# Product overview

# 2

## 2.1 Properties

### Article number

6ES7531-7KF00-0AB0

### View of the module

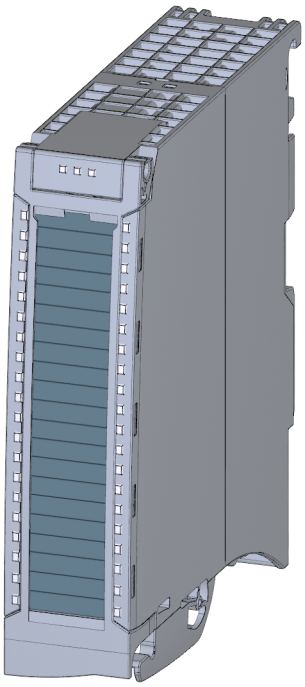


Figure 2-1 View of the AI 8xU/I/RTD/TC ST module

## Properties

The module has the following technical properties:

- 8 analog inputs
- Voltage measuring type can be set per channel
- Current measuring type can be set per channel
- Measuring type resistance adjustable for channel 0, 2, 4 and 6
- Measuring type resistance thermometers (RTD) adjustable for channel 0, 2, 4 and 6
- Thermocouple (TC) measuring type can be set per channel
- Resolution 16 bits including sign
- Configurable diagnostics (per channel)
- Hardware interrupt on limit violation can be set per channel (two low and two high limits per channel)

The module supports the following functions:

Table 2- 1 Version dependencies of the module functions

| Function | Firmware version of the module | Configuration software | |
|---|---|---|---|
| | | STEP 7 (TIA Portal) | GSD file in STEP 7 (TIA Portal) V12 or higher, or STEP 7 V5.5 SP3 or higher |
| Firmware update | V1.0.0 or higher | V12 or higher | X |
| Identification data I&M0 to I&M3 | V1.0.0 or higher | V12 or higher | X |
| Parameter assignment in RUN | V1.0.0 or higher | V12 or higher | X |
| Isochronous mode | V1.0.0 or higher | V12 or higher | --- |
| Calibration in runtime | V1.0.0 or higher | V12 or higher | X |
| Module-internal Shared Input (MSI) | V2.0.0 or higher | V13 Update 3 or higher (PROFINET IO only) | X (PROFINET IO only) |
| Configurable submodules / submodules for Shared Device | V2.0.0 or higher | V13 Update 3 or higher (PROFINET IO only) | X (PROFINET IO only) |
| Configurable after interface module IM 155-5 DP ST | V2.0.0 or higher | V13 or higher | X |

You can configure the module with STEP 7 (TIA Portal) and with a GSD file.

## Accessories

The following accessories are supplied with the module and can also be ordered separately as spare parts:

- Shield bracket
- Shield terminal
- Power supply element
- Labeling strips
- U connector
- Universal front door

## Other components

The following component must be ordered separately:

Front connectors, including potential jumpers and cable ties

You can find more information on accessories in the S7-1500 Automation System system manual (http://support.automation.siemens.com/WW/view/en/59191792) and the ET 200MP Distributed I/O System system manual (http://support.automation.siemens.com/WW/view/en/59193214).

# Technical specifications

# 6

## Technical specifications of the AI 8xU/I/RTD/TC ST

| | 6ES7531-7KF00-0AB0 |
|---|---|
| Product type designation | AI 8xU/I/RTD/TC ST |
| **General information** | |
| Hardware version | E01 |
| Firmware version | V2.0.0 |
| **Product function** | |
| I&M data | Yes; IM0 to IM3 |
| **Engineering with** | |
| STEP 7 TIA Portal can be configured/integrated as of version | V12.0 / V12.0 |
| STEP 7 can be configured/integrated as of version | as of V5.5 SP3 / - |
| **Operating mode** | |
| MSI | Yes |
| **CiR Configuration in RUN** | |
| Parameter assignment in RUN possible | Yes |
| Calibration in RUN possible | Yes |
| **Supply voltage** | |
| Type of supply voltage | DC |
| Rated value (DC) | 24 V |
| Valid range, low limit (DC) | 20.4 V |
| Valid range, high limit (DC) | 28.8 V |
| Reverse polarity protection | Yes |
| **Input current** | |
| Current consumption, max. | 240 mA; (with 24 V DC supply) |
| **Encoder supply** | |
| **24 V encoder supply** | |
| Short-circuit protection | Yes |
| Output current, max. | 53 mA |
| **Power** | |
| Power consumption from the backplane bus | 0.7 W |
| **Power loss** | |
| Power loss, typ. | 2.7 W |

| | 6ES7531-7KF00-0AB0 |
|---|---|
| **Analog inputs** | |
| Number of analog inputs | 8 |
| Number of analog inputs with current measurement | 8 |
| Number of analog inputs for voltage measurement | 8 |
| Number of analog inputs for resistance/resistance thermometer measurement | 4 |
| Number of analog inputs with thermocouple measurement | 8 |
| Permissible input voltage for voltage input (destruction limit), max. | 28.8 V |
| Permissible input current for current input (destruction limit), max. | 40 mA |
| Technical unit for temperature measurement adjustable | Yes |
| **Input ranges (rated values), voltages** | |
| 1 V to 5 V | Yes |
| Input resistance (1 V to 5 V) | 100 kΩ |
| -1 to +1 V | Yes |
| Input resistance (-1 to +1 V) | 10 MΩ |
| -10 V to +10 V | Yes |
| Input resistance (-10 V to +10 V) | 100 kΩ |
| -2.5 V to +2.5 V | Yes |
| Input resistance (-2.5 to +2.5 V) | 10 MΩ |
| -250 to +250 mV | Yes |
| Input resistance (-250 to +250 mV) | 10 MΩ |
| -5 V to +5 V | Yes |
| Input resistance (-5 V to +5 V) | 100 kΩ |
| -50 mV to +50 mV | Yes |
| Input resistance (-50 mV to +50 mV) | 10 MΩ |
| -500 mV to +500 mV | Yes |
| Input resistance (-500 mV to +500 mV) | 10 MΩ |
| -80 mV to +80 mV | Yes |
| Input resistance (-80 mV to +80 mV) | 10 MΩ |
| **Input ranges (rated values), currents** | |
| 0 mA to 20 mA | Yes |
| Input resistance (0 mA to 20 mA) | 25 Ω; (plus approx. 42 ohm for overvoltage protection by PTC) |
| -20 mA to +20 mA | Yes |
| Input resistance (-20 mA to +20 mA) | 25 Ω; (plus approx. 42 ohm for overvoltage protection by PTC) |
| 4 mA to 20 mA | Yes |
| Input resistance (4 mA to 20 mA) | 25 Ω; (plus approx. 42 ohm for overvoltage protection by PTC) |

| | 6ES7531-7KF00-0AB0 |
|---|---|
| **Input ranges (rated values), thermocouples** | |
| Type B | Yes |
| Input resistance (type B) | 10 MΩ |
| Type E | Yes |
| Input resistance (type E) | 10 MΩ |
| Type J | Yes |
| Input resistance (type J) | 10 MΩ |
| Type K | Yes |
| Input resistance (type K) | 10 MΩ |
| Type N | Yes |
| Input resistance (type N) | 10 MΩ |
| Type R | Yes |
| Input resistance (type R) | 10 MΩ |
| Type S | Yes |
| Input resistance (type S) | 10 MΩ |
| Type T | Yes |
| Input resistance (type T) | 10 MΩ |
| **Input ranges (rated values), resistance thermometers** | |
| Ni 100 | Yes, standard/climate |
| Input resistance (Ni 100) | 10 MΩ |
| Ni 1000 | Yes, standard/climate |
| Input resistance (Ni 1000) | 10 MΩ |
| LG-Ni 1000 | Yes, standard/climate |
| Input resistance (LG-Ni 1000) | 10 MΩ |
| Pt 100 | Yes, standard/climate |
| Input resistance (Pt 100) | 10 MΩ |
| Pt 1000 | Yes, standard/climate |
| Input resistance (Pt 1000) | 10 MΩ |
| Pt 200 | Yes, standard/climate |
| Input resistance (Pt 200) | 10 MΩ |
| Pt 500 | Yes, standard/climate |
| Input resistance (Pt 500) | 10 MΩ |
| **Input ranges (rated values), resistors** | |
| 0 to 150 ohm | Yes |
| Input resistance (0 to 150 ohm) | 10 MΩ |
| 0 to 300 ohm | Yes |
| Input resistance (0 to 300 ohm) | 10 MΩ |
| 0 to 600 ohm | Yes |
| Input resistance (0 to 600 ohm) | 10 MΩ |
| 0 to 6000 ohm | Yes |
| Input resistance (0 to 6000 ohm) | 10 MΩ |
| PTC | Yes |
| Input resistance (PTC) | 10 MΩ |

| | 6ES7531-7KF00-0AB0 |
|---|---|
| **Thermocouple (TC)** | |
| Technical unit for temperature measurement | °C/°F/K |
| Temperature compensation | |
| • Configurable | Yes |
| • Internal temperature compensation | Yes |
| • External temperature compensation via RTD | Yes |
| • Compensation for 0 °C reference point temperature | Yes, fixed value can be set |
| **Resistance thermometer (RTD)** | |
| Technical unit for temperature measurement | °C/°F/K |
| **Cable length** | |
| Cable length shielded, max. | 800 m; for U/I,<br>200 m for R/RTD,<br>50 m for TC |
| **Analog value formation** | |
| **Integration and conversion time / resolution per channel** | |
| Resolution with overrange (bit including sign), max. | 16 bit |
| Configurable integration time | Yes |
| Integration time, ms | 2,5 / 16,67 / 20 / 100 |
| Basic conversion time, including integration time, ms | 9 / 23 / 27 / 107 ms |
| • Additional conversion time for wire break monitoring | 9 ms |
| • Additional conversion time for wire break measurement | 150Ohm, 300Ohm, 600Ohm, Pt100, Pt200, Ni100: 2ms<br>6000Ohm, Pt500, Pt1000, Ni1000, LG-Ni1000, PTC: 4ms |
| Interference voltage suppression at interference frequency f1 in Hz | 400 / 60 / 50 / 10 |
| **Smoothing of the measured values** | |
| Configurable | Yes |
| Level: None | Yes |
| Level: Weak | Yes |
| Level: Medium | Yes |
| Level: Strong | Yes |

| | 6ES7531-7KF00-0AB0 |
|---|---|
| **Encoders** | |
| **Connection of the signal encoders** | |
| For voltage measurement | Yes |
| For current measurement as 2-wire transmitter | Yes |
| Load of 2-wire transmitter, max. | 820 Ω |
| For current measurement as 4-wire transmitter | Yes |
| For resistance measurement with 2-wire connection | Yes; only for PTC |
| For resistance measurement with 3-wire connection | Yes; all measuring ranges except PTC; internal compensation of line resistance; |
| For resistance measurement with 4-wire connection | Yes; all measuring ranges except PTC |
| **Errors/accuracies** | |
| Linearity error (relative to input range) | ± 0,02 % |
| Temperature error (relative to input range) | ± 0.005 %/K; for TC typ. T 0.02 +/- %/K |
| Crosstalk between the inputs, max. | -80 dB |
| Repeat accuracy in steady state at 25 °C (relative to input range) | ± 0,02 % |
| Temperature errors of internal compensation | +/-6 °C |
| **Operational limit in overall temperature range** | |
| Voltage, relative to input range | ± 0,3 % |
| Current, relative to input range | ± 0,3 % |
| Impedance, relative to input range | ± 0,3 % |
| Resistance thermometer, relative to input range | Pt xxx standard: +/- 1.5 K<br>Pt xxx climate: +/- 0,5 K<br>Ni xxx standard: +/- 0.5 K<br>Ni xxx climate: +/- 0.3 K |
| Thermocouple, relative to input range | Type B: >600 °C +/- 4.6 K<br>type E: >-200 °C +/- 1.5 K<br>type J: >-210 °C +/- 1.9 K<br>type K: >-200 °C +/- 2.4 K<br>type N: >-200 °C +/- 2.9 K<br>type R: >0 °C +/- 4.7 K<br>type S: >0 °C +/- 4.6 K<br>type T: >-200 °C +/- 2.4 K |
| **Basic error limit (operational limit at 25 °C)** | |
| Voltage, relative to input range | ± 0,1 % |
| Current, relative to input range | ± 0,1 % |
| Impedance, relative to input range | ± 0,1 % |
| Resistance thermometer, relative to input range | Pt xxx standard: +/- 0.7 K<br>Pt xxx climate: +/- 0.2K<br>Ni xxx standard: +/- 0.3 K<br>Ni xxx climate: +/- 0.15 K |
| Thermocouple, relative to input range | Type B: >600 °C +/- 1.7 K<br>type E: >-200 °C +/- 0.7 K<br>type J: >-210 °C +/- 0.8 K<br>type K: >-200 °C +/- 1.2 K<br>type N: >-200 °C +/- 1.2 K<br>type R: >0 °C +/- 1.9 K<br>type S: >0 °C +/- 1.9 K<br>type T: >-200 °C +/- 0.8 K |

| | 6ES7531-7KF00-0AB0 |
|---|---|
| **Interference voltage suppression for f = n x (f1 +/- 1 %), f1 = interference frequency** | |
| Series mode interference (peak value of interference < rated value of input range), min. | 40 dB |
| Common mode voltage, max. | 10 V |
| Common mode interference, min. | 60 dB |
| **Interrupts/diagnostics/status information** | |
| **Interrupts** | |
| Diagnostics interrupt | Yes |
| Limit interrupt | Yes; two high limits and two low limits each |
| **Diagnostics alarms** | |
| Diagnostics | Yes |
| Monitoring of supply voltage | Yes |
| Wire break | Yes;<br>only for 1 ... 5V,<br>4 ... 20mA, TC, R and RTD |
| Overflow/underflow | Yes |
| **Diagnostics indicator LED** | |
| RUN LED | Yes; green LED |
| ERROR LED | Yes; red LED |
| Monitoring of supply voltage | Yes; green LED |
| Channel status display | Yes; green LED |
| For channel diagnostics | Yes; red LED |
| For module diagnostics | Yes; red LED |
| **Electrical isolation** | |
| **Electrical isolation of channels** | |
| Between the channels | No |
| Between the channels, in groups of | 8 |
| Between the channels and the backplane bus | Yes |
| Between the channels and the supply voltage of the electronics | Yes |
| **Permitted potential difference** | |
| Between the inputs (UCM) | 20 V DC |
| Between inputs and MANA (UCM) | 10 V DC |
| Between M internally and the inputs | 75 V DC / 60 V AC (basic isolation) |
| **Isolation** | |
| Isolation tested with | 707 V DC (type test) |
| **Distributed mode** | |
| Prioritized startup | No |
| **Dimensions** | |
| Width | 35 mm |
| Height | 147 mm |
| Depth | 129 mm |

| | 6ES7531-7KF00-0AB0 |
|---|---|
| **Weights** | |
| Weight, approx. | 310 g |
| **Miscellaneous** | |
| Note: | Additional basic error and noise for integration time = 2.5 ms:<br>Voltage:<br>+/- 250mV: +/- 0,02%<br>+/- 80mV: +/- 0,05%<br>+/- 50mV: +/- 0,05%<br>Resistance: 150 ohm: +/- 0.02% resistance thermometer:<br>Pt100 climate: +/- 0.08 K<br>Ni100 climate: +/-0.08K<br>thermocouple:<br>Type B, R, S: +/- 3 K<br>type E, J, K, N, T: +/-1 K |

# Dimensional drawing

# A

The dimensional drawing of the module on the mounting rail, as well as a dimensional drawing with open front panel are provided in the appendix. Always adhere to the specified dimensions for installations in cabinets, control rooms, etc.

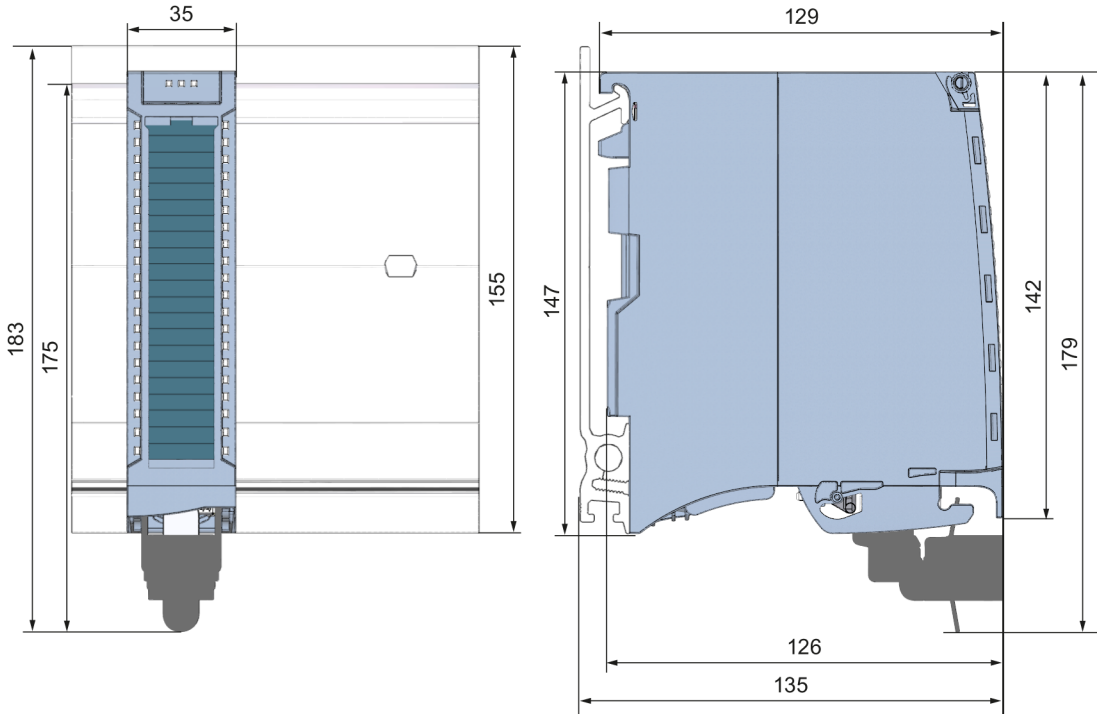



Figure A-1 Dimensional drawing of the AI 8xU/I/RTD/TC ST module

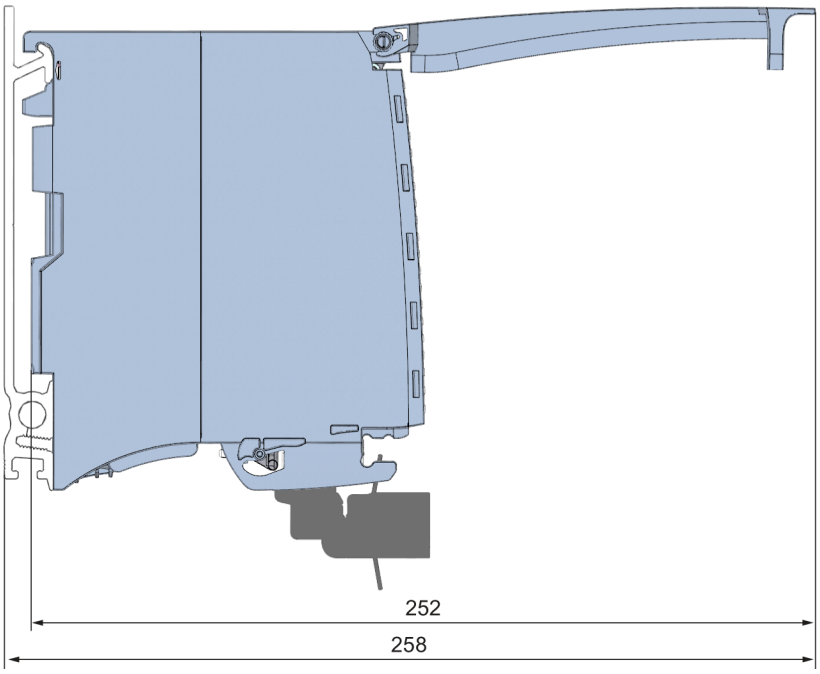



Figure A-2 Dimensional drawing of the AI 8xU/I/RTD/TC ST module, side view with open front panel