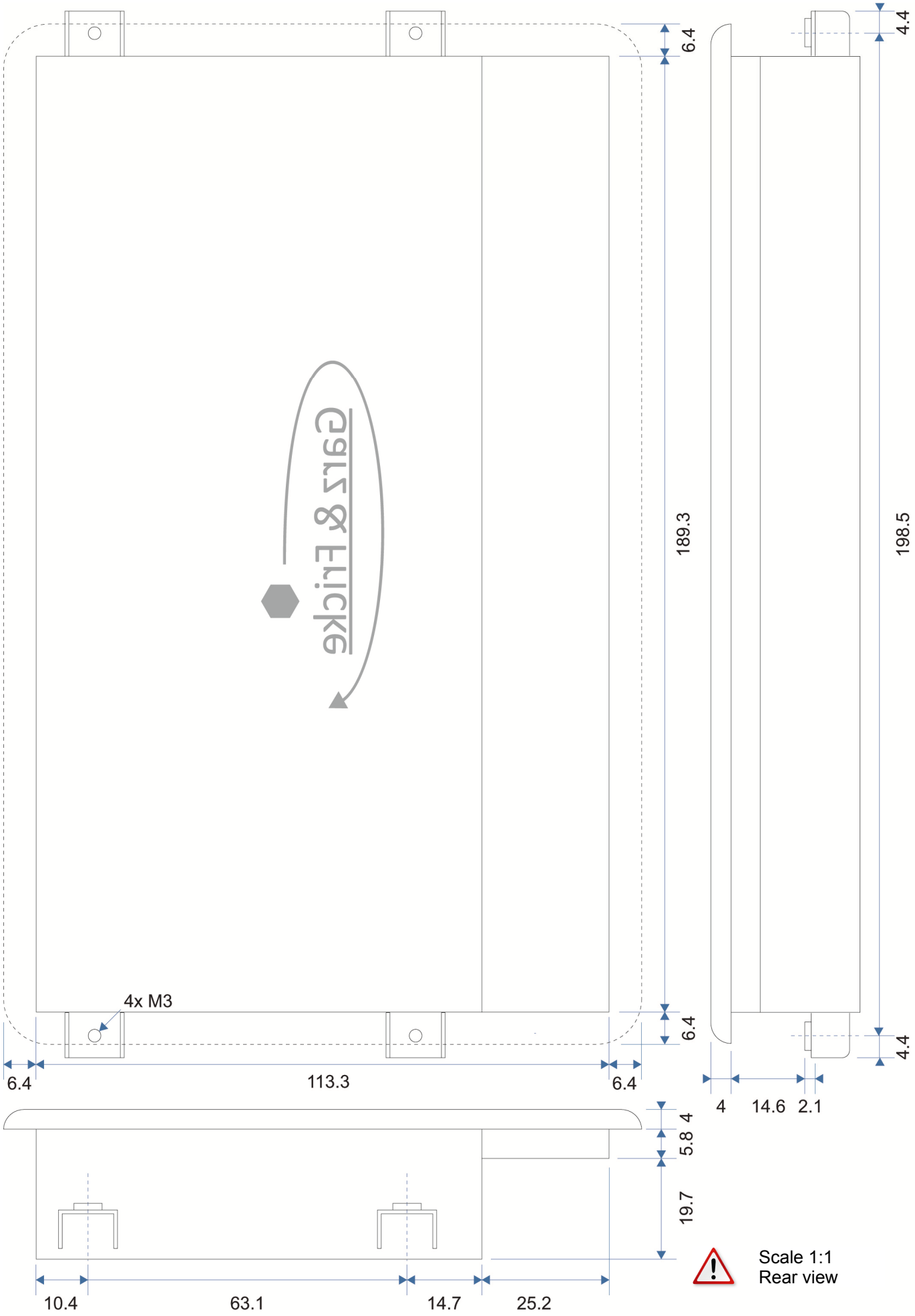


5.3 NESO 5.7 boxed



Scale 1:1
Rear view

5.4 NESO 7.0 boxed



Annex A: 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.

Annex B: 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.

Annex C: Safety instructions

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 system 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

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

(a) Due to the soft surface of the resistive touch screen, don't use stencils and/or other devices for touch operation. There are special pens available in commercial shops.
(b) Protect the LCD/touch against scratches and sharp edges. The warranty does not cover pixel failures resulting from non-compliant handling.
(c) Clean the LCD with a soft cotton cloth with alcohol. Don't use organic solvents, acid or alkali solutions.
(d) Water drops, finger fat or any similar fouling should be removed immediately from the LCD and metal frame to avoid any staining.

III Electricity

(a) The embedded systems may only be opened in accordance with the description in this user's manual for
- replacing of the Lithium battery and/or
- configuration of the RS-485 interface

(b) These procedures have to be carried-out only by qualified specialist personnel.
(c) When accessing internal components the device must be switched off and disconnected from the power source.
(d) 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 with very carefully.
(e) Don't operate or handle the unit without typical ESD protection measures, such as ground earthing.
(f) Operate the unit according to the technical specification only.

IV Damage or permanent malfunction

(a) 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

(b) In these cases the device must be shut down and secured against further use

Annex D: EMC – Declaration of electromagnetic conformity

Copies of the relevant declarations will be copied herein. Currently, the EMC tests for the four standard devices with resistive touch screen are in preparation:

NESO Product Name	Article Number
NESO 5.7 open frame	900-1739R
NESO 5.7 boxed	900-1741R
NESO 7.0 open frame	900-1740R
NESO 7.0 boxed	900-1742R

The following norms will be fulfilled:

EMC Directive 2004/108/EG
Low Voltage Directive 2006/95/EG (Electrical Safety)

In detail, the above mentioned devices will fulfill the requirements of the harmonized norms:

DIN EN 55022:2008 Class A
DIN EN 55024:2003
DIN EN 61000-3-2:2006
DIN EN 61000-3-3:2006
DIN EN 60950-1 (Electrical Safety)

This product has been designed for industrial, commercial and office use, including small business use. The most recent version of the EMC guidelines (EMC Directive 2004/108/EC) and/or the German EMC laws apply. If the user modifies and/or adds to the equipment, the prerequisites for the CE conformity declaration (safety requirements) may no longer apply.

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Annex F: 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.

Release/Date	Title	Description
V1.0, 7.5.2009	Initial document release	For PCB revision 1.1
V1.1, 19.5.2009	Additional information	Add sources for plugs and crimp contacts Correct links for online download section
V1.2, 16.5.2009	Preliminary release	New PCB revision 1.2
V1.3, 16.9.2009	Additional features	New PCB revision 1.3
V1.3.1, 2.10.2009	Minor corrections	
V1.4, 6.7.2010	Additional information	Revised document structure Changed chapters Product description Pin assignment and description, PCB drawings Added chapters Warranty hints Application notes Safety instructions EMD declaration Trademarks and service marks
V.1.4.1, 7.7.2010	Errata	4.8 Internal Audio: Pin 7/9 switched (L/R)

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