

- For Applications up to SIL4 (EN5012x) or SIL3 (IEC61508)
- Certified safe CPU board with 3 CPUs
- Safe I/O boards
- 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 a central controller of the duagon SAFE CONTROL (d-SC) System. 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 (EN5012x) or SIL3 (IEC61508).

### MODULAR 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 DUAGON SAFE CONTROL SYSTEM

d-SC 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.



d-SC 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 d-SC results in significant cost and time savings during computerization of the train.

### CERTIFICATION AND STANDARDS COMPLIANCE

d-SC components come with certification packages and complete support for the safe operating system QNX, including safe protocols, and provides the technical possibility to run a safety PLC, again saving cost and time for implementation and for certification of the final system. d-SC 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.



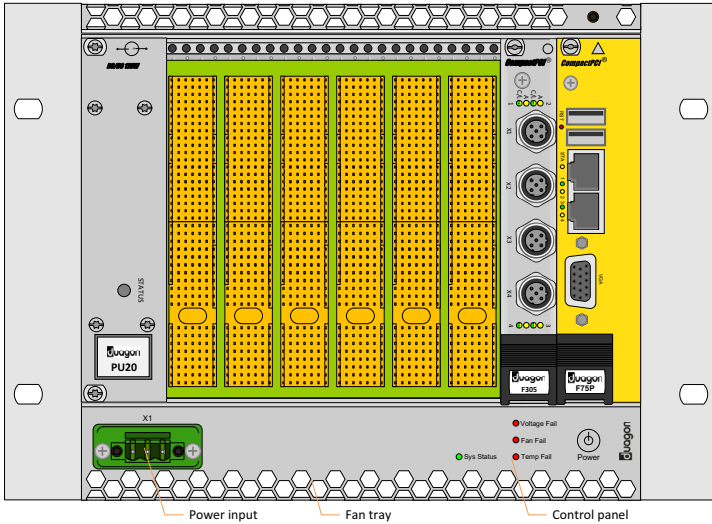
[www.duagon.com/products/mh50c/](http://www.duagon.com/products/mh50c/)

## DATA SHEET



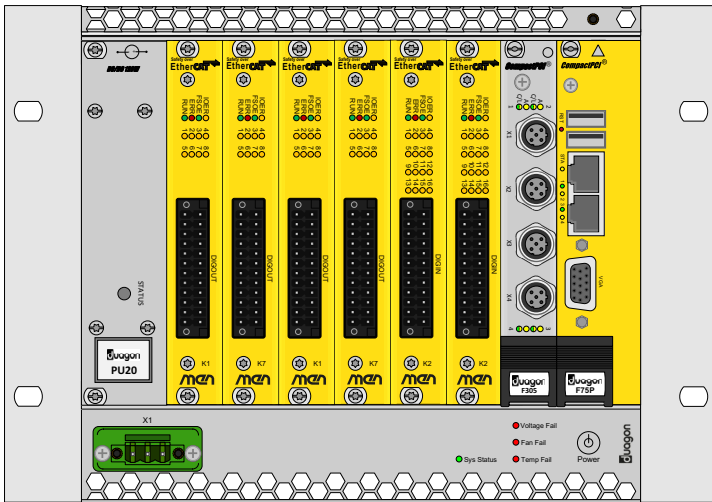
# MH50C | DIAGRAM

Slot	PSU	1	2	3	4	5	6	RT Ethernet	CPU
		I/O	I/O	I/O	I/O	I/O	I/O		



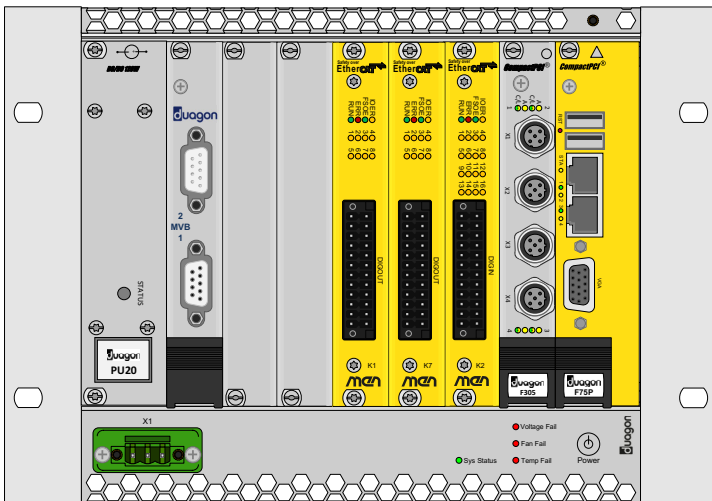
### MH50C Barebone Configuration

- 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 range power supply
  - System supervision: temp, fan, power
  - 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.



## MH50C | TECHNICAL DATA

### 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 duagon 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°C to +85°C, air-cooled, conformal coating**
- 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°C to +85°C, conformal coating**

### SAFE I/O

- d-SC 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, conformal coating**
  - **8 digital outputs, low-side switching, SIL 2 (SIL 4), -40° to +85°C, conformal coating**
  - **16 digital inputs, SIL 2 (SIL 4), -40° to +85°C, 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°C to +70°C, conformal coating**
  - **MVB ESD+ Bus Administrator, Process and Message Data, -40°C to +70°C, conformal coating**
  - **MVB EMD Device, Process and Message Data, -40°C to +70°C, conformal coating**
  - **MVB EMD Bus Administrator, Process and Message Data, -40°C to +70°C, 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, interface SA-Adapters to be ordered separately**
- Possible Configurations
  - **RS422/485, full duplex, optically isolated, -50°C to +85°C, conformal coating**
  - **RS232, optically isolated, -40°C to +85°C, conformal coating**
  - **CAN bus ISO high-speed, optically isolated, -40°C to +85°C, conformal coating**
  - **GPS receiver, SMA antenna, isolated, -40°C to +85°C, conformal coating**



## POWER SUPPLY

- PSU 3U
- Configurable: yes
- **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°C to +85°C, conformal coating**
- **120 W, 3U 6 HP PSU, wide range input 100 to 240 V AC, output 12 V / 5 V / 3.3 V DC, -40°C to +85°C, conformal coating**
- One power inlet connector

## SUPERVISION AND CONTROL

- Dedicated shelf controller monitors power, CPU status, temperature; controls fan; provides status LEDs and power button
  - **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
  - 60 W typ. (barebone configuration and 2x K1, 2x K2, 2x K7)
  - 100 W max.

## MECHANICAL SPECIFICATIONS

- Dimensions
  - (W) 214 mm, (D) 225 mm, (H) 175 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
- Weight
  - 5.7 kg (barebone configuration and 2x K1, 2x K2, 2x K7)

## 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, with up to +85°C for 10 minutes (EN 50155, class TX; EN 50125-3, low temp. class T2, high temp. class TX)
- Temperature range (storage): -40°C to +85°C
- Cooling concept
  - Air-cooled, forced convection with fan tray at system bottom
- 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
- International Protection Rating (IEC 60529): IP20
- Pollution Degree: PD 2
- Useful life: 20 years (EN 50155:2017, class L4)

## SAFETY

- Functional Safety
  - Certifiable up to SIL 4 according to EN 50129/EN 50128 and up to SIL 3 according to IEC 61508, depending on I/O board configuration
  - Hazard rate for safety functions  $\leq 1E-9$  / h
  - 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)



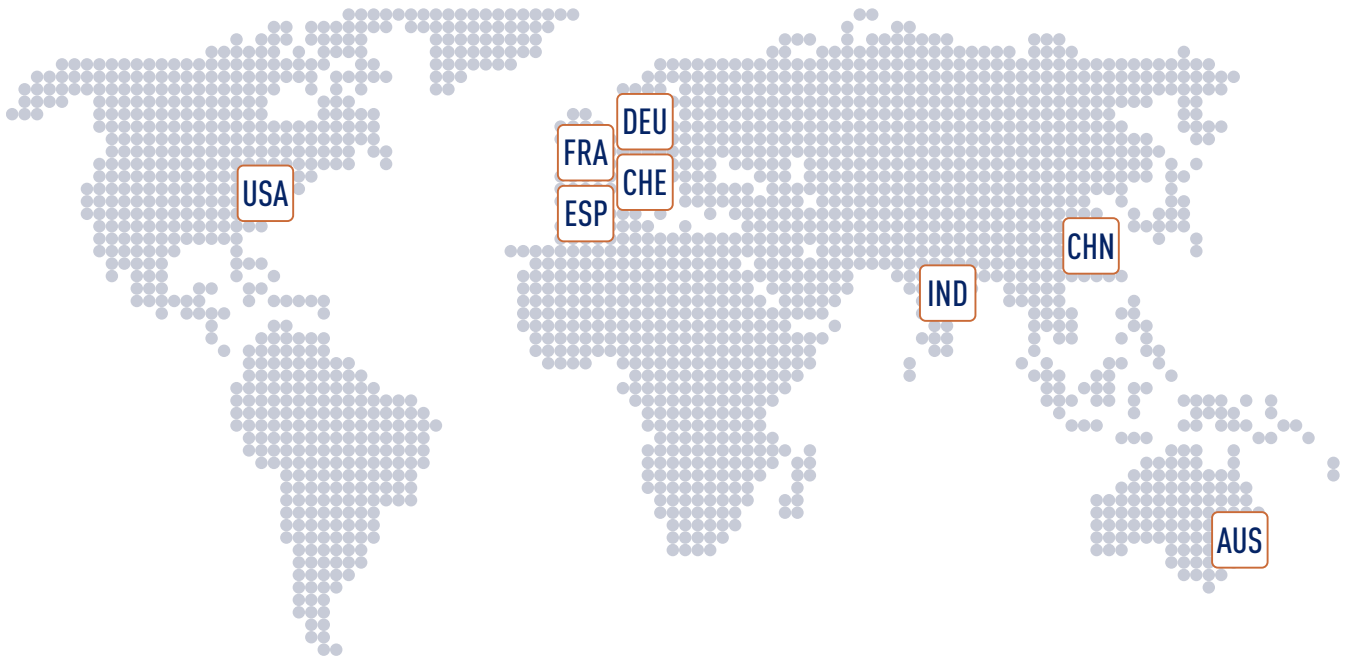
## EMC

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

## SOFTWARE SUPPORT

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

- ▶ See the product User Manual for details on software support: [www.duagon.com/products/mh50c/#doc](http://www.duagon.com/products/mh50c/#doc)
- ▶ See section Software on the product web page for available packages:  
[www.duagon.com/products/mh50c/#downl](http://www.duagon.com/products/mh50c/#downl)



## duagon | WORLDWIDE

duagon has a global presence with support and sales representatives across 8 countries. With three decentralized engineering and production sites, our customers take advantage of the added competence and flexibility.

[www.duagon.com](http://www.duagon.com)

### SWITZERLAND (HQ)

Dietikon  
Phone +41 44 743 73 00  
sales@duagon.com

### AUSTRALIA

Artarmon  
Phone +61 2 9966 9424  
sales-aus@duagon.com

### CHINA

Shanghai  
Phone +86 159 0077 2985  
sales-chn@duagon.com

### FRANCE

Gaillard  
Phone +33 450 955 312  
sales-fra@duagon.com

### GERMANY

Nuremberg  
Phone +49 911 99 335 0  
sales-deu@duagon.com

### INDIA

New Delhi  
Phone +91 11 41 61 12 48  
sales-ind@duagon.com

### SPAIN

Madrid  
Phone +34 917 880 610  
sales-esp@duagon.com

### USA

Blue Bell  
Phone +1 215 542 9575  
sales-usa@duagon.com