

K1

8 Safe Digital Outputs, High-Side Switching menTCS Safe I/O Board SIL 2 to SIL 4

- » 8 digital outputs, 24 V, 48 V, 72 V, 96 V, 110 V
- » 300 mA per channel
- » High-side switch outputs (load to ground)
- » Optical isolation from other cards
- » Fail-safe board architecture
- » Certifiable up to SIL 4 (with report from TÜV SÜD)
- » Developed according to EN 50129, EN 50128 and IEC 61508
- » Extensive supervision functions
- » Full EN 50155 compliance
- » -40 to +85°C qualified
- » Conformal coating



Digital Outputs for menTCS

The K1 is a safe digital output card for use in a modular MEN Train Control System. menTCS is a platform to perform safe train control functions, focusing on rolling stock applications like Automated Train Operation (ATO) or Automated Train Protection (ATP). It usually consists of the **MH50C menTCS controller system** and safe remote I/O boxes, e.g., **KT8**. The K1 can be a part in any of these systems, with one card providing 8 digital outputs.

Safe, Certified Railway I/O

Developed according to EN 50129/EN 50128, K1 boards can be used for SIL 1, SIL 2, SIL 3 and SIL 4 applications. All menTCS I/O components come with dedicated SIL 4 certification packages from TÜV SÜD, reducing the integrator's certification effort and risk, and resulting in lower integration costs.

Functional Safety Design

With a dedicated onboard supervisor and FSoE features (Fail Safe over Ethernet), the I/O board is equipped with all the mechanisms required to provide protection in functionally safe systems. The I/O card reacts to be fail-safe: it enters the safe state if it detects an error.

In-System Connection using Real-Time Ethernet

menTCS I/O boards are physically shorter than a 3U CompactPCI board. Inside a menTCS system, these cards connect to the backplane using an extension. This links them to the menTCS EBUS, power supply, and address lines, allowing safe real-time Ethernet communication within the system.

Front I/O is connected via spring cage terminal blocks for fast installation thanks to reduced wiring.

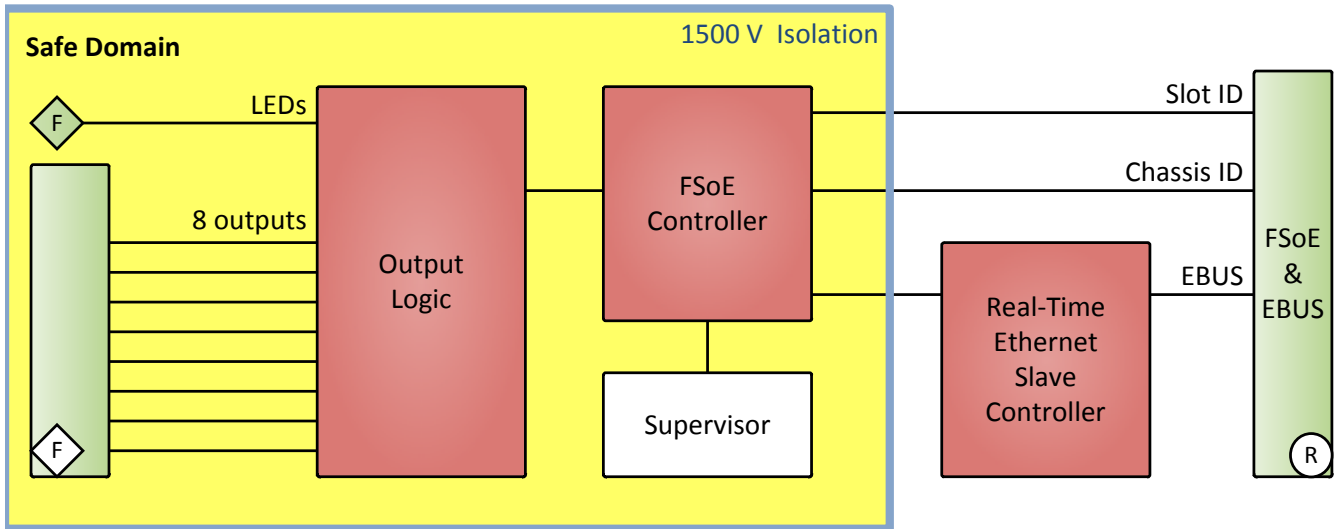
EN 50155 Rolling Stock Compliance

The K1 supports the voltage ranges defined by EN 50155 for railway applications. Being usable in all types of different trains optimizes the I/O board's interoperability. Its operating temperature complies with the class TX specifications of -40 to +70 °C (10 minutes up to +85 °C). Standard boards include conformal coating.

Along with its full EN 50155 compliance and long-term availability of a minimum 10 years, the K1 is a rail-ready I/O component.

Safe Software Concept

All menTCS components are supported by certified QNX BSP and driver software.



◊ F Front ○ R Rear

Digital Outputs

- Output voltage
 - 24 V, 48 V, 72 V, 96 V, 110 V nom. (EN 50155)
- Output current
 - 300 mA per channel max.
- Output type
 - High-side switch outputs (load to ground)

Front Interfaces

- Digital I/O
 - One spring cage terminal block
 - Eight output channels
- Status LEDs
 - Binary channel status, one LED per channel
 - I/O error
 - FSoE activity
 - Real-time Ethernet error
 - Real-time Ethernet state indication

Rear Interfaces

- EBUS
 - Two real-time Ethernet channels, ETG.1000
- menTCS FSoE
 - Slot ID and chassis ID for unique FSoE address

Supervision and Control

- Safe supervisor
 - Check for overvoltage, undervoltage, excess temperature
 - Watchdog
 - Monitor self-test

Backplane Standard

- ETG.1000 EBUS

Electrical Specifications

- Supply voltage
 - +12 V (10.8 to 13.2 V)
- Power consumption
 - tbd. W
- Isolation voltage
 - 1500 V AC

Mechanical Specifications

- Dimensions
 - 100 mm x 100 mm, 4 HP

Environmental Specifications

- Classification for railway applications
 - EN 50155: Rolling stock, vehicle body
- Temperature range (operation)
 - -40°C to +85°C (qualified components) (EN 50155, class TX)
- Temperature range (storage): -40°C to +85°C
- Cooling concept
 - Air-cooled, natural convection
- Humidity
 - EN 50155: Rolling stock, vehicle body
- Vibration/Shock
 - EN 50155: Rolling stock, vehicle body class B
- Altitude: -300 m to +3000 m
- Conformal coating

Safety

- Functional Safety
 - Certifiable to SIL 2, SIL 3 or SIL 4 according to EN 50129 ("safety case" document and certificate from TÜV SÜD)
 - Hazard rate (THR) for safety functions $\leq 1E-8 / h$
 - Board maintains safe state after a failure
- Electrical Safety
 - EN 50155: Rolling stock, vehicle body
- Flammability
 - UL 94V-0
- Fire Protection
 - EN 45545

EMC

- EN 50155: Rolling stock, vehicle body

Software Support

- PACY (Process Data Framework for Cyclic Applications)
- QNX
- **For more information on supported operating system versions and drivers see Software.**

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