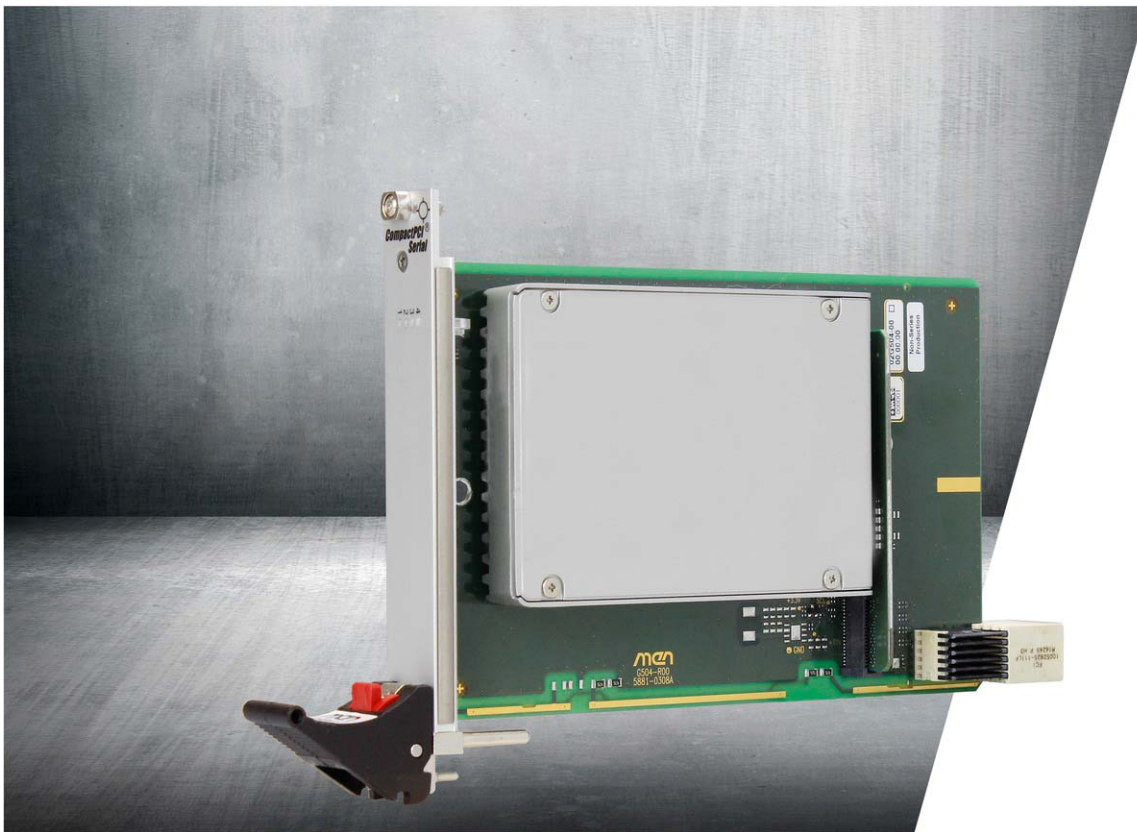


G504

NVMe SSD Rapid Storage Shuttle

3U CompactPCI Serial



User Manual



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About this Document

This user manual is intended only for system developers and integrators, it is not intended for end users.

It describes the design, functions and connection of the product. The manual does not include detailed information on individual components (data sheets etc.).



G504 product page with up-to-date information and downloads:
www.men.de/products/g504/

History

Issue	Comments	Date
E1	First issue	2017-02-08

Conventions



Indicates important information or warnings concerning situations which could result in personal injury, or damage or destruction of the component.



Indicates important information or warnings concerning proper functionality of the product described in this document.



The globe icon indicates a **hyperlink** that links directly to the Internet. When no globe icon is present, the hyperlink links to specific information within this document.

<i>Italics</i>	Folder, file and function names are printed in <i>italics</i> .
Mono	A monospaced font type is used for hexadecimal numbers, listings, C function descriptions or wherever appropriate. Hexadecimal numbers are preceded by "0x".
<i>Comment</i>	Comments embedded into coding examples are shown in green text.
IRQ# /IRQ	Signal names followed by a hashtag "#" or preceded by a forward slash "/" indicate that this signal is either active low or that it becomes active at a falling edge.
In/Out	Signal directions in signal mnemonics tables generally refer to the corresponding board or component, "in" meaning "to the board or component", "out" meaning "from the board or component".

Product Safety

Electrostatic Discharge (ESD)



Computer boards and components contain electrostatic sensitive devices. Electrostatic discharge (ESD) can damage components. To protect the PCB and other components against damage from static electricity, you should follow some precautions whenever you work on your computer.

- Power down and unplug your computer system when working on the inside.
- Hold components by the edges and try not to touch the IC chips, leads, or circuitry.
- Use a grounded wrist strap before handling computer components.
- Place components on a grounded antistatic pad or on the bag that came with the component whenever the components are separated from the system.
- Only store the product in its original ESD-protected packaging. Retain the original packaging in case you need to return the product to MEN for repair.

Legal Information

Changes

MEN Mikro Elektronik GmbH ("MEN") reserves the right to make changes without further notice to any products herein.

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2. MEN is not engaged in rendering technical or other advice or services.

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The correct function of MEN products in mission-critical and life-critical applications is limited to the environmental specification given for each product in the technical user manual. The correct function of MEN products under extended environmental conditions is limited to the individual requirement specification and subsequent validation documents for each product for the applicable use case and has to be agreed upon in writing by MEN and the customer. Should the customer purchase or use MEN products for any unintended or unauthorized application, the customer shall indemnify and hold MEN and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim or personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that MEN was negligent regarding the design or manufacture of the part. In no case is MEN liable for the correct function of the technical installation where MEN products are a part of.

Qualified Personnel

The product/system described in this documentation may be operated only by personnel qualified for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Conformity

MEN products are no ready-made products for end users. They are tested according to the standards given in the Technical Data and thus enable you to achieve certification of the product according to the standards applicable in your field of application.

RoHS

Since July 1, 2006 all MEN standard products comply with RoHS legislation.

Since January 2005 the SMD and manual soldering processes at MEN have already been completely lead-free. Between June 2004 and June 30, 2006 MEN's selected component suppliers have changed delivery to RoHS-compliant parts. During this period any change and status was traceable through the MEN ERP system and the boards gradually became RoHS-compliant.

WEEE Application



The WEEE directive does not apply to fixed industrial plants and tools. The compliance is the responsibility of the company which puts the product on the market, as defined in the directive; components and sub-assemblies are not subject to product compliance.

In other words: Since MEN does not deliver ready-made products to end users, the WEEE directive is not applicable for MEN. Users are nevertheless recommended to properly recycle all electronic boards which have passed their life cycle.

Nevertheless, MEN is registered as a manufacturer in Germany. The registration number can be provided on request.

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1 Product Overview

1.1 Product Description

Ultrafast NVMe SSD

The G504 is a CompactPCI Serial solid state drive shuttle. It is designed as a carrier board for a 2.5" NVMe SSD U.2 with ultra high data bandwidth for rapid data transfer. It is also possible to equip the G504 with an NVMe SSD M.2.

The solid state drive is intended to be used as first level storage, e.g., for buffering control data while they are analyzed.

Front Panel Status LEDs

The unit's front panel features two status LEDs signaling power and activity.

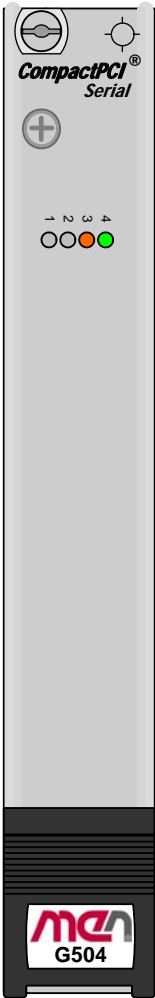
Suitable for Various Application Areas

The G504 is suitable for, e.g., automation or power and energy applications.

Its compliance with the EN 50155 standard makes the board suitable for use in railway applications.

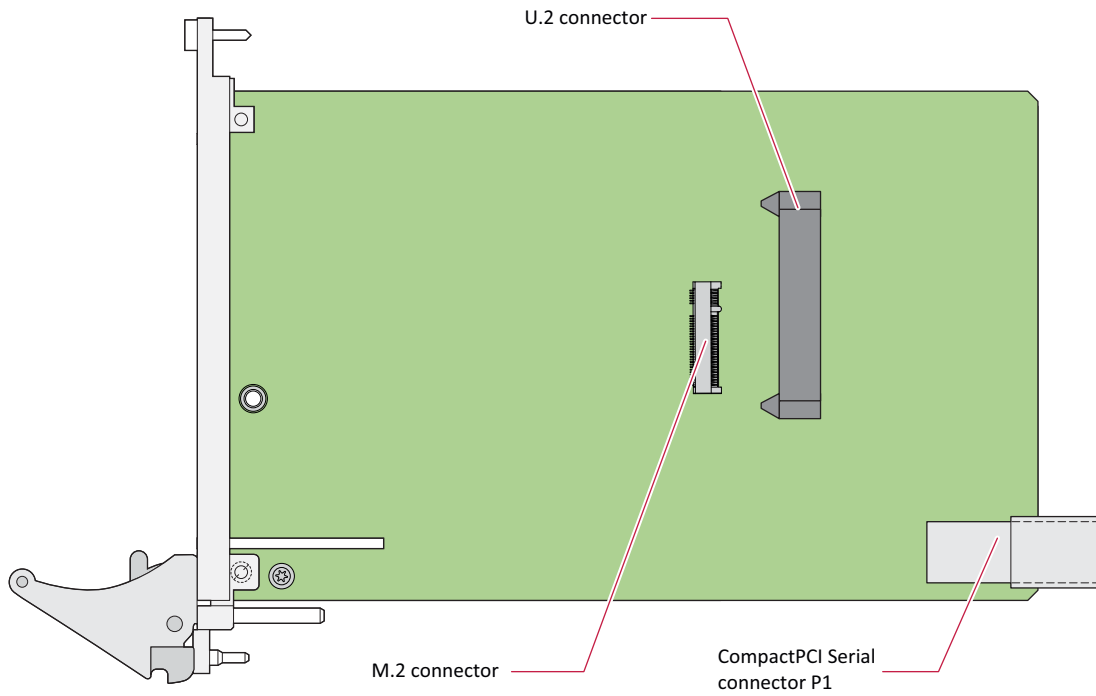
1.2 External Interfaces

Figure 1. Front interfaces



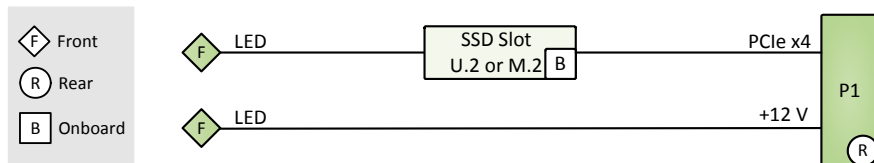
1.3 Board Layout

Figure 2. Board layout - top view



1.4 Block Diagram

Figure 3. Block diagram



1.5 Technical Data

Mass Storage

- The following mass storage devices can be assembled:
 - One 2.5" solid state drive U.2, or
 - One solid state drive M.2

Front Interfaces

- Power LED
- Activity LED

Backplane Standard

- Compliance with CompactPCI Serial PICMG CPCI-S.0 Specification
- Peripheral slot
- Host connection:
 - One PCI Express x4 link, PCIe 3.x

Electrical Specifications

- Supply voltage
 - +12 V
- Power consumption
 - 25 W max. (with U.2 SSD), or
 - 8.25 W max. (with M.2 SSD)

Mechanical Specifications

- Dimensions
 - 3U, 4 HP
- Weight
 - 122 g (without SSD) (model 02G504-00)

Environmental Specifications

- Temperature range (operation)
 - -40°C to +85°C (screened) (depending on SSD; please refer to the SSD specifications for possible limits)
 - Airflow: min. 1.5 m/s
- Temperature range (storage): -40°C to +85°C
- Cooling concept
 - Air-cooled, or
 - Conduction-cooled in MEN CCA frame
- Relative humidity (operation): max. 95% non-condensing
- Relative humidity (storage): max. 95% non-condensing
- Altitude: -300 m to +3000 m
- Shock: 15 g/11 ms
- Bump: 10 g/16 ms
- Vibration (sinusoidal): 2 g/10 Hz to 150 Hz
- Conformal coating; optional

Reliability

- MTBF: approx. 2 000 000 h @ 40°C according to IEC/TR 62380 (RDF 2000)

Safety

- Flammability (PCBs)
 - UL 94V-0

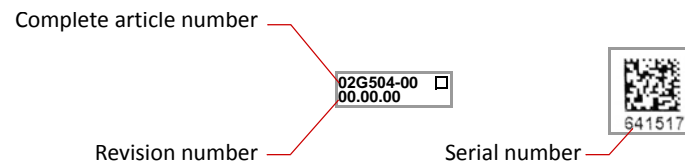
1.6 Product Identification

MEN user documentation may describe several different models and/or design revisions of the G504. You can find information on the article number, the design revision and the serial number on two labels affixed to the board.

- **Article number:** Indicates the product family and model. This is also MEN's ordering number. To be complete it must have 9 characters.
- **Revision number:** Indicates the design revision of the product.
- **Serial number:** Unique identification assigned during production.

If you need support, you should communicate these numbers to MEN.

Figure 4. Product labels



2 Getting Started

2.1 Configuring the Hardware

Check your hardware requirements before installing the board in a system. Modifications are difficult or impossible to do when the board is integrated in a system.

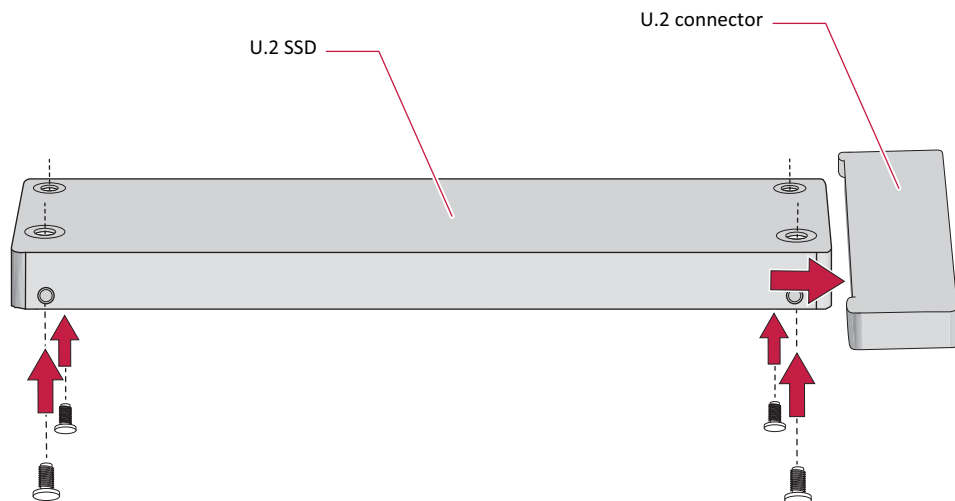


MEN offers suitable accessory articles for G504.
See the MEN website for ordering information:
www.men.de/products/g504/#ord

2.1.1 Installing a U.2 Solid State Drive

To install a U.2 solid state drive, the following steps are necessary.

- » Power down your system and remove the G504 from the system.
- » Put the board on a flat surface.
- » Place the U.2 SSD on the top side of the G504 and align the U.2 connector of the SSD with the U.2 connector on the G504.

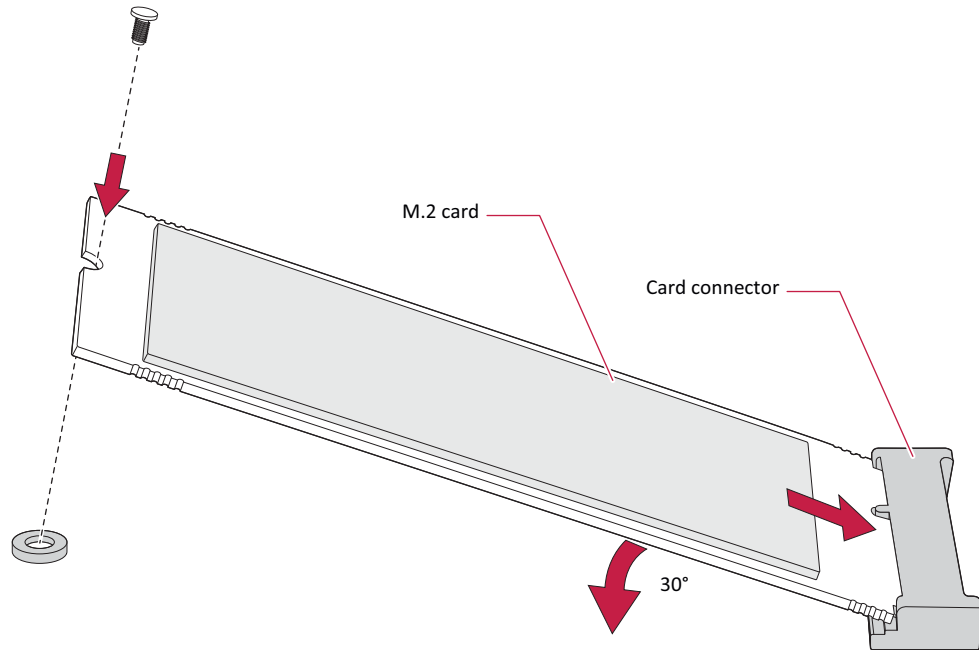


- » Firmly plug the U.2 SSD in the U.2 connector on the G504.
- » Fasten the SSD to the board from the bottom side using four M3x6 screws.

2.1.2 Installing an M.2 Solid State Drive

To install an M.2 solid state drive, the following steps are necessary.

- » Power down your system and remove the G504 from the system.
- » Put the board on a flat surface.
- » Align the SSD properly at a 30° angle to the M.2 connector on the G504.



- » Firmly push the M.2 SSD down while plugging it in the M.2 connector on the G504.
- » Fasten the SSD to the board from the top side using a M3x4 screw.

2.2 Removing an SSD

- » Power down your system and remove the G504 from the system.
- » Remove the screws holding the drive in place.
- » Unplug the drive from the G504's connector.

2.3 Integrating the Board into a System

You can use the following check list when installing the board in a system for the first time and with minimum configuration.

- » Power-down the system.
- » Insert the G504 into a peripheral slot of your CompactPCI Serial system, making sure that the backplane connectors are properly aligned.

Note: The peripheral slots of every system are marked by a circle with a plus sign behind it on the backplane and/or at the front panel: \ominus

- » Power-up the system.

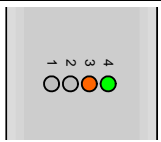
3 Functional Description

3.1 Power Supply

The G504 is supplied via the backplane.

3.2 Status LEDs

Table 1. General status LEDs at front panel

Appearance	Label	Color	Function
	1	-	Not used
	2	-	Not used
	3	Orange	Indicates SSD activity <ul style="list-style-type: none"> ▪ Blinking: Activity on SSD
	4	Green	Indicates power supply <ul style="list-style-type: none"> ▪ On: Power ON ▪ Off: Power OFF

3.3 Mass Storage

3.3.1 M.2 Slot

The G504 provides an M.2 slot.

Supported features:

- M-coding
- 22 mm module width
- 42 mm, 60 mm or 80 mm module length.

3.3.2 U.2 Slot

The G504 provides a U.2 slot for a 2.5" solid state drive.

3.4 CompactPCI Serial



Refer to the CompactPCI Serial standard PICMG CPCI-S.0 for detailed information regarding the rear I/O connectors.

- CompactPCI Serial Specification PICMG CPCI-S.0 Revision 2.0: 2015; PCI Industrial Computers Manufacturers Group (PICMG) www.picmg.org
- Introduction to CompactPCI Serial on Wikipedia: en.wikipedia.org/wiki/CompactPCI_Serial