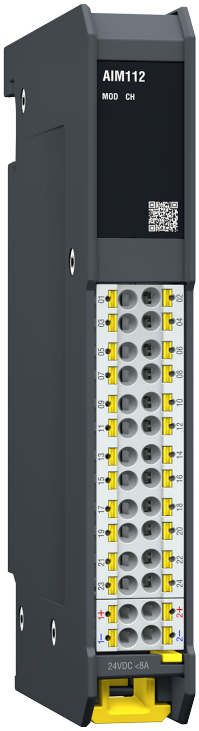

AIM112

Analog Input Module (Multi)

Modern automation solutions are highly dependent on precise, fast and robust sensors with an analog interface. The wide range of interfaces required for integration can be challenging here. This is especially the case when a large number of different interfaces requires a correspondingly large variety of types of acquisition modules.

This is a challenge that the AIM112 type modules meet very easily. Up to 12 analog inputs can be individually configured to the desired signal type. The modules provide both the common standard signals for current loops (4 mA to 20 mA, ±20 mA) and 4 high-impedance voltage measuring ranges (±10 V to ±10 mV), each adapted to the conversion range. Alternatively, channel types for all industrially relevant thermocouples including integrated characteristic linearization are available for measuring very wide temperature ranges.

Precise signal conversion is possible with a 16-bit resolution and at very high sampling rates thanks to the special measurement electronics. Widely adjustable filter chains, precisely tuned to the signal path, ensure a configurable balance between interference suppression and measurement dynamics. A hardware-accelerated high-speed interpolation that can be activated as required provides continuous measurement signals independent of the filter settings and even with very short bus cycles.

Part type designation	Part number
AIM112	00028978-00
AIM112 EC	00039170-00

Features

- 12 channel analog input module
- Channel-by-channel configurable signal type
- Temperature measurement:
  Thermocouple types J, K, T, N, E, R, S, B
- Voltage measurement ±10 V, ±1 V, ±100 mV, ±10 mV
- Current input ±20 mA, 4 mA to 20 mA
- Value range and measured value monitoring
- Synchronous clocks / latch

Common properties	
Basic function	12x analog input current, voltage, thermocouple
System	Bachmann system M100
Analog inputs – voltage	
Number of analog inputs	0 to 12 configurable
Signal standard	±10 V, ±1 V, ±100 mV, ±10 mV
Measurement range	±10.5 V; ±1.05 V; ±105 mV; ±10.5 mV (105 %)
Resolution (ADC)	16 bit
Accuracy at T_a = +25 °C	Measurement range ±10 V: 0.05 % FS Measurement range ±1 V: 0.05 % FS Measurement range ±100 mV: 0.05 % FS Measurement range ±10 mV: 0.2 % FS
Connections per input	2 (+/- differential)
Common mode voltage, max.	Measurement range ±10 V: ±1 V Measurement range ±1 V: ±1 V Measurement range ±100 mV: -1 V to +4 V Measurement range ±10 mV: ±3 V
Common mode rejection	±10 V ±0.04 % FS/V ±1 V ±0.08 % FS/V ±100 mV ±0.2 % FS/V ±10 mV ±0.25 % FS/V
Cross-talk rejection	> 60 dB
Internal scan rate, max.	10 kHz
Digital low pass filter cut-off frequency	3500 Hz to 0.875 Hz configurable
Digital low pass filter slope	> 80 dB/decade
Input impedance	> 100 kΩ
Signal cable length, shielded, max.	1000 m [1)]
Signal cable length, unshielded, max.	3 m
Interpolation	Yes (linearly interpolated intermediate values, delayed output)
Oversampling	No
Process data	Analog value Diagnostics channel quality information
Time stamps	No

[1)] *Depending on the measuring range used and the required accuracy, shorter line lengths must be provided.*

Analog inputs – current	
Number of analog inputs	0 to 12 configurable
Signal standard	4 mA to 20 mA, ±20 mA
Measurement range	At 4 mA to 20 mA: measurement range -13 mA to 21 mA At -20 mA to 20 mA: measurement range -21 mA to 21 mA
Resolution (ADC)	16 bit
Accuracy at T_a = +25 °C	Measurement range 4 mA to 20 mA: 0.2 % FS (typ.); 0.2 % FS (max.) Measurement range ±20 mA: 0.1 % FS (typ.); 0.1 % FS (max.)
Connections per input	2
Common mode voltage, max.	±6 V
Common mode rejection	±20 mA ±0.08 % FS/V 4 mA to 20 mA ±0.16 % FS/V
Cross-talk rejection	> 60 dB
Internal scan rate, max.	10 kHz

Analog inputs – current	
Digital low pass filter cut-off frequency	875 Hz to 0.875 Hz configurable
Digital low pass filter slope	> 80 dB/decade
Input impedance	≤ 270 Ω
Signal cable length, shielded, max.	1000 m
Signal cable length, unshielded, max.	3 m
Interpolation	Yes (linearly interpolated intermediate values, delayed output)
Oversampling	No
Process data	Analog value Diagnostics channel quality information
Time stamps	No
Analog inputs – thermocouple	
Number of analog inputs	0 to 12 configurable
Signal standard	Thermocouples type J, K, T, N, E, R, S, B
Measurement range	Measurement range J: -100 °C to +1200 °C Measurement range K: -50 °C to +1370 °C Measurement range T: -30 °C to +400 °C Measurement range N: -50 °C to +1300 °C Measurement range E: -100 °C to +1000 °C Measurement range R: -30 °C to +1768 °C Measurement range S: -50 °C to +1768 °C Measurement range B: +600 °C to +1820 °C
Resolution (ADC)	16 bit
Accuracy at T_a = +25 °C	Measurement range J: ±0.15 % FS Measurement range K: ±0.15 % FS Measurement range T: ±0.3 % FS Measurement range N: ±0.15 % FS Measurement range E: ±0.15 % FS Measurement range R: ±0.25 % FS Measurement range S: ±0.25 % FS Measurement range B: ±0.25 % FS
Connections per input	2 (differential)
Cold junction compensation	Internal measuring point: ±5 °C Via set value (e.g. from external sensor). The use of an external cold junction reference is recommended.
Common mode voltage, max.	±3 V
Common mode rejection	Measurement range J: ±0.40 % FS/V Measurement range K: ±0.45 % FS/V Measurement range T: ±1.40 % FS/V Measurement range N: ±0.65 % FS/V Measurement range E: ±0.40 % FS/V Measurement range R: ±0.65 % FS/V Measurement range S: ±0.65 % FS/V Measurement range B: ±0.70 % FS/V
Cross-talk rejection	> 60 dB
Internal scan rate, max.	10 kHz
Digital low pass filter cut-off frequency	0.875 Hz to 875 Hz configurable
Digital low pass filter slope	> 80 dB/decade
Input impedance	> 100 kΩ
Signal cable length, shielded, max.	1000 m

Analog inputs – thermocouple	
Signal cable length, unshielded, max.	3 m
Interpolation	Yes (linearly interpolated intermediate values, delayed output)
Oversampling	No
Process data	Analog value Diagnostics channel quality information
Time stamps	No
Module bus interface	
System	M100
Slot type	IO (1/E, 2, 3, 4, ...31)
Module data rate	Typ.: 0 Mbit/s to 33.6 Mbit/s depending on the configuration
Bus cycle time, min.	4.5 µs [1)]

[1)] *Depending on the fieldbus used and the respective configuration, lower data rates and longer cycle times can be expected.*

Synchronization/clocks	
Distributed clocks	Yes
Time resolution	1 ns (64 bit)
Time precision	25 ns within the station 100 ns via network (typ.) 1 µs via network (max.)
Synchronization functions	Synced operation Synced with oversampling operation
Latch input	AIV AIC TC
Field bus cycle time, min.	100 µs [1)]

[1)] *Depending on the fieldbus used and the respective configuration, lower data rates and longer cycle times can be expected.*

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
Error indications	Supply voltage too low Cable break / open signal circuit Threshold value overshoot
Powerfail, logic supply	No
Powerfail, signal supply	Undervoltage < 15.0 V (fallback > 17.5 V)
Overload/short-circuit	No
Open circuit	Yes
Mismatch output readback	No
Measurement range monitoring	Yes, upper/lower limit
Configurable threshold monitoring	Yes, configurable upper/lower limit
Energy supply	
Supply voltage, nominal	24 V DC
Supply voltage, range	18 V DC to 32 V DC
Power consumption from 24 V signal supply	3.3 W
Maximum residual ripple 24 V signal supply	±2.4 V

Energy supply	
Overcurrent protection required	No internal protection External protection with circuit breaker characteristic: B, C, D, Z or K Max. nominal current 8 A DC
Power dissipation, typ./max.	3.7 W / 3.9 W
Reverse polarity protection signal supply	Yes, continuously (up to -32 V)
Power consumption from backplane	480 mW
Supply terminal block bridge	Yes (1+ on to 2+, 1- on to 2-)
Product safety	
Galvanic isolation	850 V AC
Galvanic isolation between supply groups	No
Galvanic isolation between inputs	No
Permitted potential difference between analog channels	No isolation between channels
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
Keying of terminal block	Yes (6-fold per 4 contacts)
Environmental conditions	
Temperature range, operating	Standard: -30 °C to +60 °C Extended Climate: -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)
Approvals/certificates	
Product safety	CE, UKCA cULus (NRAQ, NRAQ7)
Hazard area operation	ATEX: Ex II 3G Ex ec IIC Gc
Maritime	ABS, BV, DNV, KR, LR, NK, RINA: in preparation
Hazardous substances and waste treatment	RoHS, RoHS China, REACH, WEEE
Quality management	ISO 9001 for development and production
Engineering	
Configuration tool	SolutionCenter (≥ V2.75)
Firmware package update	Yes (via SolutionCenter or console interface on the head module)

Mounting/installation	
Mounting type	Inserting and screwing onto the backplane with integrated M4 screw
Ground connection for protection class I	No
Dimensions	
Number of slots	1
Size unpacked W × H × D	23.3 mm × 152.5 mm × 95.7 mm
Mass unpacked	271 g

Order data

Part type designation	Part number	Description
AIM112	00028978-00	Analog input multitype module system M100 Configurable: 12x analog In ±0.01 V, 0.1 V, 1 V, 10 V, ±20 mA, 4 mA to 20 mA; thermocouples (J, K, T, N, E, R, S, B), 16 bit; synchronization, isolated from system, without terminal block
AIM112 EC	00039170-00	Like AIM112 with Extended Climate Range

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.*