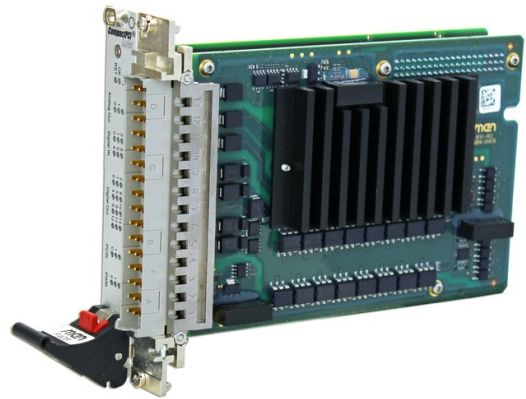


F405

Railway I/O Card - Data Acquisition & Control 3U CompactPCI

- » 32-bit/33-MHz CompactPCI
- » 16 digital outputs, high-side switching (load to ground)
- » 8 digital inputs
- » 2 analog outputs, current and voltage
- » 2 PWM outputs
- » 2 pulse counter inputs
- » 6 isolation groups
- » Status LEDs for each I/O function
- » Watchdog (software supervision)
- » -40°C to +85°C (qualified components)
- » EN 50155 compliant



Multiple I/O Functions and Status Indication

The F405 provides multiple I/O functions especially for Automatic Train Operation (ATO). All digital inputs can be operated with common GND or common positive voltage in the range of -110 V to +110 V. The pulse counter inputs can be used to connect a speed sensor and provide frequency and distance measurement as well as direction, standstill and rolling detection as built-in functions which are all integrated in the FPGA. The board's high-side switching digital outputs support voltages in the range from 24 V to 110 V. The analog outputs provide the output value as voltage or as current. With their programmable cycle and pulse length, the PWM outputs are suitable for, e.g., engine power control. The status of all inputs and outputs as well as the indication of OK and reset is shown via LEDs on the front panel.

Compact and Cost Saving

All I/O functions are located on one board and provided via one rugged I/O connector. This lowers the number of boards in the system, reducing system costs and minimizing the costs for maintenance and downtime.

Proven Components, Long-Term Availability

Due to its FPGA based design and the use of proven in use IP cores and hardware building blocks, the board provides reduced risk and effort as well as long-term availability.

Robustness and Safety Measures

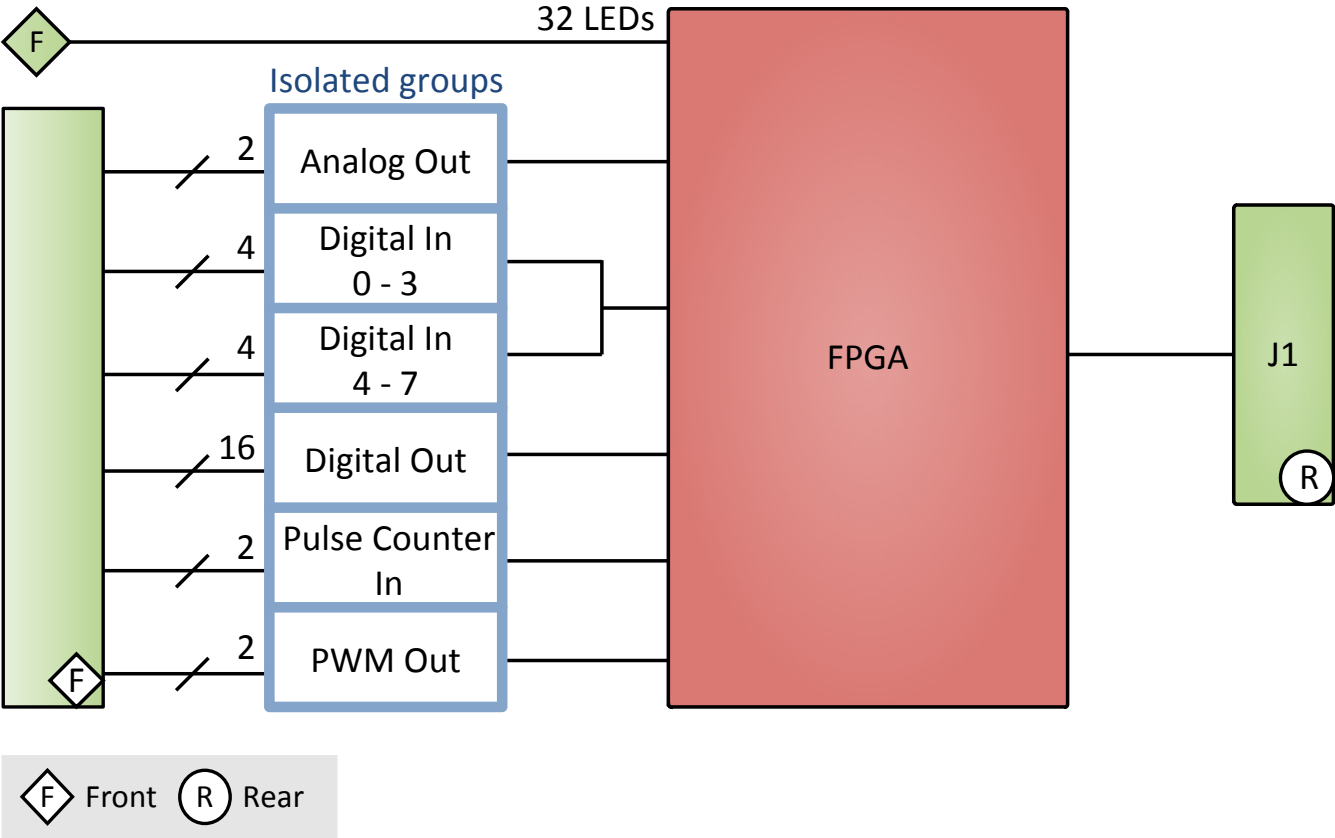
The F405 provides safe and reliable operation. In case of software failures or host connection problems, the watchdog function sets the outputs to a default state. Reverse polarity protection, overcurrent protection and readback function make the digital outputs safe and robust in use.

Designed for Harsh Environments

The F405 is designed for operation in a -40°C to +85°C temperature range according to EN 50155 class TX. The coated board withstands shock and vibration for reliable operation and a longer product life-time.

Designed for Rail Applications

The F405 is especially designed for in-vehicle railway applications, can be used in all train types and is compliant with EN 50155. With a guaranteed standard life-time of 10 years from product start, F405 facilitates the client's life-cycle management by making the overall system available at least for this period of time.



Digital Inputs

- Eight channels
 - Two isolated groups
- Input voltage
 - -110 V to +110 V
 - Logical High: -110 V to -9 V and +9 V to +110 V
 - Logical Low: -5 V to +5 V
- Input current
 - 1.5 mA to 7 mA, pulsed
- Input frequency
 - 500 Hz max.

Digital Outputs

- 16 channels
 - One isolated group
- Output voltage
 - 24 V, 48 V, 72 V, 96 V, 110 V nom. (EN 50155)
 - Voltage supplied from external source
- Output current
 - 200 mA max. per channel
 - 2000 mA max. total
- Output type
 - High-side switch outputs (load to ground)

Analog Outputs

- Two channels
 - One isolated group
 - Output value provided as voltage or current
- Output voltage range
 - 0 V to 10 V
 - Accuracy: ± 0.1 V
 - Voltage generated on board
- Output current range
 - 0 mA to 24 mA
 - Accuracy: ± 0.24 mA
- 16-bit digital-to-analog converter

PWM Outputs

- Two channels
 - One isolated group
- Output voltage
 - Logical High: 5 V to 10 V
 - Logical Low: 0 V to 1.5 V
 - Voltage generated on board
- Output current
 - 10 mA max. per channel
- PWM cycle length
 - Software configurable
 - 2 μ s to 65535 μ s
- PWM pulse length
 - Software configurable
 - 0 μ s to 65535 μ s

Pulse Counter Inputs

- Two channels
 - One isolated group
 - Frequency measurement: 0.1 Hz to 30 kHz
 - Optocoupler input
- Supported sensors
 - Sensors with digital output, e.g., Deuta DF-16, quadrature encoded for direction detection

Front Interfaces

- I/O
 - One 48-pin connector according to EN 60603-2, type F
- Status LEDs
 - OK
 - Reset
 - I/O channel status, one LED per channel

Supervision and Control

- Watchdog timer

Backplane Standard

- Compliance with CompactPCI Core Specification PICMG 2.0 R3.0
- Peripheral slot
- 32-bit/33-MHz CompactPCI bus
- V(I/O): +3.3 V

Electrical Specifications

- Supply voltage
 - +5 V
- Power consumption
 - 5 W max.
- Isolation voltage
 - 500 V AC min. (depending on isolation group)

Mechanical Specifications

- Dimensions
 - 3U, 8 HP
- Weight
 - 358 g (with heat sink) (model 02F405-00)

Environmental Specifications

- Temperature range (operation)
 - -40°C to +85°C (qualified components), compliant with EN 50155, class TX (model 02F405-00, 02F405-01)
- Temperature range (storage): -40°C to +85°C
- Cooling concept
 - Air-cooled, airflow 1.0 m/s min.
- Relative humidity (operation): max. 95% non-condensing
- Relative humidity (storage): max. 95% non-condensing
- Altitude: -300 m to +3000 m
- Shock: EN 50155 (12.2.11)
- Vibration: EN 50155 (12.2.11)
- Conformal coating

Reliability

- MTBF: 386 438 h @ 40°C according to IEC/TR 62380 (RDF 2000) (model 02F405-01)

Safety

- Electrical Safety
 - EN 50155:2007
 - EN 50155:2014
 - EN 50124-1:2001 + A1:2003 + A2:2005
- Flammability (PCBs)
 - UL 94 V-0

EMC

- EN 50121-3-2 (radiated emission)
- EN 50121-3-2 (conducted emission)
- EN 50121-3-2 (immunity)

Software Support

- Linux
- For more information on supported operating system versions and drivers see Software.

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www.men.de/products/f405/

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