Inline terminal:
2 analog input channels
ILT AI 2/SF-ME
IB IL AI 2/SF-ME

Device description

SysMik® GmbH Dresden

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We are grateful to you for criticism and suggestions. Further information (device description, available software) can be found on our homepage www.sysmik.de. Please ask for latest information.

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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.

Features

- Two analog single-ended signal inputs for the connection of either voltage or current signals
- Sensors are connected using 2-wire technology
- Three current measuring ranges: 0 mA to 20 mA, ±20 mA, 4 mA to 20 mA
- Two voltage measuring ranges: 0 V to 10 V, ±10 V
- Measured values can be represented in four different formats
- 12-bit resolution
- Diagnostic indicator

2 Order information

Description	Type	Part number	Pcs./Pkt.
Inline-Terminal with two analog input channels; including connectors and labeling fields	ILT AI 2/SF-ME	1225-100494-01-9	1
Alternative terminal type for replace:	IB IL AI 2/SF-ME	28 63 94 4	1

3 Technical data

General data	
Housing dimensions (width x height x depth)	12.2 mm x 120 mm x 71.5 mm
Weight	47 g (without connector)
Connection method for actuators	2 and 3-wire technology
Power supply for sensors	With an external power supply unit or with an additional segment terminal with a fuse IB IL 24 SEG/F
Ambient temperature (operation)	-25 °C to +55 °C
Ambient temperature (storage/transport)	-25 °C to +85 °C
Permissible humidity (operation/storage/transport)	75 % on average, bis 85 % occasionally
In the range from -25 °C to +55 °C (-13 °F to +131 °F) appropriate measures against increased humidity (> 85 %) must be taken. For a short period, slight condensation may appear on the outside of the housing if, for example, the terminal is brought into a closed room from a vehicle.	
Permissible air pressure (operation)	80 kPa to 106 kPa (up to 2000 m above sea level)
Permissible air pressure (storage/transport)	70 kPa to 106 kPa (up to 3000 m above sea level)
Degree of protection	IP20 according to IEC 60529
Class of protection	Class 3 according to VDE 0106, IEC 60536

Deviations From Common Technical Data That Are Indicated in the IB IL SYS PRO UM E User Manual	
Noise Immunity Test According to EN 50082-2	
Electrostatic discharge (ESD) according to EN 61000-4-2; IEC 61000-4-2	Criterion B 6 kV contact discharge 6 kV air discharge
Mechanical Requirements	
Shock test according to EN 60068-2-27; IEC 60068-2-27	15 g load for 11 ms, half sinusoidal wave, three shocks in each space direction and orientation 25 g load for 11 ms, half sinusoidal wave, three shocks in each space direction and orientation

Interface	
Local bus	Data routing

Power consumption	
Communications power U_L	7.5 V DC
Current consumption from U_L	48 mA (typical) / 60 mA (maximum)
I/O supply voltage U_{ANA}	24 V DC
Current consumption at U_{ANA}	13.5 mA (typical) / 18.0 mA (maximum)
Total power consumption	622 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	>220 kΩ
Limit frequency (-3 dB) of the input filter	40 Hz
Process data update of both channels	<1.5 ms
Behavior upon sensor failure	goes to 0 V
Maximum permissible voltage between analog voltage inputs and analog reference potential	±32 V
Common mode rejection (CMR)	90 dB, minimum
Reference: voltage input signal, valid for permissible DC common mode voltage range	110 dB, typical
Permissible DC common mode voltage for CMR	40 V between voltage input and FE
Current inputs	
Input resistance	50 Ω (shunt)
Limit frequency (-3 dB) of the input filter	40 Hz
Process data update of both channels	<1.5 ms
Behavior upon sensor failure	goes to 0 mA / 4 mA
Maximum permissible voltage between analog current inputs and analog reference potential	±5 V (corresponding with 100 mA across the sensor resistances)
Common mode rejection (CMR)	90 dB, minimum
Reference: current input signal, valid for permissible DC common mode voltage range	110 dB, typical
Permissible DC common mode voltage for CMR	40 V between current input and FE
Maximum permissible current	±100 mA

Safety Equipment	
Surge voltage	Suppressor diodes in the analog inputs

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 U_{ANA} / I/O	500 V AC, 50 Hz, 1 min.
7.5 V supply (bus logic), 24 V supply U_{ANA}/functional earth ground	500 V AC, 50 Hz, 1 min.
I/O/functional earth ground	500 V AC, 50 Hz, 1 min.

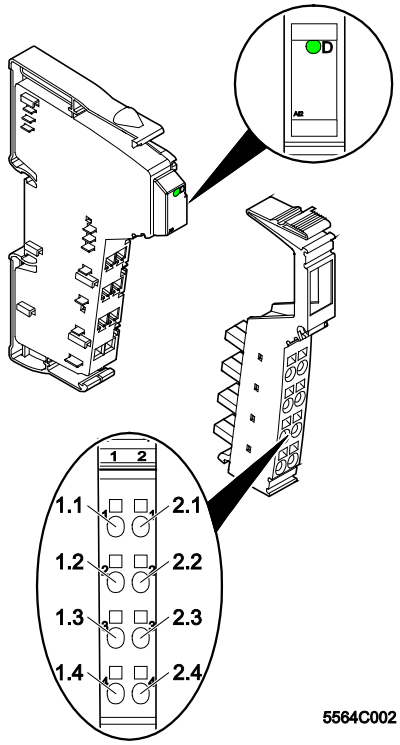
Error Messages to the Higher-Level Control or Computer System	
Failure of supply voltage U_{ANA}	Yes
Peripheral / user failure	Yes, if peripheral voltage is missing or device failure

Tolerance Behavior and Temperature Response of the Voltage Inputs (The error indications refer to the measuring range final value of 10 V.)		
	typical	**maximum**
Total error of the voltage inputs at 23 °C (73.4 °F) offset error + gain error + linearity error	±0,25 %	±0,50 %
Total error of the voltage inputs (-25 °C to +55 °C [-13 °F to +131 °F]) offset error + gain error + linearity error + drift error	±0,40 %	±0,75 %

Tolerance Behavior and Temperature Response of the Current Inputs (The error indications refer to the measuring range final value of 20 mA.)		
	typical	**maximum**
Total error of the current inputs at 23 °C (73.4 °F) offset error + gain error + linearity error	±0,30 %	±0,55 %
Total error of the current inputs (-25 °C to +55 °C [-13 °F to +131 °F]) offset error + gain error + linearity error + drift error	±0,45 %	±0,80 %

Additional Tolerances Influenced by Electromagnetic Fields				
Type of Electromagnetic - Interference	**Typical Deviation from the Measuring Range Final Value (Voltage Input)**		**Typical Deviation from the Measuring Range Final Value (Current Input)**	
	relative	**absolute**	**relative**	**absolute**
Electromagnetic fields; field strength 10 V/m, according to EN 61000-4-3 / IEC 61000-4-3	< ±2 %	< ±200 mV	< ±2 %	< ±400 µA
Conducted interference Class 3 (test voltage 10 V), according to EN 61000-4-6 / IEC 61000-4-6	< ±1 %	< ±100 mV	< ±1 %	< ±100 µA
Fast transients (burst) 4 kV supply, 2 kV input, according to EN 61000-4-4 / IEC 61000-4-4	< ±1 %	< ±100 mV	< ±1 %	< ±100 µA

4 Local diagnostic and status indicators / Terminal point assignment



Local diagnostic and status indicators

Designation	Color	Meaning
D	green	Diagnostics

Terminal point assignment

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

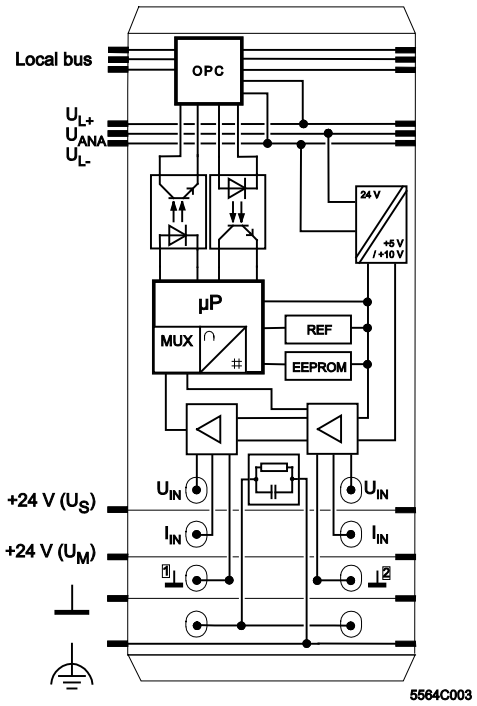


Fig. 2: Internal wiring of terminal points

Key:

OPC	Protocol chip		Power supply unit with electrical isolation
	Optocoupler	REF	Reference voltage
µP MUX	Microprocessor with multiplexer and analog-to-digital converter		Coupling network
EEPROM	Electrically erasable programmable read-only memory		Amplifier

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

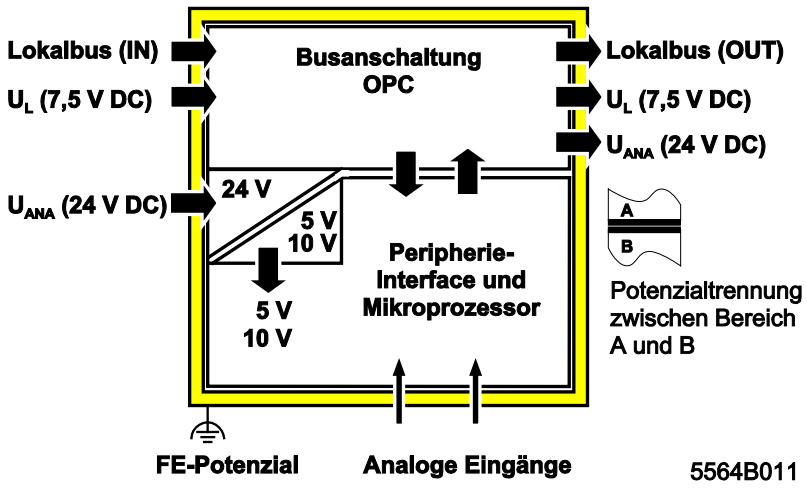


Fig. 3: Electrical isolation of the individual function areas

7 Installation instruction

High current flowing through the potential jumpers U_M and U_S leads to a temperature rise of the potential jumpers and the inside of the terminal. Observe the following instructions to keep the current flowing through the potential jumpers of the analog terminals as low as possible:

Create a separate main circuit for the analog terminals.

If this is not possible in your application and you are using analog terminals in -a main circuit together with other terminals, place the analog terminals behind all the other terminals at the end of the main circuit.

8 Connection notes

Do not connect voltages exceeding ±5 V to a current input. This damages the module electronics as the maximum permissible current of ±100 mA is exceeded.

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

Connect the shielding of the sensor with PE potential.

When using cables > 1 m (3.28 ft.) fold the outer cable sheath back and connect the shield to the terminal via the contacts 1.4 or 2.4. These contacts connect the shield directly to FE (functional earth ground) on the terminal side.

Additional wiring is not necessary.

Within the terminal, ground is connected to FE via an RC-element.

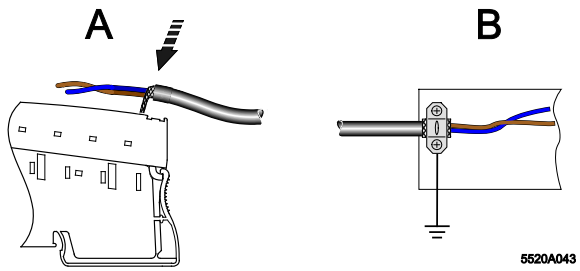


Fig. 4: Connection of analog sensors, signal cables

If you want to use **both** channels of the ILT AI 2/SF-ME terminal, you can connect the shield in various ways depending on the cable feed.

1. If **one** multi-wire cable is used to connect both -sensors, -connect the shielding as described above (Fig.4)
2. If **two individual** cables are used to connect the sensors, proceed as follows to prevent ground loops (Fig.5):

- Install a busbar with a connection to the ground potential in front of the Inline terminal (Fig.5: B). Fold back the outer sheath of the two cables at the appropriate position and connect the shields of both cables, e.g., using an SK shield clamp (see -"CLIPLINE" catalog). The busbar must be the **only** point at which the shield of every cable is connected -to ground potential.
- Lead the cables to the Inline terminal and connect the shield, as described above, to the terminal points 1.4 and 2.4. (Fig.4: A).
- Lead the sensor cable into the sensor making sure to maintain the integrity of the cable **insulation** (Fig.5: C)

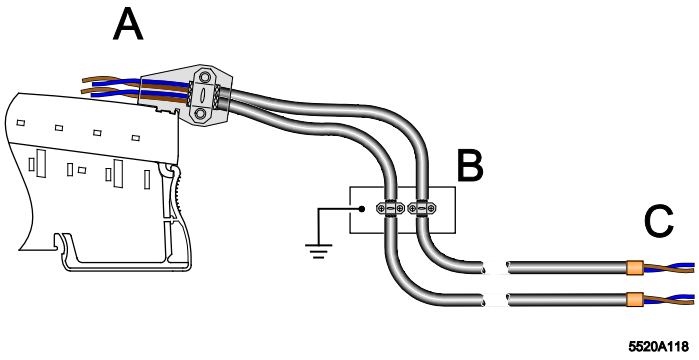
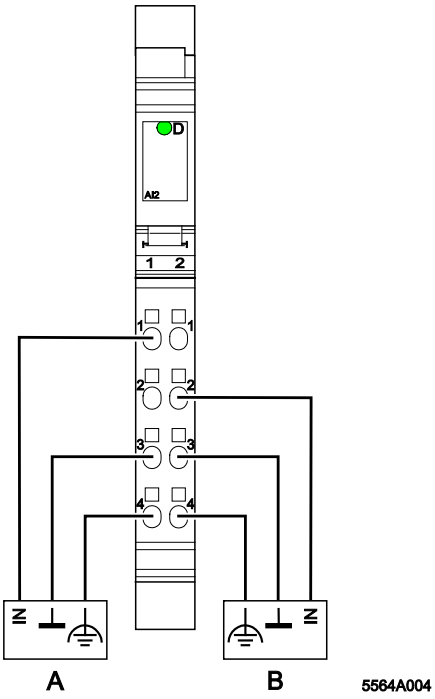


Fig. 5: Connection oft two analog sensors with individual cables

9 Connection examples

Connection of active sensors

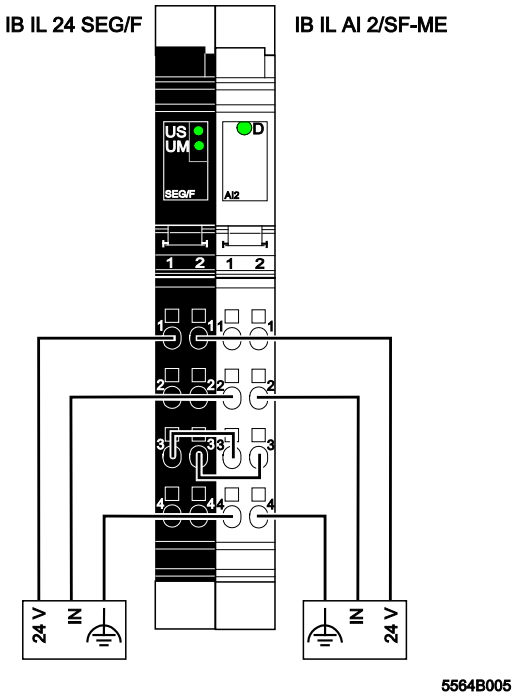


A active sensor with voltage output (channel 1)

B active sensor with current output channel 2)

Fig. 6: Connection of active sensors in 2-wire technology

Connection of passive sensors



Passive sensor supply: The sensors are supplied through a pre-connected segment terminal with a fuse. The sensors can also be supplied from an external power supply unit.

Fig. 7: Connection of two passive sensors in 2-wire technology

Figure 6 and Figure 7 show the connection schematically (without shield connector). One side of the shielding must be connected at the sensor or at an appropriate point to the functional earth ground potential.

Connection for battery monitoring

Prevention of failures!

Both reference inputs (minus inputs) of each ILT AI 2/SF-ME terminal are connected to each other. If signal sources are connected in series, wrong connections can lead to a short circuit of individual signal sources.

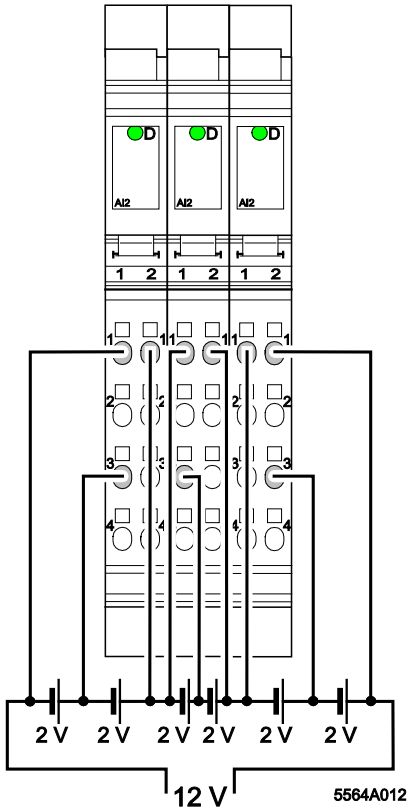


Fig. 8: Connection for battery monitoring

Because of the single-ended inputs, the following connections are necessary:

Connect the reference input of a terminal between two voltage sources.

Channel 1 measures the first voltage source with opposite polarity. The measured value must be adapted in the control system to the polarity.

Channel 2 measures the second voltage source with correct polarity.

Configure the terminal to bipolar (±10 V).