DHCON DRC02

User manual

Your Digital Heroes.

History

Revision	Date	Description/changes	Name
R01	Sep 3, 2018	Draft	AJ
R01	Sep 4, 2018	# Scope of delivery completed # Title image with texture adapted (less yellow as a result), in addition, height and width relations designed so that they are adapted automatically # User manual in German "Bedienungsanleitung" # Chapter 1.3 reworded	SD
R01	Sep 6, 2018	# Added instructions to the individual chapters # Added Chapter 5 # Added introductory page # Added imprint on the last page # Created index	AJ
R01	Sep 7, 2018	# Phrased introductory text and designed page	AJ
R01	Oct 19, 2018	# Changed image background on title page # Added questions/comments → to be clarified by AJ # 2.1 Adapted texts	SD
R01	Nov 6, 2018	# Improvement suggestions Magdalena see comments	MAD
R01	Nov 15, 2018	# Added review and various comments with the request to amend	SD
R01	Nov 11, 2018	# Put comments SD into practice or else forwarded them to SG	MAD
R01	Dec 12, 2018	# Proofreading and minor changes # Chapter references are to be realized as cross-references → To do by MAD # Issues to be clarified are still marked in yellow	SD
R01	Dec 18, 2018	# Added cross-references # Made further changes and additions # Still to be done: to what extent should AM335 be included → SG # Further open issues see comments and highlights → SG	MAD
R01	Dec 18, 2018	# Review → see comments	SD
R01	Dec 20, 2018	# final revision	MAD
R01	Feb 11, 2019	# Further amendments after review by SG	MAD
R01	Mar 18, 2019	Release	**SD**
R02	May 03, 2019	Translation to English	SG
R02	May, 03, 2019	Release	**SG**
R03	January, 07, 2020	Changed picture to 5.1.6 Outputs	**SG**
R03	January, 07, 2020	Release	**SG**

Dear customer,

We are enthusiastic about technology – and have been for more than 25 years. It is our motivation to pave the way for the digital future with our solutions. It is our spirit of discovery that drives us to realize our vision of the future, thinking outside of the box.

We see ourselves as digital heroes who will find an individual solution for your problem together with you – also with this product.

Thank you for choosing us and thus a product containing innovative solutions down to the finest detail. So that you can use our product continuously and without problems, please read the user manual carefully and keep it for future consultation.

Should you still have a problem some day, please contact us.
We are here for you and happy to help.

We hope you enjoy using this product.

Your Digital Heroes

Contents

1 General product information

1.1 Product details

With the DRC02, you have chosen a product of the DHCON series. Our DHCON products are optimized for smart home and building as well as Industry 4.0 and IoT applications. The DHCON DRC02 is a universally usable computer for control and connectivity tasks and is characterized by highest flexibility combined with low energy consumption and an availability of at least ten years.

To guarantee a long-term, error-free service life, this manual has to be read before use and be at hand for future consultation. You can find further useful information, documents, and software on www.dh-electronics.com.

Product name	DHCON DRC02
Product revision	R01
Product version	DH standard
Manufacturer	DH electronics GmbH

1.2 Scope of delivery

The following listing gives an overview of the components included in the delivery.

- Short instructions
- DIN rail controller DRC02

1.3 Manufacturer and customer service address

We do our best to provide you with all necessary information about our products. Should you however not be able to solve a problem with the user manual and the documents on our website, we are happy to help. Please feel free to contact one of our employees.

- Via our website: https://www.dh-electronics.com/kontakt-support
- Via e-mail: support@dh-electronics.com
- Via phone: +49 8662 4882 0
- Via fax: +49 8662 4882 99
- Via mail: DH electronics GmbH, Am Anger 8, 83346 Bergen, Germany

2 Product description

The DHCON DRC02 is a universally usable computer for control and connectivity tasks and can be used as gateway, router, or soft-PLC due to its variety of industrial interfaces. Due to its special capacitive button technology, it can also be used with gloves in industrial surroundings. Status information from the ongoing operation can be visualized via an OLED display and LEDs. The DRC02 DIN Rail controller differs from other available devices due to two special features:

- IN-RAIL-BUS connection significantly reduces installation effort.
  The DRC02 DIN rail controller can be connected to an IN-RAIL-BUS in the DIN rail if desired. In addition to the power supply, a CAN bus is available on the IN-RAIL-BUS. This system enables the power supply of further devices without external power supply and the connection to the DRC02 via CAN.

- Modular communication interface extensions
  It is possible to add further communication interfaces to the DRC02. The output signals of these extension modules can be picked up via the plug connectors X7 and X8 with wire-based interfaces. The following extensions are available:
  - LON TP/FT10 interface
  - Wi-Fi (2.4/5 GHz), Bluetooth (BT/BLE 5.0), Zigbee 3.0 and Thread interface (as of Q3/19)
  - 2/3/4G GPRS/UMTS/LTE and NB-IoT Narrowband-capable interface (as of Q3/19)
  - MBus and KNX interface planned
  - Upon request, further customer-specific extensions can be developed

- Modular IO extensions
  It is possible to add further IO interfaces to the DRC02. Following extensions are currently being planned:
  - Digital and analog IO modules (as of Q4/19)
  - Upon request, further customer-specific extensions can be developed

2.1 Overview

RS485 isolated

RS232 isolated

Power supply: + 24 VDC

CAN1 isolated

2x input isolated

2x output

Modular communication in-
terface extension

1.3 inch OLED display

VIN
CAN0-H
CAN0-L
NC
GND_IN

IN-RAIL-BUS
extension with CAN
interface to IO ex-
tension

4x status LEDs

5x keys

Modular communication in-
terface extension

microSD slot

2x USB 2.0 host
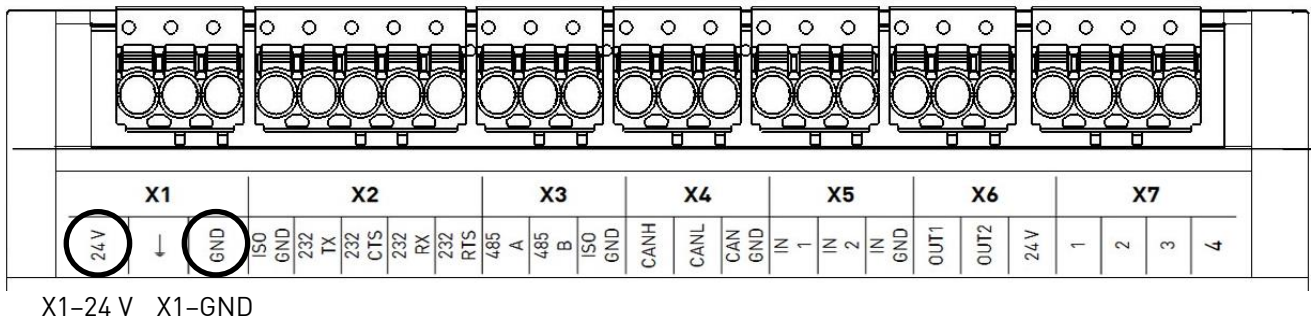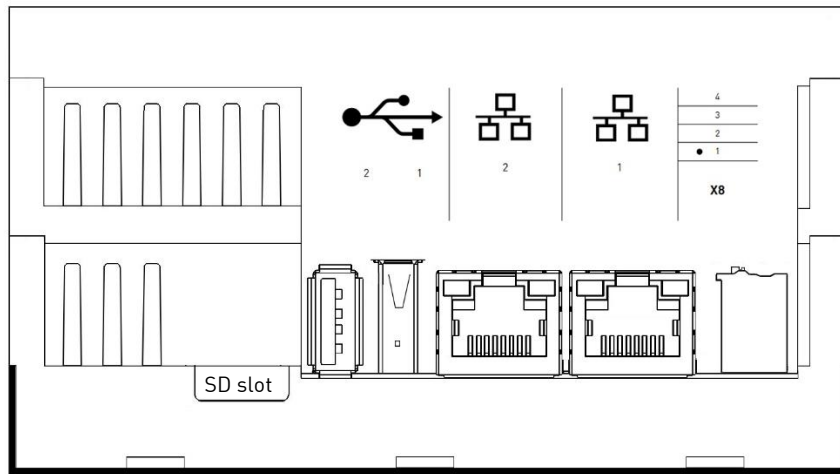
2x 100 Mbit/s Ethernet
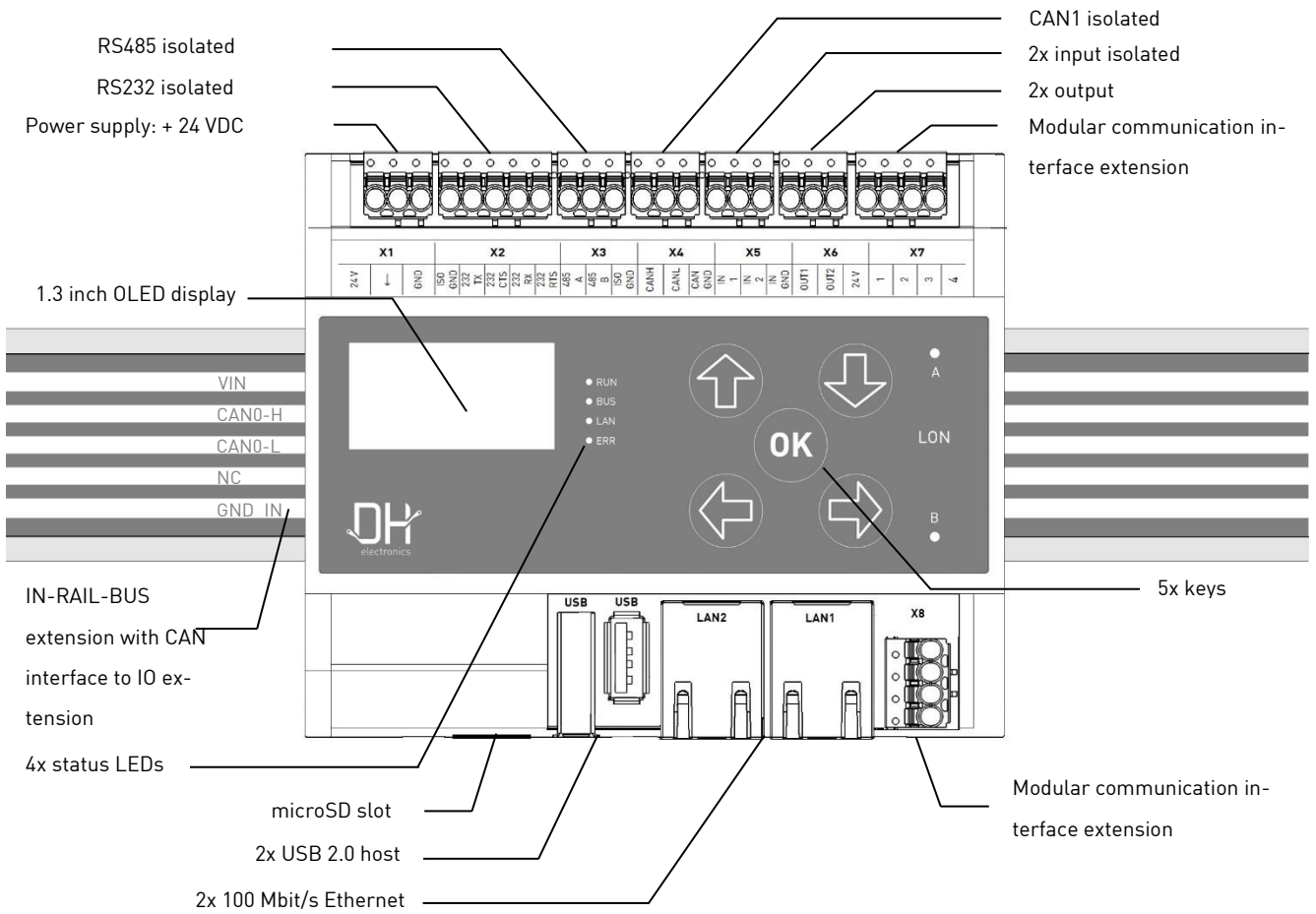
2.2 Pin assignment

In the following illustrations, the terminal connections are shown in an enlarged form.

Pin designators are used as follows: Terminal name – pin function (from left to right) see example

Pin assignment top of the device (X1 – X7)

X1–24 V   X1–GND

Pin assignment bottom of the device (X8)

Note

The assignment of the RJ45 sockets corresponds to the Ethernet standard.

The assignment of the USB sockets corresponds to the USB 2.0 standard.

2.3 Technical specifications

2.3.1 Short description

Input voltage	24 VDC ± 10 %
Input current	3.5 A (max.)
Power consumption	7 W (typ.)
Operating temperature	0 bis +50 °C
Storage temperature	–10 bis +70 °C
Protection class	IP 30
Dimensions length x width x height	107.8 x 89.8 x 60.0 mm
Weight	210 g

2.3.2 Detailed information

CPU	
Type	i.MX6x Solo | AM335x (other DHCOM CPU available upon request)
Frequency	800 MHz
RTC	Yes, battery-backed
Memory	
RAM	512 MB
eMMC Flash	4 GB
Interfaces	
Ethernet	2 x 10/100 Mbit/s
Serial COM	1 x RS232 isolated 1 x RS485 isolated
CAN	1 x up to 1 Mbit/s isolated 1 x up to 1 Mbit/s (optional for IN-RAIL-BUS)
USB 2.0	2 x USB Host 2.0
Digital inputs	2 x opto-coupler input V-input high (min. 15 VDC)
Digital outputs	2 x open-collector output I-output (max. 1 A) V-output (max. 30 VDC)
OLED display	
Diagonal	1.3 inch
Resolution	128 x 64 pixels
Color reproduction	Monochrome (white)
Service life Backlight*	30,000 hours at 80 cd/m² brightness * i.e. at an ambient temperature of 25 °C, only 50 % of the initial brightness can be reached after 30,000 hours of operation
Buttons	
Number of buttons	5 (projected capacitive buttons, can be used with gloves

3 Safety information

3.1 Graphic symbols for safety-related information

Symbol	Category	Description
	Mandatory sign	Ground before use
	Prohibition sign	General prohibition sign
	Warning sign	General warning sign
	Warning sign	Warning of electric voltage

3.2 Activities according to user groups

Activity	Layper-son	Trained specialists	Technical sales employee
Unpacking and setup		X	
Connection and launch		X	
Operation		X	
Troubleshooting			X
Maintenance			X
Disassembly		X	
Disposal		X	

3.3 Intended use

The DHCON DRC02 is a universally usable computer for control and connectivity tasks. The device may only be used in indoor applications. Any deviating use is not intended and can lead to malfunctions. Information on the secure operation and maintenance can be found in the respective chapters. Please contact us in case of any problem that you cannot solve yourself.

3.4 User group

The device may only be used by trained specialists. The specialists can carry out the tasks mentioned in Chapter 3.2 independently. In case of failures and for maintenance tasks, please contact a technical sales employee.

3.5 Danger

Inappropriate use of the device can lead to damage of objects or the injury of people. Therefore, please make sure to bear in mind the safety instructions included in the user manual and do not deviate from the recommended measures, especially regarding commissioning and decommissioning, maintenance, or in case of failure.

3.6 Special precautionary measures

If you comply with the precautionary measures contained in the user manual and take into account warning and safety indications, you should be able to operate the device without problems. Should you ever be under the impression that a secure operation cannot be guaranteed, disconnect the device from the power supply as quickly as possible and contact a technical sales employee.

4 Prepare the use of the product

The following paragraph describes the correct approach before the actual use of the product.

4.1 Transport and storage

All products of DH electronics are delivered in professional packing. In any case, the products are protected from vibrations; if necessary, a special ESD packaging is used. Our products may only be transported and stored in the provided original packaging, as only then can a high product quality be guaranteed for a longer transport or storage period. The scope of delivery should be controlled when the product is unpacked; afterwards, the packaging has to be disposed appropriately. The customer is responsible for this.

4.2 Disposal of product and packaging material

Packaging material always has to be disposed appropriately by the customer. In addition, he is responsible for disposing of the delivered product after termination of use at his own expense according to

legal regulations. The customer indemnifies DH electronics GmbH from the take-back obligation and related third-party claims.

Should the product be passed on to third parties, the customer must instruct these third parties by contract regarding taking over the duty of disposal and reiterating this duty. Should the customer refrain from doing so, he is obliged to take the delivered product back after termination of use at his own expense and to dispose of it according to legal regulations.

4.3 Preparation of the installation

Safety information

⚠️	• In electric systems, voltages can occur that are dangerous for people. When live parts are touched, this can lead to an electric shock. • Make sure that the device is disconnected from the power supply. • ***Do not supply the device via an alternating current network.***
⏚	• The device has to be grounded before use.
⚠️	• Do not drop the device. • Make sure that the ventilation slits of the housing are not covered and bear below installation instructions in mind!
🚫	• The device must not be operated in inflammable or explosive surroundings.

Installation instructions

The device is clipped into a DIN rail by means of a clip on the bottom of the housing. For this purpose, put the device onto the side opposite the clip and then push it down. The device may only be installed horizontally; a deviating installation is not permitted.
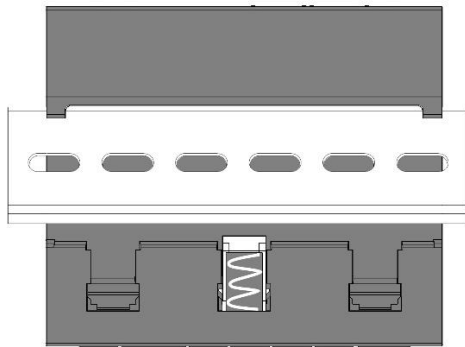
Installation on the DIN rail (rear view)
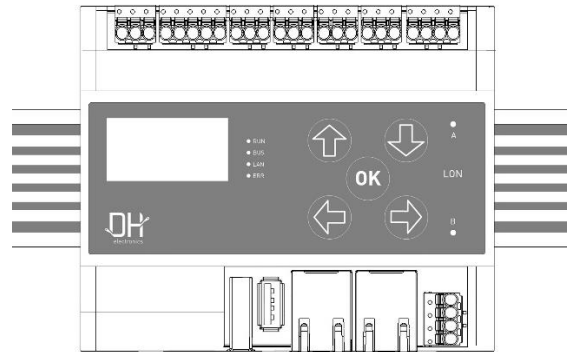
Horizontal installation position (front view)

4.4 Setup

The device is delivered in an operational condition. For setting up the device, proceed as described in the following paragraph and bear in mind the safety instructions from Chapter 3.

- Make sure that the power supply on the customer side is switched off at first.
- Put the device into the DIN rail (see Chapter 4.3).
- The device has to be grounded before use. For that purpose, connect X1⏚ with the protective conductor. For the power supply of the device, use a +24 VDC power supply unit.
  Do not supply the device with alternating voltage.
- Connect the negative lead of the power supply with X1-GND.
- Connect the positive lead of the power supply with X1-24 V.
- Switch on the supply voltage.
- The device will boot automatically.

5 Operation

Bear in mind the safety instructions from Chapter 3 and the instructions for setup from Chapter 4.4. To guarantee a secure operation, the device must only be used by trained staff according to Chapter 3.2.

5.1 Interfaces

The device contains various interfaces, which are listed and described briefly in the following.

5.1.1 Power supply

- The device is supplied via a power supply unit with +24 VDC; for this a pin header with 3 poles is used. A supply with alternating voltage is not permitted.

- Input voltage is protected against polarity reversal, the input current is limited to 2 A.

- The current limit is carried out by a 2 A fuse. Should you suspect it to have blown, please contact us immediately.
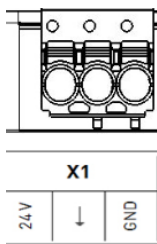
Termi-nal	Pin	Name	Description
X1	Pin1	24 V	Input voltage
X1	Pin2	⏚	Ground connection *)
X1	Pin3	GND	Input ground

*) For a fault-free operation, the ground connection must be connected according to regulations!

5.1.2 RS232

The RS232 interface is connected via a 5-pin header and is isolated (2,500 Vrms) from all other interfaces – apart from RS485.
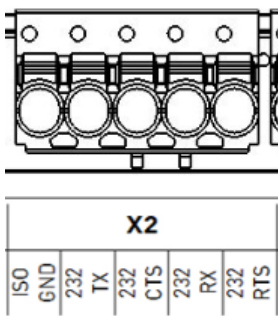
Termi-nal	Pin	Name	Description
X2	Pin1	GND_ISO	Isolated mass (together with RS485)
X2	Pin2	TX	Transmit data
X2	Pin3	CTS	Clear to send
X2	Pin4	RX	Receive data
X2	Pin5	RTS	Request to send

5.1.3 RS485

The RS485 interface is connected via a 3-pin header and is isolated (2,500 Vrms) from all other interfaces – apart from RS232.
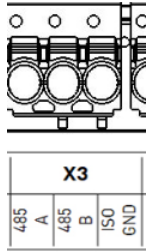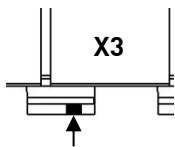
Termi-nal	Pin	Name	Description
X3	Pin1	RS485-A	Positive RS485 signal
X3	Pin2	RS485-B	Negative RS485 signal
X3	Pin3	GND_ISO	Isolated mass (together with RS232)

The bus termination of the RS485 connection can be (de-)activated with a switch underneath X3.

- Switch position in direction of the center of the housing: Bus termination activated
- Switch position in direction of the edge of the housing: Bus termination deactivated

5.1.4 CAN1

The CAN1 interface is connected via a 3-pin header and is isolated (2,500 Vrms) from all other interfaces.

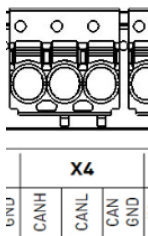| Termi-nal	Pin	Name	Description
X4	Pin1	CAN1-H	CAN1 high signal
X4	Pin2	CAN1-L	CAN1 low signal
X4	Pin3	GND_CAN	Isolated CAN mass

The bus termination of the CAN connection can be (de-)activated with a switch underneath X4.

- Switch position in direction of the housing center: bus termination activated
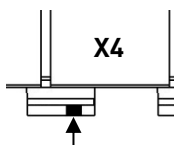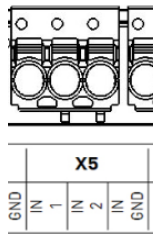- Switch position in direction of the housing edge: bus termination deactivated

5.1.5 Inputs

The input signals are connected via a 3-pin header and are isolated (2,500 Vrms) from all other interfaces.

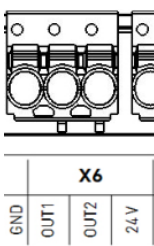| Termi-nal	Pin	Name	Description
X5	Pin1	Input1	Input1 signal, to DHCOM GPIO-G
X5	Pin2	Input2	Input2 signal, to DHCOM INT-HIGHEST-PRIO
X5	Pin3	GND_OPTO	Isolated input mass

The input signals are led to the DHCOM via an optocoupler. The optocoupler triggers at a threshold voltage of +15 VDC. The max. input voltage is +24 VDC; at higher voltages, the circuit can be destroyed.

The assignment of the DHCOM input to the input level is defined as follows:

DHCOM input	Input level
High	0 VDC
High	10 VDC
Low	15 VDC
Low	20 VDC

5.1.6 Outputs

The output signals are connected via a 3-pin header.

Termi-nal	Pin	Name	Description
X6	Pin1	Output1	Output1 signal, from DHCOM GPIO-F
X6	Pin2	Output2	Output2 signal, from DHCOM GPIO-D
X6	Pin3	VIN	Input voltage

Outputs are defined as open collectors. The max. output current is 1 ampere. At output current higher than 1 ampere, the circuit above the open-collector output can be destroyed.

Should the open-collector output be operated like an output with voltage potential, this must be wired with an external pull-up resistor. The open-collector output is suitable for the control of an external relay, for example.

Example circuit
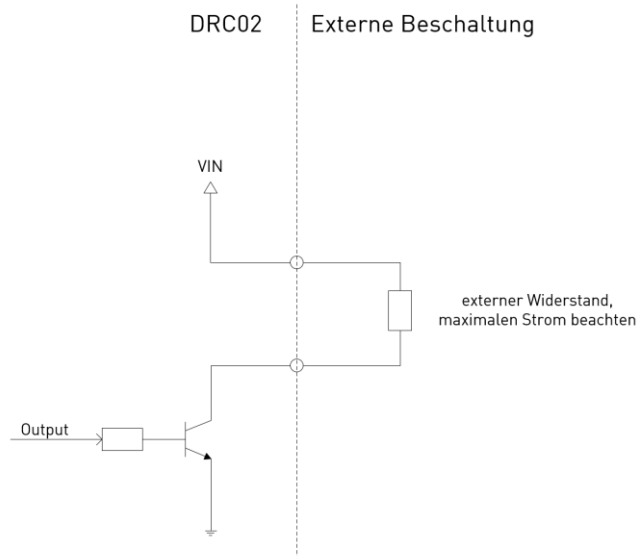
5.1.7 Extension connector

Terminals X7 and X8 of the optional, internal extension module are available in grid-bound interface extension.

The pin assignment can vary, depending on the extension module used.
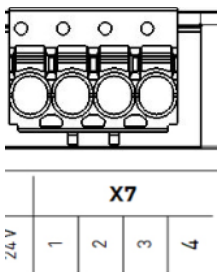
Termi-nal	Pin	Name	Without extension module
X7	Pin1	A-1	No connection
X7	Pin2	A-2	No connection
X7	Pin3	A-3	No connection
X7	Pin4	A-4	No connection
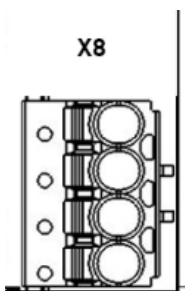
Termi-nal	Pin	Name	Without extension module
X8	Pin1	B-1	No connection
X8	Pin2	B-2	No connection
X8	Pin3	B-3	No connection
X8	Pin4	B-4	No connection

5.1.7.1 LON

The double LON TP/FT10 extension module has the following pin assignment:
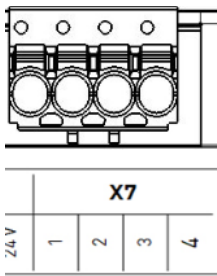
Termi-nal	Pin	Name	LON A interface
X7	Pin1	A-1	LON-A-1
X7	Pin2	A-2	LON-A-2
X7	Pin3	A-3	No connection
X7	Pin4	A-4	No connection
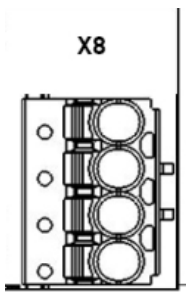
Termi-nal	Pin	Name	LON B interface
X8	Pin1	B-1	LON-B-1
X8	Pin2	B-2	LON-B-2
X8	Pin3	B-3	No connection
X8	Pin4	B-4	No connection

5.1.8 Ethernet 1 and Ethernet 2

The device offers the possibility to connect two separate Ethernet networks. Networks with up to 100 Mbit/s are supported. In addition, transmitting and receiving lines are recognized automatically via Auto MDI-X, so that both crossed and uncrossed patch cables can be used. The RJ45 sockets are allocated according to Ethernet standard and have a green LINK LED and a yellow SPEED LED. The blinking speed of the green LED stands for the data transmission rate. The yellow LED lights up when the data transmission takes place with a network speed of 100 Mbit/s. If the yellow LED does not light up, the network speed is 10 Mbit/s.
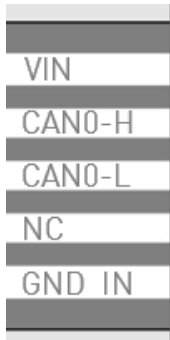
5.1.9 USB Host 1 and USB Host 2

The device has two USB 2.0 host interfaces, the first of which (Host 1) is vertical, the second (Host 2) horizontal. The assignment of both sockets corresponds to the USB 2.0 standard.
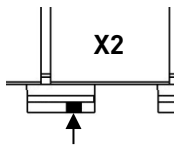
5.1.10   IN-RAIL-BUS

5.1.10.1 CAN0

The IN-RAIL-BUS extension with CAN0 interface can be connected via a contact spring block.

Termi-nal	Pin	Name	Description
IN-RAIL	Pin1	VIN	Input voltage
IN-RAIL	Pin2	CAN0-H	CAN0 high signal
IN-RAIL	Pin3	CAN0-L	CAN0 low signal
IN-RAIL	Pin4	NC	No connection
IN-RAIL	Pin5	GND_IN	Input ground

The bus termination of the CAN0 connection can be (de-)activated with a switch underneath X2.

- ▪ Switch position in direction of the housing center: bus termination activated
- ▪ Switch position in direction of the housing edge: bus termination deactivated

5.1.10.2 Power supply of the IN-RAIL-BUS

The IN-RAIL-BUS devices can also be supplied via the supply terminal X1 of the DRC02 device. For this purpose, the input voltage of the DRC02 device is connected directly to the IN-RAIL-BUS via a fuse.

Warning   The available supply voltage on the IN-RAIL-BUS is not protected against polarity reversal. The reverse polarity protection must be planned in the connected IN-RAIL-BUS device. IN-RAIL-BUS devices by DH electronics have an integrated reverse polarity protection.

The max. current is limited via the fuse in the DRC02 device. Should you want to operate higher loads on the IN-RAIL-BUS, please contact a technical sales employee.

5.1.11   OLED display

The DIN rail controller is equipped with a monochrome color reproduction (white) and a resolution of 128 x 64 pixels. The display is used to show texts and graphics.

5.1.12   Buttons for the menu control

By means of the five PCAP buttons (PCAP = projected capacitive) you can navigate in the menu. In addition, the selection of individual commands can be confirmed. With the arrow buttons, you can navigate between the individual commands (up, down, left, right), with the OK button you can confirm the selection.

5.1.13   Status LEDs

By means of status LEDs, the user gains an overview of the current operating status within short time.

The four status LEDs next to the display provide information on the on-condition, BUS and LAN connections as well as error status. The LEDs on the right show the status of the optional integrated extension module, which is connected to X7 (A) and/or X8 (B).

1.3 inch OLED display

Keys for the menu control

Status LEDs next to display

Status LEDs right
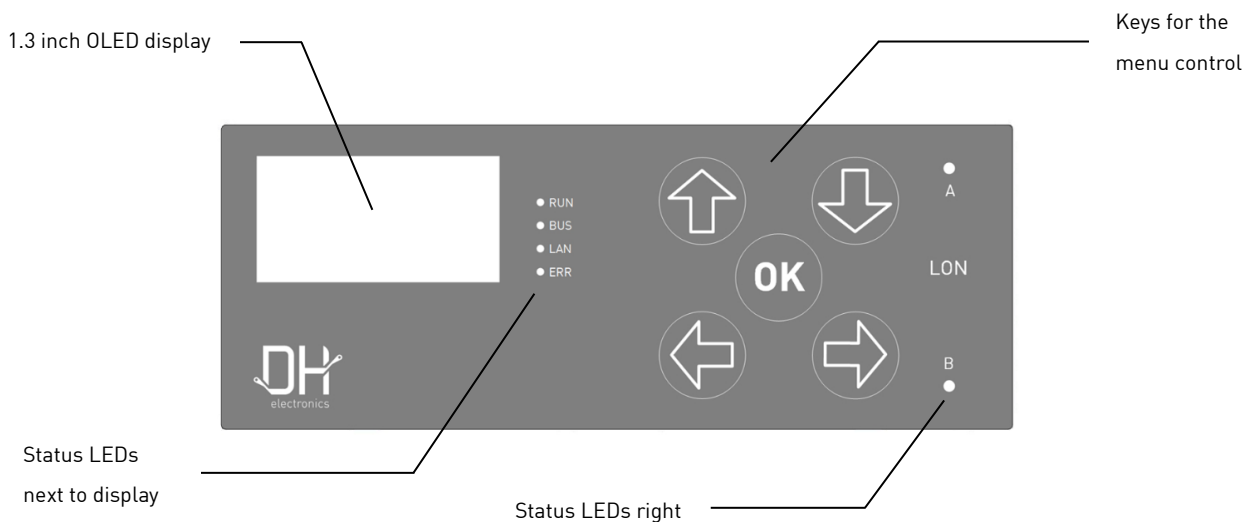
5.2 Normal mode

After the wiring has been locked, the device can be connected to the input voltage.

The functionality depends on the specific programming.

5.3 Malfunction

The procedure in case of a malfunction depends on the software. A description will follow shortly.

6 Software documentation

The following chapter describes the software-based installation and the operating options of the DRC02. As there tend to be a lot of changes, especially in the software area, we refer to the DH Wiki several times. Here you can find up-to-date information on all software-related matters. Information on the software DHCOM i.MX6x and DHCOM AM335x that can be found in the Wiki is generally also valid for DHCON DRC02. You can find answers to frequent questions about Bootloader and Linux at > DHCOM >FAQ >General.

6.1 System architecture

The following illustration describes the software's system architecture.
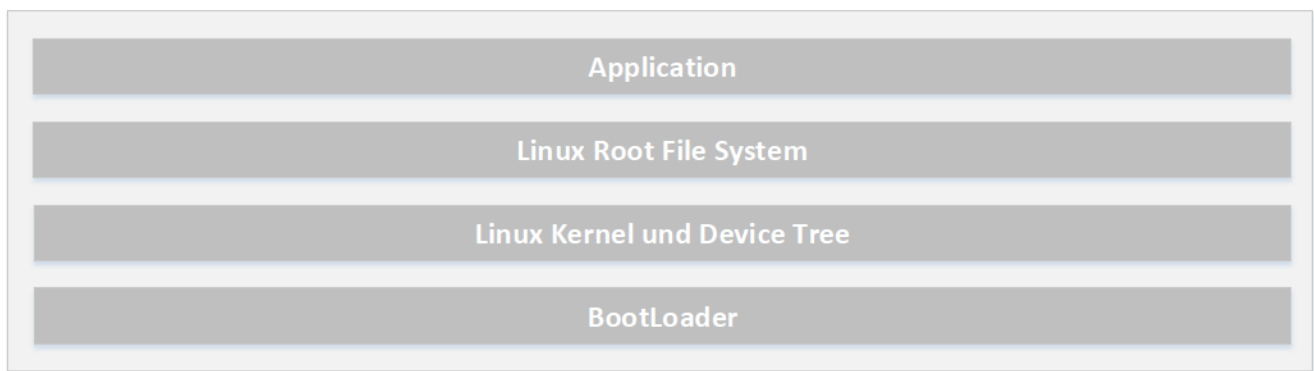
6.1.1 Boot loader U-Boot

The DHSOM-based embedded systems of DH electronics use the U-Boot boot loader (U-Boot stands for universal boot loader) as the software can run on different processors and microcontrollers. This allows for flexible configuration possibilities during the compiling. The DHCOM modules i.MX6x and AM335x use U-Boot as boot loaders.

Download: DH Wiki > DHCOM i.MX6x > Downloads > U-Boot Sources (status 12/2018)

6.1.2 Linux Kernel

After executing the boot loader software, the boot loader loads the Linux Kernel.

Download: DH Wiki > DHCOM i.MX6x > Downloads > U-Boot Sources (status 12/2018)

6.1.3 Linux root file system

The root file system has to be installed as basis for all further directories. You can choose between a pure Debian version (Jessie or Squeeze) and a Debian Qt5 version.

Download: DH Wiki > DHCOM i.MX6x > Downloads > Debian-based root file systems (status 12/2018)

6.2 Linux boot process

6.2.1 Boot loader

DHCOM products use U-Boot as boot loader. Important steps for accessing the boot loader console:

1. Connect the RS232 port (terminal X1) with the RS232 port of your PC via a null modem cable.

2. For the use of a terminal program (Tera Term, Putty), the following settings apply:

   Baud rate: 115,200 bit/s

   Data bits: 8 bit

   Parity bits: none

   Stop bits: 1 bit

   Flow control: deactivated

3. Press the "Del" key during the start of the module to call up the boot loader console.

Further information on U-Boot (recovery, console commands, updates, display and hardware settings, build process) are available in the DH Wiki at DHCOM i.MX6x > Software support > Boot loader U-Boot

6.2.2 Kernel

In the DH Wiki you can find information on the following topics at DHCOM i.MX6x > Software support > Linux > Linux Kernel: Sources for i.MX6x Kernel, Build process, update Kernel and device tree with U-Boot or Linux.

6.2.3 Root file system

In the DH Wiki you can find information on using the Debian root file system at DHCOM i.MX6x > Software support > Linux >Debian root file system. In addition to the available file systems, you can find documentation on Debian here. The commands for login, shutdown, and display calibration are especially important.

Login	Shutdown	Calibrating touchscreen (only Debian 6.0)
Debian GNU/Linux 8 dhcom ttymxc0 Dhcom login: root Password: foo	# shutdown –h now	# ts_calibrate

In addition, a root file system can be created on an SD card. Necessary steps are described in the Wiki at

DHCOM i.MX6x > Software support > Linux > How to create a micro SD card with a root file on it

6.3 Device access and login

There are several possibilities to access the device. These are briefly described in the following. Generally, both emulation programs such as Tera Term or Putty and a Linux Shell can be used for the communication between Desktop PC and embedded system.

6.3.1 Putty via RS232

First, connect the device to the power supply as described in Chapter 5.1. Also connect the COM port of your PC with the RS232 interface of the device via a null modem cable. Then, you can access the embedded system via the emulation program. Subsequently, you can establish a connection via Putty. For that, carry out the following steps:

- Identify serial or USB serial port (COMx), e.g., vial Windows Device Manager
- Select serial connection, corresponding SOM port
- Baud rate 115,200 bit/s
- Activate the console via Enter
- Call up the boot loader console via the "Del" key
- DHCOM login: root, password: foo
- root@dhcom: ~# here, commands for customer-specific programming can be entered

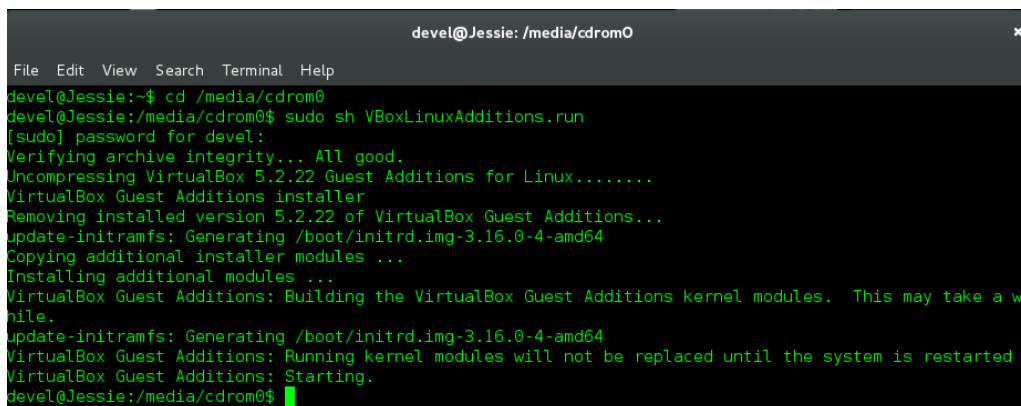## 6.3.2 Linux Console via RS232

First, connect the device to the power supply as described in Chapter 5.1. Also connect the COM port of your PC with the RS232 interface of the device via a null modem cable. Then, start Debian Jessie (in VM with the image mentioned below) and insert the guest extension. For this, please bear in mind the documentation in the DH Wiki. Open a new terminal and enter the following commands:

- $ cd /media/cdrom0
- $ sudo sh VBoxAdditions.run
- [sudo] password for devel: devel

- devel@Jessie:/media/cdrom0 $ enter customer-specific programming commands here

6.3.3 Putty via Ethernet

First, connect the device to the power supply as described in Chapter 5.1. Connect one of the two Ethernet ports of the device with the Ethernet port in the network. Then, you can access the device via the emulation program. First, identify the IP address of the device, then establish a connection via SSH. Connect the device via RS232 and connect it as described in Paragraph 6.3.1. After the login, you can call up the device's IP address via the command #ip addr. Here, the following applies:

- IP address for the right connector (Ethernet 1) see eth0:   10.64.1.137
- IP address for the left connector (Ethernet 2) see eth1:   10.64.1.132

Afterwards, you can establish an SSH connection via Putty in a new terminal. Here, enter root@ip-address (e.g., root@10.64.1.137); alternatively, you can also just enter the IP address and have to confirm that you really want to establish a connection and are asked for the following login.

Login as: root

root@IP address's password: root

root@dhcom: ~# here, commands for customer-specific programming can be entered

6.3.4 Linux Console via Ethernet

First, connect the device to the power supply as described in Chapter 5.1. Connect one of the two Ethernet ports of the device with the Ethernet port in the network. Then, start Debian Jessie (in VM with the image mentioned above) and insert the guest extension. For this, please bear in mind the documentation in the DH Wiki. Open a new terminal and enter the following commands:

- $ ssh IP address (example: $ ssh 10.64.1.132)
- devel@10.64.1.132's password: devel
- devel@Jessie: /media/cdrom0 $ enter customer-specific programming commands here

6.3.5 Virtual machine

In case you would like to run Linux in a virtual machine (in short VM), we provide a Debian-based VM, which already includes some tools and additional functions. Please bear in mind the installation instructions in the DH Wiki. Search for "Virtual machine for application development". We recommend using the VMware player; alternatively, you can use VirtualBox. After installing the VM, the corresponding image needs to be installed.

The passwords for installing the images under Debian 8 "Jessie" or else Debian 6 "Squeeze" are:

Devel user: devel

Root user: root

6.3.6 Web interface

Shortly, you will be able to access and configure the device via a Web interface.

6.4 Updates

As the device contains modules from the DHCOM series, the information on the DHCOM update mechanism described in the DH Wiki applies here. In addition to the entire image, it is possible to update only parts of the system, such as the Linux Kernel. For this, only the boot loader must be executable, a running operating system is usually not necessary. Necessary documents can be downloaded in the download section of the i.MX6x or the AM335x. The detailed update description can be found here:

DH Wiki > DHCOM i.MX6x > Software support > DHCOM update mechanism for i.MX6 (status 12/2018)

Note for updates via USB stick: We recommend using a USB stick partitioned via MBR and formatted with FAT32 with at least 1 GB memory as update medium.

6.5 Interfaces

The available interfaces of the device were already described in Chapter 5. Analogous to the description above, this section describes the interfaces of the software. You can find further information on the computer modules applied and the interface addressing in the DH Wiki. The following explanations are valid for DHCOM i.MX6x and DHCOM AM335x under Linux.

6.5.1 RS232

DHCOM i.MX6x: Control RS232 via DHCOM (FF) UART1 with the command `/dev/ttymxc0`.

DHCOM AM335x: Control RS232 via DHCOM (Rx Tx Rts Cts) UART1 with the command `/dev/ttyS0`.

Note DHCOM AM335x: valid only for Linux Kernel > 4.4.x

6.5.2 RS485

DHCOM i.MX6x: Control RS485 via DHCOM (BT) UART2 with the command `/dev/ttymxc4`.

DHCOM AM335x: Control RS485 via DHCOM (Rx Tx) UART2 with the command `/dev/ttyS1`.

6.5.3 CAN1

DHCOM i.MX6x: Control of the CAN1 interface via CAN1. This is initialized and tested as follows:

Operation	Code
Initialize	`ip link set can0 up type can bitrate 500000`
Send test message	`cansend can0 100#11.2233.44556677.88`
Receive test message	`candump can0`

DHCOM AM335x: analogous to i.MX6x

6.5.4 Inputs

DHCOM i.MX6x Control Input 1 via GPIO G, control Input 2 via highest-interrupt pin.

Following chart for control of the GPIOs is valid for controlling both inputs and outputs.

Operation	Code
See which GPIO is already used by system	`cat /sys/kernel/debug/gpio`
Export	`echo <GPIO#> >/sys/class/gpio/export`
Find out which pins are already config-ured	`/sys/class/gpio/`
Set direction	`echo in >/sys/class/gpio/gpio<GPIO#>/direction` `echo out >/sys/class/gpio/gpio<GPIO#>/direction`
Set state	`echo 0 >/sys/class/gpio/gpio<GPIO#>/value` `echo 1 >/sys/class/gpio/gpio<GPIO#>/value`

DHCOM AM335x Control Input 1 via GpIO G, control Input 2 via highest-interrupt pin.

6.5.5 Outputs

DHCOM i.MX6x Control Output 1 via GPIO F, control Input 2 via GPIO D.

The GPIOs are controlled via commands from the chart under 6.5.4.

DHCOM AM335x: Control Output 1 via GPIO F, control Input 2 via GPIO D.

The GPIOs are controlled via commands from the chart under 6.5.4.

6.5.6 USB Host 1 and Host 2

In the Linux Kernel used only USB devices of the type mass memory, i.e., USB memory sticks, are supported.

The following data systems can be used with the system:

- ext2 / ext3
- FAT32

Software updates can be imported via a USB stick. In addition, application data can be imported and exported.

6.5.7 IN-RAIL-BUS with CAN0

In addition to CAN1, the second CAN0 interface can be implemented as DRC02 option. The IN-RAIL-BUS enables the connection of CAN0 directly via the DIN rail. The interface is initialized as described in Chapter 6.5.3.

DHCOM i.MX6x: Control of the CAN0 interface via CAN0.

DHCOM AM335x: upon request.

6.6 Implementing applications of your own

After the start-up of the device and the described login, you can implement applications of your own on the device. For that, we recommend the Virtual Machine for Application Development, which you can download in the DH Wiki at DHCOM i.MX6x > Downloads > Virtual Machine for Application Development. The necessary commands for the specification of Linux as well as the Kernel user space interfaces for the access to the hardware are also described in the Wiki. Please also pay attention to the interface description in Chapter 6.5. Keys for menu control, status LEDs, and display can be programmed depending on the application. You can use the DH Setting Generator as support.

This and further information can also be found in the DH Wiki > DHCOM i.MX6x > Software support > Linux Currently, we also have example applications, which we are happy to provide you with upon request.

7 Maintenance

The product's long service life can only be guaranteed if it is maintained properly. Only use a damp cloth to clean the display and PCAP buttons. Clean the product regularly. Disconnect the device from the power supply to avoid accidental deployment.

8 Decommissioning, disassembly, disposal

The decommissioning of the device takes place step by step and will be explained briefly in the following.

- Save all relevant data and shut down the system.
- Disconnect the device from the power supply.
- Remove all connections from the device.
- Take the device out of the DIN rail. For this, please pay attention to the following illustration.

To take the device out of the DIN rail, pull down the clip on the bottom of the device with a screwdriver. Now you can release the rail out of the DIN rail, first on the bottom, then on the top.
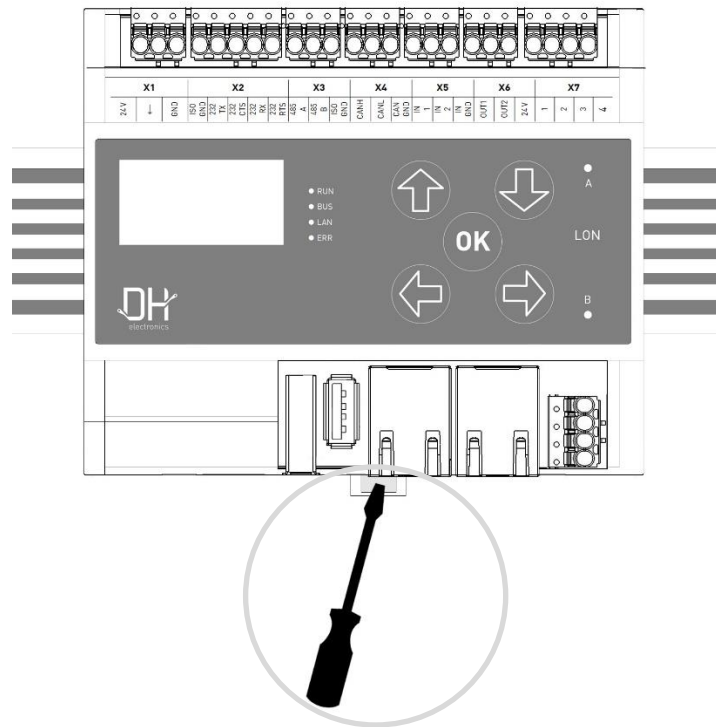
To dismantle the DIN rail – pull down clip

Use the original packaging for transport and temporary storage. As customer, you are obliged to dispose of the device appropriately. Therefore, please be aware of the guidelines mentioned in Chapters 4.1 and 4.2 in case of disposal. The device or parts of it might be able to be recycled.

9   Order information

Should you require components of the device, please contact our sales department. In exceptional cases, components cannot be reordered separately.

10 Customer-specific changes

With larger quantities, a customer-specific design for the front panel can be designed and printed upon request. If you are interested, please feel free to contact one of our sales employees.

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