MOELLER

Hardware and Engineering

EM 4-101-TX 1
Temperature Sensor Module

11/96 AWB 27-1273-GB

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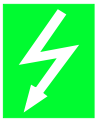

Caution!

Dangerous electrical voltage!

Before commencing the installation

- Disconnect the power supply of the device.
- Ensure that the device cannot be accidentally restarted.
- Verify isolation from the supply.
- Earth and short circuit.
- Cover or enclose neighbouring units that are live.
- Follow the engineering instructions (AWA) of the device concerned.
- Only suitably qualified personnel may work on this device/system.
- Before installation and before touching the device ensure that you are free of electrostatic charge.
- Connecting cables and signal lines should be installed so that inductive or capacitive interference do not impair the automation functions.
- Install automation devices and related operating elements in such a way that they are well protected against unintentional operation.
- Suitable safety hardware and software measures should be implemented for the I/O interface so that a line or wire breakage on the signal side does not result in undefined states in the automation devices.
- Ensure a reliable electrical isolation of the low voltage for the 24 volt supply. Only use power supply units complying with IEC 60 364-4-41 or HD 384.4.41 S2.
- Deviations of the mains voltage from the rated value must not exceed the tolerance limits given in the specifications, otherwise this may cause malfunction and dangerous operation.
- Emergency stop devices complying with IEC/EN 60 204-1 must be effective in all operating modes of the automation devices. Unlatching the emergency-stop devices must not cause uncontrolled operation or restart.
- Devices that are designed for mounting in housings or control cabinets must only be operated and controlled after they have been installed with the housing closed. Desktop or portable units must only be operated and controlled in enclosed housings.
- Measures should be taken to ensure the proper restart of programs interrupted after a voltage dip or failure. This should not cause dangerous operating states even for a short time. If necessary, emergency-stop devices should be implemented.

Contents

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About the Manual

This manual is written for engineers and technical engineers with PLC experience.

This manual provides special information for the correct connection of the module and the addressing of the module in your software.

Knowledge on

- the Suconet K fieldbus
- the master in use
- the programming software

is required for the use of this manual.

You will find the required information in the manual

- “Hardware and Engineering” of your master
- Programming software of your master

The symbols used in this manual have the following meaning:

attracts your attention on interesting tips and additional information

▶ indicates handling instructions

Note!
warns you of damage to property; product, parts in its surrouning or data may be damaged

Attention!
warns you of severe damage to property; product, parts in its surrounding or data may be severely damaged

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1 About the EM 4-101-TX1 Expansion Module

Application range

The EM 4-101-TX1 temperature sensor module is a remote expansion module which has been developed for building automation. The module can process analogue values, such as temperature, air pressure, room humidity and volume current to control ventilation, air conditioning and heating systems.

Special features

The module is part of the PS 4/EM 4/LE 4 compact series and cannot be expanded locally. You can operate the module in the Suconet K network.

The module provides the following if it is connected to the Suconet K network:

- 6 analogue inputs for Pt 100 temperature sensors and Ni 1000 sensors
- 2 analogue inputs for voltage signals 0 to 10 V
- 12-bit resolution with all analogue values

The module recognises short-circuit and wire breakage of the temperature sensors.

Hardware and software requirements

Hardware

You can connect the module to the following master controllers:

PS 4-201-MM1
PS 4-141-MM1
PS 4-151-MM1
PS 416-CPU-400
PS 416-NET-400
LE 4-501-BS1

Software

If you already have the Sucosoft S 30-S4, Sucosoft S 40 or Sucosoft LIB/CFG software, you require the updated driver and configuration disk Sucosoft LIB/CFG with the updated driver and configuration files for the EM 4-101-TX1. These files update in your software the list in the device configurator; the master thus recognises the EM 4-101-TX1.

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Setup of the module

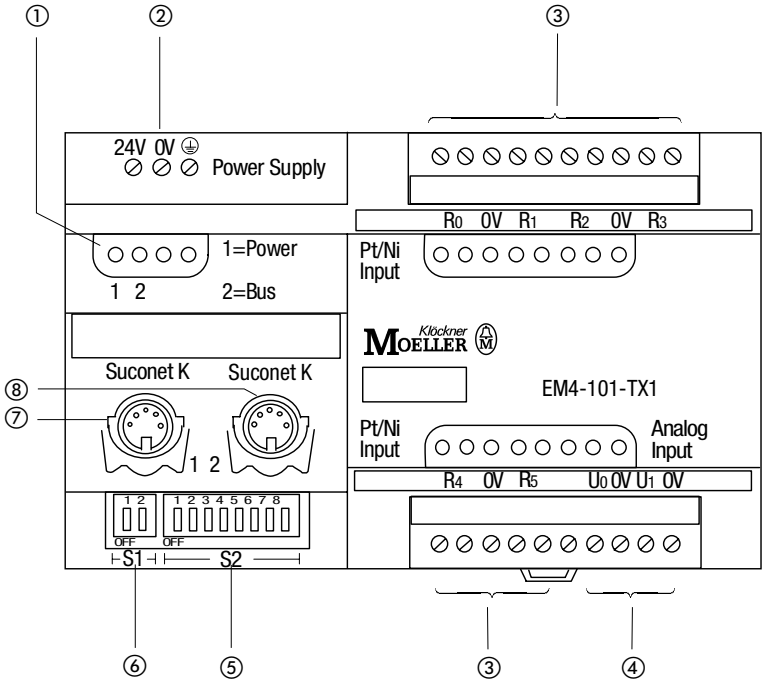

Figure 1: Setup of the module

① Status indication
② 24 V DC power supply
③ Plug-in screw terminal for Pt 100 and Ni 1000 sensors
④ Plug-in screw terminal for voltage inputs from 0 to 10 V
⑤ Switch block S2 for address coding/preselector Pt 100 and Ni 1000
⑥ Switch block S1 for bus terminating resistors
⑦ Suconet K interface 1
⑧ Suconet K interface 2

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2 Mounting

Dimensions

All expansion modules have the same dimensions. The following thus applies:

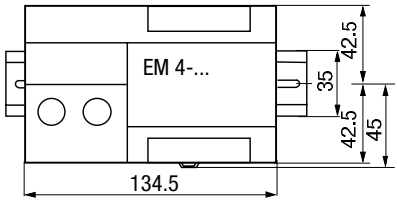

Figure 2: Front view

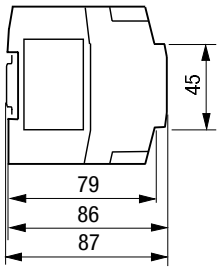

Figure 3: Side view

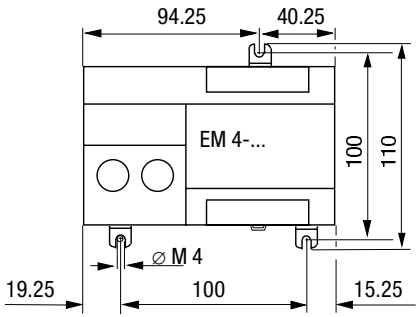

Figure 4: Front view, dimensions with fixing clips

Mounting on top-hat rail

All modules can be fixed on a top-hat rail or on a mounting plate via fixing clips.

- ▶ Locate the module ① on the top-hat rail ② so that the upper edge of the top-hat rail snaps into position.
- ▶ Use a screwdriver to slide the spring-loaded clip ③ out of the device.
- ▶ Push the module against the top-hat rail.
- ▶ Release the screwdriver; the slide snaps into position behind the top-hat rail.
- ▶ Ensure that the module is attached properly.

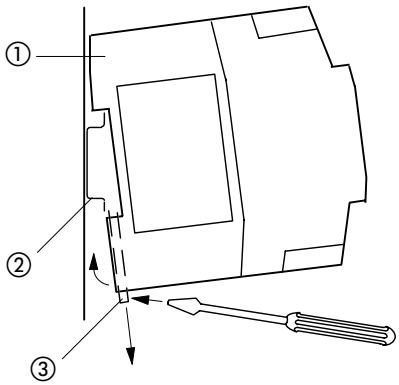

Figure 5: Mounting on top-hat rail

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Mounting on mounting plate via fixing clips

- ▶ Turn the module ① ; the slot ② for the clips ③ is located at the rear.
- ▶ Push the clips into the slot until the lug ④ snaps into position.
- ▶ Ensure that all clips snapped into position.
- ▶ Screw the module at the clips on the mounting plate with M4 screws.

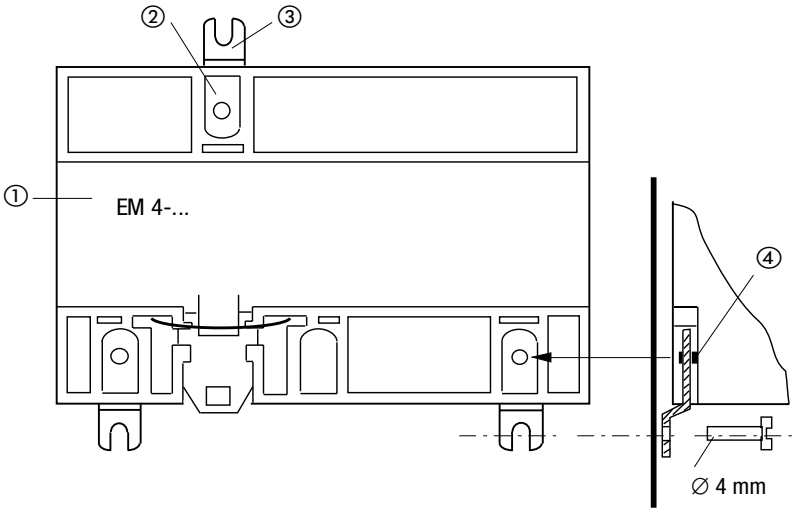

Figure 6: Mounting on mounting plate

Installing in control cabinet

Proceed as described above when mounting in the control cabinet, depending on whether you mount on top-hat rail or mounting plate.

Proceed as follows to prevent electromagnetic interferences which can effect the control electronic section:

- ▶ Maintain a spacing between the cable harness ① and the module of at least 5 cm.
- ▶ Locate the control ② and power sections ③ separately.

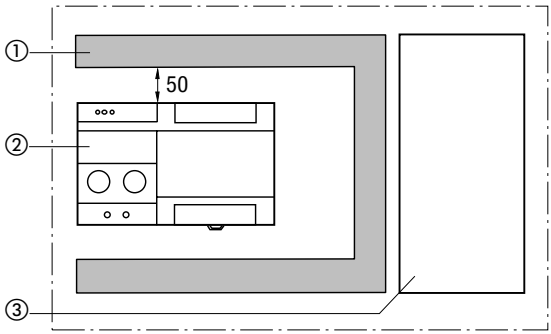

Figure 7: Arrangement in the control cabinet

Mounting/dismantling terminal strip

Attention!
Electrostatic charge.
May destroy device.
Ensure that you have discharged yourself before working on the terminals of the inputs.

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If you wish to pre-wire a circuit or change a module, you can remove the plug-in screw terminal from the module.

- ▶ Open the protective cover of the plug-in screw terminal completely.
- ▶ Remove the plug-in screw terminal from the protective cover.
- ▶ Proceed in the same way with the other plug-in screw terminal.

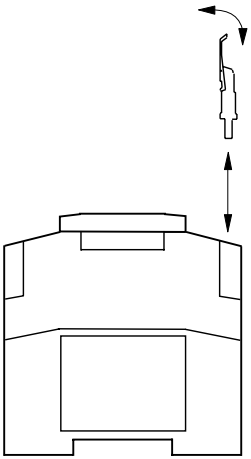

Figure 8: Fitting/removing plug-in screw terminal

Proceed as follows to fit the plug-in screw terminal into the module:

- ▶ Open the protective cover completely.
- ▶ Fit the plug-in screw terminal into the slot and press it into position.

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3 Engineering

Protection against lightning

External lightning protection

External lightning protection means the following:

measures to arrest the lightning stroke current and to conduct it to earth, i. e. screening the building

screening the cables which are routed outside the building

▶ Screen all cables which are routed outside a building. Metallic conduits are recommended for this.

Internal lightning protection

The internal lightning protection includes all measures to be taken within the building itself. These measures reduce the effects of the lightning current and its electrical and magnetic fields on metallic installations and electrical systems. These measures include:

lightning protection potential equalisation

screening

use of overvoltage protection devices

▶ Implement protection elements for signal cables where the cables concerned enter the building but at least on the control cabinet.

▶ Use overvoltage arresters or surge suppressors for this, e. g. varistors.

IInterference-free cabling

Observe the following points to ensure that the electromagnetic fields of an interference cable does not effect the cables susceptible to interferences:

- ▶ The distance between power/control/data cables must be as large as possible.
- ▶ Do not lay cables with different performance levels beside each other over larger distances.
- ▶ Keep a distance of at least 30 cm between power, data and analogue cables.
- ▶ Lay incoming and outgoing cables of one circuit in parallel so that the sum of all currents is zero. The fields will be compensated due to the inverse current flow.

Arranging components in the control cabinet

The components in the control cabinet may influence the functions of the system depending on the arrangement of the components. Proceed as follows to prevent electromagnetic interferences and to ensure error-free operation of the system or machine:

- ▶ Arrange the power and control sections separately already when planning and designing.

Power sections are, e. g.

Contactors
Coupling modules
Transformers
Frequency inverters
Current converters
DC supply devices

- ▶ Arrange the components in groups in the control cabinet which have nearly the same interference behaviour and performance level. Arrange them separately from each other.

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- Implement separators in smaller control cabinets to prevent interferences.
- Arrange the components keeping a distance of 5 cm to the ventilation slots.

Preventing interferences on data lines

Analogue signals are more susceptible to interferences than digital signals. You should thus take additional measures to meet the EMC regulations.

Note!
Electromagnetic interferences.
Radiations and emissions acc. ENV 50140 and ENV 50141 could corrupt your measuring result of up to 20 %.
In the event of a faulty connection the module may emit interferences which effect other devices.

The following engineering notes must be observed in order to meet the requirements of the EMC regulations and comply with the following European EMC standards:

EN 50081-1 (Emitted interference)

EN 50082-2 (Interference immunity):

- Connect the earth terminal of the module via a cable as short as possible (2.5 mm^2) with low impedance to the earth potential, e. g. with the top-hat rail.
- Provide a low impedance connection between the screening of the Suconet data cable and the plug connector housing.
- Fit a contact clip on the isolated part of the Suconet data cable and the analogue input cables.

- ▶ Connect the contact clip with low impedance to the earth potential on the top-hat rail; e. g. with the snap fastener (BT 432) for the top-hat rail.
- ▶ Pull back the screen at the ends of the analogue input cables.
- ▶ Isolate the screen, e. g. with a heat shrinkable sleeving.
- ▶ Earth the top-hat rail with a large contact area.

Legend of Figure 9:

① Suconet data cable
② Analogue input cable
③ Snap fastener (BT 432) for the top-hat rail
④ Contact clip (ZB 4-102-KS1) with M4 screw
⑤ Heat shrinkable sleeving

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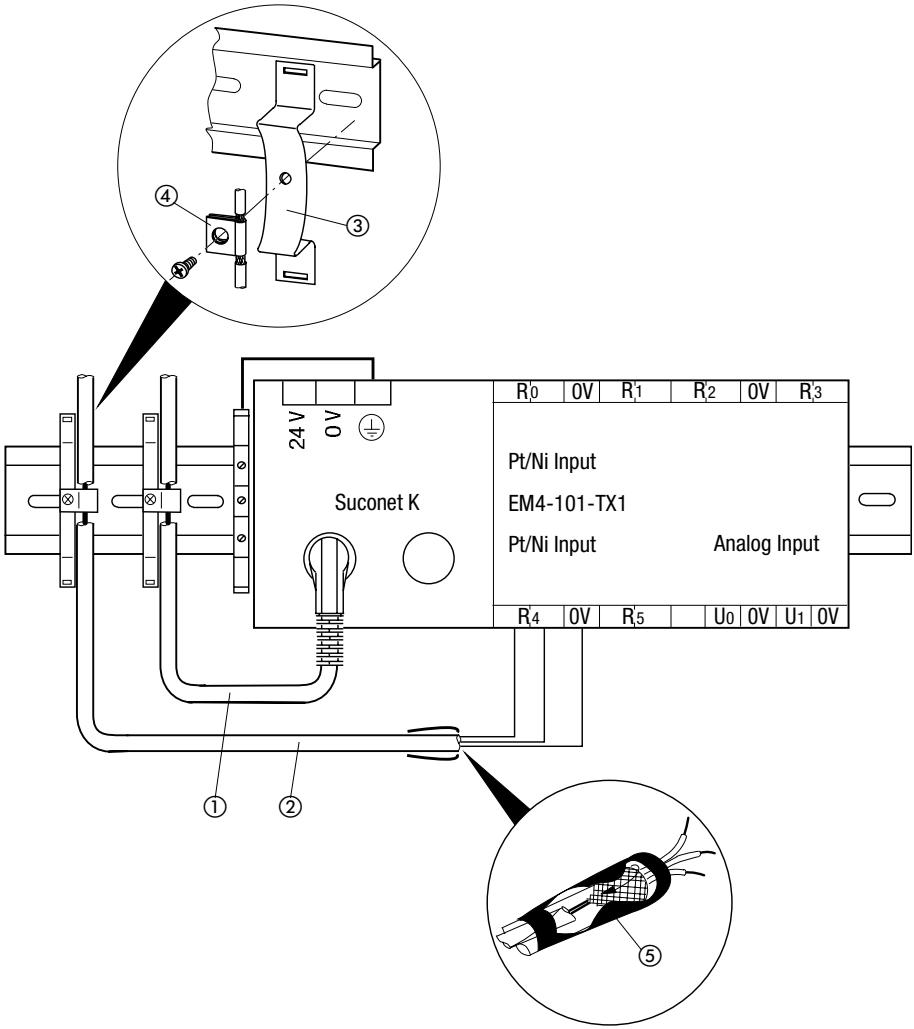

Figure 9: Earthing the module, data cable and analogue input cable

You will find further information in the TB 27-001-GB “Electromagnetic Compatibility (EMC) of Automation Systems” manual from Klöckner-Moeller.

Assigning connections

Attention!
Electrostatic charge.
May destroy device.
Ensure that you have discharged yourself before working on the terminals of the inputs.

Note!
Voltage value is too high.
May damage the module.
Do not apply external voltage to the terminals R0 to R5.

Legend of Figure 10:

① Mains connection: 24 V DC
Connection cross-section:
flexible with ferrule 0.22 to 2.5 mm^2
solid 0.22 to 2.5 mm^2

② Plug-in screw terminal

③ R0 to R5:
Pt 100 and Ni 1000 three-wire connection; implement jumper with two-wire connection (see point ⑥)
The connection cables of a sensor must have the same cross-section

Connection cross-section:
flexible with ferrule 0.22 to 1.5 mm^2
solid 0.22 to 2.5 mm^2

④ Analogue voltage inputs 0 to 10 V
Connection cross-section:
flexible with ferrule 0.22 to 1.5 mm^2
solid 0.22 to 2.5 mm^2

⑤ Suconet K interfaces

⑥ Jumper with two-wire connection

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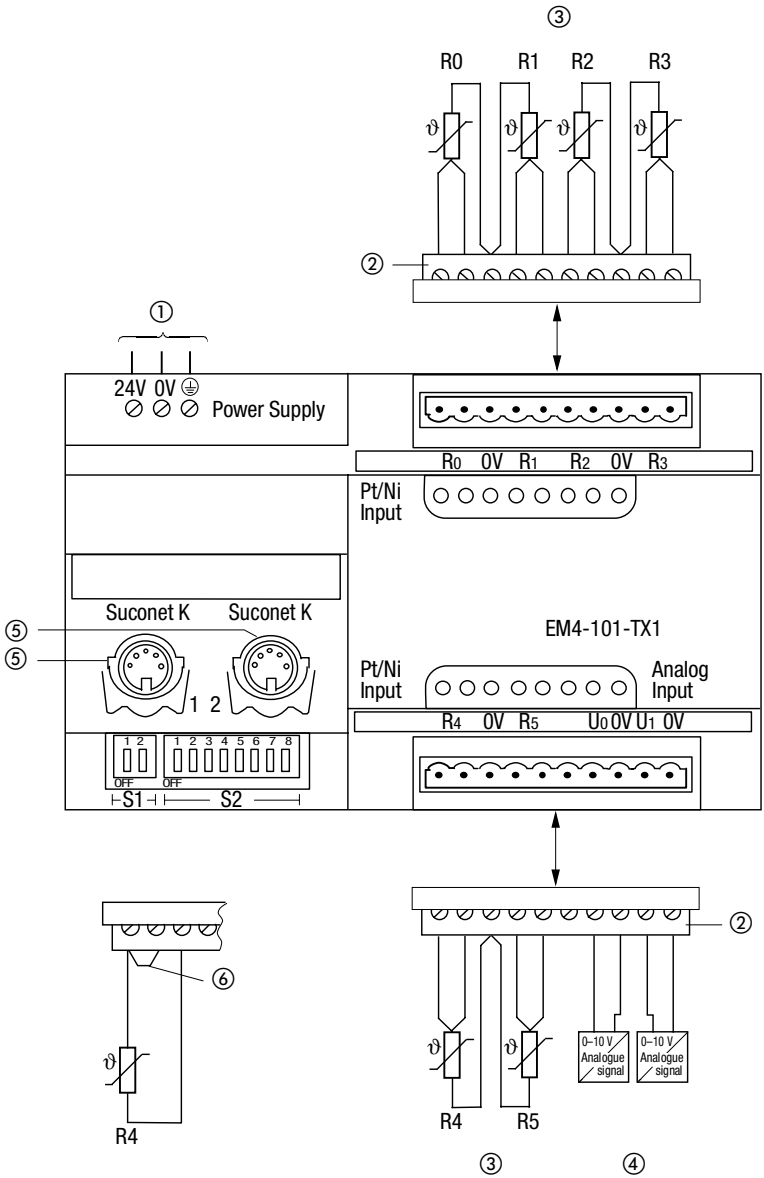

Figure 10: Assigning connections

Setup of the bus interface (RS 485)

The Suconet K bus interfaces 1 and 2 are 5-pole DIN sockets (female) and are based on the RS 485 interface.

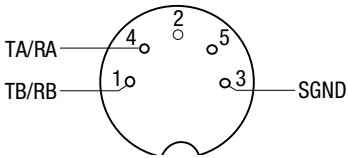

Figure 11: Pin assignment of the bus cable socket

TB/RB und TA/RA:	Send/receive data
SGND:	0 V connection
Pin 2 and 5:	not assigned

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4 Hardware Configuration

The hardware configuration is restricted to two switch blocks. With the dip switches of switch block S1 you operate the bus terminating resistors. With the dip switches of switch block S2 you can address your module and set the combination of the Pt 100 and Ni 1000 temperature sensors.

Activating/ deactivating bus terminating resistors

The bus terminating resistor prevents that the signals are interferred due to reflection on the ends of the bus cable.

The module is delivered with activated bus terminating resistors.

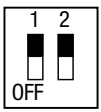

Figure 12: Factory setting of the S1 switch

The bus terminating resistor must be activated if your module is located at the beginning or end of the line.

▶ Switch both dip switches on switch block S1 to position ON.

Ensure that both dip switches are in ON position, since otherwise the bus terminating resistor is only activated on one line of the data bus. Only one line is then protected against interferences.

The bus terminating resistor must be deactivated with modules which are not located at the ends of the data line.

- ▶ Set both dip switches of the switch block S1 to OFF position.

Ensure that the bus terminating resistors are deactivated since otherwise the signals on the bus cable will be weakened.

Setting address/ selecting temperature sensors

The following figure shows the factory setting of the dip switches of the module:

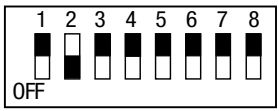

Figure 13: Factory setting of the S2 switch

Set the address via the dip switches 1 to 5. Dip switch 6 is not assigned. Select one of the four combinations of temperature sensors which you can connect via the dip switches 7 and 8.

Setting the address

Assign the module an address so that the master can recognise and scan the installed module.

- ▶ Switch off the power supply of the controller.
- ▶ Select a station address from the table and set the address on the dip switches of switch block S2.

Ensure that the station address is not assigned to a second module, otherwise the master cannot allocate the data to the module correctly.

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Table 1: Switch block S2 – address coding

Station	Dip switch				
	1	**2**	**3**	**4**	**5**
1	1	0	1	1	1
2	0	0	1	1	1
3	1	1	0	1	1
4	0	1	0	1	1
5	1	0	0	1	1
6	0	0	0	1	1
7	1	1	1	0	1
8	0	1	1	0	1
9	1	0	1	0	1
10	0	0	1	0	1
11	1	1	0	0	1
12	0	1	0	0	1
13	1	0	0	0	1
14	0	0	0	0	1
15	1	1	1	1	0
16	0	1	1	1	0
17	1	0	1	1	0
18	0	0	1	1	0
19	1	1	0	1	0
20	0	1	0	1	0
21	1	0	0	1	0
22	0	0	0	1	0
23	1	1	1	0	0
24	0	1	1	0	0
25	1	0	1	0	0
26	0	0	1	0	0
27	1	1	0	0	0
28	0	1	0	0	0
29	1	0	0	0	0
30	0	0	0	0	0

1 = ON, 0 = OFF

Selecting temperature sensors

The dip switches 7 and 8 of switch block S2 allow four different combinations with the temperature sensors Pt 100 and Ni 1000.

Table 2: Possible combinations

Dip switch		Combinations
7	**8**	
0	0	6 Pt 100
0	1	4 Pt 100[1)]/2 Ni 1000[2)]
1	0	4 Ni 1000[1)]/2 Pt 100[2)]
1	1	6 Ni 1000

1) Connections R0 to R3

2) Connections R4, R5

Ensure that you assign the defined intputs when combining the temperature sensors Pt 100 and Ni 1000, otherwise the measuring signals coming from the temperature sensors are not converted correctly.

Legend of Figure 14:

① Main switch

② Protection device for the control transformer

③ Supply unit with screen winding

④ Miniature circuit-breaker

⑤ Suconet K interface

⑥ Screening: Connect the screen of the analogue input cables as described in “3 Engineering - Preventing interferences on data cables”.

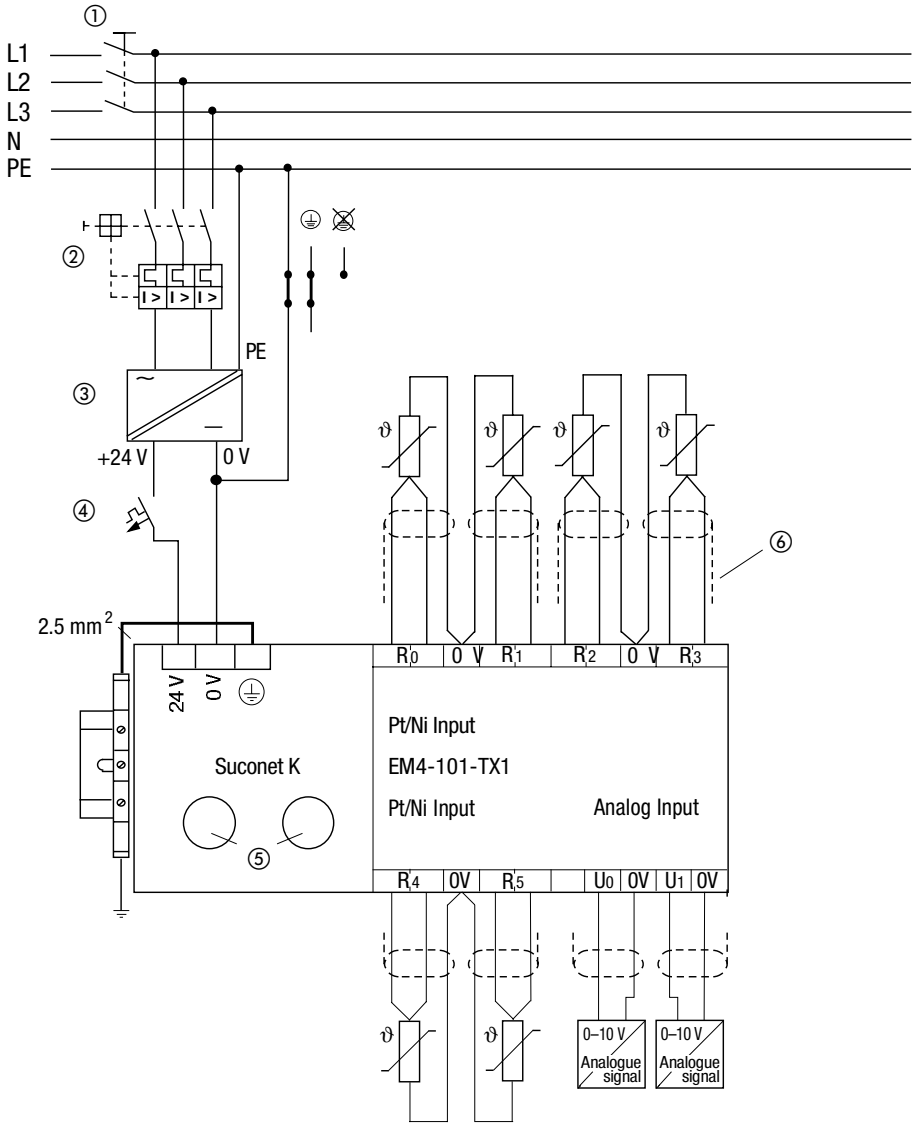

Figure 14: Wiring example

5 Software Configuration

If you already have the Sucosoft S 30-S4, Sucosoft S 40 or Sucosoft LIB/CFG software, you require the updated driver and configuration disk Sucosoft LIB/CFG with the current driver and configuration files for the EM 4-101-TX1. These files update the list in the device configurator in your software. The master controller thus recognises the EM 4-101-TX1.

PS 416

Program the master PS 416 with Sucosoft S 40. The update of the list in the device configurator is described in the “Engineering and Configuration: Suconet K interface” manual (AWB 27-1210-GB), chapter “Software Configuration”.

PS 4-201-MM1,
PS 4-141-MM1,
PS 4-151-MM1

Program the master with Sucosoft S 30-S4. The update of the list in the device configurator is decribed in the “S 30-S4; Installation, Operation, Documentation” manual in chapter “Device Configurator”.

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6 Addressing

This chapter describes how to address the inputs of the EM 4-101-TX1 in your program. With this module a logic address corresponds with a temperature sensor connection, i. e. an input terminal pair on the module. This allocation does not depend on the assignment of the connections with Ni 1000 or Pt 100.

Addressing module in Suconet K network

You can use all eight inputs with a 12-bit resolution in the Suconet K network.

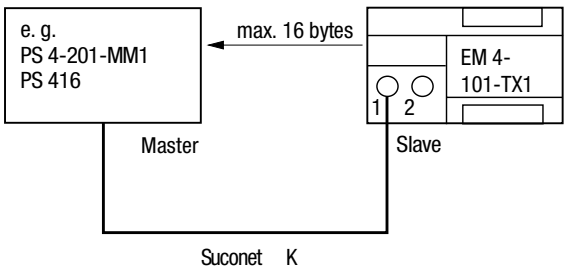

Figure 15: Data exchange between master and slave

Table 3: Operands of the analogue inputs

Analogue inputs	Input bytes
R0	IAW x.y.0.0
R1	IAW x.y.0.2
R2	IAW x.y.0.4
R3	IAW x.y.0.6
R4	IAW x.y.0.8
R5	IAW x.y.0.10
U0	IAW x.y.0.12
U1	IAW x.y.0.14

x = network line, y = station

This example shows the name of the operands if the module on line 1 is the first station.

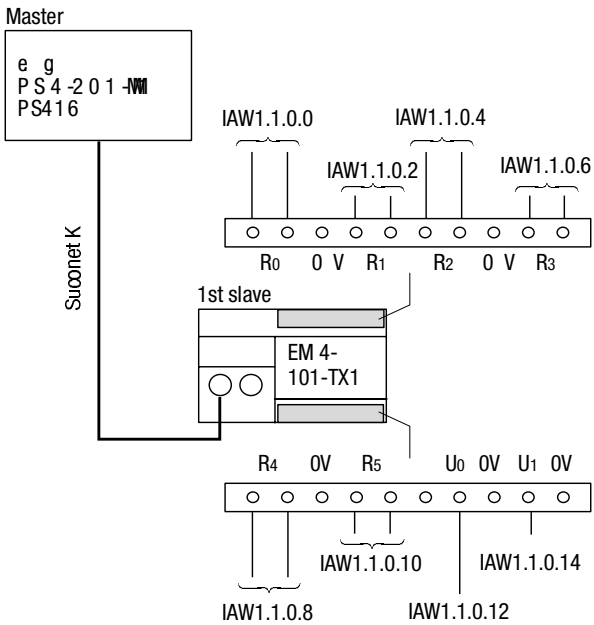

Figure 16: Addressing example

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7 Test/Commissioning/Diagnostics

Status display and error diagnostics

You can read the operating mode of the module and the data transfer error directly on the module. For this the module provides a status display with two LEDs.

Power LED

The yellow LED is lit if the internal voltage of +5 V is reached and the module is ready for operation or in operating status.

If the LED is not lit, the power supply is switched off or interrupted, and the module is switched off.

Bus LED

The bus LED can indicate three different bus states.

HALT
The LED is not lit. The master is in HALT status and data is not exchanged. The bus connection, however, is error-free.

RUN
If the LED is lit, the master is in active operating status. The bus connection is error-free, and data is exchanged.

DUE error
A data transfer error occurred if the LED flashes. The master cannot address the module. Errors in the software or hardware, e. g. faulty bus connection, address not found can be possible reasons.

Scan diagnostics byte in Suconet K

The master is assigned two diagnostic bytes in the Suconet K network. The first diagnostic byte scans hardware and software errors, such as

short-circuit, wire breakage

wrong device type

Structure of the first diagnostic byte

Bit	7	6	5	4	3	2	1

Bit 0: Reserved

Bit 1: Halt

Bit 2: Input length error

Bit 3: Reserved

Bit 4: Hardware error

Bit 5: Short-circuit, wire breakage on the temperature sensors (group signal)

Bit 6: No connection

Bit 7: Wrong device type

Scanning the first diagnostic byte:

Scan the diagnostic byte with the following syntax if the module on line 1 is the second station:

PS 4-201-MM1
PS 4-141-MM1
PS 4-151-MM1

```
L ISB 1.2.0.0
```

PS 416

```
VAR
 EMStat1:AT%ISB1.2.0.0.:Byte;
END_VAR
LD EMStat1
```

Determine on which input the wire breakage or the short-circuit occurred via the second diagnostic byte.

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Structure of the second diagnostic byte

			R5	R4	R3	R2	R1	R0
Bit	7	6	5	4	3	2	1	0

Bit 0 ... 5: Wire breakage, short-circuit on temperature sensor

Bit 6 ... 7: free

Scanning the second diagnostic byte:

Scan the diagnostic byte with the following syntax if the module on line 1 is the second station:

PS 4-201-MM1
PS 4-141-MM1
PS 4-151-MM1

```
L ISB 1.2.0.1
```

PS 416

```
VAR
 EMStat2:AT%ISB1.2.0.1.:Byte;
END_VAR
LD EMStat2
```

A bit is set in the ISB x.x.0.1 diagnostic byte if a wire breakage or short-circuit occurs on a temperature sensor R0 to R5. This means that an error occurred on one of these temperature inputs (wire breakage or short-circuit. To define the error, you must determine the value of the corresponding input. The following applies:

	Pt 100		**Ni 1000**	
	DEC value	**Diagnostic bit**	**DEC value**	**Diagnostic bit**
Wire breakage	+3000	1	+1500	1
Short-circuit	–1000	1	–500	1

The module indicates the error message “Wire breakage, short-circuit” if you did not connect temperature sensors to all temperature inputs. Connect a resistor to unused temperature inputs so that this error message is not indicated.

With Ni 1000 a 1 kΩ resistor

With Pt 100 a 100 Ω

These resistor values correspond with a temperature value of 0 °C.

These errors are also indicated in the diagnostic status word of the master. The scan possibilities are shown in the description of the master.

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8 Analogue Value Representation

The EM 4-101-TX1 has two analogue voltage inputs. The module can convert the anlogue unipolar signals in the voltage range of 0 to 10 V into digital values.

The resolution is 12 bit in the Suconet K network.

Voltage values

The analogue voltage signal is divided into 4096 increments with the 12-bit resolution. The increment values are calculated for the unipolar voltage range of 0 to 10 V as follows:

$$\frac{(upper - lower\ measuring\ limit)}{2^{12}} = 1\ LSB\ increment\ value$$

$$\frac{10\ V}{2^{12}} = 2.441\ mV$$

Each 2.44 mV voltage modification on the analogue inputs causes a modification of the binary/decimal value by “1”.

Reconvert the binary/decimal value into a voltage value if you wish to process a voltage value:

$$\frac{(upper - lower\ measuring\ limit)}{2^{12}} \times (value\ dec) + lower\ measuring\ limit = analogue\ value$$

The following applies with the unipolar measuring range of 0 to 10 V, a 12-bit resolution and the indicated value (dec) = 2047:

$$\frac{10\ V}{2^{12}} \times 2047 = 4.998\ V$$

The table applies for a voltage range of 0 to 10 V and a 12-bit resolution.

Bit numbers

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

The most significant four bits of the data value (bit 12 to bit 15) are always 0.

Table 4: Representation types of the voltage

Voltage value (V)	Binary	Dec	Hex
0.000	0000000000000000	0	0000
0.002	0000000000000001	1	0001
0.005	0000000000000010	2	0002
...	...	...	...
4.998	0000011111111111	2047	07FF
5.000	0000100000000000	2048	0800
5.002	0000100000000001	2049	0801
...	...	...	...
9.993	0000111111111101	4093	0FFD
9.995	0000111111111110	4094	0FFE
9.998	0000111111111111	4095	0FFF

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Temperature values

The value of the temperature can be indicated in three representation types.

You will find a selection of temperature values in the table of the Pt 100 and Ni 1000.

Table 5: Representation types of the temperature of Pt 100

Temperature value in °C	Binary	Dec	Hex
–100.0	1111110000011000	–1000	FC18
–50.5	1111111000000111	–505	FE07
–50.0	1111111000001100	–500	FE0C
–25.0	1111111100000110	–250	FF06
0.0	0000000000000000	0	0000
50.0	0000000111110100	500	01F4
150.0	0000010111011100	1500	05DC
253.1	0000100111100011	2531	09E3
300.0	0000101110111000	3000	0BB8

Table 6: Representation types of the temperature of Ni 1000

Temperature value in °C	Binary	Dec	Hex
–50.0	1111111000001100	–500	FE0C
–30.0	1111111011010100	–300	FED4
–20.3	1111111100110101	–203	FF35
–20.0	1111111100111000	–200	FF38
0.0	0000000000000000	0	0000
30.0	0000000100101100	300	012C
75.0	0000001011101110	750	02EE
135.6	0000010101001100	1356	054C
150.0	0000010111011100	1500	05DC

Preselect the +/- representation of the Sucosoft in the status display if you wish to compare the decimal values.

Appendix

Technical data

General	
Ambient temperature	0 °C to 55 °C
Storage temperature	–20 °C to 70 °C
Shock resistance	15 g, 11 ms
Vibration	Constant 1 g, f = 0 to 150 Hz
EMC Emitted interference Interference immunity	 EN 50081-1 Class B EN 50082-2
Interface	RS 485
Bus protocol	Suconet K
Data cable length	600 m with 187.5 Kbaud 300 m with 375 Kbaud
Transfer rate	187.5/375 Kbaud
Addressing	With coding switch
Slave address	2 to 31
Protection type	IP 20
Isolation voltage	600 V AC
Weight	440 g
Terminal design of the inputs	Plug-in screw terminals
Voltage supply	
Input voltage Nominal value Permissible range	 24 V DC 20.4 to 28.8 V DC
Max. residual ripple	5 %
Reverse voltage protection	Yes
Input current with nominal value	Typ. 150 mA
Inrush current	5 A/5 ms
Power dissipation (entire device)	Approx. 3 W
Bridging voltage dips Duration of the dip Repetition rate	 10 ms 1 s

Protection class	1
Potential isolation	Yes
Terminal design	Screw terminals
Connection cross-section	Flexible with ferrule 0.22 to 2.5 mm^2 Solid 0.22 to 2.5 mm^2
Analogue inputs	
Number of inputs	6 temperature inputs for Pt 100, Ni 1000 2 voltage inputs 0 to 10 V
Resolution	12 bits
Potential isolation Inputs to CPU Among inputs	 No No
Cable length, screened	$\leq$ 20 m (earth screen of the analogue input cable with low impedance with top-hat rail)
Connection cross-section	Flexible with ferrule 0.22 to 1.5 mm^2 Solid 0.22 to 2.5 mm^2
Terminal design	Plug-in screw terminals
Analogue inputs (voltage)	
Permissible input voltage on U_0, U_1 (destruction limit)	+20 V
Number of inputs	2
Voltage range	0 to 10 V
Deviation	Max. $\pm$ 0.5 % from final value
Connection type of the signal encoder	Two-wire connection to the measuring transducer
Input resistance	20 KΩ
Analogue inputs (Pt 100)	
Number of inputs	6
Connection type	Three/two-wire connection
Temperature range	–100 °C to +300 °C
Deviation	Max. $\pm$ 0.4 %; typ. $\pm$ 0.2 %
Linearity factor	Max. $\pm$ 0.15 %

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Repetition accuracy (in steady state at 25 °C)	Max. ±0.3 °C
Error message	Wire breakage detection Short-circuit detection
R0 to R5 short-circuit-proof	Yes
Analogue inputs (Ni 1000)	
Number of inputs	6
Connection type	Three/two-wire connection
Temperature range	–50 °C to +150 °C
Deviation	Max. ± 0.2 %; typ. ± 0.1 %
Linearity factor	Max. ± 0.1 %
Repetition accuracy (in steady state at 25 °C)	Max. ±0.2 °C
Error message	Wire breakage detection Short-circuit detection
R0 to R5 short-circuit-proof	Yes

Use the same cable cross-section with three-wire connection for the Pt 100 and Ni 1000 with all three cables.

Note!
Voltage value is too high.
May damage module.
Do not connect external voltage to the terminals R0 to R5.

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