

MANUFACTURER DOCUMENT PACKAGE

# Manufacturer's Manual

Reference package for procurement and maintenance review

SIEMENS

## 6ES7650-8AR60-0AA0

THERMOCOUPLE AND RTD INPUT MODULE

Used with the applicable SIMATIC ET 200PA SMART configuration.

REFERENCE PACKAGE

OFFICIAL DOCUMENT

Selected official manufacturer pages follow this cover.

Source: Siemens SIMATIC ET 200PA SMART technical documentation

ET 200PA SMART, analog input isolated, 8 AI thermocouples/4 AI PT100 diagnostics-capable, 1 x 20-pole required in 650-8PH

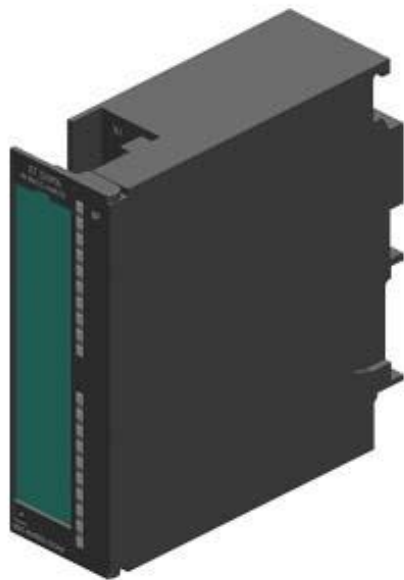


Figure similar

| General information                                                   |                                                                       |
|-----------------------------------------------------------------------|-----------------------------------------------------------------------|
| Product function                                                      |                                                                       |
| • Isochronous mode                                                    | No                                                                    |
| Input current                                                         |                                                                       |
| from backplane bus 5 V DC, max.                                       | 120 mA                                                                |
| Power loss                                                            |                                                                       |
| Power loss, typ.                                                      | 0.6 W                                                                 |
| Analog inputs                                                         |                                                                       |
| Number of analog inputs                                               | 8; 8x thermocouples; 4x RTD thermoresistors                           |
| permissible input voltage for voltage input (destruction limit), max. | 35 V; max. 35 V continuous, 75 V for max. 1 s (pulse duty ratio 1:10) |
| Constant measurement current for resistance-type transmitter, typ.    | 0.5 mA                                                                |
| Input ranges (rated values), voltages                                 |                                                                       |
| • -1 V to +1 V                                                        | Yes                                                                   |
| — Input resistance (-1 V to +1 V)                                     | 10 MΩ                                                                 |

|                                                     |       |
|-----------------------------------------------------|-------|
| • -25 mV to +25 mV                                  | Yes   |
| — Input resistance (-25 mV to +25 mV)               | 10 MΩ |
| • -250 mV to +250 mV                                | Yes   |
| — Input resistance (-250 mV to +250 mV)             | 10 MΩ |
| • -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), 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 L                                            | Yes   |
| — Input resistance (Type L)                         | 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 |
| • Type U                                            | Yes   |
| — Input resistance (Type U)                         | 10 MΩ |
| • Type TXK/TXK(L) to GOST                           | No    |
| Input ranges (rated values), resistance thermometer |       |
| • Ni 100                                            | Yes   |
| — Input resistance (Ni 100)                         | 10 MΩ |
| • Ni 200                                            | Yes   |
| — Input resistance (Ni 200)                         | 10 MΩ |
| • Pt 100                                            | Yes   |
| — Input resistance (Pt 100)                         | 10 MΩ |
| • Pt 200                                            | Yes   |
| — Input resistance (Pt 200)                         | 10 MΩ |

|                                                                        |                                                                  |
|------------------------------------------------------------------------|------------------------------------------------------------------|
| Input ranges (rated values), resistors                                 |                                                                  |
| • 0 to 150 ohms                                                        | Yes                                                              |
| — Input resistance (0 to 150 ohms)                                     | 10 MΩ                                                            |
| • 0 to 300 ohms                                                        | Yes                                                              |
| — Input resistance (0 to 300 ohms)                                     | 10 MΩ                                                            |
| • 0 to 600 ohms                                                        | Yes                                                              |
| — Input resistance (0 to 600 ohms)                                     | 10 MΩ                                                            |
| Thermocouple (TC)                                                      |                                                                  |
| Temperature compensation                                               |                                                                  |
| — parameterizable                                                      | Yes                                                              |
| — internal temperature compensation                                    | Yes                                                              |
| — external temperature compensation with Pt100                         | Yes                                                              |
| — external temperature compensation with compensations socket          | Yes                                                              |
| — for definable comparison point temperature                           | Yes; Compensation for 0 °C and 50 °C reference point temperature |
| Characteristic linearization                                           |                                                                  |
| • parameterizable                                                      | Yes                                                              |
| — for thermocouples                                                    | Type B, E, J, K, L, N, R, S, T, U                                |
| — for resistance thermometer                                           | Pt100, Pt200, Ni100 (standard range and climate range)           |
| Cable length                                                           |                                                                  |
| • shielded, max.                                                       | 200 m; 50 m with thermocouples and input ranges ≤ 80 mV          |
| Analog value generation for the inputs                                 |                                                                  |
| Measurement principle                                                  | Sigma Delta                                                      |
| Integration and conversion time/resolution per channel                 |                                                                  |
| • Resolution with overrange (bit including sign), max.                 | 16 bit; 9 to 15 bit + sign                                       |
| • Integration time, parameterizable                                    | Yes                                                              |
| • Integration time (ms)                                                | 2,5 / 16,67 / 20 / 100 ms                                        |
| • Basic conversion time, including integration time (ms)               |                                                                  |
| — additional conversion time for wire-break monitoring                 | 2.5 ms                                                           |
| • Interference voltage suppression for interference frequency f1 in Hz | 400 / 60 / 50 / 10                                               |
| Smoothing of measured values                                           |                                                                  |
| • parameterizable                                                      | No                                                               |
| Encoder                                                                |                                                                  |
| Connection of signal encoders                                          |                                                                  |
| • for voltage measurement                                              | Yes                                                              |

- for resistance measurement with two-wire connection
- for resistance measurement with three-wire connection
- for resistance measurement with four-wire connection

Yes; Without compensation of the line resistances

Yes; Without compensation of the line resistances

Yes

## Errors/accuracies

|                                                                                                                                 |                                                                                                                                                                                                                                                                 |
|---------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Linearity error (relative to input range), (+/-)                                                                                | 0.003 %                                                                                                                                                                                                                                                         |
| Temperature error (relative to input range), (+/-)                                                                              | 0.002 %/K; Temperature error: 0.001 to 0.002 %/K                                                                                                                                                                                                                |
| Crosstalk between the inputs, min.                                                                                              | 70 dB; Crosstalk attenuation between the inputs (UIISO < 60 V)                                                                                                                                                                                                  |
| Repeat accuracy in steady state at 25 °C (relative to input range), (+/-)                                                       | 0.003 %                                                                                                                                                                                                                                                         |
| <b>Operational error limit in overall temperature range</b>                                                                     |                                                                                                                                                                                                                                                                 |
| • Voltage, relative to input range, (+/-)                                                                                       | 0.09 % (±25 mV), 0.06 % (±50 mV), 0.05 % (±80 mV), 0.04 % (±250 mV / ±500 mV / ±1 V)                                                                                                                                                                            |
| <b>Basic error limit (operational limit at 25 °C)</b>                                                                           |                                                                                                                                                                                                                                                                 |
| • Voltage, relative to input range, (+/-)                                                                                       | 0.018 % (±25 mV), 0.014 % (±50 mV), 0.011 % (±80 mV), 0.008 % (±250 mV / ±500 mV / ±1 V)                                                                                                                                                                        |
| • Resistance, relative to input range, (+/-)                                                                                    | 0.006 %; 150, 300, 600 Ohm                                                                                                                                                                                                                                      |
| • Resistance thermometer, relative to input range, (+/-)                                                                        | 0.1 %; Ptxxx standard: ±0.2 K, Ptxxx climate: ±0.05 K, Ni100 standard: ±0.1 K, Ni100 climate: ±0.05 K                                                                                                                                                           |
| • Thermocouple, relative to input range, (+/-)                                                                                  | Type T: > -150 °C ±0.2 K, Type U: > -50 °C ±0.2 K, Type E: > -100 °C ±0.2 K, Type J: > -150 °C ±0.2 K, Type L: > -50 °C ±0.2 K, Type K: > -100 °C ±0.2 K, Type N: > -50 °C ±0.2 K, Type R: > +200 °C ±0.3 K, Type S: > +100 °C ±0.3 K, Type B: > +700 °C ±0.3 K |
| <b>Interference voltage suppression for <math>f = n \times (f_1 \pm 1 \%)</math>, <math>f_1</math> = interference frequency</b> |                                                                                                                                                                                                                                                                 |
| • Series mode interference (peak value of interference < rated value of input range), min.                                      | 40 dB                                                                                                                                                                                                                                                           |
| • Common mode interference, min.                                                                                                | 130 dB                                                                                                                                                                                                                                                          |
| <b>Interrupts/diagnostics/status information</b>                                                                                |                                                                                                                                                                                                                                                                 |
| Status indicator                                                                                                                | No                                                                                                                                                                                                                                                              |
| Diagnostics function                                                                                                            | Yes; Parameterizable                                                                                                                                                                                                                                            |
| <b>Alarms</b>                                                                                                                   |                                                                                                                                                                                                                                                                 |
| • Diagnostic alarm                                                                                                              | Yes; Parameterizable                                                                                                                                                                                                                                            |
| • Hardware interrupt                                                                                                            | No                                                                                                                                                                                                                                                              |
| <b>Diagnostic messages</b>                                                                                                      |                                                                                                                                                                                                                                                                 |
| • Diagnostic information readable                                                                                               | Yes                                                                                                                                                                                                                                                             |
| • Overrange                                                                                                                     | Yes; Group diagnostics for overrange and underrange                                                                                                                                                                                                             |
| • Wire-break in signal transmitter cable                                                                                        | Yes; Parameterizable                                                                                                                                                                                                                                            |
| • Group error                                                                                                                   | Yes                                                                                                                                                                                                                                                             |
| <b>Diagnostics indication LED</b>                                                                                               |                                                                                                                                                                                                                                                                 |
| • Group error SF (red)                                                                                                          | Yes                                                                                                                                                                                                                                                             |

|                                          |                                                                                              |
|------------------------------------------|----------------------------------------------------------------------------------------------|
| Potential separation                     |                                                                                              |
| Potential separation analog inputs       |                                                                                              |
| • between the channels                   | No                                                                                           |
| • between the channels and backplane bus | Yes                                                                                          |
| Permissible potential difference         |                                                                                              |
| between the inputs (UCM)                 | 75 V DC/60 V AC                                                                              |
| between MANA and M internally (UIISO)    | 75 V DC/60 V AC                                                                              |
| Isolation                                |                                                                                              |
| Isolation tested with                    | 500 V AC/707 V DC, type test                                                                 |
| Connection method                        |                                                                                              |
| required front connector                 | 20-pin                                                                                       |
| Dimensions                               |                                                                                              |
| Width                                    | 40 mm                                                                                        |
| Height                                   | 125 mm                                                                                       |
| Depth                                    | 120 mm                                                                                       |
| Weights                                  |                                                                                              |
| Weight, approx.                          | 210 g                                                                                        |
| last modified:                           | 07/31/2020  |