MH50C

menTCS Vital System Controller

SIL 4 Modular Train Control System for Safety in Transportation

- *SIL 4 modular Train Control System menTCS*
- *Certified safe CPU board with 3 CPUs*
- *Safe I/O boards (currently in certification process)*
- *QNX safe operating system available*
- *Certification packages available*
- *Extensible by distributed safe I/O boxes connected via real-time Ethernet*
- *Optional MVB, RS232, RS422, RS485, CAN, GPS*
- *Compact 40 HP application-ready system*
- *Rack-mounted or wall-mounted*
- *For rolling stock and wayside applications*

MH50C is the central controller of the modular Train Control System menTCS. It is a modular system platform usable for safety-critical train applications like train control, automatic train operation (ATO) and automatic train protection (ATP) up to SIL 4.

Modular, Built-to-Order I/O Configuration

Being based on modular 40 HP CompactPCI, the system is always configured with a safe system CPU, a real-time Ethernet card, a power supply unit and a shelf controller. Other cards are added as built-to-order (BTO) options or by the user. The safe I/O cards support the common I/O requirements requested in trains.
The composition of safe CPU card, safe train I/Os and interfaces, such as MVB, CAN or serial interfaces to connect to legacy train equipment makes the controller ideal for use in safety-critical rolling stock applications.

Application-Ready, Open Platform

The MH50C is an application-ready, open platform. This means that the user adds his application based on the basic operating system and driver software.

Part of menTCS Train Control System

menTCS is a modular SIL 4 certifiable family of CompactPCI-based standard products usable for every kind of safety-critical railway application - from a single function to the main control system of the train. It can be configured to control anything in the train that requires functional safety - with requirements from SIL 1 up to SIL 4. menTCS communicates via standard real-time Ethernet and can be configured to interface to any type of consist fieldbus network like MVB, CANopen, Profinet etc. This makes it easy to integrate into a TCN network as well as into regionally different Train Control Systems like ETCS, CTCS, ATCS or Klub-U. The high level of flexibility of menTCS results in significant cost and time savings during computerization of the train.

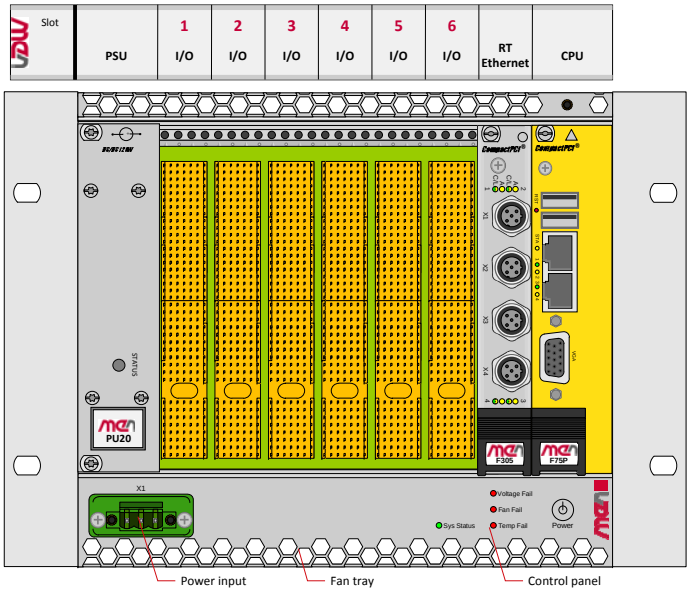
Certification and Standards Compliance

menTCS components come with certification packages and complete support for the safe operating system QNX, including safe protocols, and is prepared to work with the Flexisafe PLC software, again saving cost and time for implementation and for certification of the final system. menTCS is developed according to EN 50128 and EN 50129 standards and complies with the environmental requirements for railway applications: temperature class TX, shock, vibration, humidity, dust, isolation, PSU hold-up times, EMC regulations etc.

Mounting and Cooling Options

The system can be wall or rack-mounted, and is cooled using an additional fan tray at the bottom of the system. Cooling is independent of the mounting position.

Data Sheet



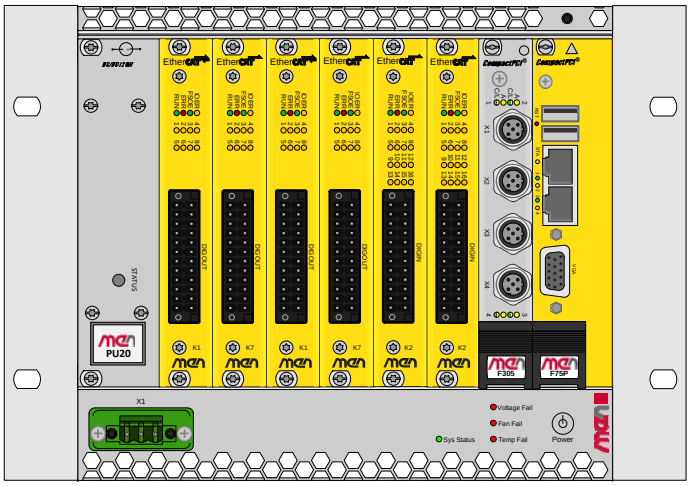
MH50C Barebone Configuration

Safe CPU card F75P
- -40°C to +85°C
- 3 Intel Atom processors
- 2 RJ45 (general purpose Ethernet)
- mSATA 8 GB, -40 to +85°C

Real-time Ethernet interface card
- 4 M12, connects distributed safe I/O

Wide DC range power supply
System supervision: temp, fan, power
Fanless or forced-air cooling

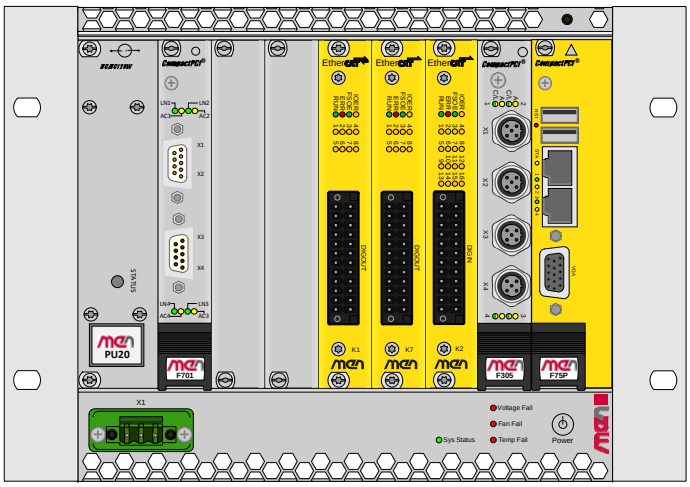
Option slots for
- Safe I/O
- MVB ESD+ Device/Bus Administrator
- MVB EMD Device/Bus Administrator
- General-purpose interfaces (RS422/RS485, RS232, CAN, GPS)



MH50C Configuration Example 1

Option slots populated with safe I/O
- 2 x 8 digital outputs, SIL 4, through K1/K7 combination: high-side and low-side switching
- 16 digital inputs, SIL 4, through 2 x K2

Safe CPU, RT Ethernet card etc. as in barebone configuration



MH50C Configuration Example 2

Option slots populated with safe I/O
- MVB master
- 8 digital outputs, high-side switching, SIL 2
- 8 digital outputs, low-side switching, SIL 2
- 16 digital inputs, SIL 2

Safe CPU, RT Ethernet card etc. as in barebone configuration

This configuration targets SIL 2 safe I/O applications: each safe I/O card is only assembled once.

Diagram

General System Characteristics

- Modular design, built-to-order configuration
- Slot and backplane set-up of the system
  - 1 PSU slot
  - 1 CompactPCI PlusIO system slot
  - 7 CompactPCI peripheral slots
- Please contact MEN sales for component combination possibilities.

CPU Board

- CPCI 3U Board
- Configurable: no
- 3x Intel Atom E680T (1.6 GHz), 2x 512 MB, 1x 1 GB DDR2 DRAM, 6 HP, front: 1 VGA, 2 USB, 2 Fast Ethernet (RJ45), -40..+85°C qualified, air-cooled, conformal coating
  - More information on F75P Safe Computer
- Mass Storage
  - SSD mSATA, 8 GB, -40 to +85°C

Real-Time Ethernet

- CPCI 3U Board
- Configurable: no
- 4 Fast Ethernet (M12); rear: real-time Ethernet (EBUS); -40..+85°C qualified, conformal coating
  - More information on F305 Real-Time Ethernet Interface Card

Safe I/O

- menTCS I/O Board
- Configurable: yes
- Possible in CompactPCI slots: 1, 2, 3, 4, 5, 6
- Possible Configurations
  - 8 digital outputs, high-side switching, SIL 2 (SIL 4), -40° to +85°C (qualified components), conformal coating
  - 8 digital outputs, low-side switching, SIL 2 (SIL 4), -40° to +85°C (qualified components), conformal coating
  - 16 digital inputs, SIL 2 (SIL 4), -40° to +85°C (qualified components), conformal coating

MVB Multifunction Vehicle Bus

- CPCI 3U Board
- Configurable: yes
- Possible in CompactPCI slots: 1
- Possible Configurations
  - MVB ESD+ Device, Process and Message Data, -40..+70°C screened, conformal coating
  - MVB ESD+ Bus Administrator, Process and Message Data, -40..+70°C screened, conformal coating
  - MVB EMD Device, Process and Message Data, -40..+70°C screened, conformal coating
  - MVB EMD Bus Administrator, Process and Message Data, -40..+70°C screened, conformal coating

Serial I/O

- CPCI 3U Board
- Configurable: yes
- Possible in CompactPCI slots: 1 to 2, 2 to 3
- 8 HP FPGA-based universal interface for direct connection of 2x CAN (first slot), 2x UART and 1x 8-bit GPIO (second slot) at front as standard FPGA content plus space for user-defined functions, -40..+85°C qualified, interface SA-Adapters to be ordered separately
  - More information on F215 Universal Interface Board
- Possible Configurations
  - RS422/485, full duplex, optically isolated, -50°C to +85°C screened, conformal coating
  - RS232, optically isolated, -40°C to +85°C screened, conformal coating
  - CAN bus ISO high-speed, optically isolated, -40°C to +85° screened, conformal coating
  - GPS receiver, SMA antenna, isolated, -40°C to +85°C qualified, conformal coating

Power Supply

- PSU 3U
- Configurable: no
- 120 W, 3U 6 HP PSU, wide range input 24 to 110 V DC, 24 V DC nom., output 12 V / 5 V / 3.3 V DC, -40..+85°C, qualified, conformal coating
  - More information on PU20 Wide-Range Power Supply Unit for Railway Systems, 24 to 110 VDC, 120 W
- One power inlet connector

Supervision and Control

- Dedicated shelf controller monitors power, CPU status, temperature; controls fan; provides status LEDs and power button
  - More information on AF2 Shelf Controller for CompactPCI Systems

Electrical Specifications

- Supply voltage
  - 24 V, 36 V, 48 V, 72 V, 96 V, 110 V DC nominal; 14.4 to 154 V max. (EN 50155)
  - Power interruption class S2 (10 ms) (EN 50155)
- Power consumption
  - 100 W max.

Mechanical Specifications

- Dimensions
  - 214 x 175 x 225 mm max. without brackets
  - 4U, 40 HP
- Mounting Possibilities
  - Wall-mount, or
  - Rack-mount in 19" cabinet
  - Two systems side-by-side to build a single 19" chassis

Environmental Specifications

- Classification for railway applications
  - EN 50155: Rolling stock, vehicle body
  - EN 50125-3: Wayside, at least 3 m off the track inside a switch box
- Temperature range (operation):
  - -40°C to +70°C (qualified components), with up to +85°C for 10 minutes (EN 50155, class TX; EN 50125-3, low temp. class T2, high temp. class TX)
- Cooling concept
  - Air-cooled, forced convection with fan tray at system bottom
- Temperature range (storage): -40°C to +85°C
- Humidity
  - EN 50155: Rolling stock, vehicle body
  - EN 50125-3: Wayside, at least 3 m off the track inside switch box
- Vibration/Shock
  - EN 50155: Rolling stock, vehicle body class B
  - EN 50125-3: Wayside, at least 3 m off the track
- Altitude: -300 m to +3000 m
- Conformal coating of board components
- International Protection Rating (IEC 60529): IP20

Safety

- Functional Safety
  - Certifiable to SIL 1, SIL 2, SIL 3 or SIL 4 according to EN 50129, depending on I/O board configuration
  - Hazard rate for safety functions <= 1E-9 / h
  - Control Processors configured for deterministic behavior, e.g., Hyper-Threading disabled, speed-step disabled, BIOS interrupts disabled
  - System maintains safe state after a failure
- Electrical Safety
  - EN 60950-1: Class I equipment
- Flammability (PCBs)
  - UL 94 V-0
- Fire Protection
  - EN 45545-2, hazard level HL3 (19MH50CB0 barebone configuration)

EMC

- EN 50155: Rolling stock, vehicle body
- EN 50121-4: Wayside at least 3 m off the track

Software Support

- I/O Domain
  - Linux
  - QNX
  - PACY (Process Data Framework for Cyclic Applications)
- Safe Domain
  - QNX
  - PACY (Process Data Framework for Cyclic Applications)
- 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/mh50c/

Contact Information