Ordering data

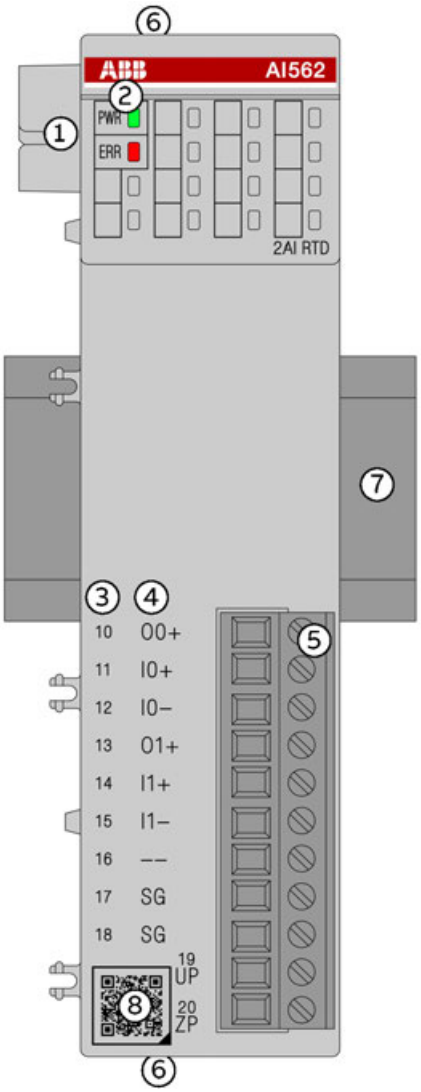
Part no.	Description	Product life cycle phase *)
1TNE 968 902 R1101	AI561, analog input module, 4 AI, U/I	Active
1TNE 968 901 R3101	Terminal block TA563-9, 9 pins, screw front, cable side, 6 pieces per unit	Active
1TNE 968 901 R3102	Terminal block TA563-11, 11 pins, screw front, cable side, 6 pieces per unit	Active
1TNE 968 901 R3103	Terminal block TA564-9, 9 pins, screw front, cable front, 6 pieces per unit	Active
1TNE 968 901 R3104	Terminal block TA564-11, 11 pins, screw front, cable front, 6 pieces per unit	Active
1TNE 968 901 R3105	Terminal block TA565-9, 9 pins, spring front, cable front, 6 pieces per unit	Active
1TNE 968 901 R3106	Terminal block TA565-11, 11 pins, spring front, cable front, 6 pieces per unit	Active



**) Modules in lifecycle Classic are available from stock but not recommended for planning and commissioning of new installations.*

1.6.2.1.2 AI562 - Analog input module

- 2 configurable analog resistance temperature detector (RTD) inputs (I0 and I1) in 1 group
- Resolution: 16 bits including sign



1 I/O bus
2 1 green LED to display power supply, 1 red LED to display error
3 Terminal number
4 Allocation of signal name
5 Terminal block for input signals (11-pin)
6 2 holes for wall-mounting with screws
7 DIN rail
8 QR code for datasheet

Intended use

The module can be used both on an AC500 processor module and on a communication interface module.

Unless expressly intended for this purpose, the following applications are prohibited:

- Use in explosion-proof areas
- Use in environments with harmful oils, acids, gases, vapors, dusts and radiation
- Operation under water
- Used as a safety module

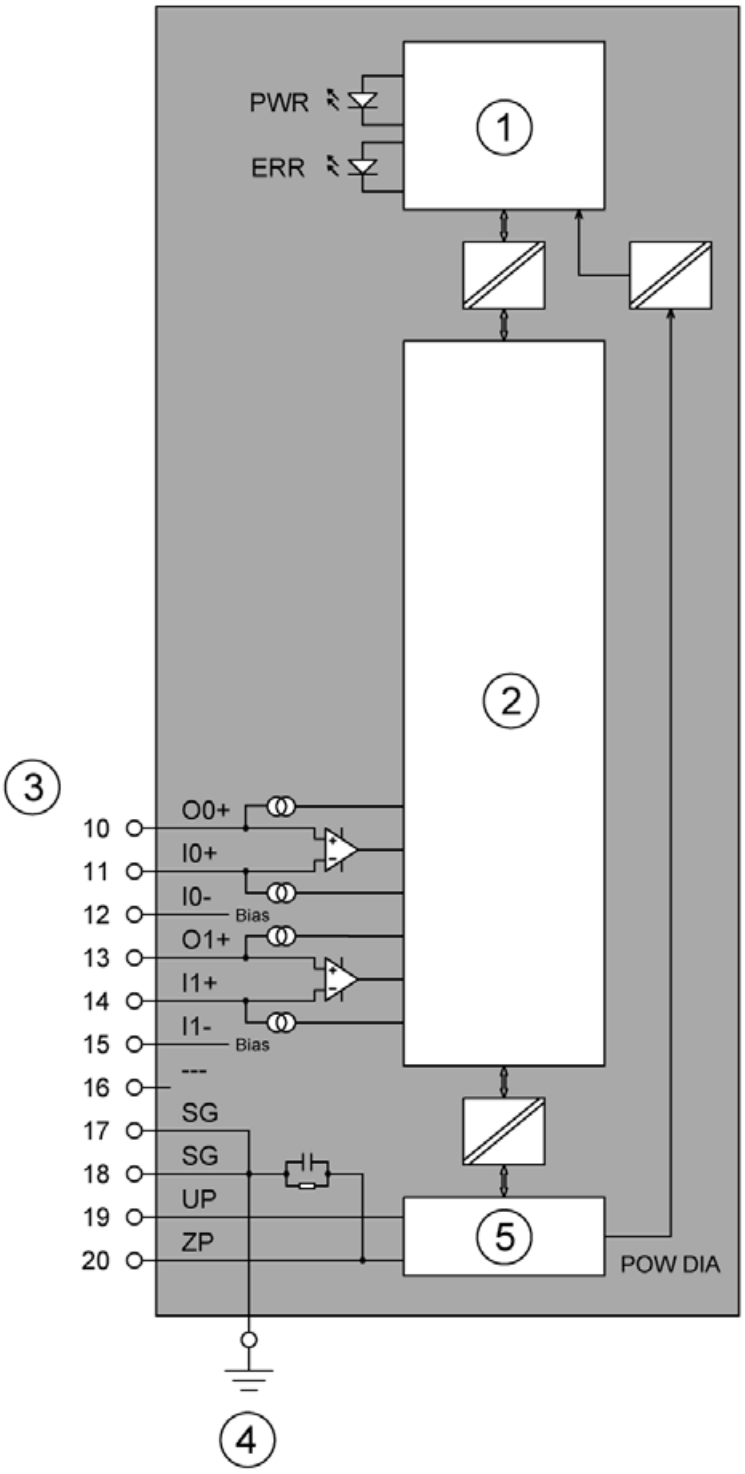
The I/O module must not be used as a decentralized I/O module with CI590-CS31-HA communication interface modules.

Connections

For a detailed description of the mounting, disassembly and connection of the module, please refer to the installation instructions.

The connection is carried out by using a removable 11-pin terminal block. These terminal blocks differ in their connection system (spring terminals or screw terminals, cable mounting from the front or from the side). The terminal blocks are not included in the module's scope of delivery and must be ordered separately.

↳ *Chapter 1.9.2.1 “TA563-TA565 - Terminal blocks” on page 1136*



1 I/O bus interface and MCU core circuit
2 ADC and logic circuit
3 Analog inputs circuit
4 Functional earth connection
5 Fly-back DC/DC power supply

The internal power supply voltage for the module's circuitry is carried out via the I/O bus (provided by a communication interface module or a CPU). Thus, the current consumption from 24 V DC power supply at the terminals L+/UP and M/ZP of the CPU/communication interface module increases by 5 mA per AI562.

The external power supply connection is carried out via the UP (+24 V DC) and the ZP (0 V DC) terminals.

WARNING!

Removal/Insertion under power

Removal or insertion under power is permissible only if all conditions for hot swapping are fullfilled.

Conditions for hot swap

“Conditions for hot swap” on page 1152

The devices are not designed for removal or insertion under power when the conditions for hot swap do not apply. Because of unforeseeable consequences, it is not allowed to plug in or unplug devices with the power being ON.

Make sure that all voltage sources (supply and process voltage) are switched off before doing any of the following actions:

– Connect or disconnect any signal or terminal block.
– Remove, mount or replace a module.

Disconnecting any powered devices while they are energized in a hazardous location could result in an electric arc, which could create an ignition source resulting in fire or explosion.

Prior to proceeding, make sure that power is disconnected and that the area has been thoroughly checked to ensure that flammable materials or ignitable concentrations are not present.

The devices must not be opened when in operation. The same applies to the network interfaces.

CAUTION!

By installing equipotential bonding conductors between the different parts of the system, it must be ensured that the potential difference between ZP and AGND never can exceed 1 V.

CAUTION!

The process supply voltage must be included in the grounding concept (e. g. grounding of the negative terminal).

CAUTION!

Analog sensors must be galvanically isolated against the ground. In order to avoid inaccuracy with the measuring results, the analog sensors should also be isolated against the power supply.

NOTICE!

Risk of imprecise and faulty measurements!

Analog signals may be severely distorted due to external electromagnetic interference.

When the length of the connection cable exceeds 20 m, a shielded and grounded cable must be used. When the shield is grounded at both ends, an independent low-impedance equipotential connection should be provided to avoid high potential differences between interconnected devices.

NOTICE!

Risk of damaging the PLC modules!

The PLC modules must not be removed while the plant is connected to a power supply.

Make sure that all voltage sources (supply and process voltage) are switched off before you do the following:

– Connect or disconnect any signal or terminal block.
– Remove or replace a module.

NOTICE!

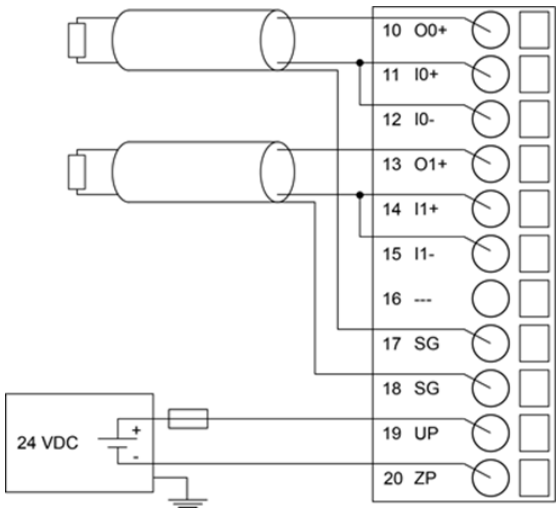
Risk of damaging the PLC modules!

Overvoltages and short circuits might damage the PLC modules.

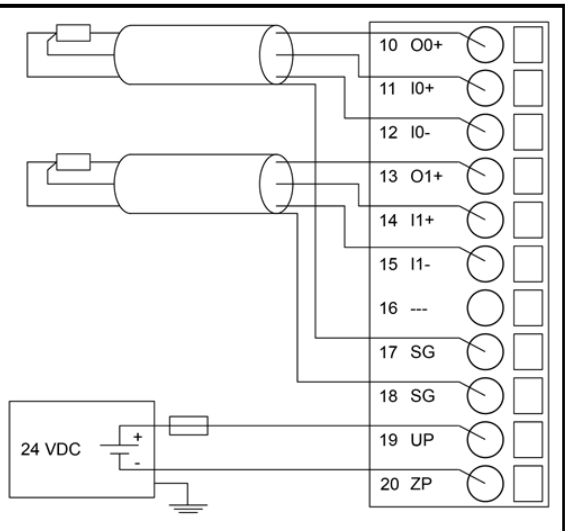
– Make sure that all voltage sources (supply voltage and process supply voltage) are switched off before you begin with operations on the system.
– Never connect any voltages or signals to reserved terminals (marked with ---). Reserved terminals may carry internal voltages.

Generally, analog signals must be laid in shielded cables. The cable shields must be grounded at both sides of the cables. In order to avoid unacceptable potential differences between different parts of the installation, low resistance equipotential bonding conductors must be laid.

Connection of RTDs



2-wire connection



3-wire connection

With 2-wire connection, the resistance of the connection wires influences the accuracy of the measured value. Use 3-wire connection to achieve the guaranteed measuring accuracy.

Parameterization

The module itself does not store configuration data. It receives its parameterization data from the master device of the I/O bus (CPU or communication interface module) during power-up of the system.

Hence, replacing I/O modules is possible without any re-parameterization via software.

> *If the external power supply voltage via UP/ZP terminals fails, the I/O module loses its configuration data. The whole station has to be switched off and on again to re-configure the module.*

The arrangement of the parameter data is performed with Automation Builder software.

The parameter data directly influences the functionality of modules.

For non-standard applications, it is necessary to adapt the parameters to your system configuration.

Table 56: Module parameters

Name	Default value	Values in menu
Ignore module	No	• Yes • No
Check supply	On	• On • Off

Table 57: Channel parameters

Name	Default	Values in menu
Channel configuration	Not used	• Not used (default) • 2-wire Pt100 -50 °C ... +400 °C • 3-wire Pt100 -50 °C ... +400 °C • 2-wire Pt1000 -50 °C ... +400 °C • 3-wire Pt1000 -50 °C ... +400 °C • 2-wire Ni1000 -50 °C ... +150 °C • 3-wire Ni1000 -50 °C ... +150 °C • 2-wire Ni100 -50 °C ... +150 °C • 3-wire Ni100 -50 °C ... +150 °C • Analog input resistance 0 Ω ... 150 Ω • Analog input resistance 0 Ω ... 300 Ω

Diagnosis

Table 58: Error severity E3: Warnings

Error severity	Location	Error code	d1	d2	d3	d4	Description	Remedy
								
E3	iob (I/O bus)	9	14	1 ... 10	31	31	Overflow diagnosis buffer	New start
E3	iob (I/O bus)	11	14	1 ... 10	31	31	Process voltage too low	Check process voltage

Error severity	Location	Error code	d1	d2	d3	d4	Description	Remedy
								
E3	iob (I/O bus)	19	14	1 ... 10	31	31	Checksum error in the I/O module	Replace I/O module
E3	iob (I/O bus)	26	14	1 ... 10	31	31	Parameter error	Check master

Table 59: Error severity E4: Warnings

Error severity	Location	Error code	d1	d2	d3	d4	Description	Remedy
								
E4	iob (I/O bus)	7	14	1 ... 10	1	0 ... 7	Analog value underflow at an analog input	Check input value
E4	iob (I/O bus)	48	14	1 ... 10	1	0 ... 7	Analog value overflow at an analog input	Check input value or terminal

State LEDs

LED		State	Color	LED = OFF	LED = ON	LED flashes
	PWR	Process voltage 24 V DC via terminal	Green	CPU module voltage or external 24 V DC supply voltage is missing	3.3 V system voltage (I/O bus) and external 24 V DC supply voltage are present	---
	ERR	Channel or module error	Red	No error or process voltage is missing	Severe error in the module	Error on 1 or more channels of the module

Measuring ranges

Risk of invalid analog input values!

The analog input values may be invalid if the measuring range of the inputs is exceeded.

Make sure that the analog signal at the connection terminals is always within the signal range.

Resistance temperature detectors

Range	Pt100 / Pt1000 -50 °C ... +400 °C	Ni1000 / Ni100 -50 °C ... +150 °C	Digital value	
			Decimal	Hex.
Overflow	> +450.0 °C	> +160.0 °C	32767	7FFF
Measured value too high	+450.0 °C : +400.1 °C		4500 : 4001	1194 : 0FA1
		+160.0 °C : +150.1 °C	1600 : 1501	0640 : 05DD
Normal range	+400.0 °C : : : : + 0.1 °C	 +150.0 °C : : + 0.1 °C	4000 2000 1500 700 : 1	0FA0 07D0 05DC 02BC : 1
	0,0 °C	0.0 °C	0	0000
	-0.1 °C : -50.0 °C	-0.1 °C : -50.0 °C	-1 : -500	FFFF : FE0C
Measured value too low	-50.1 °C : -60.0 °C	-50.1 °C : -60.0 °C	-501 : -600	FE0B : FDA8
Underflow	< -60.0 °C	< -60.0 °C	-32768	8000

Resistances

Range	Resistance 0 Ω ... 150 Ω	Resistance 0 Ω ... 300 Ω	Digital value	
			Decimal	Hex.
Overflow	>176.383 Ω	>352.767 Ω	32767	7FFF
Measured value too high	176.383 Ω 150.005 Ω	352.767 Ω 300.011 Ω	32511 27649	7EFF 6C01
Normal range	150.000 Ω : 0.005 Ω	300.000 Ω : 0.011 Ω	27648 : 1	6C00 : 0001
	0 Ω	0 Ω	0	0000

Technical data

Technical data of the module

The system data of AC500-eCo apply.

Chapter 2.5.1 “System data AC500-eCo” on page 1165

Only additional details are therefore documented below.

Parameter		Value
Process voltage		
	Rated value	24 V DC
	Max. ripple	5 %
	Protection against reversed voltage	Yes
	Rated protection fuse on UP	Yes, external additional fuse recommended
	Galvanic isolation	500 V DC from system
Current consumption		
	From 24 V DC power supply at the terminals L+/UP and M/ZP of the CPU/communication interface module	Ca. 5 mA
	Current consumption from UP in normal operation	● 0.04 A ● 0.02 A (version E0 or later)
	Inrush current from UP (at power up)	● Typ. 0.1 A^2s, Max. 0.16 A^2s ● Typ. 0.015 A^2s, Max. 0.03 A^2s (version E0 or later)
Surge-voltage (max.)		35 V DC for 0.5 s
Max. power dissipation within the module		● 1.1 W ● 0.6 W (version E0 or later)
Weight		Ca. 120 g
Mounting position		● Horizontal mounting ● Vertical mounting
Cooling		The natural convection cooling must not be hindered by cable ducts or other parts in the control cabinet.
Internal power supply		Through the I/O bus interface (I/O bus)
External power supply		Via terminals (process voltage UP = 24 V DC)

NOTICE!
All I/O channels (digital and analog) are protected against reverse polarity, reverse supply, short circuit and temporary overvoltage up to 30 V DC.

Technical data of the analog inputs

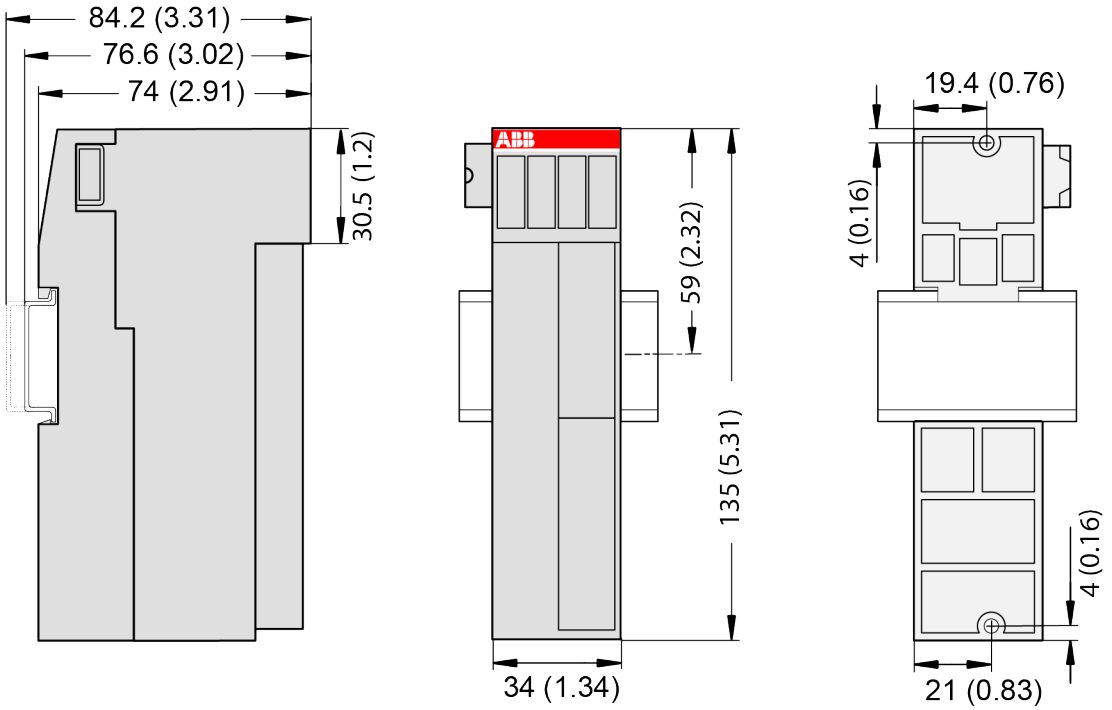
Parameter	Value
Number of channels per module	2 configurable RTD (resistance temperature detector) inputs
Distribution of channels into groups	1 group of 2 channels

Parameter		Value	
Input type		Module ground referenced RTD for 2-wire and 3-wire resistance temperature detectors	
Galvanic isolation		500 V DC	
	Between the channels	No	
	Between the channels and I/O bus	Yes	
	Between the channels and process supply voltage (UP, ZP)	Yes	
Common mode input range		Pt100, Pt1000, Ni100, Ni1000	
		150 Ω, 300 Ω	
Configurability		2-wire Pt100 -50 °C ... +400 °C, 3-wire Pt100 -50 °C ... +400 °C, 2-wire Pt1000 -50 °C ... +400 °C, 3-wire Pt1000 -50 °C ... +400 °C, 2-wire Ni1000 -50 °C ... +150 °C, 3-wire Ni1000 -50 °C ... +150 °C, 2-wire Ni100 -50 °C ... +150 °C, 3-wire Ni100 -50 °C ... +150 °C, Analog input resistance 0 Ω ... 150 Ω, Analog input resistance 0 Ω ... 300 Ω(each input can be configured individually)	
Channel input resistance		> 100 kΩ	
Input filter attenuation		-3 dB at 3.6 kHz	
Indication of the input signals		No	
Module update time		All channels: < 1 s	
Conversion time		Typ. 190 ms per channel	
Resolution			
	RTD	0.1 °C	
	Resistance	150 Ω: 1 LSB (5.4 mΩ); 300 Ω: 1 LSB (10.8 mΩ)	
Conversion error of the analog values caused by non-linearity, adjustment error at factory and resolution within the normal range*			
	Before verison E0	Typ.	Depending on RTD max. ±0.6 % of full scale at +25 °C
		Max.	±2 % of full scale at 0 °C ... +60 °C or EMC disturbances
	Version E0 or later	Typ.	Pt100, Pt1000, 300 Ω: ±0.05 % of full scale at +25 °C Ni100, Ni1000, 150 Ω: ±0.1 % of full scale at +25 °C
		Max.	±0.2 % of full scale at -20 °C ... +60 °C; ±0.5 % of full scale at EMC disturbances
Unused inputs		Can be left open and should be configured as "Not used"	
Input data length		4 bytes	
Power dissipation inside the sensor (max.)		1 mW	

Parameter		Value
Repeatability		0.05 % of full-scale
Overvoltage protection		Yes, up to 30 V DC
Wire loop resistance		< 20 Ω
Max. cable length (conductor cross section > 0.14 mm²)		
	Unshielded wire	10 m
	Shielded wire	100 m

*For 2-wire connection, the cable should be as short as possible to reduce error. If the cable is long, use 3-wire connection to achieve the guaranteed measuring accuracy.

Dimensions



The dimensions are in mm and in brackets in inch.

Ordering data

Part no.	Description	Product life cycle phase *)
1TNE 968 902 R1102	AI562, analog input module, 2 AI, RTD	Active
1TNE 968 901 R3102	Terminal block TA563-11, 11 pins, screw front, cable side, 6 pieces per unit	Active