**Module and Application Description**

**PROCONTROL P**

**Input/Output, Signal Conditioning**

**Input Module for Analog Signals**

4-fold, 0/4 ... 20 mA, 0 ... 10 V

**81EU01-E/R3310**

**Application**

The input module is used as a substitute for the following input modules with transmitters:

81EA02-E/R1010
- without correcting function
  - 2-wire transducer, 4 ... 20 mA, with supply from the module
  - 4-wire transducer, 0/4 ... 20 mA, with external power supply for the transducers
  - Input of voltage signals within 0 ... 10 V

81EA02-E/R1011
- with correcting function
  - 2-wire transducer, 4 ... 20 mA, with supply from the module
  - 4-wire transducer, 0/4 ... 20 mA, with external power supply for the transducers
  - Input of voltage signals within 0 ... 10 V

81EA02-E/R1013
- with extended correcting function and extended plausibility limits
  - 2-wire transducer, 4 ... 20 mA, with supply from the module
  - 4-wire transducer, 0/4 ... 20 mA, with external power supply for the transducer
  - Input of voltage signals within 0 ... 10 V

The module incorporates a total of 4 function units. Each function unit may be used for any type of input mode. Any combination is possible. The allocation as well as the settings of all the parameters can be programmed easily using the configuration list. The programmed values are stored in an EEPROM to ensure that they are not lost in the event of a power failure. They can be changed any time.

Every analog signal may be assigned up to 4 limit values.

In the case of current signal input, the input signal is available for each function unit at one of the module outputs (passive direct output).

In an input module, up to 4 independent correction or filter calculations can be carried out. Programming is done by structuring function blocks. The conditions relevant to this application have to be taken into account.

**Features**

The module can be plugged into any PROCONTROL station with an external power supply unit. It is equipped with a standard interface for the PROCONTROL station bus.

The module sends the converted input signals in the form of telegrams over the station bus to the PROCONTROL bus system. The telegrams are checked before they are sent and are marked with test flags. This ensures that the receiving module can check them for error-free transmission.

The telegrams received over the station bus, e.g. for the correction calculations are checked by the module for error-free transmission, based on their test flags.

Provision is made to eliminate interference among the function units of the module and the station bus.

If 2-wire transducers for a range of 4 ... 20 mA are connected, a short-circuit-proof and monitored transmitter power supply is available for each function unit.

A response of the internal monitoring circuits or of the input signal monitoring function is indicated in the form of a disturbance annunciation ST (general disturbance) on the front panel of the module.

Switches and jumpers are mounted on the module for setting the operating mode.
Application with analog transmitters

Types of transmitters
The function units of the module can be used for:
- 2-wire transducers, 4 ... 20 mA, with supply from the input module
- 4-wire transducers, 0 ... 20 mA and 4 ... 20 mA, with external power supply of the transducers
- Input of voltage signals within 0 ... 10 V

For the applicable type of connection please refer to the connection diagrams.
The application-specific settings are made for each function unit by means of switches and jumpers and by programming the configuration list using the PDDS.

Transducer power supply
Depending on the position of slide switch Sn10 (cf. Setting the operating modes), the transducer is supplied short-circuit-proof from the input module via the respective contact En1+

The maximum potential difference between the reference potentials in the case of external power supply is to be taken into consideration.

It is not admissible to connect several supply outputs En1+ in parallel.

Analog signal input circuit and monitoring

Current input
The input current signal is led over a Zener diode for extracting the current signal and a high-accuracy 50-ohm measuring resistor.
The 90-Kohm series resistor and the 10-Kohm measuring resistor for voltage input are switched off in this case.

Voltage input
The input voltage signal is led over a high-accuracy 90-Kohm series resistor and a high-accuracy 10-Kohm measuring resistor.
The 50-ohm measuring resistor for current input is switched off and the Zener diode is bridged.
The measuring voltage present at the measuring resistor is connected to the joint input instrument amplifier via a multiplexer and, after that, converted into a digital 12-bit analog signal by an A/D converter.
The input instrument amplifier and the A/D converter are monitored with the help of reference voltages.
The analog signals are monitored for plausibility inside the module. The monitoring function responds as soon as an upper limit (OG) or a lower limit (UG) is violated.

These limits can be modified via the configuration list. Their default settings are 118.75 % for the upper limit and -6.25 % for the lower limit.
The plausibility monitoring function can be suppressed separately for each function unit. For this purpose, the maximum values for the upper and lower limits need to be entered into the configuration list.
The digital 12-bit signal is completed by the relevant sign and is sent by the input module as a telegram to the station bus.

As soon as the analog signal monitoring responds, the analog value telegram will be sent with the disturbance bit set.

If an input is overloaded due to faulty circuitry, for instance, the function unit concerned is switched off immediately. The ‘Process channel fault’ message in the diagnosis register and the disturbance bit set in the data telegram indicate that a fault has occurred in the function unit concerned. Every 30 seconds, there will be a new attempt to reactivate the disconnected function unit.

Signal output
In the case of current input, the analog input signal is available at the X21 process connector, via outputs An1(+) and An2(-), for further processing. If the signal output is not given a burden of max. 100 ohms, the voltage required by the input circuit increases by typ. 5.1 V.

Application for correction and filter calculations

When being used for analog signal input, the following function blocks are available on the module for correcting flow-rate and level measurements as well as for filtering measured values:
- Correcting function for flow-rate measurement for water/steam
- Correcting function for flow-rate measurement for gases with a variable reference pressure
- Correcting function for level measurement
- Non-linear filter

One function block can be used per function unit.

Function blocks KOR1, KOR3 and NIV contain the FIL function.
The function blocks include inputs for specifying the correcting quantity as well as basic calculation values, and for issuing the corrected value and the internal status messages via outputs. The outputs of the function blocks for corrected values are allocated to the analog value telegrams of the associated function unit.

In order to be able to perform the correction, the inputs of the function blocks must be assigned module inputs, signals from the station bus, and fixed values. These are defined by the user.

This procedure is referred to as structuring. The structure list includes all of the information. The list is stored in the EEPROM of the module.
The exact procedure of structuring the function blocks is described in the function block descriptions.

For structuring, the following limit values of the module have to be considered:
- Max. number of the function blocks 4
- Max. number of the signals from the bus 20
- Max. no. of function blocks for each function unit 1

When function blocks are being used, the respective module cycle time is increased by the specified computation time of the function block.
The cycle time required for structure processing is calculated automatically by the module and is stored in module register 205. It can be read there by the PDDS.

The corrected analog values are sent to the PROCONTROL bus system in the form of a telegram.

In addition, it is possible to output the uncorrected raw values as a telegram as well.

Telegrams for the function blocks, received from the bus, may be disturbed and carry a disturbance bit. The module uses the value in this telegram for calculating and forwards the calculated value as a telegram with a disturbance bit.

The module incorporates a monitoring function for cyclic renewal of the telegrams to be received from the bus. If a signal has not been renewed for a certain time (e.g., due to failure of the sending module), the receive monitoring function in the module will respond. This function sets the disturbance bit in the receive register allocated to the telegram. The module then uses the value transferred last with this telegram for calculating and forwards the calculated value together with a disturbance bit.

Limit signals

When being used for analog signal input, up to 4 limit values can be programmed on the module for each function unit. For each limit value, one of four hysteresis values can be chosen. Programming is done with the PDDS using the limit value list. The limit value list is saved in the EEPROM on the module.

For making subsequent changes, the limit value list can be filed in a RAM memory. This information is lost, however, if a power failure occurs. In such a case, the module switches immediately over to the list in the EEPROM. If the limit value list has been loaded both into the EEPROM and into the RAM, list processing will be performed in the mode defined by the PDDS, i.e., EEPROM/RAM.

In the event mode, any violation of a limit value is immediately indicated to the station bus in the form of a limit signal telegram. The same happens when the input signal monitoring feature responds, but in this case together with the associated analog value telegram. The associated disturbance bits of the analog value and limit signal telegram will be set. All the limit values assigned to the analog value are set to "0".

The limit value range is within -150 % ... +150 % of the set signal range.

The following hysteresis values can be set individually for each limit value:
- HY1 = 0.39 %
- HY2 = 1.56 % (default setting)
- HY3 = 3.12 %
- HY4 = 6.25 %

The hysteresis may be above or below the limit value, depending on whether minimum value underflow or maximum value overflow has been selected (cf. Figure 1).

Event generation

The input module transmits its information in the form of telegrams to the station bus, either cyclically or in the event mode.

In the event mode, data are transmitted whenever analog values in the module have changed. In this case, the cyclic mode is interrupted and the module is immediately granted the permission to transmit.

When analog transmitters are connected, the module interprets the following occurrences as events:
- Response of a limit signal
- Response of a monitoring function
- Change of an analog value by an adjustable threshold value within an adjustable time span since the last transmission to the station bus.

As soon as the module detects an analog value change by more than the specified value, it will initiate an event transfer if the set time value has been exceeded since the last transfer as well.

Adjustable analog value change: 0.2 % ... 6.8 %
Default setting: 1.56 %

Adjustable time value: 40 msec, 200 msec
Default setting: 200 msec

The values in the configuration list are set using the PDDS.

Simulation

A maximum of 32 signals can be simulated.

Simulation of send registers

It is possible to simulate the send registers of the analog transmitters by means of the PDDS. All of the send registers can be simulated.

Simulation of receive registers

Receive register simulation is possible using the function block for correction or filter calculations by means of the PDDS. It is possible to simulate all of the bus signals.
Setting the operating modes

Setting the function units

The four slide switches S110 ... S410 are provided for the 4 function units. They can be set to position 1 or 2.

They are used to set the type of input signal and the type of transducer power supply.

In this case, the following allocations apply:

<table>
<thead>
<tr>
<th>Switch S110 ... S410</th>
<th>Externally supplied transducer 0 ... 20 mA</th>
<th>Position 1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Externally supplied transducer 4 ... 20 mA</td>
<td>Position 1</td>
</tr>
<tr>
<td></td>
<td>Internally supplied transducer 4 ... 20 mA</td>
<td>Position 2</td>
</tr>
<tr>
<td></td>
<td>Voltage input 0 ... 10 V</td>
<td>Position 1</td>
</tr>
</tbody>
</table>

In addition to the switches, two jumpers are available in each function unit.

They are used to set the type of input signal and the value of the measuring resistance.

In this case, the following allocations apply:

<table>
<thead>
<tr>
<th>Measuring range</th>
<th>Jumper 7/8/9</th>
<th>Jumper 10/11/12</th>
</tr>
</thead>
<tbody>
<tr>
<td>0/4.. 20 mA</td>
<td>8 – 7</td>
<td>11 – 10</td>
</tr>
<tr>
<td>0 ... 10 V</td>
<td>8 – 9</td>
<td>11 – 12</td>
</tr>
</tbody>
</table>

In addition, a jumper 13/14/15 is provided for each function unit that can be used for bridging the Zener diode. This way, the voltage made available by the module for supplying the 2-wire measuring transducers is increased by typ. 5.1 V. The outputs for decoupled signals are not used in that case.

In this case, the following allocations apply:

<table>
<thead>
<tr>
<th>Jumper 7/8/9</th>
<th>Jumper 10/11/12</th>
<th>Switch S110 ... S410</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 – 8</td>
<td>14 – 13</td>
<td>Externally supplied transducer 0 ... 20 mA</td>
</tr>
<tr>
<td>10 – 11</td>
<td>14 – 15</td>
<td>Externally supplied transducer 4 ... 20 mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Internally supplied transducer 4 ... 20 mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Voltage input 0 ... 10 V</td>
</tr>
</tbody>
</table>

Settings in the configuration list

So the module can take up operation, besides setting the operating mode correctly by means of switches and jumpers in the function units, it is necessary to load a configuration list that indicates type of application and setting values. Before that, all process inputs of the module are given a high-resistance bias and the module transmits no data telegrams to the bus. The ST lamp indicates the presence of a disturbance. Nevertheless, the module can receive information over the bus. The module waits for the configuration list to be transmitted by the PDDS.

After transmission of the configuration list, the module fully participates in bus communication. The lamp goes off.

The configuration list contains all the settings required by the module, listed according to function units (Table 1). The column for standard settings contains the default value which is entered if no other value is set.

<table>
<thead>
<tr>
<th>Transmitter type, measuring range</th>
<th>0 ... 20 mA</th>
<th>4 ... 20 mA</th>
<th>0 ... 10 V</th>
<th>Value range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower plausibility limit</td>
<td>-200 ... 0 %</td>
<td></td>
<td></td>
<td>-6.25 %</td>
</tr>
<tr>
<td>Upper plausibility limit</td>
<td>0 ... 199.9 %</td>
<td></td>
<td></td>
<td>118.75 %</td>
</tr>
<tr>
<td>Threshold</td>
<td>0.2 ... 6.8 % (increments approx. 0.2 %)</td>
<td></td>
<td></td>
<td>1.56 %</td>
</tr>
<tr>
<td>Timeout</td>
<td>40, 200 msec</td>
<td></td>
<td></td>
<td>200 msec</td>
</tr>
<tr>
<td>Number of the function block</td>
<td>(1 ... 4), KOR1, KOR3, NIV, FIL</td>
<td></td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>Filter function</td>
<td>16 2/3, 50, 60 Hz</td>
<td></td>
<td></td>
<td>50 Hz</td>
</tr>
</tbody>
</table>

Table 1: Configuration list
Signal output to the PROCONTROL bus

The module sends the data telegrams over its standard station bus interface. The data are transferred serially.

Signal identification

The conditioned and digitized input signals as well as the limit signals formed in the module are written into special registers. The processing section writes the following data into the address part of the data telegram:
- System address (within 0 .. 3)
- Station address (within 1 .. 249)
- Module address (within 0 .. 58)
- Register address (within 0 ... 7 for analog values and limit signals
  8 for status message
  9 ... 12 for raw values
  205 for module cycle time
  246 for diagnostic data)

Data communication with the module

Address formation

System and station addresses are identical for all the modules of a PROCONTROL station. They are set automatically by the station bus control module.

The module address is set automatically when the module is plugged into the slot reserved in the PROCONTROL station.

The data words of the input signals and the results of the diagnosis are written into special registers of the shared memory. The register number also serves as the register address. Every analog value and limit signal is assigned a permanent register. This assignment is done automatically when a process signal is connected to the process connector of the module.

Always all the analog value and limit signal telegrams are sent.

In the case of incompletely programmed limit values of an input signal, the bits of the unprogrammed limit values in the limit signal telegram are always set to "0".

Reading the data

Address data are needed for reading the contents of a register. Table 2 shows the address data and the contents of the associated registers.

Diagnosis and annunciation functions

Disturbance annunciations on the module

Disturbances are indicated by an LED on the module front:
- Disturbance ST

Light-emitting diode ST indicates all module disturbances and data communication disturbances involving the module.

Disturbance signals to the annunciation system

The annunciation system or the control diagnosis system (CDS) receive the disturbance messages from the input module via the bus.

Diagnosis

Inside the module's processing section, the telegrams received and the formation of the telegrams to be sent, as well as the internal signal processing functions are monitored for fault-free condition (self-diagnosis).

In the event of a disturbance, the fault type is written into the diagnosis register and a disturbance signal is sent to the PROCONTROL system.

Upon request, the module sends a telegram with the data stored in the diagnosis register (register 246) (cf. Figure 2).

The contents of the diagnosis register, the message on the general disturbance line, the messages on the CDS, and the ST lamp are shown in Figure 2.

If the "Process channel fault" message is indicated in the diagnosis register, this may be due to one of the following reasons:
- Analog signal not plausible, i.e. the values are smaller or greater than the set plausibility limits
- Disturbance of the internal reference values of the analog inputs
- Transmitter monitoring responded
- Input monitoring responded

If the "Processing fault" message is indicated in the diagnosis register, this may be due to one of the following reasons:
- Invalid configuration list
- Internal module voltages disturbed
- Hardware defect on the module
<table>
<thead>
<tr>
<th>Type of information</th>
<th>Address word</th>
<th>Data word (bit address)</th>
<th>DA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog value FE1</td>
<td>a a a</td>
<td>0 VZ 100% 50% 25% 12.5% 6.25% 3.125% 1.56% 0.78% 0.39% 0.195% 0.097% 0.048% 0 0 SM 5</td>
<td></td>
</tr>
<tr>
<td>Limit signals FE1</td>
<td>a a a 1</td>
<td>0 0 0 GO4 GU4 M4 GO3 GU3 M3 GO2 GU2 M2 GU1 GU1 M1 SM 3</td>
<td></td>
</tr>
<tr>
<td>Analog value FE2</td>
<td>a a a 2</td>
<td>MW2 0 0 SM 5</td>
<td></td>
</tr>
<tr>
<td>Limit signals FE2</td>
<td>a a a 3</td>
<td>0 0 0 GO4 GU4 M4 GO3 GU3 M3 GO2 GU2 M2 GU1 GU1 M1 SM 3</td>
<td></td>
</tr>
<tr>
<td>Analog value FE3</td>
<td>a a a 4</td>
<td>MW3 0 0 SM 5</td>
<td></td>
</tr>
<tr>
<td>Limit signals FE3</td>
<td>a a a 5</td>
<td>0 0 0 GO4 GU4 M4 GO3 GU3 M3 GO2 GU2 M2 GU1 GU1 M1 SM 3</td>
<td></td>
</tr>
<tr>
<td>Analog value FE4</td>
<td>a a a 6</td>
<td>MW4 0 0 SM 5</td>
<td></td>
</tr>
<tr>
<td>Limit signal FE4</td>
<td>a a a 7</td>
<td>0 0 0 GO4 GU4 M4 GO3 GU3 M3 GO2 GU2 M2 GU1 GU1 M1 SM 3</td>
<td></td>
</tr>
<tr>
<td>Status message SF</td>
<td>a a a 8</td>
<td>0 0 0 MF43 MF42 MF41 MF33 MF32 MF31 MF23 MF22 MF21 MF13 MF12 MF11 SM 1</td>
<td></td>
</tr>
<tr>
<td>Raw value FE1</td>
<td>a a a 9</td>
<td>MW1 0 0 SM 5</td>
<td></td>
</tr>
<tr>
<td>Raw value FE2</td>
<td>a a a 10</td>
<td>MW2 0 0 SM 5</td>
<td></td>
</tr>
<tr>
<td>Raw value FE3</td>
<td>a a a 11</td>
<td>MW3 0 0 SM 5</td>
<td></td>
</tr>
<tr>
<td>Raw value FE4</td>
<td>a a a 12</td>
<td>MW4 0 0 SM 5</td>
<td></td>
</tr>
<tr>
<td>Module cycle time</td>
<td>a a 205</td>
<td>Time value 100 msec</td>
<td></td>
</tr>
<tr>
<td>Diagnosis register</td>
<td>a a 246</td>
<td>For register allocation see Fig. 2</td>
<td></td>
</tr>
</tbody>
</table>

Table 2: Register allocation and bit significance of the telegrams

Explanation:
FE = Function unit
SM = General disturbance signal telegram
VZ = Sign
MWn = Digital measured value
Mn = Single disturbance signal
GOn = Max. limit value n overflow
GUn = Min. limit value n underflow
MFn = Status message
DA = Data type
a = Address according to location

Please note:
The telegrams of registers 9 through 12 are sent only if the raw values are output as well and the associated correcting function is structured.
If limit values of function units remain unprogrammed, the associated bits GOn, GUn and Mn in the limit signal telegram are set to 0.
Configuration register 200 is not used, since the contents of this register has been replaced by the configuration list.
### Module operating

#### Diagnosis register 246

<table>
<thead>
<tr>
<th>Bit</th>
<th>Type</th>
<th>Description</th>
<th>CDS messages *)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>S</td>
<td>Parameter fault</td>
<td>6615</td>
</tr>
<tr>
<td>14</td>
<td>S</td>
<td>Process channel fault</td>
<td>6600</td>
</tr>
<tr>
<td>13</td>
<td>S</td>
<td>Processing fault</td>
<td>6601</td>
</tr>
<tr>
<td>12</td>
<td>S</td>
<td>Checksum error</td>
<td>6602</td>
</tr>
<tr>
<td>11</td>
<td>0</td>
<td>Timer defective</td>
<td>6604</td>
</tr>
<tr>
<td>10</td>
<td>S</td>
<td>Module restart executed</td>
<td>6605</td>
</tr>
<tr>
<td>9</td>
<td>D</td>
<td>Bus deactivation defective</td>
<td>6606</td>
</tr>
<tr>
<td>8</td>
<td>S</td>
<td>Receive monitoring responding</td>
<td>6610</td>
</tr>
<tr>
<td>7</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>S</td>
<td>Event mode fault</td>
<td>6612</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Module not operating

- Wrong firmware PROM
- Hardware defect of processing section
- EEPROM not valid
- Processing initialization active

#### Module not accessible from bus

- Module transmitter switched off by bus control module
- Module address not within 0 - 58
- Hardware defect of bus interface

D = Dynamic annunciations are cancelled after the diagnosis register has been sent
S = Static annunciations disappear automatically upon deactivation
0 = Not used

---

Figure 2: 81EU01/R3310 diagnostic messages

*) The control diagnosis system (CDS) provides a description for every message number. Among other data, this description contains:

- Information on cause and effect of the disturbance
- Recommendations for elimination of the fault.

This ensures quick elimination of a disturbance.
Function diagram

Terminal designations: The module consists of a printed-circuit board (cf. "Mechanical design"). The printed-circuit board is equipped with connectors X21 and X11. Connector X21 contains all of the process inputs. Connector X11 contains the standard station bus interface and the operating voltages for the module.
Connection diagrams

**Current signal input**
4-wire transducers, 0/4 ... 20 mA, with external power supply or 2-wire transducers, 4 ... 20 mA, with supply from the module

![Connection Diagram for Current Signal Input]

**Voltage signal input**
Transducers 0 ... 10 V

![Connection Diagram for Voltage Signal Input]
Mechanical design

Board size: 6 units, 1 division, 160 mm deep
Connector: to DIN 41 612
   1 x for station bus connection, 48-pin edge-connector, type F (connector X11)
   1 x for process connection, 32-pin edge-connector, type F (connector X21)

Weight: approx. 0.6 kg

View of connector side:

Contact assignments of the X21 process connector

View of contact side:

<table>
<thead>
<tr>
<th></th>
<th>b</th>
<th>z</th>
</tr>
</thead>
<tbody>
<tr>
<td>02</td>
<td>A11+</td>
<td>E11+</td>
</tr>
<tr>
<td>04</td>
<td>A12-</td>
<td>E12-</td>
</tr>
<tr>
<td>06</td>
<td>A21+</td>
<td>E21+</td>
</tr>
<tr>
<td>08</td>
<td>A22-</td>
<td>E22-</td>
</tr>
<tr>
<td>10</td>
<td>A31+</td>
<td>E31+</td>
</tr>
<tr>
<td>12</td>
<td>A32-</td>
<td>E32-</td>
</tr>
<tr>
<td>14</td>
<td>A41+</td>
<td>E41+</td>
</tr>
<tr>
<td>16</td>
<td>A42-</td>
<td>E42-</td>
</tr>
<tr>
<td>18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>32</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Side view and view of the module front

[Diagram of the module front with labels and connections]

1. EPROM programmed order number: GJR2403644Pxxxx
   xxxx = Position number according to the applicable program version.
Technical data

In addition to the system data, the following values apply:

**Power supply**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating voltage UD = 5.0 V</td>
<td>4.9 ... 5.1 V, typ. 5.0 V</td>
</tr>
<tr>
<td>Power consumption at UD = 5.0 V</td>
<td>220 mA</td>
</tr>
<tr>
<td>Operating voltage US = 24 V</td>
<td>19.5 ... 30 V, typ. 24 V</td>
</tr>
<tr>
<td>Power consumption at US = 24 V (depending on the type of configuration)</td>
<td>Configuration basic current + per FU (with act. transmitt.) 2-wire transd. 140 mA 7 mA + measuring current 4-wire transd. 140 mA 7 mA + measuring current 3.5 ... 7.0 W depending on operating voltage and configuration</td>
</tr>
</tbody>
</table>

**Analog transmitters**

**Input values — current input**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input current, nominal range (corresponds to 0 ... 100 %)</td>
<td>0 ... 20 mA</td>
</tr>
<tr>
<td>Maximum range</td>
<td>-1 ... 30 mA</td>
</tr>
<tr>
<td>Measuring resistor</td>
<td>50 ohms</td>
</tr>
<tr>
<td>Destruction limits</td>
<td>± 50 mA</td>
</tr>
<tr>
<td>Voltage between En1+ and En2- with open current output An1+ and An2-</td>
<td>5.1 V (Zener voltage)</td>
</tr>
<tr>
<td>Line resistance (forward and return line)</td>
<td>≤ 100 ohms</td>
</tr>
<tr>
<td>Line length</td>
<td>≤ 1000 m</td>
</tr>
</tbody>
</table>

**Input values — voltage input**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input voltage, nominal range (corresponds to 0 ... 100 %)</td>
<td>0 ... 10 V</td>
</tr>
<tr>
<td>Maximum range</td>
<td>-0.5 ... 15 V</td>
</tr>
<tr>
<td>Measuring resistor</td>
<td>100 Kohms</td>
</tr>
<tr>
<td>Destruction limits</td>
<td>± 25 V</td>
</tr>
<tr>
<td>Line resistance (forward and return line)</td>
<td>≤ 100 ohms</td>
</tr>
<tr>
<td>Line length</td>
<td>≤ 1000 m</td>
</tr>
</tbody>
</table>

**Output values**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Admissible burden at An1+ and An2 (passive current output)</td>
<td>≤ 100 ohms</td>
</tr>
</tbody>
</table>

**Accuracy**

All data are based on 100 % of the signal range end value (20 mA, unless specified otherwise)

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy (over a temperature range of 0 to 70 °C, aging, voltage range)</td>
<td>&lt; 0.3 %</td>
</tr>
<tr>
<td>Accuracy in as-delivered condition (23 °C)</td>
<td>&lt; 0.1 %</td>
</tr>
<tr>
<td>Quantization error</td>
<td>&lt; 0.02 %</td>
</tr>
<tr>
<td>Linearity error</td>
<td>&lt; 0.1 %</td>
</tr>
<tr>
<td>Temperature sensitivity</td>
<td>&lt; 50 ppm/K (typ. 30 ppm/K)</td>
</tr>
<tr>
<td>Errors due to digital linearization</td>
<td>1 LSB</td>
</tr>
<tr>
<td>Resolution, at 0 ... 20 mA</td>
<td>12 bits</td>
</tr>
<tr>
<td>at 4 ... 20 mA</td>
<td>12 bits</td>
</tr>
<tr>
<td>Common-mode rejection</td>
<td>120 dB</td>
</tr>
<tr>
<td>Normal-mode rejection at 16 2/3, 50 and 60 Hz</td>
<td>50 dB</td>
</tr>
</tbody>
</table>
Transducer power supply
Terminal voltage (voltage between En1+ and En2-)
At outputs An1+ and An2 not connected \[\leq 10 \text{ V}\]
At outputs An1+ and An2 connected (burden \[\leq 100 \text{ ohms}\]) \[\leq 13 \text{ V}\]
At outputs An1+ and An2 jumpered internally (jumper 13/14) \[\leq 15 \text{ V}\]

Times
Processing time
For complete module
- Analog transmitters, without function blocks 80 msec
- Additional times
  if function blocks are used (for each function):
    - KOR1 105 msec
    - KOR3 125 msec
    - NIV 105 msec
    - FIL 70 msec

Initialization time
Upon power connection or when the module is plugged in
- Without function blocks being used 1 ... 12 sec
- With function blocks being used 2 ... 22 sec

Interference immunity (of the process inputs and outputs)
- Electrostatic discharge immunity DIN EN 61000-4-2 8 kV / 4 kV
- Radiated, radio-frequency, electromagnetic field, immunity DIN EN 61000-4-3 10V/m
- Electrical fast transient/burst immunity DIN EN 61000-4-4 2 kV
- Surge Immunity DIN EN 61000-4-5 2 kV / 1 kV
- Conducted disturbances immunity DIN EN 61000-4-6 10 V

ORDERING DATA
Order no. for complete module:
Type designation: 81EU01-E/R3310 Order number: GJR2403600R3310