

# K2

## 16 Safe Digital Inputs for menTCS SIL 2 to SIL 4 Modular Train Control System I/O Board

- » 16 digital inputs, 24 V, 48 V, 72 V, 96 V, 110 V
- » 1 to 10 mA, pulsed
- » 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 Inputs for menTCS

The K2 is a safe digital input 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 K2 can be plugged into any of these systems, with one card providing 16 safe digital inputs.

### 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 K2 inputs are voltage sensitive and are typically connected to digital outputs of other systems or to relay contacts.

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 K2 is certified to CENELEC standards EN 50128 and EN 50129. Developed in a SIL 4 process, the systematic capability of the K2 is SIL 4. However, to control a SIL 4 function, the system design must provide a second K2 input board or another separated way to evaluate the status of the external signal. A single K2 provides a maximum safety level of SIL 2.

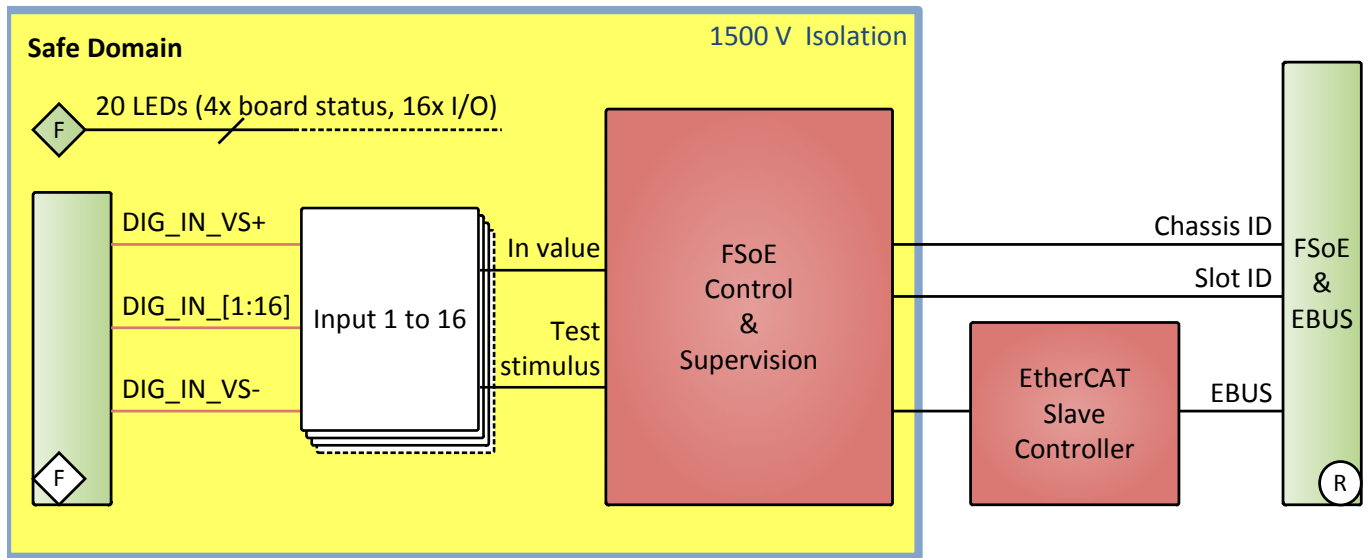
All menTCS I/O components come with dedicated SIL 4 certification packages from TÜV SÜD, reducing the integrator's certification effort and risk, and resulting in lower integration costs.

### EN 50155 Rolling Stock Compliance

The K2 supports the voltage ranges defined by EN 50155 for railway applications. 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 its full EN 50155 compliance and long-term availability of a minimum 10 years, the K2 is a rail-ready I/O component.

### Safe Software Concept

All menTCS components are supported by certified QNX BSP and driver software. Application software accesses the K2 via the PACY software framework (Process Data Framework for Cyclic Applications). Its API allows the application to control and monitor all features of the K2.



F Front
 R Rear

Note: All channels have the same switching circuitry.

**Digital Inputs**

- 16 channels
- Input voltage
  - 24 V, 48 V, 72 V, 96 V, 110 V nom. (EN 50155)
- Input current
  - 1 mA to 10 mA, pulsed
- Switching threshold relative to reference voltage
- Programmable input filter

**Front Interfaces**

- Digital I/O
  - One 24-pin PCB plug
  - 16 input 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.
  - 2.6 W max.
- Isolation voltage
  - 1500 V AC

**Mechanical Specifications**

- Dimensions
  - 100 mm x 100 mm, 4 HP
- Weight
  - 202 g (model 06K002-10)

## 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
  - 701 857 h @ 40°C according to IEC/TR 62380 (RDF 2000) (model 06K002-10)

## 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  $\leq 1E-8$  / h
  - 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](http://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](http://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](http://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](http://www.men-china.cn)

### **Up-to-date information, documentation and ordering information:**

[www.men.de/products/k2/](http://www.men.de/products/k2/)

*The date of issue stated in this data sheet refers to the Technical Data only. Changes in ordering information given herein do not affect the date of issue. All brand or product names are trademarks or registered trademarks of their respective holders.*

*MEN is not responsible for the results of any actions taken on the basis of information in the publication, nor for any error in or omission from the publication. MEN expressly disclaims all and any liability and responsibility to any person, whether a reader of the publication or not, in respect of anything, and of the consequences of anything, done or omitted to be done by any such person in reliance, whether wholly or partially, on the whole or any part of the contents of the publication.*

*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.*

© 2017 MEN Holding

## Contact Information

