Inline terminal: 8 analog inputs
ILT AI 8/SF
IB IL AI 8/SF

Device description

SysMik® GmbH Dresden

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Contents

1 Description

Note: This device description is only valid in association with the IL SYS INST UM user manual or the Inline system manual of the specifically used bus system.
Make sure you always use the latest documentation – it can be downloaded at www.sysmik.de.

The terminal is designed for use within an Inline station. It is used to acquire analog voltage or current signals.

Merkmale

- Eight analog single-ended signal inputs for the connection of either voltage or current signals
- Connection of sensors in 2-wire technology
- Various current and voltage measuring ranges
- Channels are configured independently of one another using the bus system
- 16-bit analog/digital converter
- Diagnostics indicator

2 Order information

Description	Type	Part number	Pcs./Pkt.
Inline analog input terminal, complete with accessories (connector and labeling field), 8 inputs, 0 mA ... 20 mA, 4 mA ... 20 mA, ±20 mA, 0 V ... 10 V, ±10 V, (additionally 0 mA ... 40 mA, ±40 mA, 0 V ... 5 V, ±5 V, 0 V... 25 V, ±25 V, 0 V ... 50 V), 2-wire connection technology	ILT AI 8/SF	1225-100496-01-3	1
Alternatively usable terminal:	IB IL AI 8/SF	2727831	1

Optional Add-Ons (Purchase via Phoenix Contact):

Description	Type	Part no.	Pcs./Pkt.
Inline shield connector for analog Inline terminals	IB IL SCN 6-SHIELD-TWIN	2740245	5
User manual: "Automation Terminals of the Inline Product Range"	IL SYS INST UME	2698737	1

3 Technical data

General Data	
Housing dimensions (width x height x depth)	48.8 mm x 136.8 mm x 71.5 mm
Weight	213 g (with connectors)
Connection method for actuators	2-wire technology with shield connection
Ambient temperature (operation)	-25 °C to +55 °C
Ambient temperature (storage/transport)	-25 °C to +85 °C
Permissible humidity (operation/storage/transport)	10 % to 95 % according to DIN EN 61131-2
Permissible air pressure (operation/storage/transport)	70 kPa to 106 kPa (up to 3000 m above sea level)
Degree of protection	IP20
Class of protection	III, IEC 61140, EN 61140, VDE 0140-1
Connection data for Inline connector	
Connection method	Spring-cage terminals
Conductor cross-section	0.08 mm² to 1.5 mm² (solid or stranded), 28 – 16 AWG
Connection data for UL approvals	
Connection method	Spring-cage terminals
Conductor cross-section	0.2 mm² to 1.5 mm² (solid or stranded), 24 – 16 AWG

Interface	
Local bus	Data routing
Transmission speed	500 kBit/s

Power consumption	
Communications power U_L	7,5 V DC
Current consumption from U_L	48 mA (typical) / 55 mA (maximum)
I/O supply voltage U_{ANA}	24 V DC
Current consumption at U_{ANA}	24 mA (typical) / 35 mA (maximum)
Total power consumption	936 mW (typical)

Supply of the Module Electronics and I/O Through the Bus Coupler/Power Terminal	
Connection method	Potential routing

Analog input stages	
Voltage inputs	
Input resistance	240 kΩ, minimum
Characteristics of the input filters (input stage)	1st order
Limit frequency (-3 dB) of the input filters	3.5 kHz
Behavior on sensor failure	Goes to 0 V
Maximum permissible voltage between analog voltage inputs and an analog reference potential or between two voltage inputs	50 V
Current inputs	
Input resistance	25 Ω (Shunt)
Limit frequency (-3 dB) of the input filters	3,5 kHz
Behavior on sensor failure	Goes to 0 mA or 4 mA
Maximum permissible voltage between analog current inputs and an analog reference potential or between two current inputs	±2.5 V (correspondends to 100 mA via shunts)
Maximum permissible current in every input	±100 mA

Safety Equipment	
Surge voltage and overcurrents	100% overload, maximum

Electrical isolation/isolation of the voltage areas
To provide electrical isolation between the logic level and the I/O area, it is necessary to supply the station bus coupler and the sensors connected to the analog input terminal described here from separate power supply units. Interconnection of the power supply units in the 24 V area is not permitted (see also IL SYS INST UM E user manual).
Common potentials
The 24 V main voltage, 24 V segment voltage, and GND have the same potential. FE is a separate potential area.
Separate potentials in the system consisting of bus coupler/power terminal and I/O terminal

Test distance	Test voltage
7.5 V supply (bus logic), 24 V supply UANA/I/O	500 V AC, 50 Hz, 1 min.
7.5 V supply (bus logic), 24 V supply UANA/functional earth ground	500 V AC, 50 Hz, 1 min.
I/O/functional earth ground	500 V AC, 50 Hz, 1 min.

Error Messages to the Higher-Level Control or Computer System	
Failure of supply voltage U_{ANA}	Yes
Peripheral / user failure	Yes, if peripheral voltage is missing or device failure

Tolerance and Temperature Response

The percentage values refer to the relevant positive measuring range final value. Unless stated otherwise, nominal operation (nominal voltage, preferred mounting position, default format, default filter setting, identical measuring range setting for channels) is used as the basis. The tolerance values refer to the operating temperature range specified in the tables. The operable range outside this temperature range is not taken into consideration. Please also take into consideration the tolerances influenced by electromagnetic interference.
The maximum tolerance values represent the worst-case measurement inaccuracy. They contain the theoretical maximum possible tolerances in the corresponding measuring ranges as well as the theoretical maximum possible tolerances of the calibration and test equipment.

Voltage inputs: Tu = 25 °C

Measuring range	Absolute (typical)	Absolute (maximum)	Relative (typical)	Relative (maximum)
0 V ... 5 V; ±5 V	± 1.0 mV	± 5.0 mV	± 0.02 %	± 0.10 %
0 V ... 10 V; ±10 V	± 2.0 mV	± 10.0 mV	± 0.02 %	± 0.10 %
0 V ... 25 V; ±25 V	± 5.0 mV	± 25.0 mV	± 0.02 %	± 0.10 %
0 V ... 50 V	±10.0 mV	± 50.0 mV	± 0.02 %	± 0.10 %

Voltage inputs: Tu = -25 °C...+55 °C

Measuring range	Absolute (typical)	Absolute (maximum)	Relative (typical)	Relative (maximum)
0 V ... 5 V; ±5 V	± 5.0 mV	± 15.0 mV	± 0.10 %	± 0.30 %
0 V ... 10 V; ±10 V	± 10.0 mV	± 30.0 mV	± 0.10 %	± 0.30 %
0 V ... 25 V; ±25 V	± 25.0 mV	± 75.0 mV	± 0.10 %	± 0.30 %
0 V ... 50 V	± 50.0 mV	± 150.0 mV	± 0.10 %	± 0.30 %

Current inputs: Tu = 25 °C

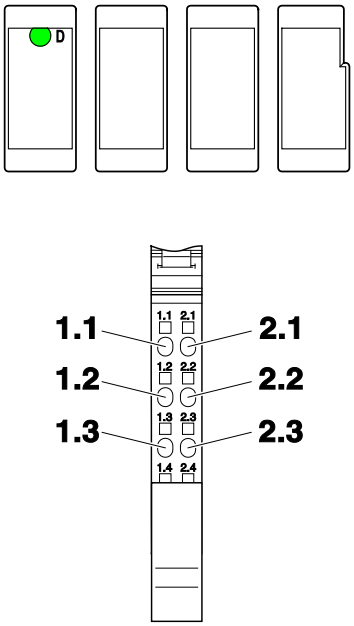
Measuring range	Absolute (typical)	Absolute (maximum)	Relative (typical)	Relative (maximum)
0 mA ... 20 mA; 4 mA ... 20 mA; ±20 mA	± 8.0 µA	± 40.0 µA	± 0.04 %	± 0.20 %
0 mA ... 40 mA; ±40 mA	± 16.0 µA	± 80.0 µA	± 0.04 %	± 0.20 %

Current inputs: Tu = 25 °C

Measuring range	Absolute (typical)	Absolute (maximum)	Relative (typical)	Relative (maximum)
0 mA ... 20 mA; 4 mA ... 20 mA; ±20 mA	± 28.0 µA	± 80.0 µA	± 0.14 %	± 0.40 %
0 mA ... 40 mA; ±40 mA	± 56.0 µA	± 160 µA	± 0.14 %	± 0.40 %

Additional Tolerances Influenced by Electromagnetic Fields		
Type of electromagnetic interference	**Typical deviation of the measuring range final value (voltage input), relative**	**Typical deviation of the measuring range final value (current input), relative**
Electromagnetic fields; field strength 10 V/m according to EN 61000-4-3/IEC 61000-4-3	< ±2 %	< ±2 %
Conducted interference Class 3 (test voltage 10 V) according to EN 61000-4-6/IEC 61000-4-6	< ±1 %	< ±1 %
Fast transients (burst) 4 kV supply, 2 kV input according to EN 61000-4-4/IEC 61000-4-4	< ±1 %	< ±1 %

4 Local diagnostic and status indicators / Terminal point assignment



Local diagnostic and status indicators

Designation	Color	Meaning
D	gren	Diagnostics

Terminal point assignment for each connector

Terminal point	Signal	Assignment
1.1	+U1	Voltage input cannel 1
2.1	+U2	Voltage input cannel 2
1.2	+I1	Current input cannel 1
2.1	+I2	Current input channel 2
1.3, 2.3	-1, -2	Minus input (for both current and voltage)
1.4, 2.4	Shield	Shield connection

Functional identification: green

Fig. 1: local diagnostic and status indicators / terminal point assignment

5 Internal circuit diagram

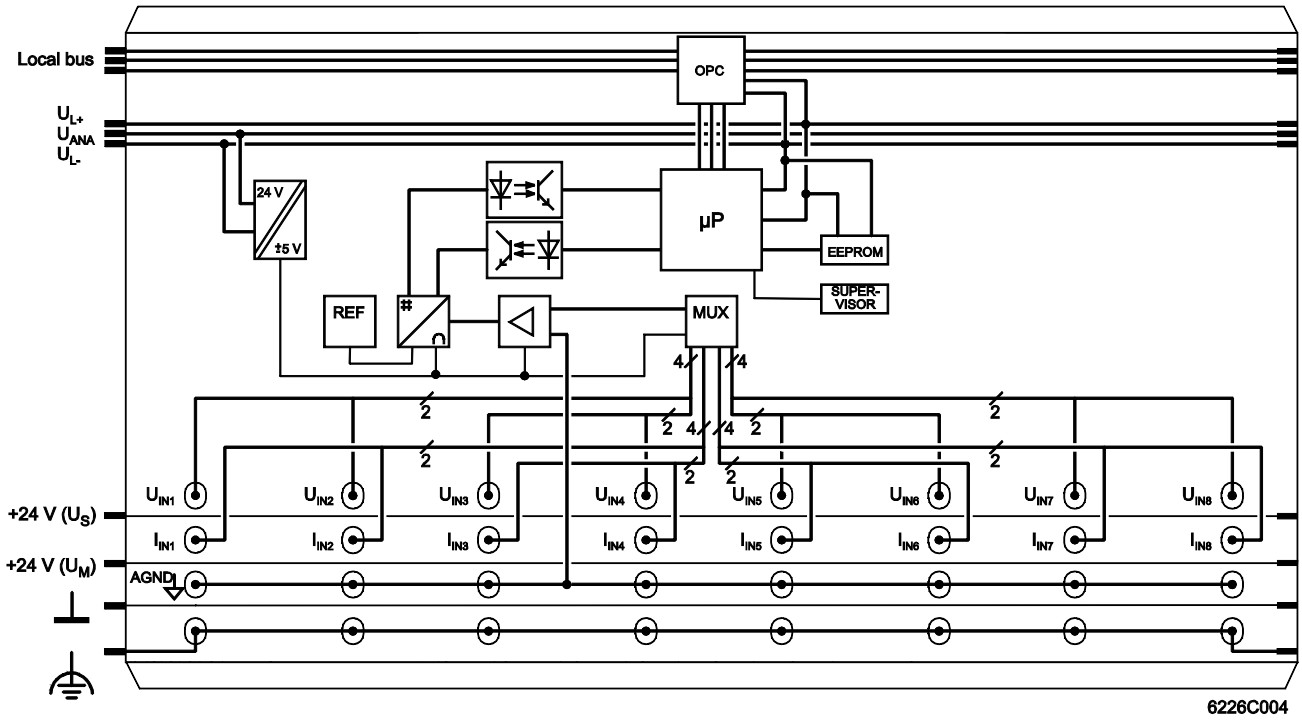


Fig. 2: Internal wiring of terminal points

Key:

OPC	**Protocol chip**		**Power supply unit with electrical isolation**
	Optocoupler	REF	Reference voltage source
µP	Microprocessor		Analog/digital converter
EEPROM	Electrically erasable programmable read-only memory		Amplifier
SUPER-VISOR	Microprocessor monitoring	MUX	Multiplexer

Note: Other symbols used are explained in the IL SYS INST UM E user manual or in the Inline system manual for your bus system.

6 Electrical isolation

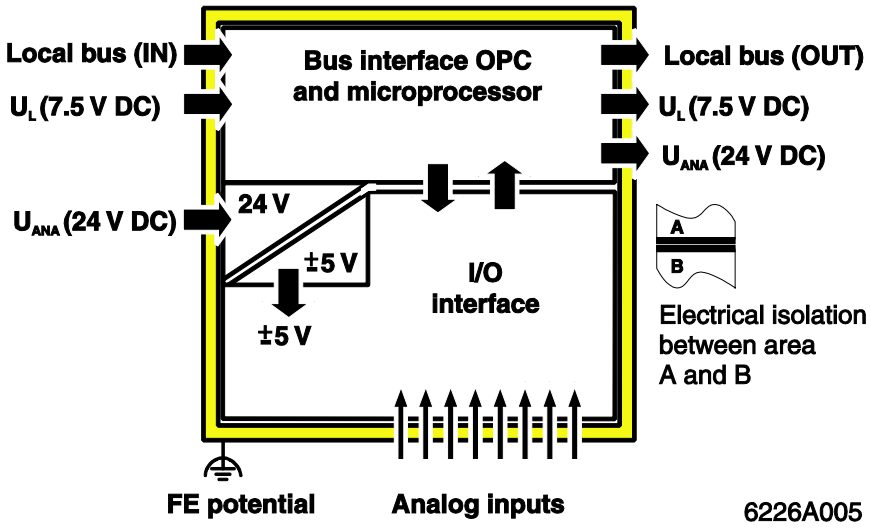


Fig. 3: Electrical isolation of the individual function areas

7 Installation instruction

High current flowing through potential jumpers U_M and U_S leads to a temperature rise in the potential jumpers and inside the terminal. To keep the current flowing through the potential jumpers of the analog terminals as low as possible, always place the analog terminals after all the other terminals at the end of the main circuit (for the sequence of the Inline terminals: see also IL SYS INST UM E user manual).

8 Connection notes

NOTE: Invalid measured values

Do not apply current and voltage signals to one input channel simultaneously as you will not obtain valid measured values.

NOTE: Module damage

Do not connect voltages above ±2.5 V to a current input. The module electronics will be damaged, as the maximum permissible current of ±100 mA will be exceeded.

Always connect the analog sensors using shielded, twisted pair cables.

Connect the shielding to the Inline terminal using the shield connection clamp. The clamp connects the shield directly to FE on the terminal side. Additional wiring is not necessary.

Insulate the shielding at the sensor or connect it with a high resistance and capacitance to the PE potential.

9 Connection examples

Note: Observe the Connection notes!

Fig. 4 shows the connection schematicly (without shield connector).

Connection oft active sensors

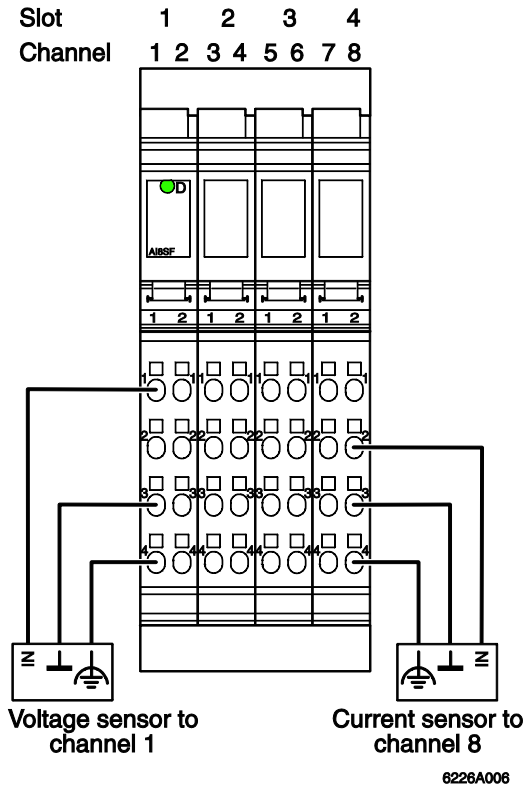


Fig. 4: Connection of active sensors in 2-wire technology with shield connection

The sensors have the same reference potential!

10 Application notes

Notes on typical applications are provided here in order to facilitate optimum use of the terminal in different operating modes.

Precision DC measurements

Precision DC measurements constitute an optimum area of application for the terminal. The high-resolution analog/digital converter and excellent instrumentation amplifier technology achieve a very high level of accuracy (typically 0.02% in the voltage range).

In order to take full advantage of these features, the following is recommended:

- Filtering: 32-sample mean value

This suppresses undesirable interference signals and provides a low-noise, accurate measured result. Non-time-critical, i.e., slow processes are a prerequisite for this configuration.

Linked voltages

When using linked voltages, ensure that the terminal has eight single-ended inputs. A common ground potential should be used with linked voltages. As the terminal has many measuring ranges, for example the 0 V ... 50 V range, and the resolution is high enough, applications with several linked voltages can also be used without any problems.

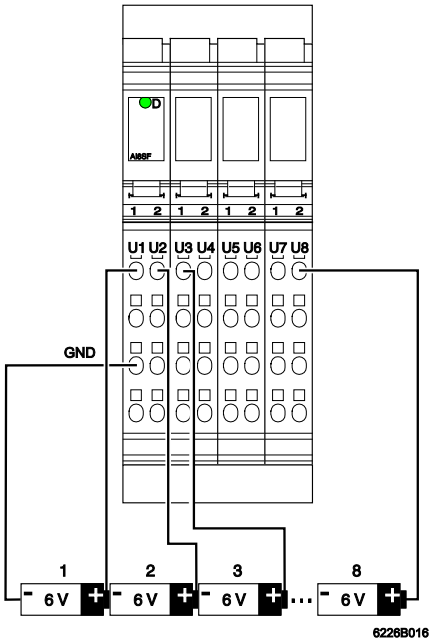


Fig. 5: Measuring linked voltages

Current loops

If the terminal is used to measure currents in current loops, make sure that the eight current inputs operate on a common ground potential (single-ended). Thus, the measuring input should always be on the GND potential with the minus input.

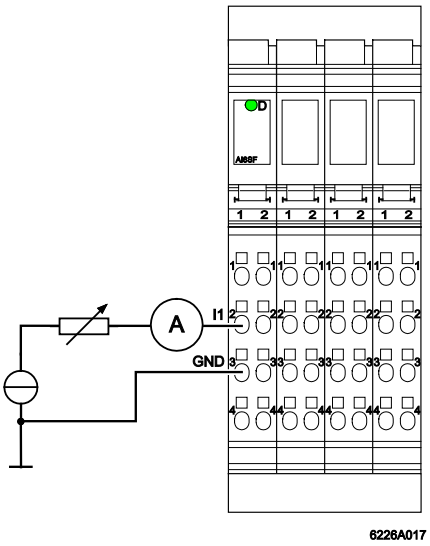


Fig. 6: Measuring currents