



Industry Computer MBox-Advanced-E41M User's Guide

MBox-Advanced-E41M UG 0101





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REVISION HISTORY

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1. IMPORTANT INFORMATION

1.1 General

Be sure to follow the tips given in this User's Guide to make the best use of the Industry Computer MBox-Advanced-E41M. Failure to do so might lead to discomfort, injury, or cause the Industry Computer MBox-Advanced-E41M to fail.

1.2 Symbols and Typographic Conventions

Table 1: Terms and Conventions

Symbol	Meaning
	This symbol represents the handling of electrostatic-sensitive modules and / or components. These components are often damaged / destroyed by the transmission of a voltage higher than about 50 V. A human body usually only experiences electrostatic discharges above approximately 3,000 V.
	This symbol indicates a possible source of danger. Acting against the procedure described can lead to possible damage to your health and / or cause damage / destruction of the material used.
	This symbol represents important details or aspects for working with TQ-products.

1.3 Before You Start

Read this User's Guide carefully to ensure that you completely understand it, before you start working with the Industry Computer MBox-Advanced-E41M.

This User's Guide provides information, which is essential for proper operation of the Industry Computer MBox-Advanced-E41M. General safety instructions must be adhered to and only trained and authorized personnel is permitted to work with the Industry Computer MBox-Advanced-E41M.

1.4 Intended Use

TQ DEVICES, PRODUCTS AND ASSOCIATED SOFTWARE ARE NOT DESIGNED, MANUFACTURED OR INTENDED FOR USE OR RESALE FOR THE OPERATION IN NUCLEAR FACILITIES, AIRCRAFT OR OTHER TRANSPORTATION NAVIGATION OR COMMUNICATION SYSTEMS, AIR TRAFFIC CONTROL SYSTEMS, LIFE SUPPORT MACHINES, WEAPONS SYSTEMS, OR ANY OTHER EQUIPMENT OR APPLICATION REQUIRING FAIL-SAFE PERFORMANCE OR IN WHICH THE FAILURE OF TQ PRODUCTS COULD LEAD TO DEATH, PERSONAL INJURY, OR SEVERE PHYSICAL OR ENVIRONMENTAL DAMAGE. (COLLECTIVELY, "HIGH RISK APPLICATIONS")

You understand and agree that your use of TQ products or devices as a component in your applications are solely at your own risk. To minimize the risks associated with your products, devices and applications, you should take appropriate operational and design related protective measures.

You are solely responsible for complying with all legal, regulatory, safety and security requirements relating to your products. You are responsible for ensuring that your systems (and any TQ hardware or software components incorporated into your systems or products) comply with all applicable requirements. Unless otherwise explicitly stated in our product related documentation, TQ devices are not designed with fault tolerance capabilities or features and therefore cannot be considered as being designed, manufactured or otherwise set up to be compliant for any implementation or resale as a device in high risk applications. All application and safety information in this document (including application descriptions, suggested safety precautions, recommended TQ products or any other materials) is for reference only. Only trained personnel in a suitable work area are permitted to handle and operate TQ products and devices. Please follow the general IT security guidelines applicable to the country or location in which you intend to use the equipment.

This device is not suitable for use in areas where children may be present.



1.5 Duty of Care

It must be ensured that the Industry Computer MBox-Advanced-E41M is only used in environments, which meet the specification of the Industry Computer MBox-Advanced-E41M.

This User's Guide has to be read and understood completely and the personnel working with the Industry Computer MBox-Advanced-E41M must be trained regarding standards, regulations and instructions. It also has to be ensured, that the Industry Computer MBox-Advanced-E41M is mounted, operated and maintained according to the instruction of this User's Guide. All applicable national and international regulations and standards have to be obeyed.

1.6 Limited Warranty

Parts subject to natural wear and tear are excluded from the warranty, taking into account the legal regulations.

This applies to e.g., coin cell batteries.

1.7 Liability and Warranty Obligation

TQ-Systems GmbH shall be exempted from the statutory accident liability obligation in case the user does not observe the information provided in this User's Guide or the warnings on the device. In the event of damage caused by failure to observe the information provided in this User's Guide or the warnings on the device, TQ-Systems GmbH shall not be required to honour the warranty even during the warranty period and shall be exempted from the statutory accident liability obligation.

1.8 Safety Guidelines

Use the following safety guidelines to protect your Industry Computer MBox-Advanced-E41M from potential damage and ensure your personal safety.

Non-observance of the following safety guidelines can lead to injuries of the operator and/or damage of the Industry Computer MBox-Advanced-E41M.

In cases of non-observance of the safety guidelines TQ-Systems GmbH is exempt from accident liability, even if the Industry Computer MBox-Advanced-E41M is still under warranty. The Industry Computer MBox-Advanced-E41M must be used as specified in this User's Guide, which describes the safety guidelines for the Industry Computer MBox-Advanced-E41M as well as for the operator. The installation location of the Industry Computer MBox-Advanced-E41M has to meet the requirements of the country's standards and regulations. If power cables are delivered with the Industry Computer MBox-Advanced-E41M only these may be used. Ensure that there is a sufficient air circulation to cool the Industry Computer MBox-Advanced-E41M. Do not cover the Industry Computer MBox-Advanced-E41M or mount it close to heat sources or in damp places.

To completely disconnect the Industry Computer MBox-Advanced-E41M from mains, the power cord has to be disconnected. Make sure the power cord is always easy accessible. Only open the M Industry Computer MBox-Advanced-E41M to insert or remove add-on cards, after all cables are disconnected from the Industry Computer MBox-Advanced-E41M. This may only be done by qualified personnel. If add-on cards are installed in the Industry Computer MBox-Advanced-E41M, all effective legal regulations and all technical data has to be adhered to. It has to be ensured, that the power consumption of add-on cards does not exceed the limitations and the current consumption specified on the label of the Industry Computer MBox-Advanced-E41M.

Very important! A safe operation is not possible when the Industry Computer MBox-Advanced-E41M is visibly damaged or is not functioning at all. In this case the Industry Computer MBox-Advanced-E41M must be switched off and it must be ensured that the Industry Computer MBox-Advanced-E41M cannot be put back into operation.

It is very important to ensure that the wires of power cords are sufficiently dimensioned, according to the maximum electrical specifications of the Industry Computer MBox-Advanced-E41M. Standards and regulations like EN60950-1, VDE0100 have to be adhered to.

This information helps you to safely use the MBox-Advanced.

Follow and keep all information provided with the Industry Computer MBox-Advanced-E41M. The information in this User's Guide does not alter the terms of your purchase agreement or the TQ-Systems GmbH Limited Warranty. Your safety is important to us. The Industry Computer MBox-Advanced-E41M is developed to be safe and effective. Power cords, power adapters, and other features can create potential safety risks that may result in physical injury or property damage, especially if misused. To reduce these risks, follow the instructions in this User's Guide, and observe all warnings on the Industry Computer MBox-Advanced-E41M and in this User's Guide. By carefully following the information contained in this User's Guide and provided with the Industry Computer MBox-Advanced-E41M, you can help protect yourself from hazards and create a safer environment.

Do not attempt to service the Industry Computer MBox-Advanced-E41M yourself unless instructed to do so by TQ-Systems GmbH or this User's Guide.

1.9 Grounding Considerations

To avoid damaging the Industry Computer MBox-Advanced-E41M caused by ESD make sure the following measures are adhered to:

Ground your workplace with e.g. anti-static mats and ground yourself with a wrist strap. Only use conductive tools when working on the Industry Computer MBox-Advanced-E41M. Always handle electrostatic sensitive components at their edges, preferably wear conductive gloves.

Remove the power cord from the Industry Computer MBox-Advanced-E41M before connecting or removing cables or before inserting or removing add-on cards. Do not touch the contacts of connectors. Keep your work environment tidy and free of non-conductive materials.

1.10 Handling the Industry Computer MBox-Advanced-E41M

Note: Handling the Industry Computer MBox-Advanced-E41M



Improper or incorrect handling of the Industry Computer MBox-Advanced-E41M can substantially reduce its life span.
TQ-Systems GmbH cannot be held responsible for unauthorized modifications made by the user and the consequences thereof, which may alter the conformity of the Industry Computer MBox-Advanced-E41M.

1.11 Coin Cell Battery

Attention: Coin cell battery



Danger of explosion if the coin cell battery is incorrectly replaced. Replace the coin cell battery only with a coin cell battery of the same type and size.

The temperature inside the housing of the MBox-Advanced can get very high, especially, when the outside temperature is high and if the MBox-Advanced is operated at high load.
For safety reasons, it is obligatory to use a coin cell battery that has a maximum operating temperature of 100 °C or higher.

Check for correct polarity before inserting the coin cell battery in its socket. Do not immerse into water, heat to more than +100 °C, repair or disassemble the coin cell battery. Dispose the coin cell battery as required by local ordinances or regulations.



2. ABOUT THIS MANUAL

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2.4 Imprint

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2.5 Service, Support, and RMA

Please visit our website www.tq-group.com for latest product documentation, drivers, utilities and technical support.

You can register on our website www.tq-group.com to have access to restricted information and automatic update services.

For direct technical support you can contact our FAE team support@tq-group.com.

Our FAE team can also support you with additional information, which is not provided on our website.

For service/RMA, please contact our service team service@tq-group.com or your TQ sales representative.



3. INTRODUCTION

The Industry Computer MBox-Advanced-E41M is a compact Embedded PC based on Intel® Atom™, Pentium® and Celeron® CPUs (code name "Alder Lake-N" and „Amston Lake“) for embedded applications. The highly reliable hardware in combination with the rugged housing design enables the usage in industrial and harsh environmental conditions.

The Industry Computer MBox-Advanced-E41M focuses to meet individual configurations depending on customers demand. Typical applications are embedded servers, gateways, and all applications, which place high demands on quality, durability and long-term availability.

3.1 Overview

The following key functions are implemented in the Industry Computer MBox-Advanced-E41M:

External Interfaces (standard)

- 4 × Gigabit Ethernet
- 2 × USB 3.0
- 1 × RS-232
- Power button / Reset button

Internal Interfaces and connection possibilities

- M.2 B-Keyed socket

Power Supply

- Input voltage range: 9 V to 30 V DC +/- 0%
- Using a power adapter with Limited Power Source (LPS) certification is obligatory.
IEC/EN62368-1 PS2 or
IEC/EN60950-1 LPS (sub-clause 2.5)

3.2 Versions

Several different configurations of the Industry Computer MBox-Advanced-E41M are available on request.

Please refer to www.tq-group.com/en/products/tq-embedded/x86-architecture/mbox-advanced/ for detailed information.

3.3 Order Codes

The Industry Computer MBox-Advanced-E41M order code contains the product name and an appendix, which specifies the configuration:

- MBOX-ADV-E41M-AA RK REV.0100

3.4 Accessories

3.4.1 Mass Storage Devices

- M.2 SSD 256 Gbyte, -40 °C to +85 °C

3.4.2 Adapter for wall mounting, rack mounting

Wall mount adapter:

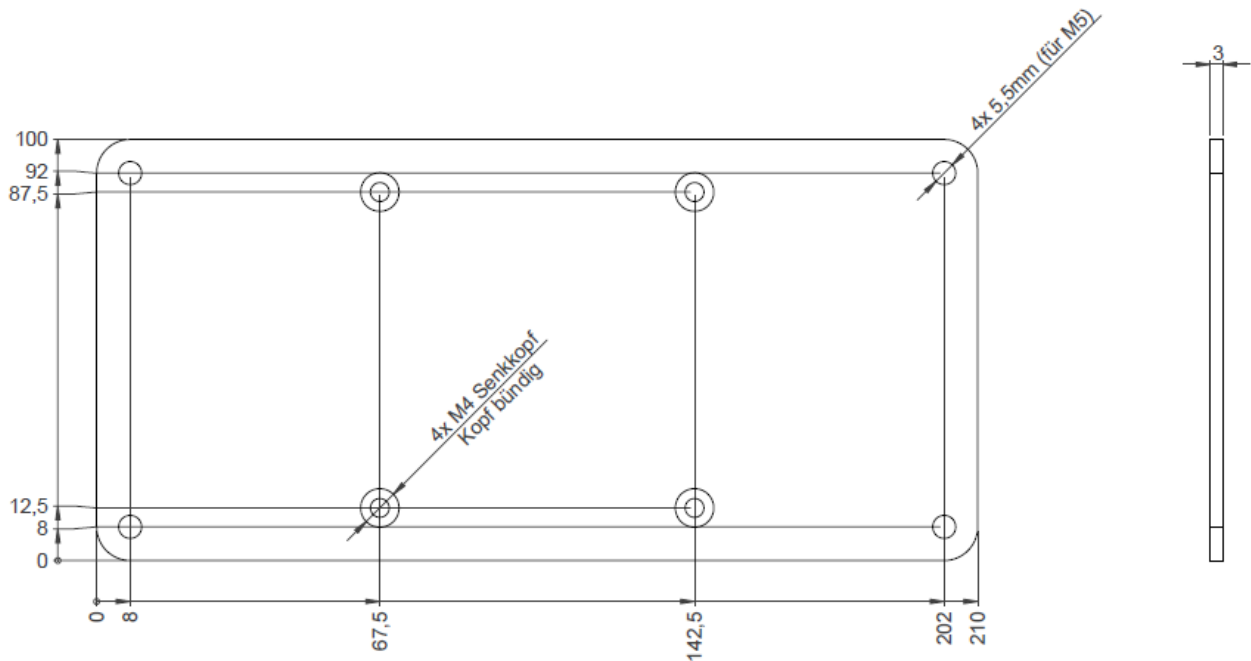


Illustration 1: Wall mount adapter

3.4.3 Installation in control cabinets

DIN rail mounting set for installation in control cabinets is available on request.

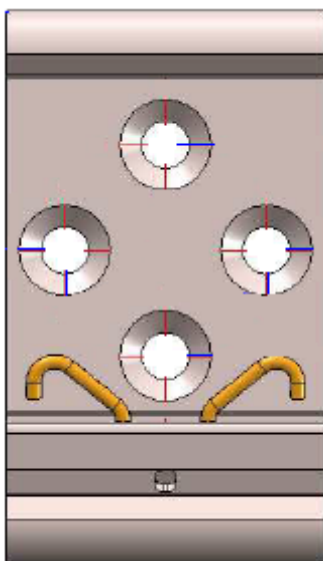


Illustration 2: DIN rail mounting clip

4. INDUSTRY COMPUTER MBOX-ADVANCED-E41M FUNCTION

4.1 Power Adapter

4.1.1 Supply Voltage

The Industry Computer MBox-Advanced-E41M has a wide-range voltage input of 9 V to 30 V DC +/- 0%.



Using a power adapter with Limited Power Source (LPS) certification IEC/EN62368-1 PS2 or IEC/EN60950-1 LPS (sub-clause 2.5) is obligatory.

TQ-Systems GmbH recommends the AC Adapter TRH70A120 from CINCON (Input 90 to 264 V AC) for applications **up to 45 °C**. A Power-Kit is available on request.

At higher ambient temperatures or other environmental conditions, a suitable power supply has to be selected.

4.1.2 Power Consumption

The power consumption of the system significantly depends on the configuration and the connected devices (COM Express™ module, mass storage devices, USB devices etc.). The maximum input current of the Industry Computer MBox-Advanced-E41M is limited to **5 A** by a fuse.

The Industry Computer MBox-Advanced-E41M system only supports COM Express™ modules with a maximum processor power consumption of **9 W**.

All USB devices connected to the Industry Computer MBox-Advanced-E41M should not exceed **5 W** in total.

Note: Industry Computer MBox-Advanced-E41M power requirement



The power supply for the Industry Computer MBox-Advanced-E41M must be configured with enough reserve.
When selecting the power supply, the maximum power consumption of all components must be taken into account.

4.2 Environmental Conditions

The following temperature parameters were determined by qualification tests (standard configurations without add-on cards, but with I-Temp mass storage):

- Storage temperature: -40 °C to +85 °C
- Operating temperature: -40 °C to +60 °C or 0 °C to +60 °C (depending on COM Express™ module)
- Relative humidity (operating / storage): 10 % to 90 % (not condensing)

When I/O extension modules or HDD/SSDs are selected, attention has to be paid to their storage and operating temperature limits. The temperature inside the Industry Computer MBox-Advanced-E41M differs from the ambient temperature.

Note: Industry Computer MBox-Advanced-E41M environmental conditions



When powering the Industry Computer MBox-Advanced-E41M, make sure the chassis is not covered by any objects.
Otherwise the heat dissipation will be restricted by physical effects and the maximum operating temperature will be reduced.

4.3 Connectors and Interfaces

4.3.1 External Connectors

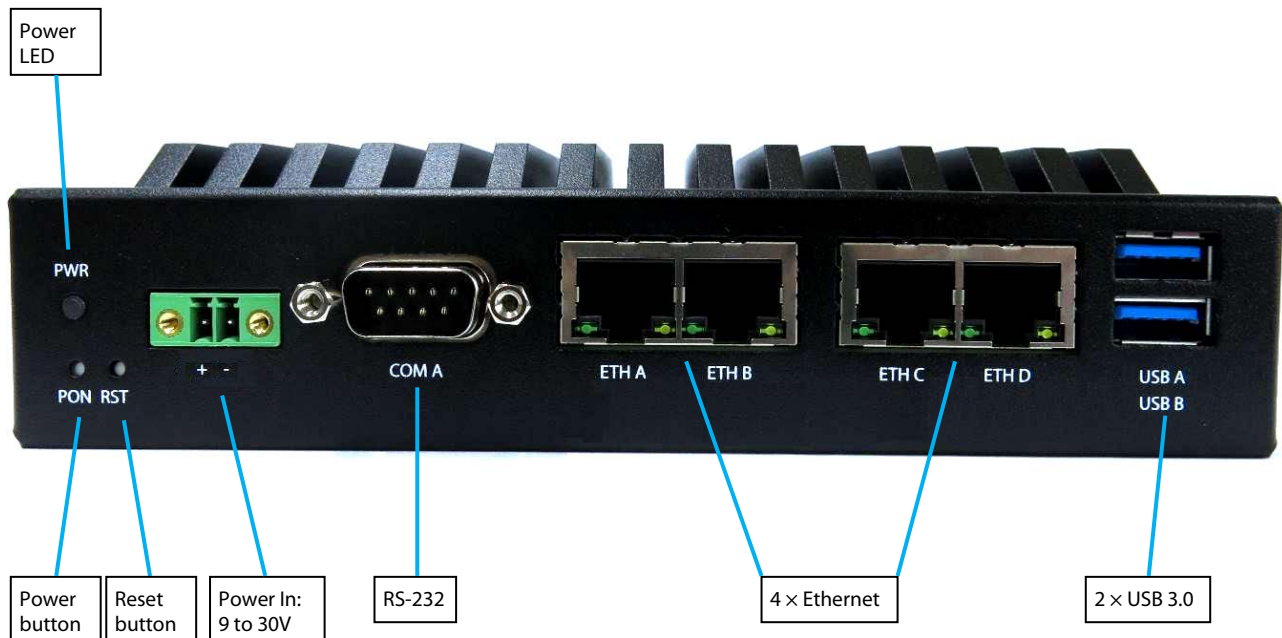


Illustration 3: Industry Computer MBox-Advanced-E41M, Front View

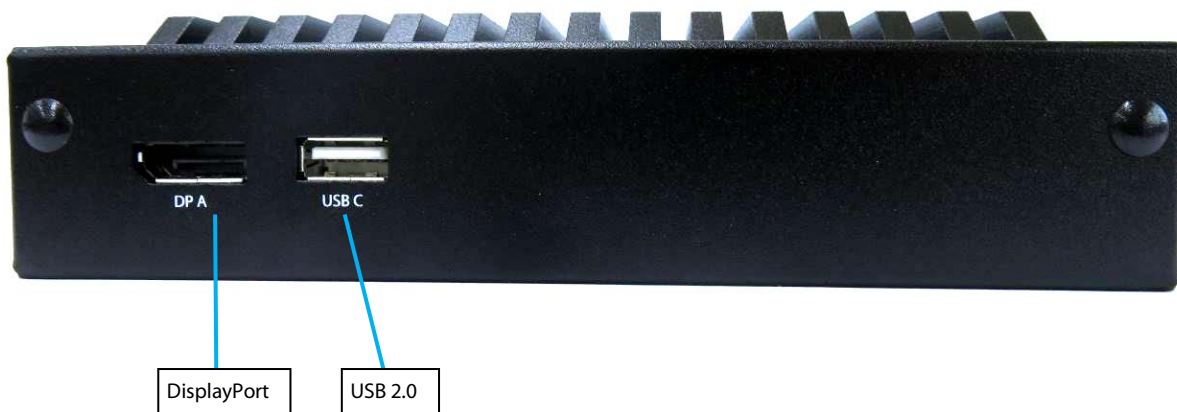


Illustration 4: Industry Computer MBox-Advanced-E41M, Rear View

4.3.1.1 Power Supply Connector

The Industry Computer MBox-Advanced-E41M has a wide-range voltage input.

- Connector type: Phoenix MC 1,5/ 2-GF-3,5-LR (1817615)
- Mating connector: e.g. Phoenix FMC 1,5/ 2-STF-3,5 (1966091)

Table 2: Pinout Power-In Connector

Pin	Signal	Remark
1 (+)	9 to 30 V	Fused @ 5A
2 (-)	GND	–

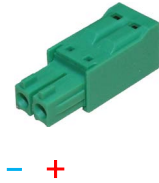


Illustration 5: DC Power Supply Connector

Note: Industry Computer MBox-Advanced-E41M applying power



Do not connect or disconnect the power supply of the Industry Computer MBox-Advanced-E41M under voltage.
Switch off the voltage before unplugging.

4.3.1.2 USB Host Interfaces

The Industry Computer MBox-Advanced-E41M provides two USB 3.0 and one USB2.0 host interface.
USB cables connected at these interfaces should have a maximum length of 3 meter.

4.3.1.3 Gigabit Ethernet

The Industry Computer MBox-Advanced-E41M provides four Gigabit Ethernet ports.
Ethernet controllers with 10/100/1000 Mbps speed are implemented on both ports.

Table 3: Ethernet LEDs

LED	Status
Left, green (Link)	Off: no link
	LED is lit: link established
Right, yellow (ACT)	Off: no activity
	LED is lit: activity



Illustration 6: RJ45 Connectors

4.3.1.4 RS-232 Serial Interface

The Industry Computer MBox-Advanced-E41M provides one serial port:

- D-Sub RS-232 port (4-wire)
- Legacy compatible (IO addresses and IRQs)
- Up to 115 kbaud

4.3.1.5 DisplayPort

The Industry Computer MBox-Advanced-E41M provides one DisplayPort interface, which supports DP++ signalling.
Thus monitors with DP, DVI, HDMI and VGA input can be connected using dedicated cables and adapters.

4.3.1.6 Power and Reset Button

At the rear side of the Industry Computer MBox-Advanced-E41M a Power and a Reset Button is available providing the following functionality.

Table 4: Power and Reset Button Functionality

Status	Event	System response
No power supply connected	Supply with power	System starts automatically (S0)
System is shut down or in sleep mode (S3, S4, S5)	Push power button <5 sec	System starts (S0)
System is running (S0)		System shuts down or turns to sleep mode (S3, S4, S5), depending on Windows settings
	Push power button >5 sec	Forced shutdown (S5)
System is running (S0)	Push reset button	Reset is generated

4.3.1.7 Power and General-Purpose LED

The Industry Computer MBox-Advanced-E41M provides a Power LED and a general-purpose LED (optional), visible at the front.

Table 5: Power LED

LED colour	Function
Green	Active in Run State (S0)
Blue	Active in Sleep (S3) or Off (S5) state

Table 6: General Purpose LED (optional)

LED colour	Function
Blue	GPO1 = Low
Red	GPO2 = Low
Green	GPO3 = Low

4.3.2 Optional External Connectors and Interfaces

4.3.2.1 M.2 Socket with B-Key (for I/O devices)

The Industry Computer MBox-Advanced-E41M provides an M.2 socket for an M.2 module with 22 mm width and 42 / 80 mm length. A USB and a SATA interface are routed to this M.2 socket.

Single- or double-sided M.2 modules type 2242 with B or B+M-Key can be inserted.

Single-sided M.2 modules type 2280 with B or B+M-Key can be inserted.

4.3.2.2 SATA Connector

The Industry Computer MBox-Advanced-E41M provides a standard SATA connector, which is only accessible if the back cover of the housing is not mounted. This interface is for service purposes.

5. MECHANICS

5.1 Dimensions

The following illustrations show the Industry Computer MBox-Advanced-E41M. All dimensions are in mm.

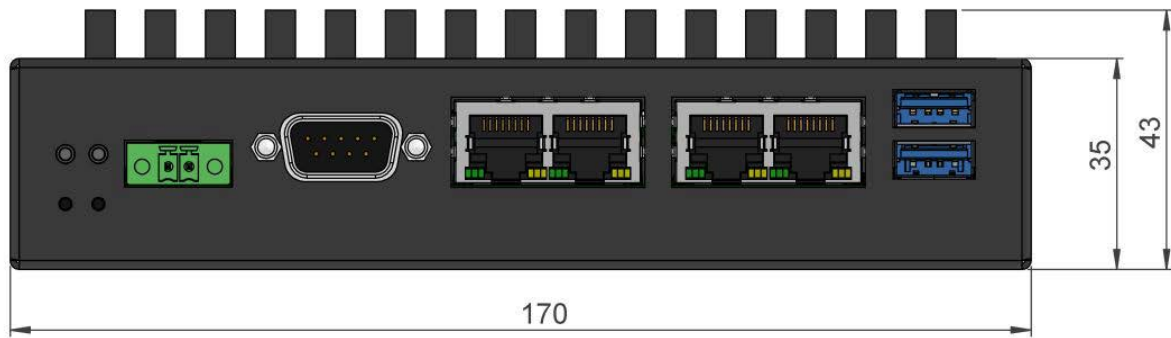


Illustration 7: Industry Computer MBox-Advanced-E41M Dimensions, Front

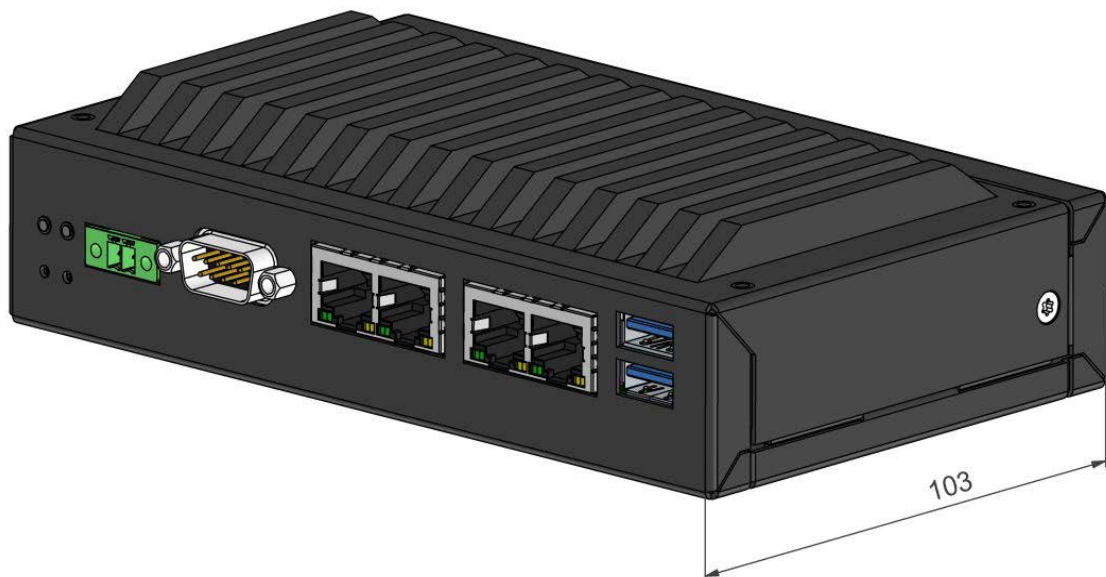


Illustration 8: Industry Computer MBox-Advanced-E41M Dimensions, Depth

5.2 Industry Computer MBox-Advanced-E41M mounting

There are several options to mount the Industry Computer MBox-Advanced-E41M:

- DIN rail with a clamp (Please see chapter Accessories (3.4) for more information.)
- Adapter plate (Please see chapter Accessories (3.4) for more information.)
- Directly with screws

The housing provides six M4 threads for various mounting options. All dimensions are in mm.

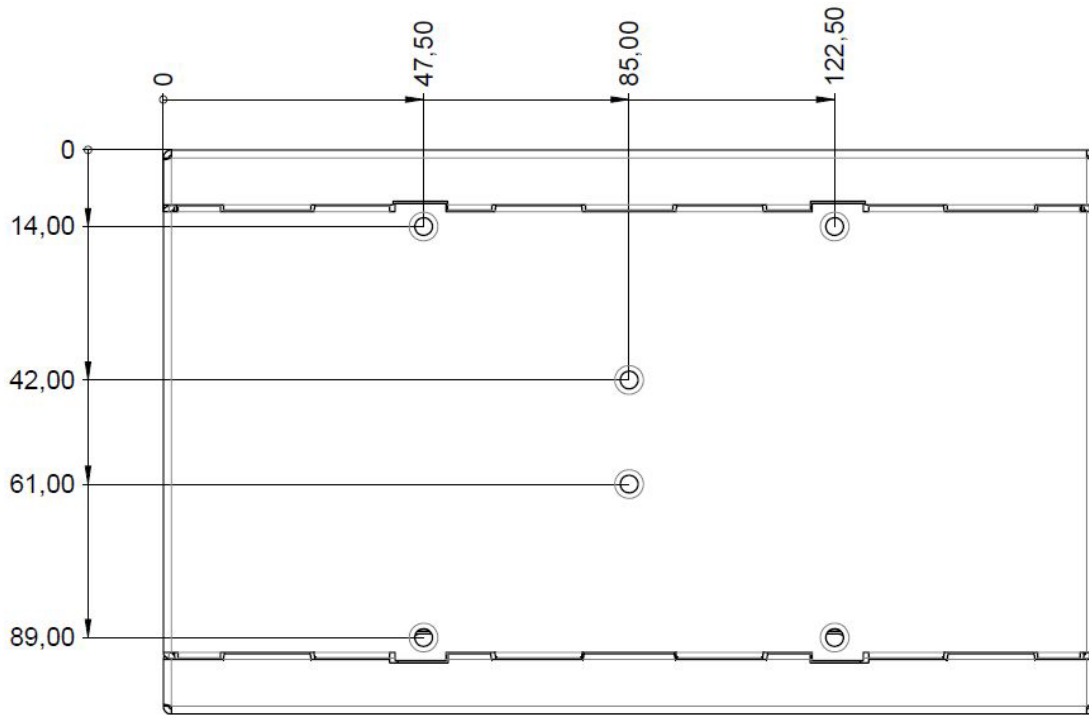


Illustration 9: Industry Computer MBox-Advanced-E41M Position of mounting holes, Bottom View

Please contact support@tq-group.com for more details or ideas to meet your requirements.

5.3 Open and close housing

1. To open the Industry Computer MBox-Advanced-E41M, remove two screws at the sides.



Illustration 10: Industry Computer MBox-Advanced-E41M, Mounting 1

2. Pull off the rear panel.

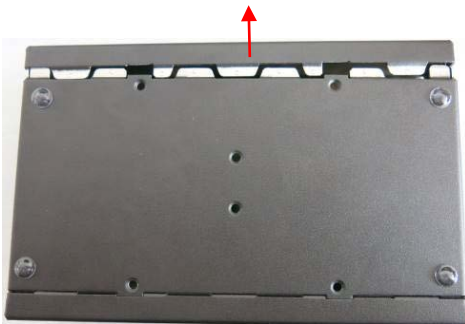


Illustration 11: Industry Computer MBox-Advanced-E41M, Mounting 2

For reassembly of the Industry Computer MBox-Advanced-E41M, perform mounting step 2 to mounting step 1.



6. REGULATORY INFORMATION

6.1 EC-Declaration of Conformity

We declare under our sole responsibility that the Industry Computer MBox-Advanced-E41M complies with the essential requirements which are laid down in the referred harmonization measures.

A separate document exists for the EC Declaration of Conformity.

6.2 Cyber Security

A Threat Analysis and Risk Assessment (TARA) must always be performed by the customer for their individual end application, as the ABox-93xxLA is only a sub-component of an overall system.

6.3 Export Control and Sanctions Compliance

The customer is responsible for ensuring that the product purchased from TQ is not subject to any national or international export/import restrictions. If any part of the purchased product or the product itself is subject to said restrictions, the customer must procure the required export/import licenses at its own expense. In the case of breaches of export or import limitations, the customer indemnifies TQ against all liability and accountability in the external relationship, irrespective of the legal grounds. If there is a transgression or violation, the customer will also be held accountable for any losses, damages or fines sustained by TQ. TQ is not liable for any delivery delays due to national or international export restrictions or for the inability to make a delivery as a result of those restrictions. Any compensation or damages will not be provided by TQ in such instances.

The classification according to the European Foreign Trade Regulations (export list number of Reg. No. 2021/821 for dual-use-goods) as well as the classification according to the U.S. Export Administration Regulations in case of US products (ECCN according to the U.S. Commerce Control List) are stated on TQ's invoices or can be requested at any time. Also listed is the Commodity code (HS) in accordance with the current commodity classification for foreign trade statistics as well as the country of origin of the goods requested/ordered.

6.4 Warranty

TQ-Systems GmbH warrants that the product, when used in accordance with the contract, fulfils the respective contractually agreed specifications and functionalities and corresponds to the recognized state of the art.

The warranty is limited to material, manufacturing and processing defects. The manufacturer's liability is void in the following cases:

- Original parts have been replaced by non-original parts.
- Improper installation, commissioning or repairs.
- Improper installation, commissioning or repair due to lack of special equipment.
- Incorrect operation
- Improper handling
- Use of force
- Normal wear and tear

6.5 Statement on California Proposition 65

California Proposition 65, formerly known as the Safe Drinking Water and Toxic Enforcement Act of 1986, was enacted as a ballot initiative in November 1986. The proposition helps protect the state's drinking water sources from contamination by approximately 1,000 chemicals known to cause cancer, birth defects, or other reproductive harm ("Proposition 65 Substances") and requires businesses to inform Californians about exposure to Proposition 65 Substances.

The TQ device or product is not designed or manufactured or distributed as consumer product or for any contact with end-consumers. Consumer products are defined as products intended for a consumer's personal use, consumption, or enjoyment. Therefore, our products or devices are not subject to this regulation and no warning label is required on the assembly.

Individual components of the assembly may contain substances that may require a warning under California Proposition 65. However, it should be noted that the Intended Use of our products will not result in the release of these substances or direct human contact with these substances. Therefore you must take care through your product design that consumers cannot touch the product at all and specify that issue in your own product related documentation.

TQ reserves the right to update and modify this notice as it deems necessary or appropriate.



7. ENVIRONMENT PROTECTION

7.1 REACH®

The EU-chemical regulation 1907/2006 (REACH® regulation) stands for registration, evaluation, certification and restriction of substances SVHC (Substances of very high concern, e.g., carcinogen, mutagen and/or persistent, bio accumulative and toxic). Within the scope of this juridical liability, TQ-Systems GmbH meets the information duty within the supply chain with regard to the SVHC substances, insofar as suppliers inform TQ-Systems GmbH accordingly.

7.2 WEEE®

TQ-Systems GmbH encourages owners to recycle their Industry Computer MBox-Advanced-E41M when it is not needed anymore.

The Waste Electrical and Electronic Equipment (WEEE®) mark applies only to countries within the European Union (EU) and Norway. Appliances are labelled in accordance with European Directive 2012/19/EU concerning waste electrical and electronic equipment (WEEE®). The Directive determines the framework for the return and recycling of used appliances as applicable throughout the European Union.

7.3 Recycling

Users of the Industry Computer MBox-Advanced-E41M must not dispose the Industry Computer MBox-Advanced-E41M as unsorted municipal waste, but use the collection framework available in their country for the return, recycle, or recovery of WEEE® and minimize any potential effects on the environment and human health due to the presence of hazardous substances.

MBox-Advanced-E41M must be recycled, mechanically shredded, or incinerated without the battery.





8. APPENDIX

8.1 Driver Download

The Industry Computer MBox-Advanced-E41M is well supported by Standard Operating Systems, which already include most of the drivers required.

It is recommended to use the latest Intel® drivers to optimize performance and make use of the full Industry Computer MBox-Advanced-E41M feature set.

Please consult the following TQ product webpage for detailed information, where drivers can be downloaded.

<https://www.tq-group.com/de/produkte/tq-embedded/cpu-familien/x86-architektur/tgmxe41m/>

