Application

The input module is used to input standard current signals in the signal ranges 0/4...20 mA, as well as voltage signals in the range 0...10 V.

Two–wire transducers (at 4...20 mA) and externally supplied transducers (at 0/4...20 mA) can be connected to the module.

With a current signal input the input signal is available for further use at a module output for each function unit (passive direct output).

The module (with 4 function units) is available in three basic versions:

81EA02–E/R1010: without correction functions
81EA02–E/R1011: with correction functions
81EA02–E/R1013: with extended correction function and plausibility limits

The following applies to 81EA02–E/R1011 and R1013:

Each function unit is able to perform one correction and/or filtering calculation. For this purpose, standard functions which can be structured are provided on the module.

The correction variable as well as both correction auxiliary variables can be optionally fed to each standard function by the 4 analog input units or via the bus.

As a matter of principle the corrected values are output via the bus. In addition to the corrected values, limit values for analog signals and the status messages for the standard functions are also output to the bus system.

Features

The module can be plugged into any multi-purpose processing station of the PROCONTROL bus system. It incorporates a standard interface to the PROCONTROL station–bus.

The telegrams received via the station–bus are checked by the module for faultless transfer by means of parity bits.

The telegrams sent from the module to the station–bus are provided with parity bits. This ensures faultless transfer.

A voltage source that is supplied with US = +24 V is available for each function unit when connecting two–wire transducers in the range 4...20 mA.

The input signals are supplied to the processing section via an isolation facility. This eliminates any interaction between the process side and the bus side.

The following annunciations are signalled at the front of the module by light–emitting diodes:

– Module disturbance – ST
– Simulation – SIM

Switches and plug–in jumpers are provided on the module for setting the operating modes.

Interference voltages on the input lines are suppressed by module–internal protective circuits.

The following modules may be plugged into the front of the module by means of connector X1:

– Battery pack 89NB02 (Order no. GJR2355100R0100) as a back–up battery for a RAM–memory integrated in the module
– RAM clearing module 89PL01 (Order no. GJR2366000R0100) for clearing a RAM integrated in the module.
Signal conditioning and monitoring

The first function unit and the process circuit section which is identical for all function units is described below. The other function units operate similarly.

Signal input

Signal input is via inputs E11(+) and E12(–). The current signal is routed via a Z–diode and a resistor. The voltage present at the resistor is fed to the common multiplexer provided for all 4 function units. The multiplexer cyclically scans all 4 function units controlled by the microprocessor of the unit.

The output signal of the multiplexer is fed to an adjustable analog amplification circuit (see "Functional circuit diagram"). There, the appropriate input measuring range settings are effected.

The input signal is converted to a 12–bit data word via an analog/digital converter.

A potential–isolation facility implemented with optical couplers provides the processing section with digitized input signals. The processing section handles the input signals, calculates the sign and transfers the measured values to the PROCONTROL bus system as a data telegram.

A suitably designed voltage source is also available for each function unit when two wire transducers in the range 4...20 mA are connected. Their function is monitored by the module self diagnosis facility. For the max. terminal voltage available at the transducer see "Technical Data".

4–wire transducers must be fed externally.

Signal output

The analog input signal is also available for further processing at the process connector via outputs A11(+) und A12 (FE1). If the signal output is not terminated with a load of 100 ohm max. the voltage requirement of the input circuit is increased by 5.1 V in the typical case. This applies, however, only to the current input ranges 0/4 ... 20 mA.

Input signal monitoring

The input signal and the corrected value are monitored for plausibility within permanently set limits. The monitor responds when the following upper or lower limit values are violated:

<table>
<thead>
<tr>
<th>Limit value</th>
<th>Upper limit</th>
<th>Lower limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input signal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Version R1010, R1011</td>
<td>+118 %</td>
<td>– 6 %</td>
</tr>
<tr>
<td>Version R1013</td>
<td>+150 %</td>
<td>–18.75 %</td>
</tr>
<tr>
<td>Corrected value</td>
<td>+200 %</td>
<td>–200 %</td>
</tr>
</tbody>
</table>

When the monitor responds, the red light–emitting diode ST at the front of the module emits a steady light. The disturbed measured value, however, is transferred together with its disturbance bit.

In order to prevent disturbance annunciations from unused function units, input signal monitoring for these function units can be blocked.

Correction calculation (for R1011/R1013)

Standard functions

Standard functions are provided on the module for pressure and temperature corrections and for corrections to flow rate and level measurements, as well as for filtering measured values. These are filed in the form of software packages in EPROMs.

The following standard functions are available:

– Correction function for flow rates of water/steam KOR1
– Correction function for flow rates of gases KOR2
– Correction function for flow rates of gases with variable reference pressure KOR3 (R1013 only)
– Correction function for level NIV
– Non–linear filters FIL

One standard function can be used for each function unit.
**Structuring**

The standard functions incorporate inputs for specifying the correction variables and basic calculation values as well as outputs for putting out the corrected value and the internal status messages (see messages MFXY in the status telegram of register 8). The corrected values are firmly allocated to the analog telegrams of the four function units.

Hardware inputs as well as software inputs (via bus) of the module, and additionally fixed values have to be allocated to the inputs of a standard function in order to perform a correction calculation. These data are specified by the user in plant-specific mode. This procedure is called structuring. The structure list comprises the total of all information.

This list is filed on the module in an erasable PROM (user PROM) as part of the user program.

The following limit values of the module must be observed during structuring:

- Max. number of hardware module inputs 4 (function units)
- Max. number of bus inputs (EGn) 20

The exact structuring procedure for standard functions is set forth in the functional block descriptions.

Unlike outputs of control modules, the outputs for the standard functions cannot be structured, they are allocated (analog value telegrams) to specific source registers in the shared memory (see Addressing).

The cycle time required for structuring is determined by the module and entered into module register 205.

**Formation of limit signals**

Four limit signals which are independent of each other can be derived on the module from each corrected measured value, or each uncorrected measured value if the correction function is not used. The limit values can be specified here within a range 0...110 %. One of the four hysteresis ranges below can be allocated to each limit value:

- HY1 = 0.39 %
- HY2 = 1.56 %
- HY3 = 3.12 %
- HY4 = 6.25 %

For the formation of the limit value, two types of limits values are distinguished:

- Upper limit value
- Lower limit value

The characteristic curve for these two limit value types is shown in the diagrams below.

![Upper limit value](image)

![Lower limit value](image)

The limit values, hysteresis values and type of limit value are specified by the user via the control system operator station. The appropriate information is filed on the user PROM as a limit value list.

A duplicate of the limit value list is filed in a RAM on the module for on-line changes to these values.

When the input signal monitor responds, all limit signals (GOXX, GUXX) allocated to the measured value are set to "0", and the disturbance bits (MXX, SMXX) are set to "1" (see "Source register allocation").

After power ON, the limit signals are fed to the station-bus with a delay.

The 4 limit values for each of the 4 corrected or uncorrected measured values are filed in specific source registers of the shared memory (see "Addressing").
Addressing

General

The data exchange of the module with the bus system is carried out via a shared memory. Here, incoming telegrams to be received by the module, and output values of the standard functions as well as uncorrected values and limit values which are designed to leave the module are buffered.

To this end, the shared memory incorporates source registers for the telegrams to be sent and sink registers for telegrams to be received.

The allocation of module output values to the source registers of the shared memory is predetermined.

The allocation of the bus inputs to the sink registers of versions R1011 and R1013 is laid down by information supplied by the user through the control system operator station. The user information is supplied in the form of an address list.

Address list for module inputs

In the address list for module inputs of versions R1011 and R1013, the source location address of the telegram to be received is allocated to each module input. The following information is obtained for one module input:

<table>
<thead>
<tr>
<th>Input</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>EG1</td>
<td>1, 120, 54, 13</td>
</tr>
</tbody>
</table>

where: 1st No. System no. (0... 3)

2nd No. Multi-purpose (1... 249)

3rd No. Module no. (1... 58)

4th No. Register no. (0... 63)

The process-related KKS code can be given instead of the complete source location address when the address list is input by the central operator station.

The address list for module inputs thus obtained is translated into two module–internal lists, a bus address list and an allocation list for module inputs.

The bus address list contains the source address of all telegrams which are to be received by the module.

Received telegrams whose addresses are not in the bus address list are ignored by the module. Received telegrams whose addresses are available in the bus address list are written into the sink registers of the shared memory.

In the allocation list, each module input is allocated the sink register number of the shared memory under which the telegram meant for it is filed.

Both lists are filed on the user PROM together with the structure list and the limit value list.

The microprocessor, however, does not work with the allocation list directly but with a duplicate which is filed in the read–write memory.

Formation of address

The allocation of the corrected values and of the limit values derived from them to the source registers is specified by a special structuring instruction.

Binary status messages for standard functions as well as raw values (uncorrected values) are permanently allocated to the shared memory. This also applies to measured values (and their limit values) which are input via one of the four hardware function units and which are not corrected.

The system and station addresses are the same for all modules in a multi–purpose processing station. They are set on the modules jointly and automatically via the station–bus control module.

The module address is set automatically by plugging the module into the slot provided within the multi–purpose processing station.

In this way, the exact source location address is defined for all output information.
Source register allocation

<table>
<thead>
<tr>
<th>Reg No.</th>
<th>Information</th>
<th>Telegram</th>
<th>DA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bit position</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>Analog value</td>
<td>VZ</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Limit values</td>
<td>0 0 0 0</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Analog value</td>
<td>VZ</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Limit values</td>
<td>0 0 0 0</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Analog value</td>
<td>VZ</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Limit values</td>
<td>0 0 0 0</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Analog value</td>
<td>VZ</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Limit values</td>
<td>0 0 0 0</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Status</td>
<td>SF</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Raw value of</td>
<td>VZ</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Raw value of</td>
<td>VZ</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Raw value of</td>
<td>VZ</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Raw value of</td>
<td>VZ</td>
<td></td>
</tr>
<tr>
<td>200</td>
<td>Configuration register</td>
<td>0 0 0 0 0 0 0 0 0 0</td>
<td></td>
</tr>
<tr>
<td>205</td>
<td>Module cycle time</td>
<td>Time value 100 ms</td>
<td>Time value 10 ms</td>
</tr>
<tr>
<td>246</td>
<td>Diagnosis announcements</td>
<td>Processing and process disturbed</td>
<td>Bus adaption disturbed</td>
</tr>
</tbody>
</table>

Explanation:

SMX = General disturbance bit telegram
SB = Disturbance bit telegram
MXX = Limit value X individual disturbance annunciation
VZ = Sign
DA = Data type
GOXX = Upper limit value X violated
GUXX = Lower limit value X violated
FEX = Function unit analog input
MFXY = Status annunciation Y, standard function X (Annunciation outputs of the standard functions)

Note:

Register 8 is used in module versions R1011 and R1013 only.

Registers 9 – 12 are used in module versions R1011 and R1013 only if the raw values are also output and the associated correction function has been structured.

In the case of unprogrammed limit values per function unit, the respective bits MXX, GUXX and GOXX are always set to “0” in the limit value telegram.

Registers 200, 205 and 246 can be read via module 89PT01.
Formation of events

The module is normally requested in cycles by the PROCONTROL system to transfer the information filed in the source registers of the shared memory.

If values change within the cycle time, this is treated as an “Event”.

The module recognizes the following occurrences as events:

- Change of status in the case of binary values
- Response of the input signal monitor
- Change of a measured value by a programmable threshold value and expiration of an adjustable time period since the last transfer (cyclical or event mode), see also “Event triggering for the analog signals”.

When an event occurs, the cyclic mode is interrupted and the new values are transferred to the bus with priority.

Diagnosis

The received telegrams and the formation of the telegrams to be sent out as well as the internal signal processing are monitored for errors in the processing section of the module (self-diagnosis).

In the event of a disturbance, the type of disturbance is filed in the diagnosis register and a disturbance annunciation is sent to the PROCONTROL system simultaneously.

The module transfers a diagnosis telegram with the data stored in the diagnosis register after the bus grant.

It is also possible to scan the current status of the module and the data at any time from the control system operator station (remote diagnosis).

The diagnosis register can be called by giving the complete address and the data type. The diagnosis register has the register number 246 and the data type 0.

Disturbance bit

The telegrams arriving via the bus are provided with a disturbance bit on bit position 0. This disturbance bit is generated by the source module on the basis of plausibility checks and is set to “1” when particular disturbances are present (see Functional block descriptions).

In order to be able to recognize errors during signal transfer, the module in its versions R1011 and R1013 also incorporates a monitoring feature that supervises the incoming telegrams for cyclic renewal. If a signal has not been renewed for a specified time (e.g. due to failure of the source module), bit position 0 is set in the allocated sink register of the shared memory.

A set disturbance bit in an incoming telegram influences the calculation of the corrected value only insofar that after the calculation the corrected value is also provided with a disturbance bit. This disturbance bit of the corrected value is available on the bus.

Simulation

Limit values and threshold values can be changed and input values (e.g. auxiliary correction variables) can be simulated via the control system operator station.

To this effect the information contained in the limit value and threshold value list duplicates or in the allocation list duplicate are over-written by constants.

The simulated input values are filed on a simulation list (R1011/R1013 only).

The simulation of limit values and threshold values is indicated at the front of the module by a light-emitting diode SIM.
External back-up supply for RAM memory

The following measures are provided as a power supply back-up for the RAM:

- Capacitor for short-time voltage failures (integrated in the module)
- For a long-time supply (module unplugged) the battery pack 89NB02 may be plugged into the front panel (front connector X1).

For clearing the RAM memory the RAM clearing module 89PL01 is available; it is plugged into the front panel (front connector X1).

Attention:
If the 89PL01 is plugged in permanently the RAM area of the module is not backed up in the event of a power failure.

Operating modes

The input module incorporates several switches and plug-in jumpers by means of which the various operating modes can be set.

The location and designation of the switches and plug-in jumpers are shown under "Mechanical design".

Setting the process section

Four slide switches S110 – S410 are provided for the four function units. They have the positions 1 and 2.

These switches can be used to specify whether a transducer with external or internal power supply is employed for the measuring range of 4...20 mA.

The following allocation applies here:

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

<table>
<thead>
<tr>
<th>Jumper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current input 0/4...20 mA</td>
</tr>
<tr>
<td>Voltage input 0...10 V</td>
</tr>
</tbody>
</table>

In addition, plug-in jumpers 5 and 6 are provided for each function unit. They serve to specify for the measuring ranges 0..10 and 0/4...20 mA (only externally supplied transducers), whether the measured input value is to be connected with or without an earth connection.

The following allocation applies here:

<table>
<thead>
<tr>
<th>Measured value input</th>
</tr>
</thead>
<tbody>
<tr>
<td>without earth connection</td>
</tr>
<tr>
<td>with earth connection</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Measured value input</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jumper 5 – 6</td>
</tr>
<tr>
<td>removed</td>
</tr>
<tr>
<td>in place</td>
</tr>
</tbody>
</table>

The measured values of the 4 function units are fed via the multiplexer to an amplifier circuit. This can be adjusted via the plug-in jumpers 10 – 11 and 12 – 13.

The following allocation applies here:

<table>
<thead>
<tr>
<th>Measuring range</th>
</tr>
</thead>
<tbody>
<tr>
<td>0/4...20 mA</td>
</tr>
<tr>
<td>0...10 V</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Measuring range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jumper 10 – 11</td>
</tr>
<tr>
<td>12 – 13</td>
</tr>
</tbody>
</table>

Since this amplifier circuit is common to all 4 function units, it is also possible to choose between current input and voltage input jointly for all 4 function units.

For standard current input, however, one may choose between the ranges 0...20 mA and 4...20 mA for each function unit separately. Change-over is effected in the processing section.
Setting the processing section

Input signal ranges

For versions R1010 and R1011:

The module operates at 0...20 mA/0...10 V in the measuring range 0 %...150 %; at 4...20 mA in the measuring range –25 %...150 %. The measured values, too, are transferred in these ranges. However, the monitor responds below –6 % (only 4...20 mA) and above 118 % unless it is blocked (see "Input signal monitoring").

For version R1013:

The module operates at 0...20 mA/0...10 V in the measuring range 0 %...175 %; at 4...20 mA in the measuring range –25 %...175 %. The measured values, too, are transferred in these ranges. However, the monitor responds below –18.75 % (only 4...20 mA) and above 150 % unless it is disabled (see "Input signal monitoring").

It is possible to choose between 0...20 mA and 4...20 mA for each function unit, using contacts 1 to 4 of switch S101. Contact 5 is used to change from current input to voltage input.

<table>
<thead>
<tr>
<th>Input current range</th>
<th>S101: 1 – 4, : 5</th>
<th>Function Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>0...20 mA*</td>
<td>ON</td>
<td>1, 2, 3, 4</td>
</tr>
<tr>
<td>4...20 mA</td>
<td>ON</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Input voltage range</th>
<th>S101: 1 – 4, : 5</th>
<th>Function Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>0...10 V</td>
<td>ON</td>
<td>1, 2, 3, 4</td>
</tr>
<tr>
<td></td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

On delivery, the module is calibrated to the current range 0...20 mA by means of potentiometers R111 (0 %) and R112 (100 %). No re-calibration is necessary when switching over to 4...20 mA.

However, if the function units are changed over later from current input to voltage input, a new calibration is necessary using the above potentiometers.

* = setting as delivered

X = any setting

Input signal monitoring

In order to prevent disturbance annunciations from unused function units, or in the case of an intended range limit violation, the input signal monitor can be disabled with contacts 1 to 4 of switch S103.

<table>
<thead>
<tr>
<th>Monitoring</th>
<th>Function Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disabled</td>
<td>ON</td>
</tr>
<tr>
<td>Effective *</td>
<td>ON</td>
</tr>
</tbody>
</table>

Event generation for the analog signals

In addition to direct event generation by an alteration of a binary value or a response of the input signal monitor, an event can also be generated by an alteration of an analog value.

The processing section monitors the measured value for changes of more than the permissible set percentage (threshold value) since the last value transfer to the station-bus. This threshold value can be specified in percent for each function unit within a range of ≥ 0.2 % via the control system operator station. If no threshold value is set (programmed) by the user, the module operates automatically with a value of 1.56 %.

A change of the analog value by more than the specified threshold value generates an event only after a set period of time has elapsed since the last transfer to the station-bus.
Two time periods can be set for each function unit via contacts 1 to 4 of switch S102. They are effective for those function units only for which no correction function has been structured.

<table>
<thead>
<tr>
<th>Monitoring</th>
<th>Function Unit</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 ms</td>
<td>S102:1</td>
<td>ON</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>S102:2</td>
<td>ON</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>S102:3</td>
<td></td>
<td>ON</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>S102:4</td>
<td></td>
<td>ON</td>
<td></td>
<td></td>
</tr>
<tr>
<td>200 ms</td>
<td>S102:1</td>
<td>ON</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>S102:2</td>
<td></td>
<td>ON</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>S102:3</td>
<td></td>
<td>ON</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>S102:4</td>
<td></td>
<td>ON</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Contact 5 of switch S102 belongs functionally to module versions R1011 and R1013 with correction functions. It serves to specify whether the module only transfers the corrected values or also the raw values as a telegram. In switch position S102:5 = "ON" the raw values are also included in the event generation.

Setting is done jointly for all 4 function units:

The following allocation applies here:

<table>
<thead>
<tr>
<th>Addit. transfer of raw values*</th>
<th>S102:5</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td></td>
</tr>
</tbody>
</table>

The positions of contacts 1 – 5 of switch S101 and the position of contact 5 of switch S102 can be read out indirectly from the control system operator station. The settings of the contacts are filed in the configuration register (see also “Telegram table”).

The following allocation generally applies (for each bit):

Contact in “OFF” position = Bit = 0
Contact in “ON” position = Bit = 1

Special setting

The two plug-in jumpers X4 are located on the module (see "Mechanical design").

They have no application-related function and serve for factory-testing of the processing section only.

Caution: Both jumpers must be in place during normal operation of the module.

Annunciation functions

Annunciations on the module

Two red light-emitting diodes are provided at the front of the module.

The light-emitting diode ST emits a steady light if disturbances are detected during the self-diagnosis of the module. This also includes:

- Input signal monitoring (FE1...FE4) responded
- Monitor for cyclical renewal of telegrams responded

The individual disturbance annunciations are filed in the diagnosis register.

The light-emitting diode SIM emits a steady light if a simulation has been carried out via the control system operator station.

Annunciation functions to the station bus

Events or disturbances are recognized by the processing section. Events are signalled immediately. Disturbances are stored. The signal “Common disturbance Station” is output simultaneously. The diagnosis register is then read out from the control system operator station for evaluation.

* = setting as delivered
Functional diagram

Terminal designations

The module incorporates a total of 3 connectors. X1 is located at the front and is used for plugging in RAM clearing module and the battery pack.

Connector X2 incorporates all process inputs and outputs. X3 incorporates the standard interface to the station–bus and the voltage supplies for the module.
Connection diagrams

0/4...20 mA via externally supplied or two-wire transducer

0...10 V

Mechanical design

Board size: 6 units, 1 division, 160 mm deep

Connector: to DIN 41 612

1 x for station-bus connection, 48-pole, edge-connector type F (connector X3)

1 x for process connection, 48-pole, edge connector type F (connector X2)

1 x for battery pack 9-pole, to MIL-C-24 308 socket connector type HD (Firm AMP) (for X1)

Weight: approx. 0.6 kg
Position of switches, jumpers, memory modules and front panel

Memory modules:

1. bus and module program without correction functions (A148) GJTN160230P1(27128) GJR2353101Pxxxx (for R1010)
2. bus and module program with correction functions (A149) GJTN160230P1(27128) GJR2353102Pxxxx (for R1011)
3. user PROM (A150) HETN400795P1(2764) (for R1011 and R1013)

Order number:
(Component) (PROM programmed)

Note:
xxxx = Position numbers corresponding to the appropriate revision.
Version R1013 replaces version R1011.
Technical data

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

**Power supply**

- Operating voltage bus side: $U_{D+} = +5$ V
- Operating voltage process side: $U_S = +24$ V
- Current consumption: $I_S = 0.04$ A, $I_D = 1$ A
- The output current must be taken into account in the case of transmitter power supply:
  - $P_V = 6$ W (without transmitter power supply)
  - $P_V = 7.88$ W (with transmitter power supply)
- Reference potential bus section: $Z_D = 0$ V
- Reference potential process section: $Z = 0$ V

**Power dissipation, typ.**

**Output values**

- A11/A12 Passive current output to Permissible load $R \leq 100$ Ohm
- A41/A42 (at $I_a < 25$ mA)

**Input values**

- Range 0...20 mA
  - Conversion range: 0...40 mA = 0...200 %
  - Nominal signal range: 0...20 mA = 0...100 %
  - Internal load resistance: $R = 100$ Ohm
  - Max. permissible input current without destruction of load: $I_e = 50$ mA
  - Voltage between EX1(+) and EX2(−) without destruction of load $U = 5.1$ V (zener voltage)

- Range 4...20 mA
  - Conversion range: 4...36 mA = 0...200 %
  - Nominal signal range: 4...20 mA = 0...100 %
  - Internal load resistance: $R = 100$ Ohm
  - Max. permissible input current without destruction of load: $I_e = 50$ mA
  - Voltage between EX1(+) and EX2(−) without destruction of load $U = 5.1$ V (zener voltage)

**Voltage source data**

- No-load voltage
  - US = approx. 0.8 V
- Voltage, with reference to Z
  - for $I_a = 25$ mA
  - US = approx. 1.5 V
- Short-circuit current
  - $I = 30$ ... 60 mA
- Max. terminal voltage (UK)
  - to 2-wire transducer
  - for A1X/A2X not wired $U_{K_{max}} \leq 10$ V
  - for A1X/A2X wired $U_{K_{max}} \leq 13$ V
  - (load $\leq 100$ ohm)
  - for A1X/A2X with external jumper $U_{K_{max}} \leq 15$ V
Input values

Range 0...10 V

Extended signal range 0...12 V = 0...120 %
Nominal signal range 0...10 V = 0...100 %
Input resistance R = 100 kohm (= 1 analog load AL)
Permissible input voltage UE = +/- 45 V at < 10 ms

Transfer values

Scanning time of inputs t = 50 ms (12.5 ms per value)
Linearity error ≤ 0.1 %
Conversion error at 4...20 mA 0.048 % (=1 LSB)
Amplification error at 70 °C and 20 °C calibration temperature 0.15 % typ. 0.3 % max.

Zero error

0...20 mA 0.08 % typ. 0.3 % max.
4...20 mA 0.1 % typ. 0.37 % max.
0...10 V 0.05 % typ. 0.07 % max.

Total error incl. aging

0 ...20 mA < 0.7 %
4 ...20 mA < 0.82 %
0 ...10 V < 0.47 %

Resolution 12 Bit
Common-mode voltage range −12 V ... +12 V
Common-mode rejection 60 dB
Series-mode rejection, cut–off frequency typ. 5.6 Hz
increase 20 dB/decade

ORDERING DATA

1. Complete module

<table>
<thead>
<tr>
<th>Type designation</th>
<th>Order number</th>
</tr>
</thead>
<tbody>
<tr>
<td>81EA02–E/R1010</td>
<td>GJR2366000R1010</td>
</tr>
<tr>
<td>81EA02–E/R1011</td>
<td>GJR2366000R1011</td>
</tr>
<tr>
<td>81EA02–E/R1013</td>
<td>GJR2366000R1013</td>
</tr>
</tbody>
</table>

Version 81EA02–E/R1013 replaces 81EA02–E/R1011

2. Memory modules: See “Mechanical design”

Technical data are subject to change without notice!