

10.4.2 Analog input module AI 8 x 16 Bit

Article numbers

Standard module: 6ES7 650-8AK60-0AA0

Module with conformal coating: 6ES7 650-8AK60-1AA0

Properties

The analog input module AI 8 x 16 Bit is characterized by the following properties:

- 8 inputs and 8 outputs (for supplying of 2-wire transducers)
- HART conforming
In non-redundant operation, connection of a resistance of approximately 100 in series with the transducer is recommended.
- Resolution of 15 bits + sign (regardless of integration time)
- Setting of the transducer for each module (via a jumper at terminals 10 and 11):
 - 2-wire transducer current, only in measuring range 4 ... 20 mA
 - 4-wire transducer current
- Configurable measuring range for each channel
 - 0 ... 20 mA
 - ± 20 mA
 - 4 ... 20 mA
- Configurable smoothing for each channel
- Configurable integration time/interference frequency suppression for each channel
- Configurable diagnostics
- Configurable diagnostic interrupt
- Electrical isolation
 - Channels electrically isolated for 4-wire transducer to load voltage L+
 - Channels electrically isolated from IM 650
- Group error display (SF LED)
- Configuration in Run (CiR) supported

Wiring and block diagrams of the AI 8 x 16 Bit with 2-wire transducer operation

If the module is used for 2-wire transducer operation, a jumper must be inserted between terminals 10 and 11. This activates the short-circuit-protected transducer supply of the module and implements the jumpering at the analog input.

All channels of the module operate in 2-wire transducer mode in this case. This is shown in the figure below using channel 0 as an example.

The parameter assignment is made via HW Config as "2WMT current"

* The Zener diodes 5.1 V (e.g., BZX85C5V1) are only required if a module is pulled and the system should continue to run.

Technical specifications of the AI 8 x 16 Bit

Technical specifications	
Dimensions and weight	
Dimensions W x H x D (mm)	40 x 125 x 117
Weight	Approx. 205 g
Module-specific data	
Number of inputs	8
Number of supply outputs	8
Cable length, shielded	Max. 800 m
Temperature range	
• Horizontal mounting position	0 °C to 60 °C
• Vertical mounting position	0 °C to 40 °C
Voltages, currents, potentials	
Rated load voltage L+	24 V DC
• Reverse polarity protection	Yes
Power supply of the 2-wire transducer	Yes
• Short-circuit-proof	Short-circuit current approx. 40 to 60 mA
Electrical isolation	
• Between the channels and backplane bus	Yes
• Between channels	Permissible common-mode voltage in the case of 4-wire transducer: 75 V DC 60 V AC
• Between the channels and load voltage L+	For 2-wire transducer: No For 4-wire transducer: Yes
• Between the backplane bus and load voltage L+	Yes
Isolation, designed for basic isolation	
• Between the channels and backplane bus (U_{ISO})	75 V DC 60 V AC
• Between the channels and load voltage L+	For 4-wire transducer: 75 V DC 60 V AC
• Between the backplane bus and load voltage L+	75 V DC 60 V AC
Isolation tested	
• Channels from backplane bus and load voltage L+	500 V AC or 707 V DC, type test
• Backplane bus from load voltage L+	500 V AC or 707 V DC, type test
• Between channels	No
Current consumption	

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Technical specifications			
• From backplane bus		Max. 120 mA	
• From load voltage L+ (supply current of all connected transducers)		Typ. 20 mA per transducer	
Power loss of the module		Approx. 1.5 W	
Analog value formation			
Measuring principle	SIGMA-DELTA		
Integration time/ interference frequency suppression (per channel)	60 Hz	50 Hz	10 Hz
• Configurable	Yes	Yes	Yes
• Integration time in ms	16.6	20	100
• Basic conversion time including inte- gration time in ms (per channel)	55	65	305
• Basic execution time of the module (all channels enabled) in ms	440	520	2440
• Resolution in bits + sign (including overrange)	15 + sign	15 + sign	15 + sign
• Smoothing of the measured values	Yes, assignable in 4 levels:		
	Level: None Weak Medium Strong		Time constant: 1 x cycle time * 4 x cycle time * 32 x cycle time * 64 x cycle time *
Noise suppression, error limits			
Interference voltage suppression for $f = n \times (f_1 \pm 1 \%)$, (f_1 = interference frequency)			
• Common-mode interference (only possible with 4-wire trans- ducers ($U_{cm} < 60 \text{ V AC}$)		> 100 dB	
• Series-mode interference (peak value of disturbance < nomi- nal value of input range)		> 40 dB	
Crosstalk attenuation between inputs ($U_{iso} < 60 \text{ V}$)		> 70 dB	
Operating error		$\pm 0.15\%$	
Basic error		$\pm 0.1\%$	
Temperature error (relative to input range)		$\pm 0.001\%/K$	
Linearity error (relative to input range)		$\pm 0.01 \%$	
Repeatability (in steady-state condition at 25 °C, relative to input range)		$\pm 0.1\%$	
Status, interrupts, diagnostics			
Status display		No	
Group error display (SF LED)		Yes	
Diagnostic interrupts		Configurable	
Diagnostic functions		Configurable	
Characteristics of the transducer supply			

Technical specifications		
Output voltage for transducer and cable with 22 mA transducer current (measurement resistance on module already taken into account)	≥ 18 V (when UN = 24 V)	
Sensor selection data		
Input ranges (rated values / input resistance)		
Current	0 mA to 20 mA 4 mA to 20 mA ± 20 mA	140 Ω 140 Ω 140 Ω
Permissible input current for current input (destruction limit)	40 mA	

* Cycle time = Basic conversion time per channel x Number of enabled channels

10.4.2.1 Parameters of the AI 8 x 16 Bit

Parameter assignment

The parameters are assigned using the parameter assignment dialog of HW Config

Parameters of the AI 8 x 16 Bit

The table below provides an overview of the assignable parameters and their default settings for the AI 8 x 16 Bit.

The default settings apply when you have not assigned parameters in HW Config or you have not changed any parameters.

Table 10-11 Parameters of the AI 8 x 16 Bit

Parameter	Value range	Default setting	Scope
Diagnostic interrupt enable	Yes / No	Yes	Module
Diagnostics			
Group diagnostics analog	Yes / No	Yes	Channel
Wire break check	Yes / No	Yes	Channel
Smoothing	None Weak Medium Strong	None	Channel
Measurement type	Disabled 4WMT * current 2WMT * current	4WMT * current	Module