CARRIERTRONIC
Full Service Embedded Provider

Verdin Pico-ITX-IPC Serie

Datasheet

Data sheet and instructions

Version: November.2025, v1.2
Doc No.: P000000

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General information

This document is intended for the end customer. The safety instructions must be passed on by the machine manufacturer or system provider.

Technical changes

carriertronic GmbH reserves the right to change and adapt the information, designs and technical data contained in this documentation without prior notice.

History

The following versions of these instructions for use have already been published:

Version	Notice
Feb.2025, v1.0	Release
Feb.2025, v1.1	Changed SoM Details
Nov. 2025, v1.2	Changed Ethernet Speed in Interface Description

Safety instructions:

⚠ DANGER	
	**Indicates an imminent danger** Failure to follow the instructions may result in serious injury or death.

⚠ WARNING	
	**Indicates a dangerous situation** Failure to follow the instructions may result in serious injury.

⚠ CAUTION	
	**Indicates a potentially dangerous situation** Failure to follow the instructions may result in injury.

NOTE	
	**Indicates useful information** Important information to avoid malfunctions that could result in material damage.

Manual

Product description

The Verdin Pico-ITX IPC series is a low-cost Industry PC system.

This system is characterized above all by its simple integration into existing or new projects.

Thanks to the different versions, which can be adapted to your project if necessary, both stand-alone use and integrated use with existing hardware is possible without further ado.

The IPC can be ordered and configured with any Toradex SOM from the Verdin family.

Please feel free to contact us!

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Technical information

SoM-Details	Compatible with Verdin Family (customer-configurable)
RTC	Battery protected
EEPROM	2kByte
PCIe	A M.2 Key-M Slot is available on carrier
Temperature	Digital Temperature Sensor with I2C Interface
Mechanics	DINrail
Power supply	+12V-48V VDC ±5%
Ethernet	1x PoE 1000Mbit/s Ethernet, with TSN 1x RGMII 1000Mbit/s Ethernet
USB-OTG	Dual role interface (host/client)
Media	HDMI (2.0a, up to 4K)

IPC properties

Cooling	Passive (Natural air convection)
Operating Temperature	-20 ~ 50°C
Humidity	5 ~ 80% (non-condensing)
Weight	500 g

NOTE

Information
Interface description can be found in the overview

Power supply

Parameter Name	Min	Typ	Max	Tol.	Unit
Input voltage	+12	-	+48	±5%	V
Overcurrent protection	-	-	2	-	A
Recommended input voltage	-	24	-	-	V

NOTE

The appliance may only be installed by a qualified electrician.
Observe the national and international regulations for the installation of electrical systems.

⚠ WARNING

The output of the power supply unit must meet the criteria of a safety extra-low voltage (SELV) in accordance with IEC 60664-1.
If an unsuitable power supply unit is used, there is a risk of electric shock.

Design and function

Carrier board

The carrier board is equipped with a SoM from Toradex AG. It contains all the interfaces available on the panel on board. The SoM can vary within the Toradex Verdin Family depending on requirements.

Battery

An internal 3V lithium battery CR2032 guarantees a constant power supply to the RTC when the main power supply is switched off.

Aux Power Input

The carrier board features an AUX power input, designed to connect an external power supply ranging from +12V to +48V DC. This wide voltage range ensures compatibility with various industrial and commercial power sources.
The AUX power input is electrically isolated, providing robust protection against ground loops and electrical noise. This isolation enhances system reliability in environments with fluctuating or noisy power conditions, making it suitable for industrial applications.
The AUX input can serve as the primary power source or as a backup, ensuring operational flexibility and redundancy for critical systems.

Ethernet ETH1 with PoE and TNS

The Ethernet interface ETH1 is operated via an Ethernet controller of the processor. The electrically isolated 10/100/1000 Mbit Ethernet interface is available on an RJ45 connector.

Ethernet ETH2

The Ethernet interface ETH2 is operated via an Ethernet controller on the RGMII interface of the processor. The electrically isolated 10/100/1000 Mbit Ethernet interface is available on an RJ45 connector.

HDMI

The carrier board is equipped with an HDMI interface compliant with HDMI 2.0a specifications. This allows for high-definition video and audio transmission with resolutions up to 4K (3840x2160) at 60 Hz. The HDMI interface ensures compatibility with modern display technologies, supporting HDR (High Dynamic Range) for enhanced visual quality. This interface is ideal for applications requiring crisp, clear visuals, such as industrial HMI, digital signage, or multimedia playback.

USB-OTG

The carrier board has a USB-C connector, which can be operated both as a client and as a host. The recovery image from Toradex can be flashed in the client configuration (USB-OTG).

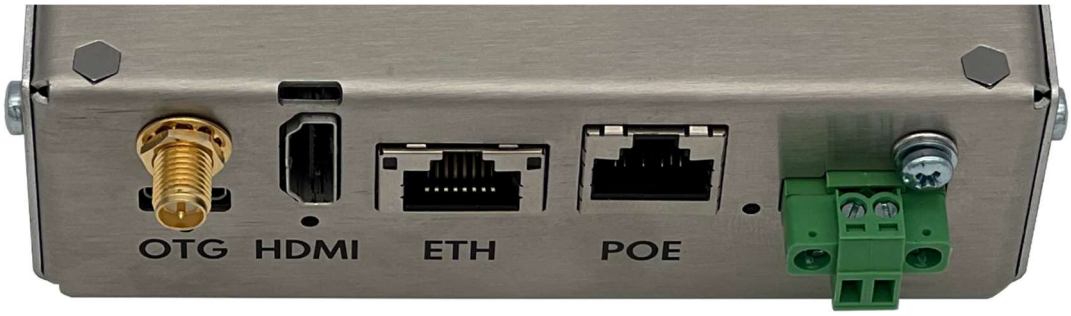
M.2 Connector (Key-M)

The carrier board is equipped with an M.2 Connector (Key-M), supporting modular expansion options such as NVMe SSDs or other M.2 devices. The connector is configured with 1 PCIe Gen 3 lane (x1), providing a data transfer rate of up to 8 GT/s (Gigatransfers per second).

Plug assignment

Interfaces Description

Ref.	Interface (IO-Shield)	Application
X301	Aux Power Input	PWR
X800	Ethernet 1000 Mbit with TSN and PoE	ETH1
X801	Ethernet 1000 Mbit	ETH2
X1100	HDMI 2.0a	HDMI
X700	USB-C 3.0 – DRP (Recovery)	USB-OTG



X700	X1100	X801	X800	X301
USB-C DRP	HDMI	ETH2	ETH1 PoE	Aux PWR

X301 Aux Power Input

1 2

Pin	Singal	Typ	Description
1	0V	PWR	Supply 0Volt DC
2	+VDC	PWR	Supply +12V – 48VDC ±5%

Connection cable: shorter 3m, unshielded

- Socket type: Phoenix Contact MC 1,5/ 2-GF-3,5 AU – 1995787
- Plug type: Phoenix Contact MC 1,5/ 3-STF-3,5 – 1847055 (Included in the scope of delivery)

Note

Information
A slow-blow SMD fuse is installed as overcurrent protection

ETH 1 Connector with PoE and TSN (X800)

ETH1 Connector RJ45 (X800)
Würth Elektronik (615008160221)

The pin assignments for 8 pin RJ45 Connector are shown in the table below.

Pin	Connection	SODIMM Pin
1	D0_P	225
2	D0_N	227
3	D1_P	233
4	D2_P	239
5	D2_N	241
6	D1_N	231
7	D3_P	247
8	D3_N	245

Cable: min. Cat 5e (RJ45)

PoE Classification

As soon as the PoE voltage is detected, the IC classifies the voltage supplied via the PoE power supply unit (PSE).
Once the classiciation has been successfully completed. The PoE voltage is switched through to the system.

If an external voltage (AUX) is added which is in the classified voltage window (+12V DC bis 48V DC), the LT4275A switches to the AUX voltage with priority.

Only PoE power supply units (PSU) that do not exceed the permissible voltage range according to 802.3af may be used.

The PoE PSU used must be short-circuit proof.

Ethernet 2 Connector (X801)

The Ethernet interface is based on the KSZ9131RNXI 10/100/1000 Mbps Ethernet transceiver. For more information refer to the KSZ9131RNXI IC datasheet.

ETH2 Connector RJ45 (X801)
Würth Elektronik (7499111615) / Bel Fuse Inc. (A829-1J1T-KM)

ETH2 Connector RJ45 pin assigment

Pin	Connection
1	D0+
2	D0-
3	D1+
4	D2+
5	D2-
6	D1-
7	D3+
8	D3-

Cable: min. Cat 5e (RJ45)

HDMI Connector (X1100)

Connector Type: Right Angle
TE Connectivity: 2007435-1

The pin assignments for HDMI Connector shown in the table below.

Pin	Signal	IO-Type	SODIMM	Voltage	Pull-up/Pull-down	Beschreibung
1	HDMI_1_TXD2_L_P	O	87			Positive differential HDMI data signal, lane 2
2	GND	PWR				
3	HDMI_1_TXD2_L_N	O	85			Negative differential HDMI data signal, lane 2
4	HDMI_1_TXD1_L_P	O	81			Positive differential HDMI data signal, lane 1
5	GND	PWR				
6	HDMI_1_TXD1_L_N	O	79			Negative differential HDMI data signal, lane 1
7	HDMI_1_TXD0_L_P	O	75			Positive differential HDMI data signal, lane 0
8	GND	PWR				
9	HDMI_1_TXD0_L_N	O	73			Negative differential HDMI data signal, lane 0
10	HDMI_1_TXC_L_P	O	69			Positive differential HDMI reference clock signal
11	GND	PWR				
12	HDMI_1_TXC_L_N	O	67			Negative differential HDMI reference clock signal
13	HDMI_1_CEC_CON		63		27k to +V3.3_SW	HDMI Consumer Electronic Control
14	NC					Not Connected
15	HDMI_1_DDC_SCL		59	+5V	1.8k to +V5_HDMI_1_DISP	DDC Interface Clock
16	HDMI_1_DDC_SDA		57	+5V	1.8k to +V5_HDMI_1_DISP	DDC Interface Data
17	GND	PWR				
18	+V5_HDMI_1_DISP	PWR		+5V		HDMI Power Out
19	HDMI_1_HPD_CON	I	61			HDMI Hot Plug Detect
S1,S2	GND_CHASSIS	FE				
S3,S4	GND_CHASSIS	FE				

USB 1 Interface Type-C Connector (X700)

The USB-C port X700 is connected to USB_1 of the SoM.
Native USB-2.0 is available, USB-Superspeed (3.0) is type specific.

The USB port can be used in recovery mode to enable software loading onto the module by acting as a dual-role port (DRP) for both host and client.

The DRP port has a maximum output current of 1A.

Further details can be found in the datasheet of the TUSB321 USB Type-C.

Pin	Signal	Type	SODIMM Pin
A1	GND	PWR	
A2	USB1_SSTX1_CON_P	O	180
A3	USB1_SSTX1_CON_N	O	178
A4	USB_1_VBUS	PWR	
A5	USB_1_CC1	I	
A6	USB_1_D_CON_P	IO	165
A7	USB_1_D_CON_N	IO	163
A8	NC		
A9	USB_1_VBUS	PWR	
A10	USB1_SSRX2_CON_N	I	184
A11	USB1_SSRX2_CON_P	I	186
A12	GND	PWR	
B1	GND	PWR	
B2	USB1_SSTX2_CON_P	O	180
B3	USB1_SSTX2_CON_N	O	178
B4	USB_1_VBUS	PWR	
B5	USB_1_CC2	I	
B6	USB_1_D_CON_P	IO	165
B7	USB_1_D_CON_N	IO	163
B8	NC		
B9	USB_1_VBUS	PWR	
B10	USB1_SSRX1_CON_N	I	184
B11	USB1_SSRX1_CON_P	I	186
B12	GND	PWR	
SH1/SH2	GND_CHASSIS	FE	
SH3/SH4	GND_CHASSIS	FE	

M.2 Connector (Key-M)

The M.2 Connector (Key-M) supports the following module sizes, enabling flexible integration of various peripheral devices:

- **2230**: Width 22 mm, Length 30 mm
- **2242**: Width 22 mm, Length 42 mm
- **2252**: Width 22 mm, Length 52 mm
- **3042**: Width 30 mm, Length 42 mm
- **3052**: Width 30 mm, Length 52 mm

These supported sizes allow the connection of modules with different performance classes and functionalities, including SSDs, wireless communication modules, or specialized solutions.

Technical Features

- **Signal Standards**: PCIe, NVMe, SATA
- **Mounting Options**: Screw fastenings ensure stable connection even in vibrating environments.
- **Operating Temperature**: Suitable for harsh industrial environments.

Installation Guide for the M.2 Key-M Slot

Preparation

Work Environment:

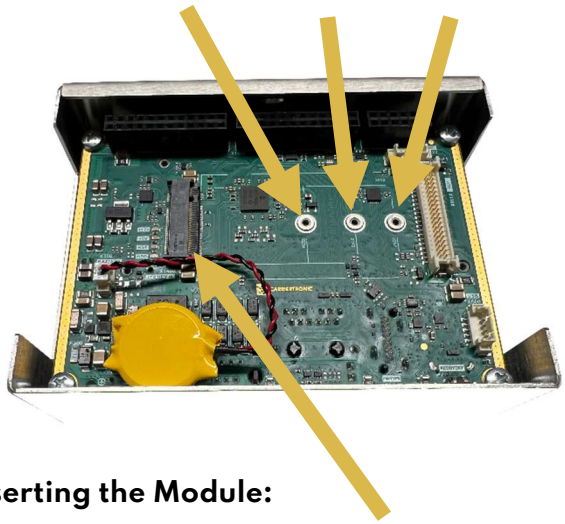
- Work in an electrostatic discharge (ESD)-safe environment to prevent damage to components.

Installing the M.2 Module

- Turn off the Device
- Remove the 4 screws from the side of the housing
- Remove the cover

Preparing the Mounting Point:

- Identify the hole on the PCB corresponding to the module size (e.g., 2230, 2242, 2252, 3042, or 3052).
- Screw the standoff into the appropriate position on the PCB. Ensure the standoff is firmly tightened.



Inserting the Module:

- Carefully slide the module into the slot until it is fully seated.

Securing the Module:

- Press the module flat against the PCB until the screw hole on the module aligns with the standoff.
- Use an appropriate screw to secure the module to the standoff. Tighten the screw gently without over-tightening.

Commissioning

Mounting on DINrail mount

1. Preparation:
   Ensure that the mounting area is clean and well-ventilated. Check if there is enough space for the industrial PC and all required connections.
   Tools Required: Screwdriver (if necessary for securing), DIN-rail.
2. Mounting the Industrial PC onto the DIN-Rail
   Locate the DIN-rail clip on the back of the industrial PC.
   Hook the lower part of the clip onto the bottom edge of the DIN-rail.
   Push the upper part of the device inward until the clip fully snaps onto the DIN-rail.
3. Ensure the device is securely and stably mounted on the rail.

Power supply

The device is operated with +12-48VDC. Connect the plug connector to X301.

Earthing

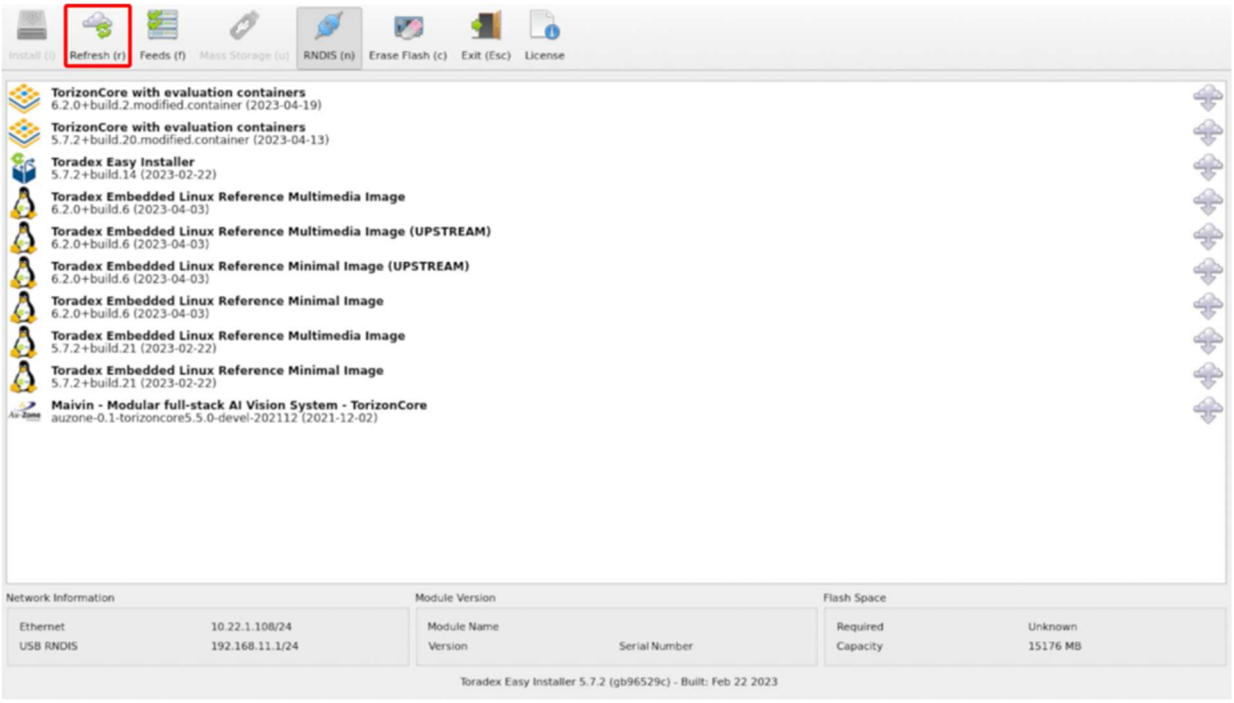
The functional earthing of the enclosure dissipates interference that may be transmitted via external signal cables or cables from external modules. To ensure effective interference dissipation, the device must be connected to a low-resistance functional earth connection.

Earthing can typically be established via the DIN rail. Additionally, the enclosure offers an optional screw connection on the front side (see image) to provide an alternative earthing point.

Installing the operating system (OS)

After switching on, the device boots the Toradex Easy Installer OS.

Available images for download are listed. If not, check the Ethernet cable and press the "Refresh" button.



In addition to the feeds via the Internet, you can also provide images (e.g. your own) via USB stick.

You can also find Toradex images adapted to our products on our website under 4Devs

Our recommendation is Torizon.

Torizon OS Technical Overview

Torizon is an easy-to-use industrial Linux platform that simplifies the development and maintenance of our devices. One of Torizon's main components is the Torizon OS (formally TorizonCore): An open source minimal embedded Linux image which, among other essential services, provides an optimized container runtime and components for secure offline and remote over-the-air (OTA) updates, device monitoring and remote access.

Yocto OS Technical Overview

Yocto-Project is one of the most popular frameworks for creating a customized embedded Linux distribution.

Toradex maintains its own product-ready BSP layers and reference images,

that are compatible with the Yocto project.

As we have adhered to Toradex's standard PinOut, our devices are compatible with Toradex's reference images.

This provides an ideal starting point for your embedded Linux project.

Temperature Sensor

The Carrier Board provides a digital temperature sensor, with an I²C interface.
This is a useful feature for the remote equipment monitoring.
For detailed information check the TMP1075 datasheet.

Sensor	Sensor Location	Adress
1	Carrier Board	I2c_1 0x44

EEPROM

A 2-Kbit EEPROM (IC1000) with I²C interface is placed on the carrier board.
The EEPROM can be used to store important data or for board identification.
Technical details on the EEPROM can be found in data sheet M24C02-FMC6TG.

The EEPROM can be accessed via the address 0x57 on the generic serial bus I2C_1.

GPIO4_IO03 can be used to deactivate the EEPROM write protection.

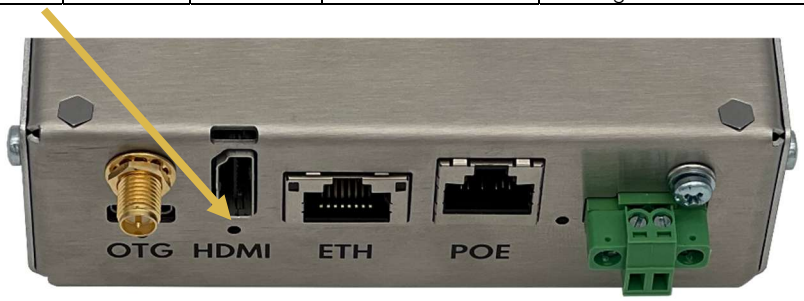
Signal	IO-Type	SODIMM	Voltage	Pull-up/Pull-down	Description
WC#	O	220	1.8V	100k to 1.8V_SW	Set the GPIO to logic low to disable write protection.

Kernel Heartbeat / PWR Rail LED

A dual LED (LED402) is installed on the interface front of the IPC,
which can be used to display the kernel status via Heartbeat (HB).
The signal color of the HB LED is red.

The green LED lights up when Reset is not active and the CTRL_PWR_EN_MOCI signal has been switched. The green LED therefore indicates the power rail status of device.

Signal	IO-Type	SODIMM	Pull-up/Pull-down	Description
HEARTBEAT_LED	O	216	-	LED "double" flashes at a load average-based rate

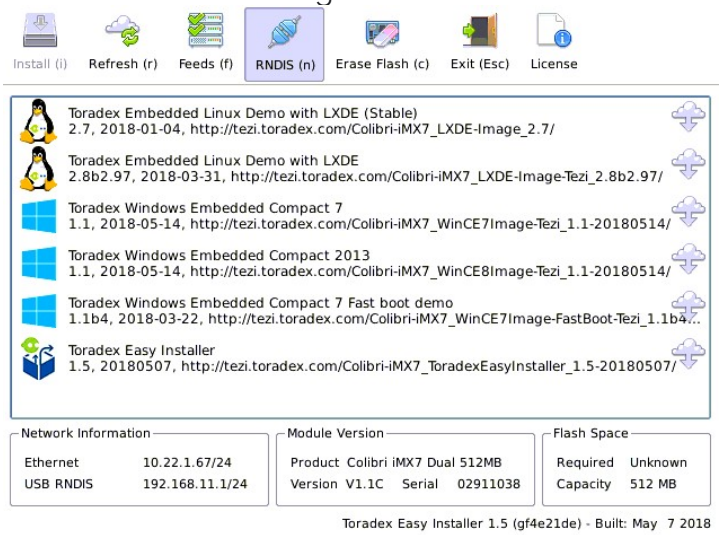


https://android.googlesource.com/kernel/msm/+/android-msm-flo-3.4-kitkat-mr1/Documentation/devicetree/bindings/gpio/led.txt

Backup/Restore

1. Switch off the device
2. Press the recovery button and switch the device back on at the same time

3. connect your laptop to the USB-OTG (USB-C) port using a suitable USB cable
4. Download Toradex Easy Installer (TEZI) with standard LVDS output (native): https://developer.toradex.com/easy-installer/toradex-easy-installer/download-tezi/
5. Unzip the Toradex Easy Installer package, change to this directory, and use one of the scripts on the host machine to load and execute the tool through USB OTG interface.
   Detailed information can be found under the following link: https://developer.toradex.com/easy-installer/toradex-easy-installer/loading-toradex-easy-installer/#312-run-the-recovery-mode-script
6. Select the desired image.



Dimensions

A [mm]	B [mm]	C [mm]	Comment
110	80	36	

Maintenance

Instructions

NOTE

Information
The Industrie PC are maintenance-free!
Opening the device voids the manufacturer's warranty!

⚠ WARNING

Only qualified specialist personnel may carry out maintenance on the device.
Improper repairs can lead to danger for the user.

Technical Support

Although we adhere to the highest quality standards and carry out comprehensive functional tests, electronic components and devices can be damaged through daily use.

A machine failure in production causes considerable costs. For this reason, carriertronic GmbH processes complaints as quickly as possible.

Please fill in the enclosed repair accompanying letter and enclose it together with the touch panel or IPC. This will ensure that the repair can begin immediately and that it is processed quickly.

Technical support can be contacted as follows:

Service, repair and technical support

Phone: +49(0)7033 708974-0
E-mail: support@carriertronic.com

Device seal

A seal is affixed to all carriertronic GmbH devices.
This serves as proof that the device has not been opened by a third party.
In the event of a defect, please do not open the device. Contact our service department, who will discuss the next steps with you.

Disposal

A crossed-out dustbin symbol indicates that both the product and the accessories must not be disposed of with household waste at the end of their life cycle. Instead, you should return old appliances to designated free collection and collection points in your area. Please observe the local regulations for proper and environmentally friendly disposal.

If the old electrical or electronic device contains personal data, you are responsible for deleting this data before returning or disposing of it.

By following the appropriate disposal instructions and safely removing personal data, you will help to protect the environment and prevent unwanted data disclosure.

Environmental specifications

Operating temperature:	-20°C bis +50°C
Storage temperature:	-20°C bis +85°C

Storage

To ensure optimum conditions for the product, please observe the following recommendations:

- Store the product in the boxes provided by us or in comparable packaging.
- Observe the recommended storage conditions that we have specified.

By following these guidelines, you will ensure that the product is stored under optimal conditions and that its longevity is guaranteed.

Disclamer

All data is provided for information purposes only and is not guaranteed for legal purposes. The information has been carefully checked and is believed to be accurate.

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