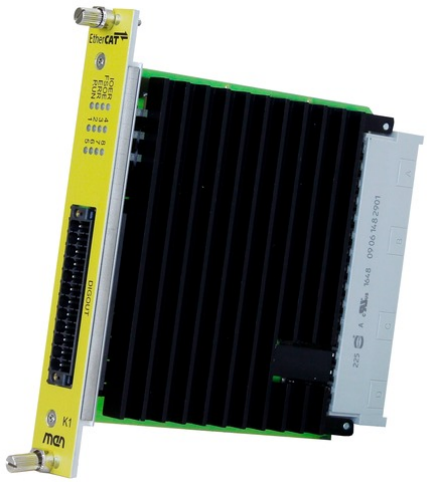
K1

8 Safe Digital Outputs, High-Side Switching for menTCS

SIL 2 to SIL 4 Modular Train Control System I/O Board

- 8 digital outputs, 24 V, 48 V, 72 V, 96 V, 110 V
- 300 mA per channel, 1200 mA total
- High-side switch outputs (load to ground)
- Optical isolation from other cards
- Fail-safe board architecture
- Currently in certification process with TÜV SÜD
- Developed acc. to EN 50129, EN 50128, IEC 61508
- Extensive supervision functions
- EN 50155 fully compliant
- -40°C to +85°C
- Conformal coating



Digital Outputs for menTCS

The K1 is a safe digital output card for use in the menTCS MEN Train Control System. The menTCS platform performs safe train control functions in rolling stock applications like Automated Train Protection (ATP) or CBTC (Communications Based Train Control). It usually consists of a controller system, e.g., MH50C, and safe remote I/O boxes, e.g., KT8. The K1 can be plugged into any of these systems, with one card providing 8 safe digital outputs with read-back and testing capabilities.

Safe Communication using EtherCAT and FSoE

menTCS I/O boards are EtherCAT devices, connected to the host via a backplane "EBUS" link. On top of EtherCAT, a safety layer called FSoE (Fail Safe Over EtherCAT) provides safe real-time Ethernet communication between the host system and the I/O board.

Made for Rail I/O Functions

The K1 can switch voltages from 24 V to 110 V nominal as specified by EN 50155. Typical loads are relay coils, digital inputs of other systems or LED indicators. The outputs are high-side switching, i.e. the load has to be connected to the low side.
The I/O card's fail-safe behavior provides functional safety: it enters the safe state if it detects an error.
Front I/O is connected via a 24-pin PCB plug for fast installation thanks to reduced wiring.

Soon To Be Certified up to SIL 4

The K1 is currently being certified to CENELEC standards EN 50128 and EN 50129. Developed in a SIL 4 process, the systematic capability of the K1 is SIL 4. However, to control a SIL 4 function, the system design must provide a second cut-off path to put the load into a safe state, e. g., by switching the load's low side with a relay or via a K7 I/O board (the low-side switching counterpart of K1). A single K1 provides a maximum safety level of SIL 2.
All menTCS I/O components will come with dedicated SIL 4 certification packages from TÜV SÜD, reducing the integrator's certification effort and risk, and resulting in lower integration costs.

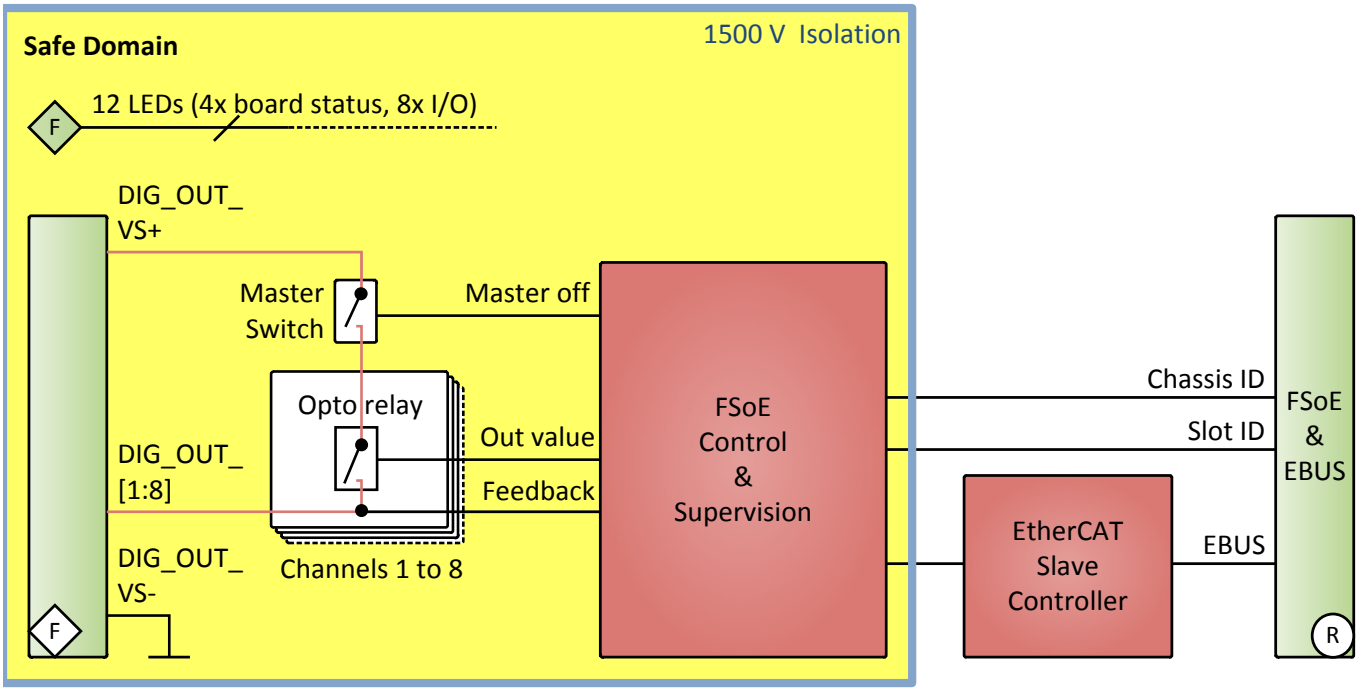
EN 50155 Rolling Stock Compliance

Being usable in all types of different trains optimizes the card's interoperability. It supports operating temperatures of -40°C to +85°C according to EN 50155 class TX. Standard boards include conformal coating. With full EN 50155 compliance and a long-term availability of 10 years minimum, the K1 is a rail-ready component.

Safe Software Concept

All menTCS components are supported by certified QNX BSP and driver software. Application software accesses the K1 via the PACY software framework (Process Data Framework for Cyclic Applications). Its API allows the application to control and monitor all features of the K1.

Data Sheet



F Front R Rear Note: All channels have the same switching circuitry.

Diagram

Digital Outputs

- Eight channels
- Output voltage
  - 24 V, 48 V, 72 V, 96 V, 110 V nom. (EN 50155)
  - Voltage supplied from external source
- Output current
  - 300 mA max. per channel
  - 1200 mA max. total
- Output type
  - High-side switch outputs (load to ground)

Front Interfaces

- Digital I/O
  - One 24-pin PCB plug
  - 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
  - 1.6 W typ.
  - 2.5 W max.
- Isolation voltage
  - 1500 V AC

Mechanical Specifications

- Dimensions
  - 100 mm x 100 mm, 4 HP
- Weight
  - 192 g (model 06K001-10)

Environmental Specifications

- Classification for railway applications
  - EN 50155: Rolling stock, vehicle body
  - EN 50125-3: Wayside, at least 1 m off the track inside a switch box, low temperature class T2 and high temperature class TX
- Temperature range (operation)
  - -40°C to +85°C (EN 50155, class TX)
- Temperature range (storage): -40°C to +85°C
- Cooling concept
  - Air-cooled, airflow 0.5 m/s
- Humidity
  - EN 50155: Rolling stock, vehicle body
- Vibration/Shock
  - EN 50155: Rolling stock, vehicle body class B
- Altitude: -300 m to +3000 m

Reliability

- MTBF
  - 756 167 h @ 40°C according to IEC/TR 62380 (RDF 2000) (model 06K001-10)

Safety

- Functional Safety
  - Certifiable to SIL 2, SIL 3 or SIL 4 according to EN 50129 (currently in certification process with TÜV SÜD)
  - Hazard rate (THR) for safety functions <= 1E-8 / h (single card configuration)
  - Board maintains safe state after a failure
- Electrical Safety
  - EN 50155: Rolling stock, vehicle body
- Fire Protection
  - EN 45545-2, hazard level HL3

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.

Germany

MEN Mikro Elektronik GmbH

Neuwieder Straße 3-7
90411 Nuremberg
Phone +49-911-99 33 5-0

sales@men.de
www.men.de

France

MEN Mikro Elektronik SAS

18, rue René Cassin
ZA de la Châtelaine
74240 Gaillard
Phone +33-450-955-312

sales@men-france.fr
www.men-france.fr

USA

MEN Micro Inc.

860 Penllyn Blue Bell Pike
Blue Bell, PA 19422
Phone 215-542-9575

sales@menmicro.com
www.menmicro.com

China

MEN Mikro Elektronik (Shanghai) Co., Ltd.

Room 808-809, Jiaxing Mansion, No. 877 Dongfang Road
200122 Shanghai
Phone +86-21-5058-0961

sales@men-china.cn
www.men-china.cn

Up-to-date information, documentation and ordering information:
www.men.de/products/k1/

Contact Information