

## 16 SAFE DIGITAL INPUTS FOR D-SC



- 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
- Certified to EN 5012x (SIL 2/4), EN 50159, IEC 61508 (SIL 2/3)
- 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 D-SC

The K2 is a safe digital input card for use in the duagon SAFE CONTROL (d-SC) System. The d-SC 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 (ETHERCAT AND FSOE)

d-SC I/O boards are EtherCAT slave 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 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.

### SAFETY-CERTIFIED

The K2 is certified to CENELEC standards EN 50128 and EN 50129. The board is developed in a SIL 4 process according to EN 50128 and EN 50129. The systematic capability of the K2 is SIL 3 according to IEC 61508. However, to control a SIL 4 function according to EN 50128 and EN 50129 or SIL 3 function according to IEC 61508, the

system design must provide a second K2 input board or another separated way to evaluate the status of the external signal. All d-SC I/O components come with dedicated 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 long-term availability on the market of 10 years minimum from the start of series production, the K2 is a rail-ready I/O component. If required, the K2 can also comply to Railways (Wayside) standard EN 50121-4 and Industrial standard EN 61000-4-5 by connecting an external EMC suppressor circuitry.

### SAFE SOFTWARE CONCEPT

All d-SC 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.

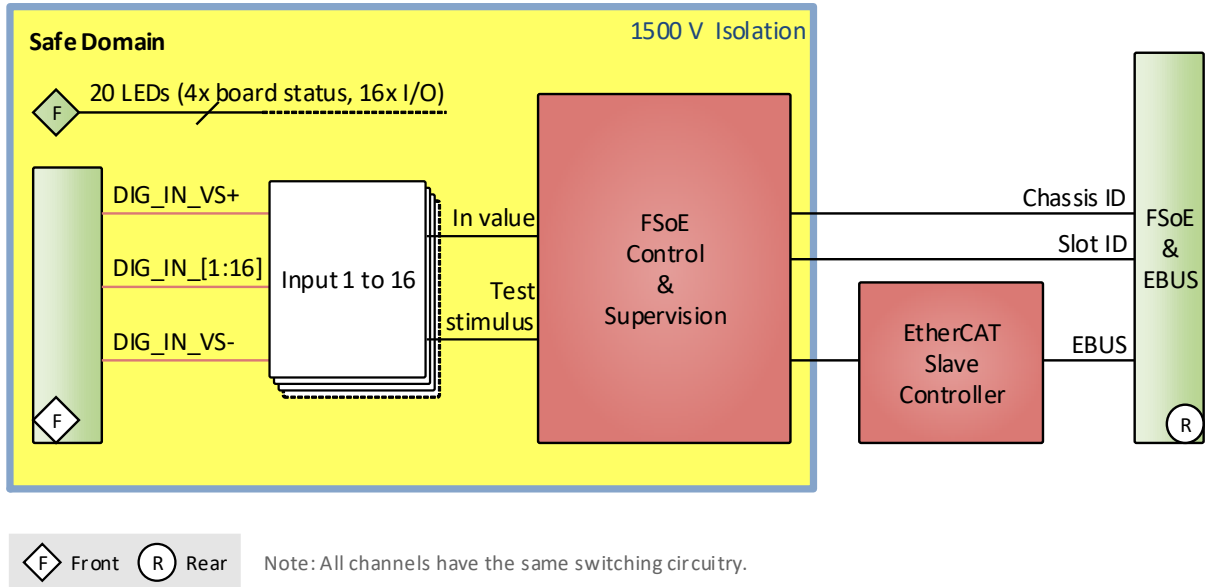


[www.duagon.com/products/k2/](http://www.duagon.com/products/k2/)

**DATA SHEET**



**K2 | DIAGRAM**



**K2 | TECHNICAL DATA**

**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
- d-SC 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
  - Clock monitoring



## 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.

## 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
- Pollution degree: PD 2
- Useful life: 20 years

## RELIABILITY

- MTBF
  - 703 682 h @ 40°C according to IEC/TR 62380 (RDF 2000) (model 06K002-10)

## SAFETY

- Functional Safety
  - Certifiable to SIL 2 with single channel according to EN 50129
  - Certifiable to SIL 4 with dual channel according to EN 50129
  - Hazard rate (HR=PFH) for safety functions  $\leq 7E-8$  / h (single card configuration)
  - SIL 2 according to IEC 61508 with single channel (HFT=0)
  - SIL 3 according to IEC 61508 with dual channel (HFT=1)
  - SFF > 92% according to IEC 61508
  - Board maintains safe state after a failure
- Electrical Safety
  - EN 50155: Rolling stock, vehicle body
- Flammability (PCBs)
  - UL 94 V-0
- Fire Protection
  - EN 45545-2, hazard level HL3

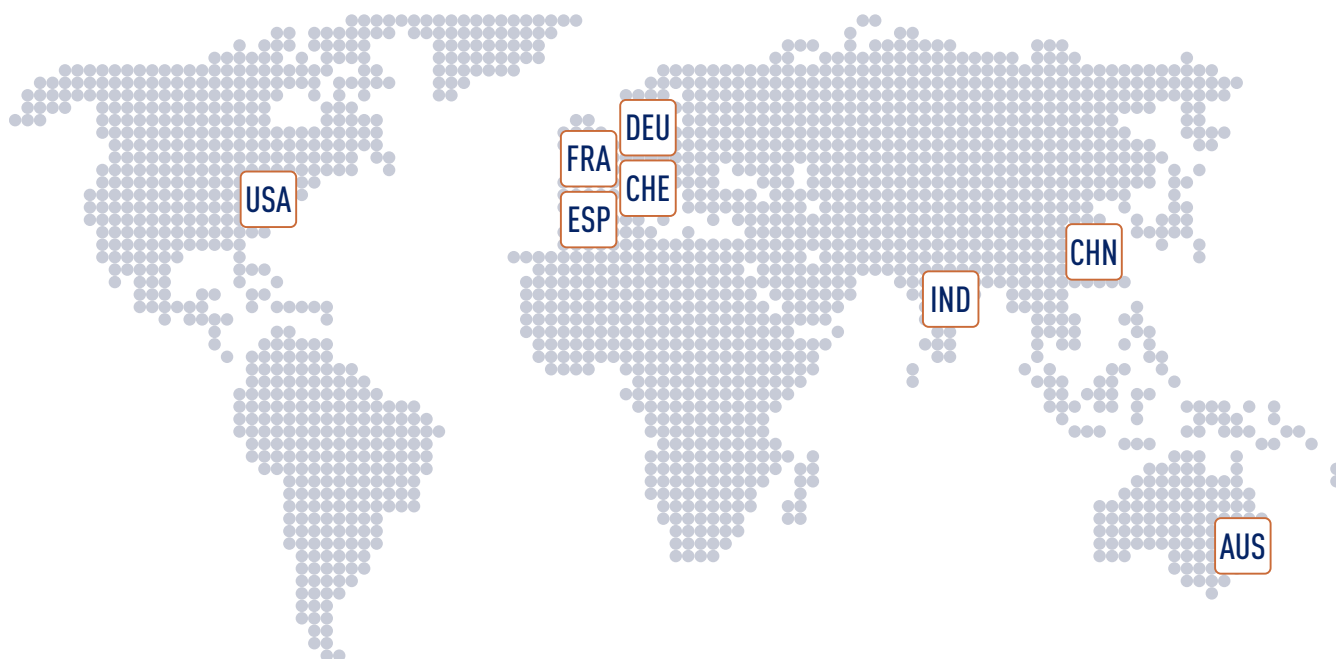
## EMC

- EN 50155: Rolling stock, vehicle body

## SOFTWARE SUPPORT

- PACY (Process Data Framework for Cyclic Applications)
- QNX

▶ See the product User Manual for details on software support: [www.duagon.com/products/k2/#doc](http://www.duagon.com/products/k2/#doc)



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### 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