

SIO142

Safety Digital Input/Output Module

Combined safety I/O module with 8 safe digital inputs and 4 safe digital outputs for safety applications with a low I/O count. Communication with the safety controller is provided via FSoE.

The inputs achieve SIL 2 / PL d (Category 3) in single-channel operation and SIL 3 / PL e (Category 4) when used in pairs. Equivalence and antivalence monitoring is performed directly within the module. Configurable digital input filters adapt signal acquisition to the connected sensors. Configurable test pulses on the inputs and OSSD test pulses on the outputs enable the detection of wiring errors such as cross faults, short circuits, and external voltages. The sensor supply provides up to 600 mA per channel, while voltage and current are measured by the module.

Part type designation	Part number
SDO104	On request
SDO104 EC	On request

Features

- Inputs
  - 8 inputs, SIL 2 / PL d (Cat. 3) in single-channel operation; SIL 3 / PL e (Cat. 4) when used in pairs
  - Singe-wire connection technology
  - Test pulses configurable from 100 µs to 500 ms
  - Sensor supply up to 600 mA per channel
  - Measurement of voltage and current of the sensor supply
  - Safety-rated signal preprocessing: equivalence, antivalence
  - Configurable digital input filters
  - Pulse extension
- Outputs
  - 4 outputs up to SIL 3 / PL e / Cat. 4
  - 2 A output current per channel
  - Configurable OSSD test pulses
  - Short-circuit and overload protection
  - FSoE fieldbus connection

preliminary

Common properties	
Basic function	8x safety digital input 24 V DC type 1/3 Standard sink 4x equivalence/antivalence 8x pulse extension 8x test pulses 4x safety digital output DC type 2 4x test pulses Parallel connection of outputs
System	Bachmann system M100
Fail safe digital inputs – 24 V	
Number of digital inputs	8
Signal standard	IEC 61131-2 type 1 / type 3 sink (P-reading)
Voltage category, nominal	24 V DC
Signals per supply group	4 (2 groups)
Connections per input	1 (1 signal, 4 clock signals, 4 GND connections total)
Signal supply voltage range	18 V DC to 32 V DC
Operating voltage range (high/on)	11 V DC to 32 V DC
Off-state voltage (low/off)	-32 V DC to +5 V DC
Overvoltage protection	-40 V DC to +40 V DC
Input current, on-state, nominal	2 mA
Input current, off-state, max.	0.5 mA
Signal on delay, max.	20 µs
Signal off delay, max.	20 µs
Digital spike filter	0. 200 µs, 500 µs, 1 ms, 2 ms, 5 ms, 10 ms, 20 ms, 50 ms, 100 ms, 1 s, 2 s, 5 s
Internal scan rate, max.	500 µs
Maximum input frequency	< 1 kHz
Impulse extension	Yes
Time stamps	No
Signal state indication	Yes, green numeric LED per channel
Signal cable length, shielded, max.	1000 m
Signal cable length, unshielded, max.	600 m
Signal supply monitoring	Yes

preliminary

Fail safe digital outputs – 24 V	
Test Pulses on Outputs	Yes, configurable
Number of digital outputs	
Signal standard	IEC 61131-2 type 2 source (HighSide, P-switching) (8x)
Voltage category, nominal	24 V DC
Output type	Semiconductor
Signals per supply group	2
Signal supply voltage range	18 V DC to 32 V DC
Overvoltage protection	-32 V to + 40 V
Connections per output	2 (DO,GND)
Output current per channel, nominal, continuous	2 A
Output current per group, max.	8 A
Paralleling outputs	Yes
Coupled outputs	Yes: 2 outputs can be combined
Signal on delay, max.	< 2 ms
Signal off delay, max.	< 2 ms
Internal scan rate, max.	500 µs
Signal inversion	No
Pulsetrains	No
Time triggered output	No
Signal state indication	Yes, green numeric LED per channel
Sensor/actuator supply 24 V DC	
Test Pulses on Sensor Supply	Yes, configurable
Number of supply points 24 V DC	4
Output current per channel, nominal, continuous	800 mA
Short-circuit protected, supply	Yes
Overvoltage protection	-40 V to + 40 V
Module-to-module communication	
Signal propagation to neighbour	No
Signal receiver from neighbor modules	No
Module bus interface	
System	M100
Slot type	IO (1/E, 2, 3, 4, ...31)
Synchronization/clocks	
Field bus cycle time, min.	500 µs

preliminary

Diagnostics	
Electronic type plate	Yes (application interface and in the engineering tool)
Machine readable type plate	Yes (QR code with type and part information and internet link)
Environmental conditions sensor	Integrated (temperature)
Operational indications	LED "MOD" (red/green) module status LED "CH" (red/green) channel status summary LED "SAF" (red/green) safety status Numeric LED per channel (green) digital level of the channel
Powerfail, logic supply	Yes
Powerfail, signal supply	Yes
Overload/short-circuit	Yes
Open circuit	Yes
Mismatch output readback	Yes
Energy supply	
Supply voltage, nominal	24 V DC
Supply voltage, range	18 V DC to 32 V DC
Supply voltage, short-term overload	40 V
Power dissipation, typ./max.	< 2.5 W
Reverse polarity protection signal supply	Yes, continuously (up to -40 V)
Supply terminal block bridge	No
Product safety	
Galvanic isolation	850 V AC
Galvanic isolation between supply groups	No
Degree of protection acc. IEC 60529	IP40, terminal block IP30
Protection class acc. IEC 61010-1, IEC 61010-2-201	III
Overvoltage category acc. IEC 61010-1	II
Rated impulse withstand voltage acc. IEC 61000-4-5	Supply DC: • 500 V DM • 1000 V CM
Short-circuit protected, outputs	Thermal overload protection
Keying of terminal block	Yes (6-fold per 4 contacts)
Environmental conditions	
Temperature range, operating	-30 °C to +70 °C
Temperature range, transport and storage	-40 °C to +85 °C
Installation altitude, max.	Up to 2000 m without temperature derating 2000 m to 4500 m: Reduction of the max. ambient temperature by 0.1 °C per 100 m elevation
Air pressure	106 kPa to 58 kPa (0 m to 4500 m)
Relative humidity, operation	Standard: 0 % to 100 % noncondensing Extended Climate: 0 % to 100 % with temporary condensation
Pollution degree acc. IEC 61010-1	Standard: 2, noncondensing Extended Climate: 2
Vibration	6 g (14.1 Hz to 500 Hz) 7.5 mm amplitude (2 Hz to 14.1 Hz) Test duration: 15 h
Shock	45 g max. (test scope 18 shocks) 20 g permanently (test scope 6000 shocks)

preliminary

Approvals/certificates	
Functional safety	Yes: IEC 61508, IEC 62061, IEC 61131, ISO 13849 (SIL 3/ PLe/ Cat.4)
Maritime	ABS, BV, ClassNK, DNV, KR, LR, RINA: in preparation
Hazardous substances and waste treatment	RoHS, RoHS China, REACH, WEEE
Quality management	ISO 9001 for development and production

Accessories

Part type designation	Part number	Description
BPR1nn	00039235-nn	Backplane for DIN-rail mounting Active backplane system M100: BPR1nn with nn = 04 to 16 slots in increments of 1, as well as 20, 24, 28, 32 slots, for DIN-rail mounting; delivery without backplane slot covers and without mounting rail
BPR1nn EC	00039236-nn	Like BPR1nn; Extended Climate Range
BPS1nn	00039237-nn	Backplane for direct screw mounting Active backplane system M100: BPS1nn with nn = 04 to 16 slots in increments of 1, as well as 20, 24, 28, 32 slots, for direct screw mounting; delivery without backplane slot covers and without screws
BPS1nn EC	00039238-nn	Like BPS1nn; Extended Climate Range
TPI100_W24_P5.0_Cgy_L1to24		Signal terminal block Completely removable terminal block, push-in spring connector for system M100, 24-way/contacts, pitch 5.0 mm, female, conductors flexible 0.2 mm² to 2.5 mm² (24 to 14 AWG), solid 0.2 mm² to 1.5 mm² (24 to 16 AWG), with wire end ferrules 0.25 mm² to 1.5 mm² (24 to 16 AWG), stripping length: 10 mm, rating: 300 V / 8 A per contact, connector color: gray, push-release: yellow, labeling: 1 to 24
TPI100_W4_P5.0_Cgy_Lsup		Supply terminal block Completely removable terminal block, push-in spring connector for system M100, 4-way/contacts, pitch 5.0 mm, female, conductors flexible 0.2 mm² to 2.5 mm² (24 to 14 AWG), solid 0.2 mm² to 1.5 mm² (24 to 16 AWG), with wire end ferrules 0.25 mm² to 1.5 mm² (24 to 16 AWG), stripping length: 10 mm, rating: 300 V / 8 A per contact, connector color: gray, push-release: yellow, labeling: 1+/1-/2+/2-
TKP106		Keying element Keying element for signal terminal blocks and supply terminal blocks TPI100 for system M100, plastic ring with 6 keying elements
TPI100_W24_W4_Set [1)]	00042412-00	Terminal block set for M100 standard modules: • 1x TPI100_W24_P5.0_Cgy_L1to24 • 1x TPI100_W4_P5.0_Cgy_Lsup • 2x TKP106

[1)] *All components of the set are also available in bulk packages.*

preliminary