Module and
Application Description

PROCONTROL P

Input/Output, Signal Conditioning

Input Module for Pulse Counters

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Application

The input module for pulse counters is used for counting the pulses coming from pulse generators and for connecting the types of transmitter given in the following.

Up to 16 pulse counting function blocks – designated ZIP – and 1 time receiving function block – designated UHR – can be programmed on one input module through structurizing. Up to 4 limit values and one start value can be assigned to each pulse counter.

All binary transmitters can be used as input of a pulse counting function block.

Binary Transmitters

- Single and changeover contacts with or without line monitor
- Inductive initiators acc. to NAMUR DIN 19234
- Electronic transmitters

Analog transmitters for current signals

- Twin–wire transducers 4 ... 20 mA supplied from the input module
- 4–wire transducers 0 ... 20 mA, 4 ... 20 mA and 0...5 mA with external power source

Temperature transducers

- Thermocouples with transducers for current signals of 4 ... 20 mA and cold junctions inside the transducer. Linearization is on the input module.
- Resistance thermometers with transducers for current signals of 4 ... 20 mA

The module consists of 16 function units. Each function unit may be used for any type of input mode. Any combination is possible. Parameter allocation and setting is programmed easily via the configuration list. The programmed values are stored in an EEPROM to ensure that they are not lost in the event of power failure. They can be changed any time.

Up to four limit values can be allocated to each analog signal.

Features

The module can be plugged into any station of the PROCONTROL bus system. It incorporates a standard interface for the PROCONTROL station bus.

The module transmits the input signals and/or converted input signals in telegrams via the station bus to the PROCONTROL bus system. Before transmission the telegrams are checked and provided with parity bits. This ensures that the receiving module can check for fault–free transmission.

The module checks the telegrams received over the station bus by their parity bits for fault–free transmission.

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

A short–circuit–proof and monitored transmitter power source is available for each function unit, suitable for the various applications.

In case the internal monitoring circuits or the input signal monitor respond, disturbance annunciation ST (general disturbance) will be indicated on the front panel of the module.

Response of the internal monitoring circuits is indicated as disturbance annunciation SG (module disturbance) on the front panel of the module.

Application of binary transmitters

Types of transmitters

The function units of the module can be used for

- single/changeover contacts
  with 48 V supply from the module, incl. monitoring
- single/changeover contacts
  with 48 V supply from the module, without monitoring
- single/changeover contacts
  with 24 V supply from the module, without monitoring
- contacts or electronic transmitters
  with external power supply of up to 60 V, without monitoring
- inductive initiators acc. to NAMUR (DIN 19234),
  with supply from the module, incl. monitoring.

For the applicable type of connection refer to the connection diagrams

For programming of the application−specific settings refer to the configuration list.

Transmitter power supply from the module

The transmitter power supply for the different binary mode applications is available for each function unit at the appropriate output Sn.

The transmitter power supply is short−circuit−proof and monitored on the module.

The applications of “single/changeover contacts with 48 V supply from the module with or without monitoring” allow parallel supply of max. 4 contacts with a common root from one Sn supply output.

The application of “single/changeover contacts with 24 V supply from the module, without monitoring” allows parallel supply of max. 16 contacts with a common root from one Sn supply output.

Those inputs grouped together to be supplied from one common source are susceptible to mutual interference.

In the case of common supply, those Sn supply outputs which are not required shall not be used.

If the transmitters are supplied from an external power source, the respective Sn supply output on the module shall not be used.

It is not permissible to connect several Sn supply outputs in parallel.

The maximum permissible static potential difference between the reference potentials shall not be exceeded when an external power source is used.

Binary signal input circuit and monitoring

Signal input for binary transmitters is through inputs En.

Each input is provided with bounce suppression time obtained from the number of n processing cycles. The module detects the first signal change as an effective signal if the signal is present for more than n processing cycles. The number of processing cycles (n) can be freely configured.

Entry into the corresponding register takes place after elapse of the response time, which is equal to the bounce suppression time plus a processing period of 3 ms.

In the applications of “single/changeover contacts with 48 V supply from the module with or without monitoring”, a current of about 5 mA will flow through the closed contact.

In the applications of “single/changeover contacts with 48 V supply from the module with monitoring”, a resistor of 47 kOhm +/− 2 % shall be connected in parallel with the contact. This allows to monitor the following faults:

- Wire break and short−circuit to earth in the transmitter line
- Wire break and short−circuit to earth in the transmitter supply line
- Interruption in suppression resistor when the contact is open
- Breaking of changeover contact.

When the ”Inductive initiator acc. to NAMUR (DIN 19234)” is used, the signals of a function unit are evaluated as follows:

active area free	En = ”0” signal
active area covered	En = ”1” signal

Monitoring is for:

- Wire break and short−circuit to earth in the transmitter line
- Wire break and short−circuit earth to in the transmitter supply line
- Interruption in the transmitter.

Reaction to the response of a monitoring function

As soon as a monitoring function responds, the relevant transmitter signals are set to zero in the telegram, the single disturbance bit and the general disturbance bit are set to 1.

Use of analog transmitters

Types of transmitters

The function units of the module can be used for

- 2−wire transducers, 4 ... 20 mA, supplied from the input module
- 4−wire transducers, 0 ... 20 mA, 4 ... 20 mA and 0 ... 5 mA with external power supply of the transducer
- and the following thermocouples with transducers for 4 ... 20 mA and a cold junction before or inside the transducer. Linearization is in the input module.
  - Thermocouples type S (PtRh−Pt) acc. to DIN IEC 584
  - Thermocouples type K (NiCr−Ni) acc. to DIN IEC 584
  - Thermocouples type J (Fe−CuNi) acc. to DIN IEC 584
  - Thermocouples type L (Fe−CuNi) acc. to DIN 43710
  - Thermocouples type N (NiCrSil−NiSil)
- resistance thermometers Pt 100 acc. to DIN IEC 751 with transducer for 4 ... 20 mA

For type of connection refer to the connection diagrams.

For programming of the application−specific settings refer to the configuration list.

Transducer supply

The transducer supply from the input module is short-circuit-proof, is available at the respective supply output Sn and is monitored on the input module.

In the case of external supply of the transducer, the supply contact of the respective function unit is not used.

The maximum potential difference among the reference potentials shall not be exceeded in case of external power supply.

Several Sn supply outputs shall not be connected in parallel.

Analog signal input circuit and monitoring

The current input signal is converted into a measuring voltage by a high−precision measuring resistor, transmitted to the input measuring amplifier via a multiplexer and finally converted into a 12−bit analog signal by an analog−to−digital converter.

The input measuring amplifier and the analog−to−digital converter are monitored by means of reference voltages.

The analog signals are monitored for plausibility on the module. The monitor responds as soon as the upper limit (OG) or the lower limit (UG) is violated.

These limits can be readjusted via the configuration list. The upper limit is preset to 118.75 % and the lower limit to −6.25 %.

The plausibility check can be suppressed for each function unit separately. This requires the entry of the OG and UG maximum values into the configuration list.

The input module transmits the digital 12−bit signal, complemented by a prefix sign, as telegram to the station bus.

When the analog signal monitor has responded, the analog value telegram is transmitted with the disturbance bit set.

If an input is overloaded − e.g. due to a connection fault −, the function unit concerned will be immediately deactivated.

The fault of the function unit concerned is indicated by the ”Process channel fault” message present in the diagnosis register as well as by the disturbance bit set in the data telegram. Every 30 seconds an attempt is made to reactivate the switched−off function unit.

Connection of thermocouples and resistance thermometers

The connection of thermocouples and resistance thermometers requires a transducer to be connected in the incoming circuit. It is required that the cold junction for thermocouples is located before or inside the transducer.

The thermocouples and the associated transducer are linear with respect to the thermal e.m.f. Therefore, the current signals within 4 ... 20 mA from the temperature transducers for thermocouples are linearized in the input module. For this purpose, the characteristics of the permissible thermocouples are stored on the EPROM of the thermocouple.

The resistance thermometer and the associated transducer are linear with respect to temperature. Linearization on the input module is not required.

Within the plausibility limits, the measured value transmitted to the station bus is always identical with the measured temperature.

The temperature transmitters and the associated transducers shall be selected according to the required measuring range.

When earthed thermocouples are used, isolated transducers are required.

Measuring ranges:

The transmitters have the following ranges.

Thermocouple	Nominal range	100 % value
Type S	0 ... 1200 ˚C	1000 ˚C
Type K	0 ... 600 ˚C	600 ˚C
	0 ... 1000 ˚C	1000 ˚C
Type L	0 ... 200 ˚C	150 ˚C
	0 ... 400 ˚C	300 ˚C
Type N	0 ... 600 ˚C	600 ˚C
Type J	0 ... 300 ˚C	300 ˚C
	0 ... 600 ˚C	600 ˚C

Resistance thermometer	Nominal range	100 % value
Pt 100	0 ... 150 ˚C	150 ˚C
	0 ... 300 ˚C	300 ˚C
	0 ... 600 ˚C	600 ˚C

If the measuring range limits are violated, a disturbance bit will be added to the temperature values.

The measuring range of the module which can be represented is −200 % ...+199.9 %. The minimum and maximum values which are actually transmitted depend on the type of transducer selected.

Use for pulse counting

When used for pulse counting, the module can be programmed to have as many as 16 ZIP function blocks. Each of these function blocks is provided with inputs for release, reset, counting threshold and differential generation cycle, in addition to the counter input.

For synchronization of the differential generation cycle with the system time, configuration of the time receiving function block UHR is required. Only the time master's source address is entered at this function block.

If no time receiving function block UHR has been configured, the differential generation cycle runs asynchronously with the system time of the module−internal clock.

The following limit values of the module shall be observed for structuring of the function blocks:

– max. number of pulse counting function blocks	16
– max. number of signals from the bus	52
– max. number of pulse counting function blocks per function unit	1
– max. number of time receiving function blocks	1

The outputs for counter reading, counter differential and limit values are allocated to fixed module registers.

The output values are output to the PROCONTROL bus system in the form of telegrams.

Moreover, the raw values of the counter inputs can be output in the module's binary value telegrams.

Telegrams arriving over this bus for the function blocks may be faulty and therefore contain a disturbance bit. The module uses this value in its arithmetic operations and transmits the calculated value in a telegram with the disturbance bit set.

The module incorporates a monitoring feature which checks the telegrams to be received by the bus for cyclic updating. When a signal has not been updated for a particular time (since the source module failed for instance), the sink time watchdog will respond. The watchdog sets the disturbance bit in the sink register allocated to this telegram. The module then uses the last value transmitted in this telegram and forwards the calculated value with the disturbance bit set.

Limit signals

Analog input

When the module is used for analog signal input, max. 4 limit values can be programmed for each function unit. One out of four hysteresis values can be selected for each limit value.

Programming is by means of the PDDS on the basis of the limit value list. The limit value list is stored on the module in an EEPROM.

The limit value list can be stored in a RAM if changes shall be made. But these data will be lost in case of voltage failure. In that case, the module changes over to the list in the EEPROM immediately. If the limit value list is loaded both into EEPROM and RAM, the list processing will be performed in the mode defined by the PDDS, i.e. EEPROM/RAM.

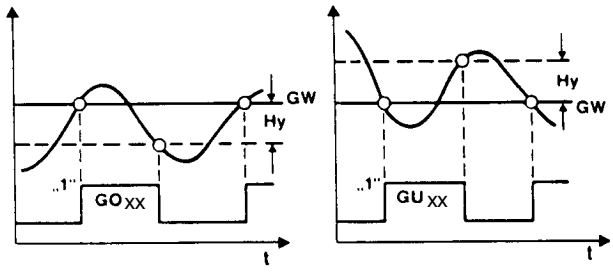
In the event mode, any violation of a limit value is immediately signalled to the station bus in the form of a limit signal telegram. The same happens when the input signal monitoring feature responds, but in this case together with the associated analog value telegram. Then the disturbance bits of the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

The limit value range is −150 % ... +150 % of the selected signal range.

The following hysteresis values can be set for each limit value individually:

– HY1 = 0.39 %
– HY2 = 1.56 % (standard setting)
– HY3 = 3.12 %
– HY4 = 6.25 %

The hysteresis can be above or below the limit value depending on whether violation of the minimum or maximum value has been selected (see Fig. 1).



upper limit value lower limit value

Fig. 1: Option for limit value setting

When these function blocks are used, the limit values are always derived from the corrected analog values.

Pulse counter

For each counter function block a set of 4 limit values can be defined. Allocation of this set of limit values to the counter function block is implemented via input NR, i.e. the number of the associated function unit.

If the counter's limit values ZGW1 to ZGW4 configured in the limit value list are violated, the associated limit value bits GO1, GU1 to GO4, GU4 are set, and the associated limit value telegram as well as the counter reading are transferred on event basis.

Event generation

The input module transmits the data in telegrams to the station bus either cyclically or in the event mode.

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

When binary transmitters are connected, the module interprets the following occurrences as events:

- Switching of a connected contact, response of a NAMUR transmitter, change in a connected electronic signal.
- Response of a monitor

When analog transmitters are connected, the module interprets the following occurrences as events:

- Response of a limit signal
- Response of a monitor
- 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 the change of an analog value by more than the specified value, the module initiates an event transfer if the set time value has been exceeded since the last transfer, too.

Adjustable analog value change:	0.2 % ... 6.8 %	
	standard setting:	1.56 %
Adjustable time value for current signals	40 ms, 200 ms	
	standard setting:	200 ms
for temperature signals	200 ms, 1000 ms, 2000 ms	
	standard setting:	1000 ms

  The values on the configuration list are set by means of the PDDS.

When used as pulse counter, the module interprets the following occurrences as events:

- Resetting of a function block
- Overflowing of a function block
- Violation of one of the 4 limit values
- Differential generation at defined instants
- Violation of the counter's counting threshold

  As soon as the module detects the violation of the counting threshold, it initiates an event transfer of the counter reading if the permanently set time−out of 200 ms has been exceeded since the last transfer.

Simulation

A total of max. 32 signals can be simulated.

Source simulation

Source simulation is possible for both binary and analog transmitters. Simulation is performed by means of the PDDS. All 16 sources can be simulated.

Sink simulation

Sink simulation is possible with function block ZIP. Simulation is performed by means of the PDDS. All bus signals can be simulated.

For any restriction see statement given above.

Setting the operating modes

The type of application and the setting values are required to be loaded in the form of a configuration list before the module can take up operation. Before that, all process inputs of the module have a high−resistance bias and the module transmits no data telegrams on the bus. The fault lamps ST and SG signal the presence of disturbances. Nevertheless, the module can receive data via the bus. The module is waiting for the configuration list to be transmitted by the PDDS.

After transmission of the configuration list, the module takes an active part in bus communication. The disturbance LEDs are deenergized.

The configuration list contains all the settings required by the module, listed acc. to function units (table 1).

Settings can be performed within the defined range of values.

The column for standard setting contains the default value which is entered if no other value is set.

Special setting for function unit 1:

Two plug−in jumpers X100 and X101 are provided on the module for connecting four−wire transducers.
For standard applications, these jumpers are plugged into positions 1/2 and 4/5.
In the positions 2/3 and 5/6, lines E01 (z02) and S01 (z04) are permanently connected to Z.
In this case, function unit 1 is no longer available.

	Range of values	PDDS presetting
Type of transmitter, measuring range	0 ... 20 mA 4 ... 20 mA 0 ... 5 mA TE type S, 0 ... 1200 ˚C TE type K, 0 ... 600 ˚C TE type K, 0 ... 1000 ˚C TE type L, 0 ... 200 ˚C TE type L, 0 ... 400 ˚C TE type N, 0 ... 600 ˚C TE type J, 0 ... 300 ˚C TE type J, 0 ... 600 ˚C Pt 100, 0 ... 150 ˚C Pt 100, 0 ... 300 ˚C Pt 100, 0 ... 600 ˚C Contact, 48 V with monitor Contact, 48 V without monitor Contact, 24 V without monitor Contact/electronic signal, up to 60 V Inductive initiator acc. to NAMUR DIN 19234	4 ... 20 mA
Plausibility limit, lower end	−200 ... 0 %	−6.25 %
Plausibility limit, upper end	0 ... 199.9 %	118.75 %
Threshold value	0.2 ... 6.8 % (step approx. 0.2 %)	1.56 %
Time−out (time−out not possible with binary signals)	40, 200, 1000 , 2000 ms	200 ms
Transfer raw value	Yes, No	No
No. of function block	(1 ... 16), ZIP	−
Bounce suppression (processing cycles)	1 ... 10	3
Filter function *)	16 2/3, 50, 60 Hz	50 Hz
Linearization (relevant only for thermocouples)	Yes, No	No

Table 1: Configuration list

*) Setting valid for all function units with analog transmitters.

Signal output to the PROCONTROL bus

The module transfers the data telegrams through a standard interface to the station bus. Data transfer is serial.

Identification of signals

The conditioned and digitalized input signals and 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	(possible 0 ... 3)	
Station address	(possible 1 ...249)	
Module address	(possible 0 ... 58)	
Register address	(possible 0 ... 31	for analog values and limit signals
	32 ... 35	for binary values
	36 ...147	for pulse counting blocks
	148 ...199	for sink registers
	205	for module cycle
	246	for diagnosis data)

Data communication with the module

Address formation

The system and station addresses are identical for all 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 diagnosis results are written into special registers of the shared memory. The register number is the register address. A register is permanently assigned to each data word. Assignment is automatic when a process signal is connected to the process connector of the module.

No telegrams are transferred for function units which are not used.

If none of the four possible limit signals of an existing input signal is programmed, the associated limit signal telegram will not be transferred.

If not all limit values of an input signal are programmed, those bits in the limit signal telegram which belong to the non−programmed limit values are always set to “0”.

Reading the data

Address−related information is needed to read the contents of a register. Table 2 shows this information and the contents of the respective register.

Type of information	Address word				Data word (bit address)																DA
	System	Station	Module	Register	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
Analog value FE1	a	a	a	0	VZ	100 %	50 %	25 %	12.5 %	6.25 %	3.125 %	1.56 %	0.78 %	0.39 %	0.195 %	0.097 %	0.048 %	MB *1		SM	*2
						MW1															
Limit signals FE1	a	a	a	1	0	0	0	GO 4	GU 4	M 4	GO 3	GU 3	M 3	GO 2	GU 2	M 2	GO 1	GU 1	M 1	SM	3
Analog value FE16	a	a	a	30	VZ	MW16												MB *1		SM	*2
Limit signals FE16	a	a	a	31	0	0	0	GO 4	GU 4	M 4	GO 3	GU 3	M 3	GO 2	GU 2	M 2	GO 1	GU 1	M 1	SM	3
Binary values FE1 – FE4	a	a	a	32	0	0	0	E 4	NE 4	M 4	E 3	NE 3	M 3	E 2	NE 2	M 2	E 1	NE 1	M 1	SM	3
Binary values FE5 – FE8	a	a	a	33	0	0	0	E 8	NE 8	M 8	E 7	NE 7	M 7	E 6	NE 6	M 6	E 5	NE 5	M 5	SM	3
Binary values FE9 – FE12	a	a	a	34	0	0	0	E 12	NE 12	M 12	E 11	NE 11	M 11	E 10	NE 10	M 10	E 9	NE 9	M 9	SM	3
Binary values FE13 – FE16	a	a	a	35	0	0	0	E 16	NE 16	M 16	E 15	NE 15	M 15	E 14	NE 14	M 14	E 13	NE 13	M 13	SM	3
Module cycle time	a	a	a	205	Time value 100 ms				Time value 10 ms				Time value 1 ms				Time value 0.1 ms				0
Diagnosis register	a	a	a	246	Allocation see Fig. 2																0

Table 2: Register allocation and bit significance in the telegrams (applies to all analog value telegrams)

Explanation

FE = Function unit
SM = General disturbance annunciation ”telegram”
VZ = Sign
MWn = Digital measured value
En = Binary signal input
NEn = Negated value of En
Mn = Individual disturbance annunciation
GOn = Max. limit value n violated
GUn = Min. limit value n violated
DA = Data type
a = Address depending on place of installation

Note:

In the limit signals (if not disturbed), bits GU and GO are always antivalent.

*1 Measuring range, depending on type of transmitter, for
- – temperature sensors: 00 measuring range 0 ... 150 ˚C
  01 measuring range 0 ... 300 ˚C
  10 measuring range 0 ... 600 ˚C
  11 measuring range 0 ...1000 ˚C
- – current sensors: 00 fixed

*2 Data type, depending on type of transmitter, for
- – current sensors: 5
- – temperature sensors: 6

For function units combined with a pulse counting function block, the raw value is entered in the binary value telegram if ”Transfer raw value” has been programmed; if this is not the case, value 0 will be entered.

Type of information	Address word				Data word (bit address)																DA
	System	Station	Module	Register	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
Counter reading 76 FE1	a	a	a	36	Data byte								Byte identification				Consistency identification			SM	26
					BCD 7				BCD 6				0	0	0	0	X	X	X		
Counter reading 54 FE1	a	a	a	37	BCD 5				BCD 4				0	0	0	1	X	X	X	SM	26
Counter reading 32 FE1	a	a	a	38	BCD 3				BCD 2				0	0	1	0	X	X	X	SM	26
Counter reading 10 FE1	a	a	a	39	BCD 1				BCD 0				0	0	1	1	X	X	X	SM	26
Counter reading identification FE1	a	a	a	40	0	0	0	0	0	0	0	1	1	1	1	1	X	X	X	SM	26
Counter differential FE1	a	a	a	41	VZ	ZD1														SM	4
Counter limit signals FE1	a	a	a	42	0	0	0	GO 4	GU 4	M 4	GO 3	GU 3	M 3	GO 2	GU 2	M 2	GO 1	GU 1	M 1	SM	2
Counter reading 76 FE16	a	a	a	141	BCD 7				BCD 6				0	0	0	0	X	X	X		
Counter reading 54 FE16	a	a	a	142	BCD 5				BCD 4				0	0	0	1	X	X	X	SM	26
Counter reading 32 FE16	a	a	a	143	BCD 3				BCD 2				0	0	1	0	X	X	X	SM	26
Counter reading 10 FE16	a	a	a	144	BCD 1				BCD 0				0	0	1	1	X	X	X	SM	26
Counter reading identification FE16	a	a	a	145	0	0	0	0	0	0	0	1	1	1	1	1	X	X	X	SM	26
Counter differential FE16	a	a	a	146	VZ	ZD16														SM	4
Counter limit signals FE16	a	a	a	147	0	0	0	GO 4	GU 4	M 4	GO 3	GU 3	M 3	GO 2	GU 2	M 2	GO 1	GU 1	M 1	SM	2

Table 3: Register allocation and bit significance of the counter telegrams

Explanation:

FE = Function unit
SM = General disturbance annunciation telegram
BCDn = Binary−coded digit position
VZ = Sign
ZDn = Counter differential (integer number)
Mn = Individual disturbance annunciation
GOn = Max. limit value n violated
GUn = Min. limit value n violated
DA = Data type
a = Address depending on place of installation

Note:

In the limit signals (if not disturbed), bits GU and GO are always antivalent.
The telegrams relating to the counter readings of each function unit are transferred as consistent telegrams.

	FE 1	FE 2	FE 3	FE 4	FE 5	FE 6	FE 7	FE 8	FE 9	FE 10	FE 11	FE 12	FE 13	FE 14	FE 15	FE 16
Counter reading 10	36	43	50	57	64	71	78	85	92	99	106	113	120	127	134	141
Counter reading 32	37	44	51	58	65	72	79	86	93	100	107	114	121	128	135	142
Counter reading 54	38	45	52	59	66	73	80	87	94	101	108	115	122	129	136	143
Counter reading 76	39	46	53	60	67	74	81	88	95	102	109	116	123	130	137	144
Counter reading identification	40	47	54	61	68	75	82	89	96	103	110	117	124	131	138	145
Counter differential	41	48	55	62	69	76	83	90	97	104	111	118	125	132	139	146
Counter limit signals	42	49	56	63	70	77	84	91	98	105	112	119	126	133	140	147

Table 4: Allocation of register addresses to function units

Diagnosis and annunciation functions

Disturbance annunciations on the module

The following annunciations are signalled on the front panel of the module:

	Designation of LED
– Disturbance	ST
– Disturbance Module	SG

The LED ST signals all disturbances of the module and disturbances in the data communication with the module.

The LED SG signals module disturbances only.

Disturbance signals to the annunciation system

The annunciation system and the CDS control diagnosis system receive the disturbance signals from the input module via the bus.

Diagnosis

In the processing section of the module the received telegrams, the generation of the telegrams to be transmitted and the internal signal processing are monitored for errors (self–diagnosis).

If a disturbance occurs, the type of the disturbance is stored in the diagnosis register and a disturbance signal is transmitted to the PROCONTROL system at the same time.

When requested, the module transmits a telegram which contains the data stored in the diagnosis register (register 246) (see Fig. 2).

The contents of the diagnosis register, the signals on the general disturbance lines, the messages on the CDS, and lamps ST and SG are shown in Fig. 2.

If message ”Process channel fault” is indicated in the diagnosis register, this may be due to one of the following reasons:

– Analog signal not plausible; values are above or below the plausibility limits specified.
– Internal reference values of analog inputs disturbed.
– Transmitter monitoring responded.

If message ”Processing fault” is indicated in the diagnosis register, this may be due to one of the following reasons:

– No valid configuration list.
– Internal module voltages disturbed.
– Hardware fault on the module.

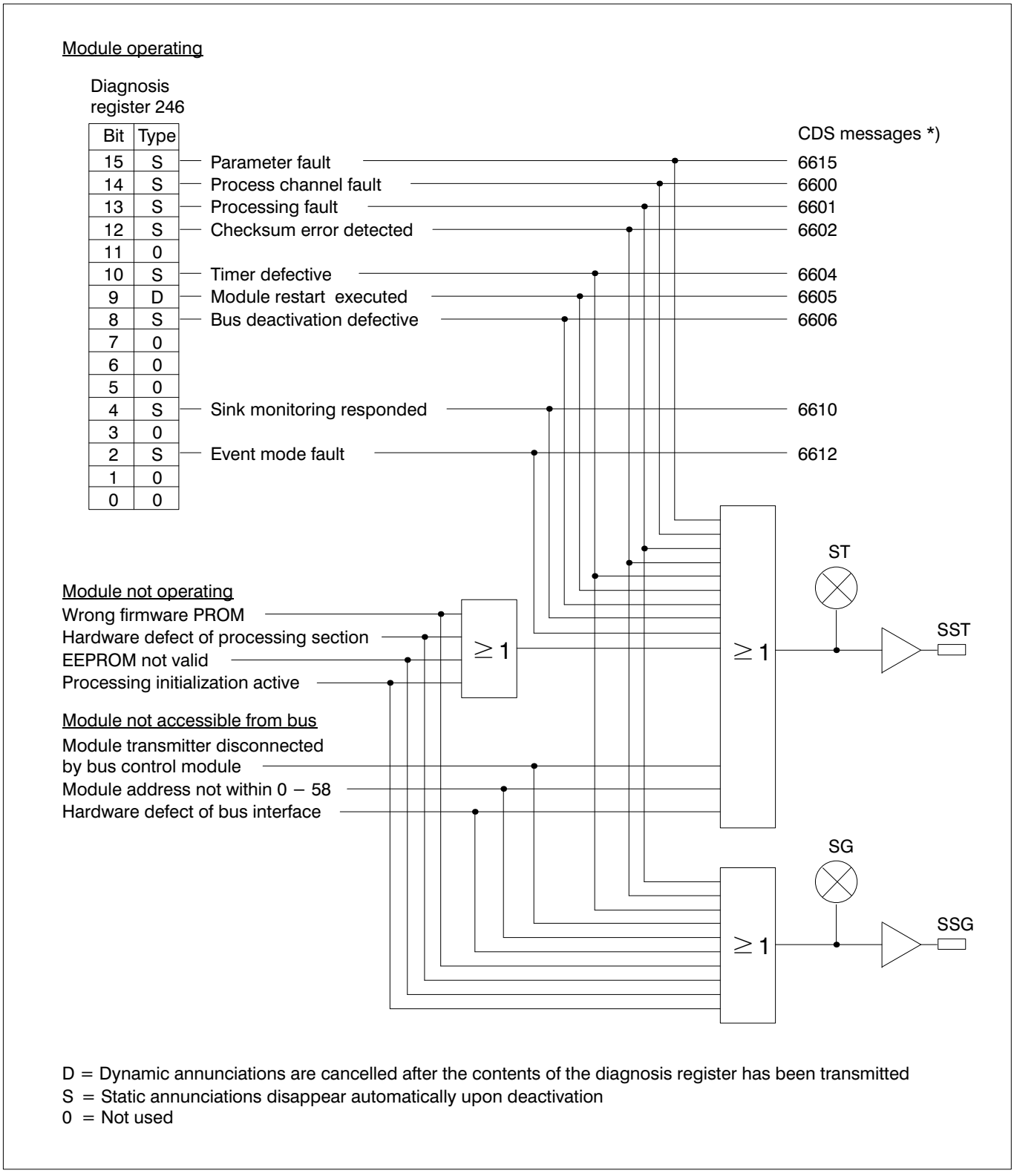


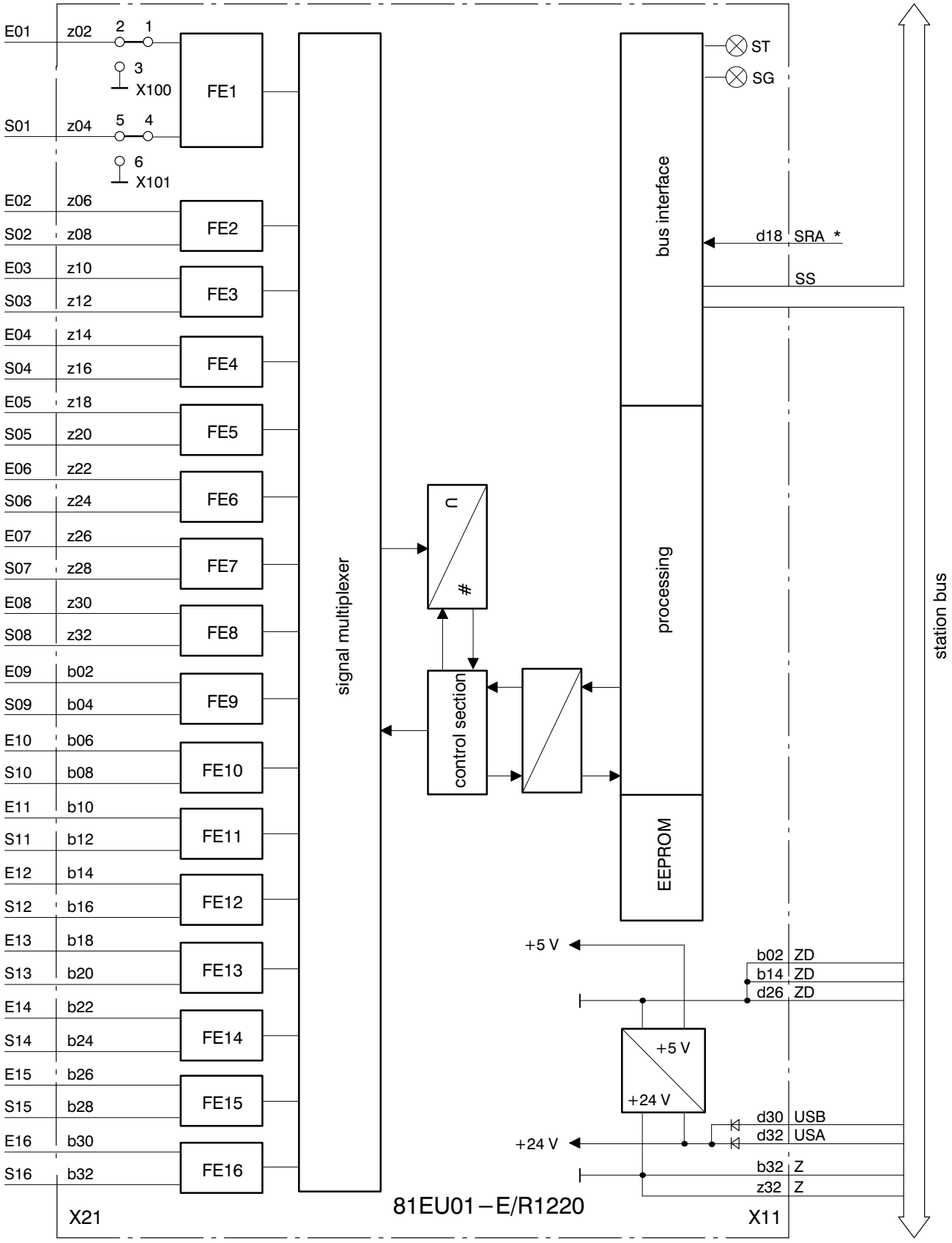
Fig. 2: Diagnosis messages of 81EU01

*) The control diagnosis system (CDS) provides a description for every message number. This description comprises:
- Information about cause and effect of the disturbance
- Recommendations for elimination

Function diagram

Terminal designations: The module consists of a printed circuit board (see “Mechanical design”). The printed circuit board is equipped with connectors X21 and X11. Connector X21 contains all process inputs.

Connector X11 incorporates the standard interface with the station bus and the operating voltages of the module.

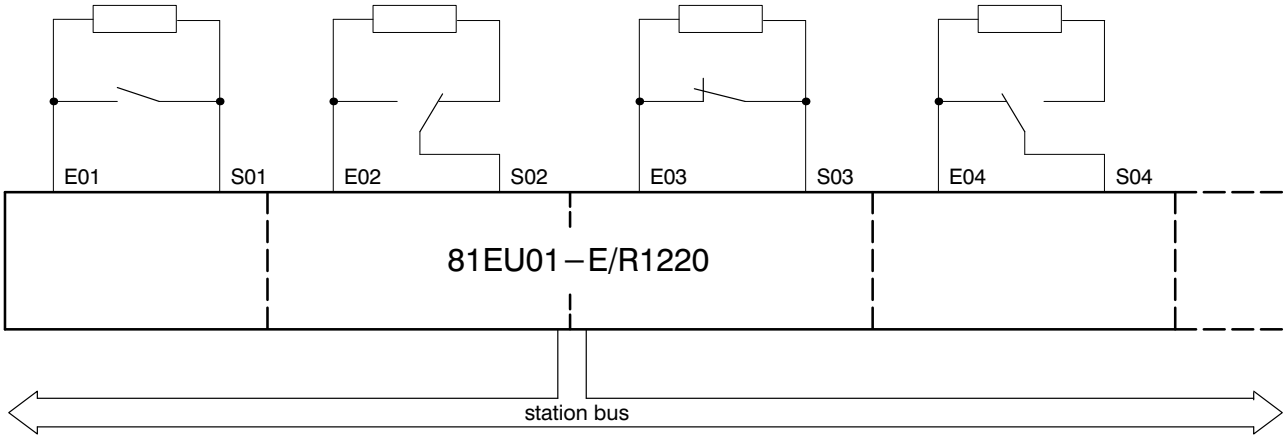


* Connect connector X11/d18 with ZD to ensure proper functioning of the module (once per subrack).

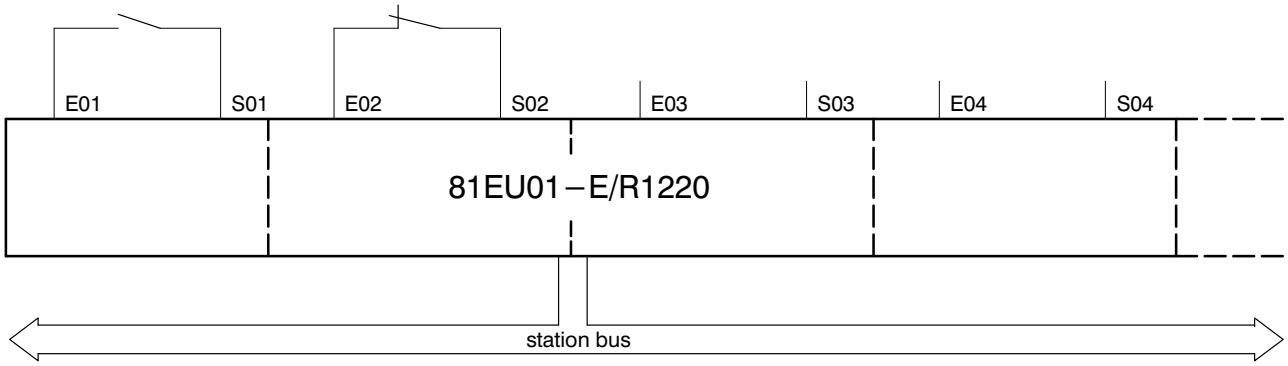
Connection diagrams (each connection diagram can be used for each function unit.)

Standard application

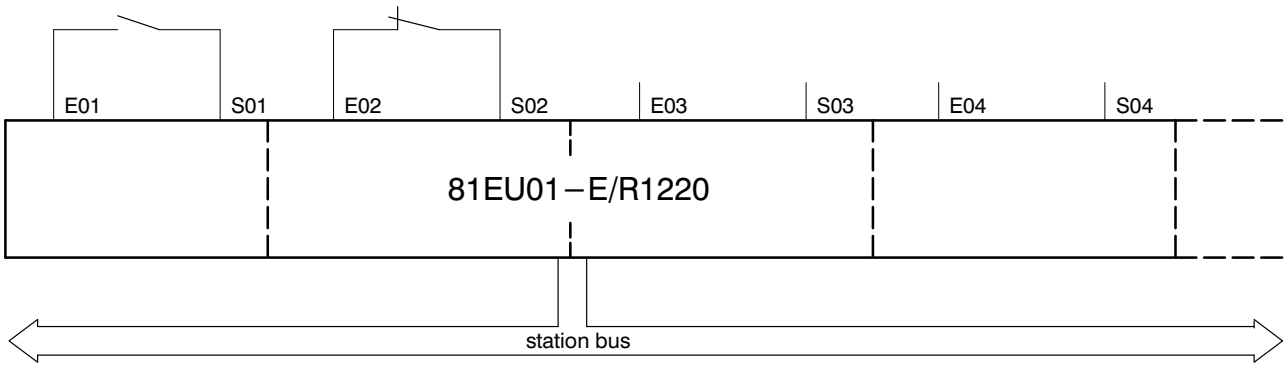
Single/changeover contacts with 48 V supply from the module
with monitoring



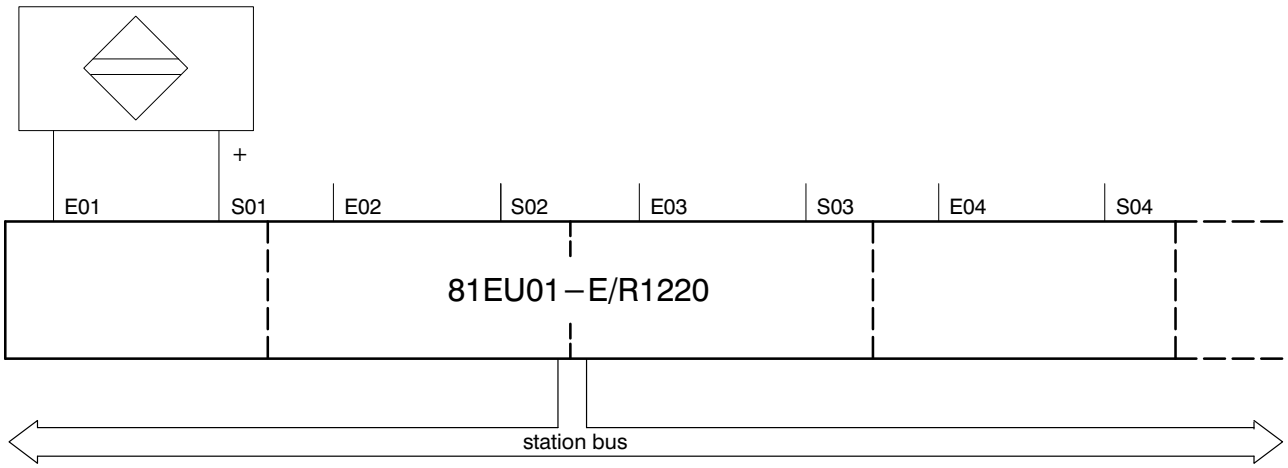
Single/changeover contacts with 48 V supply from the module
without monitoring



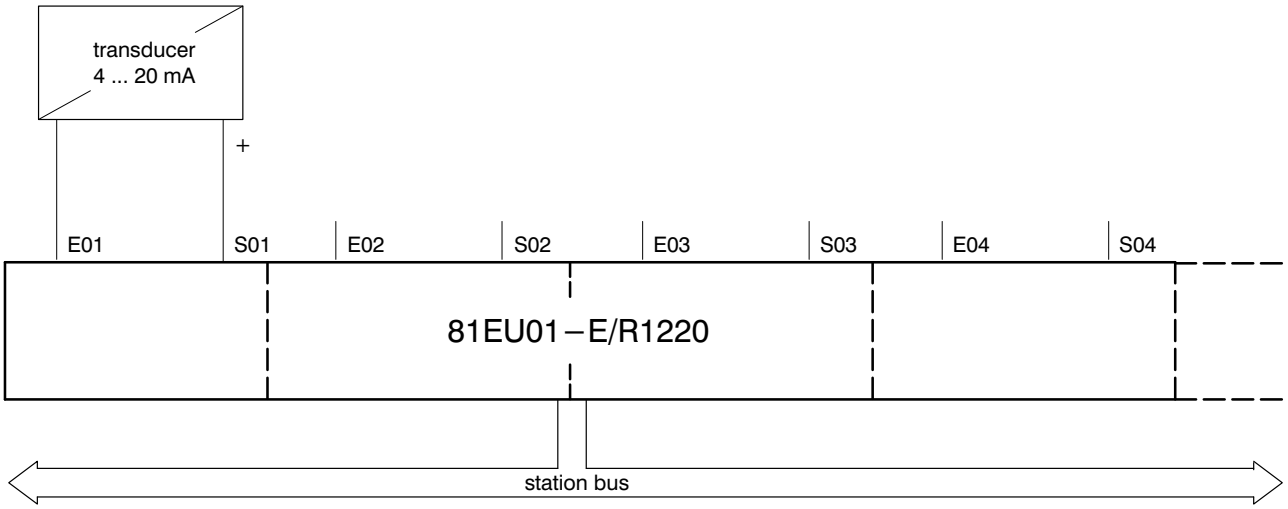
Single/changeover contacts with 24 V supply from the module
without monitoring



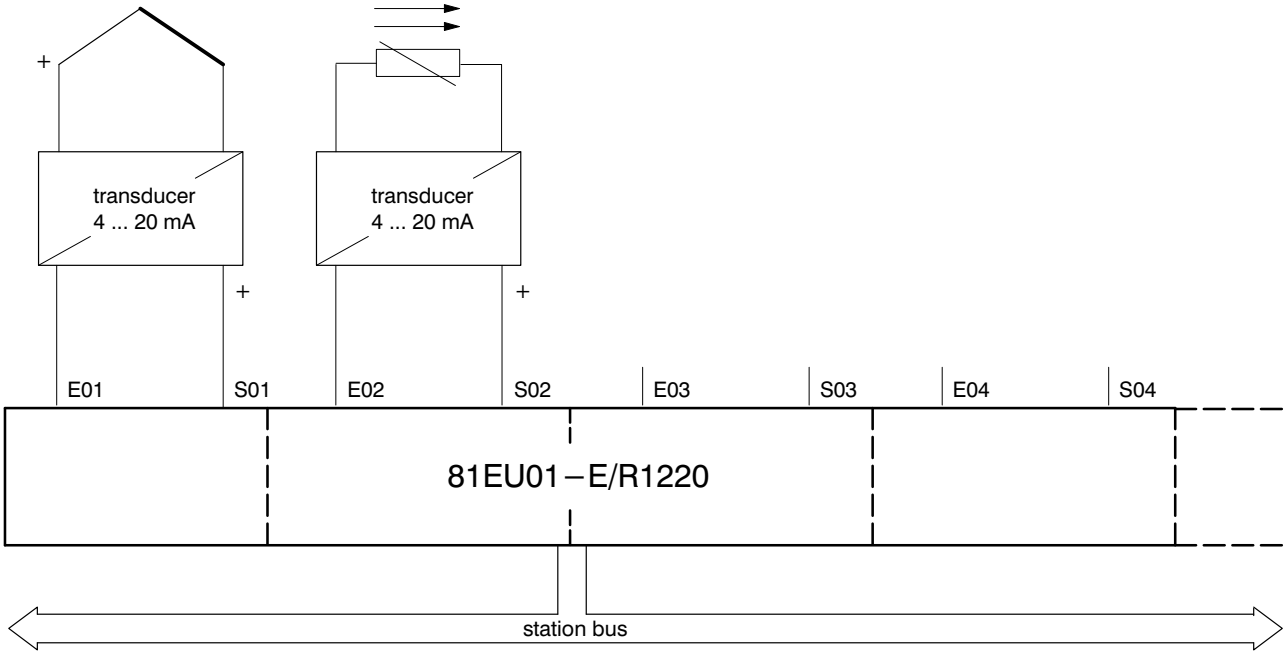
Inductive initiator acc. to NAMUR (DIN 19234)



2−wire transducer, 4 ... 20 mA supplied from the module

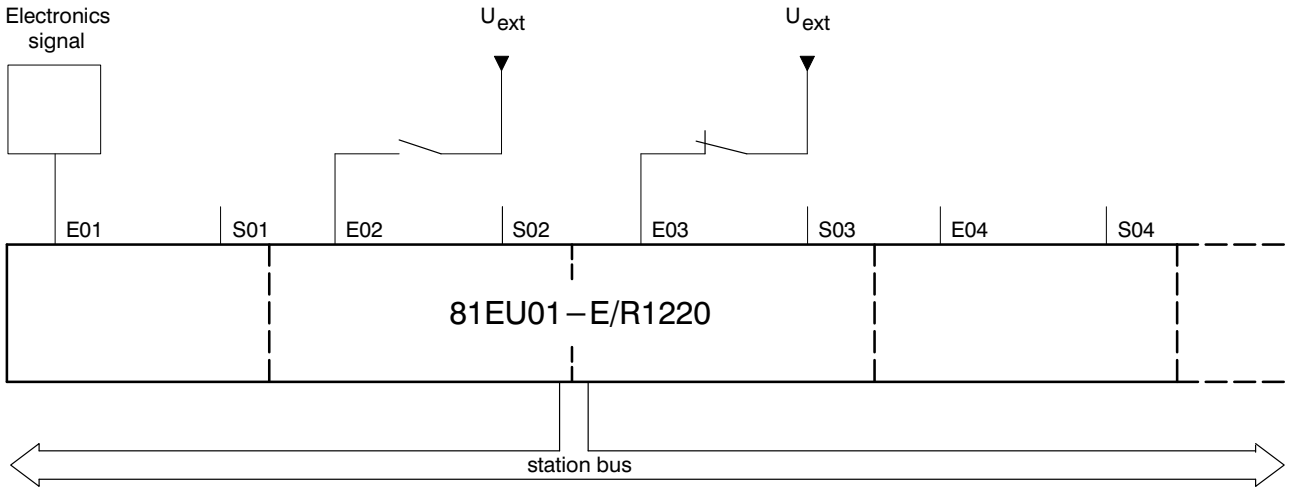


Temperature transducer



Special application

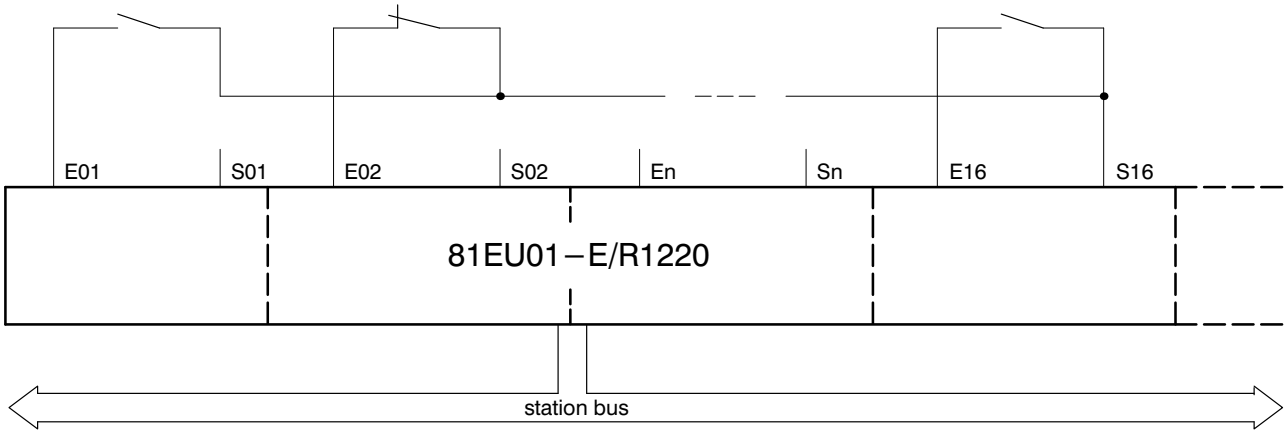
Contacts or electronic transmitters with external power supply
without monitoring



Caution:
Max. static potential difference between the reference potentials permissible < 0.5 V

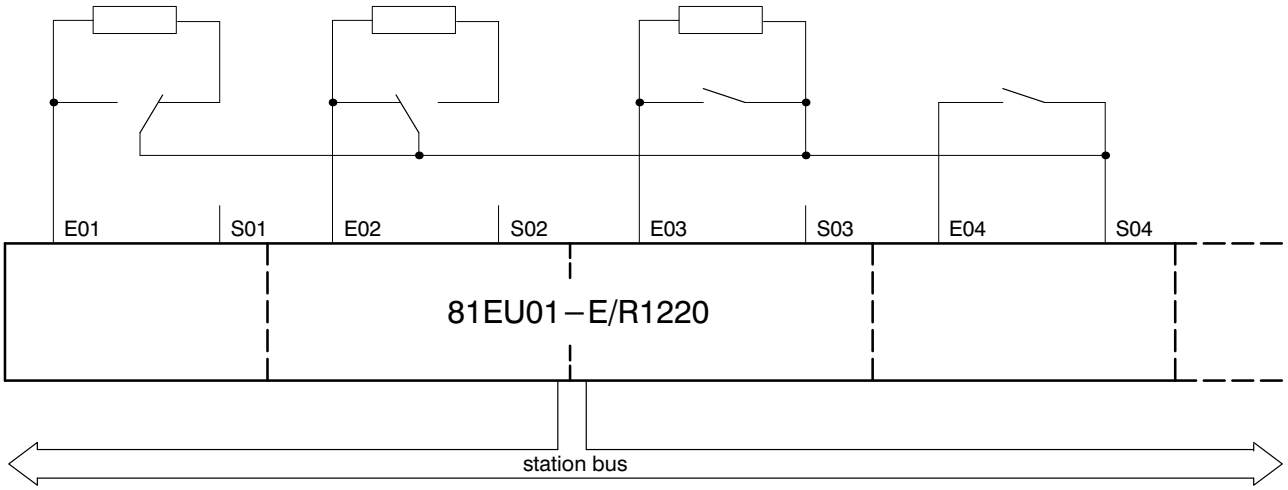
Parallel power supply:

Single/changeover contacts with 24 V supply from the module,
without monitoring, max. 16 contacts permissible

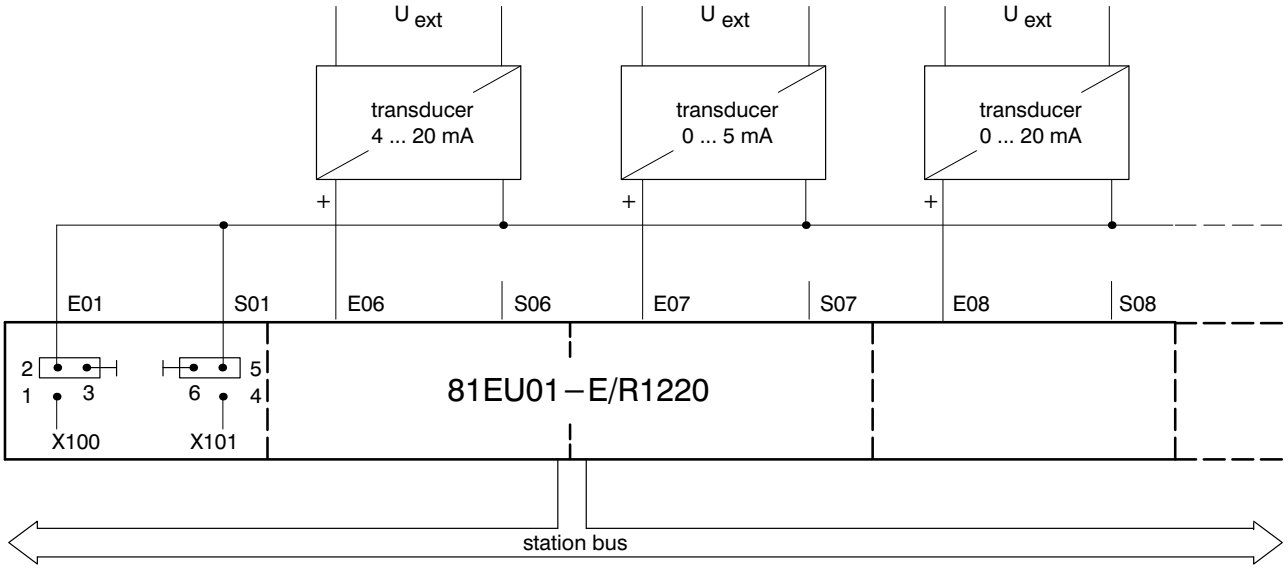


Parallel power supply:

Single/changeover contacts with 48 V supply from the module with or without monitoring, max. 4 contacts permissible



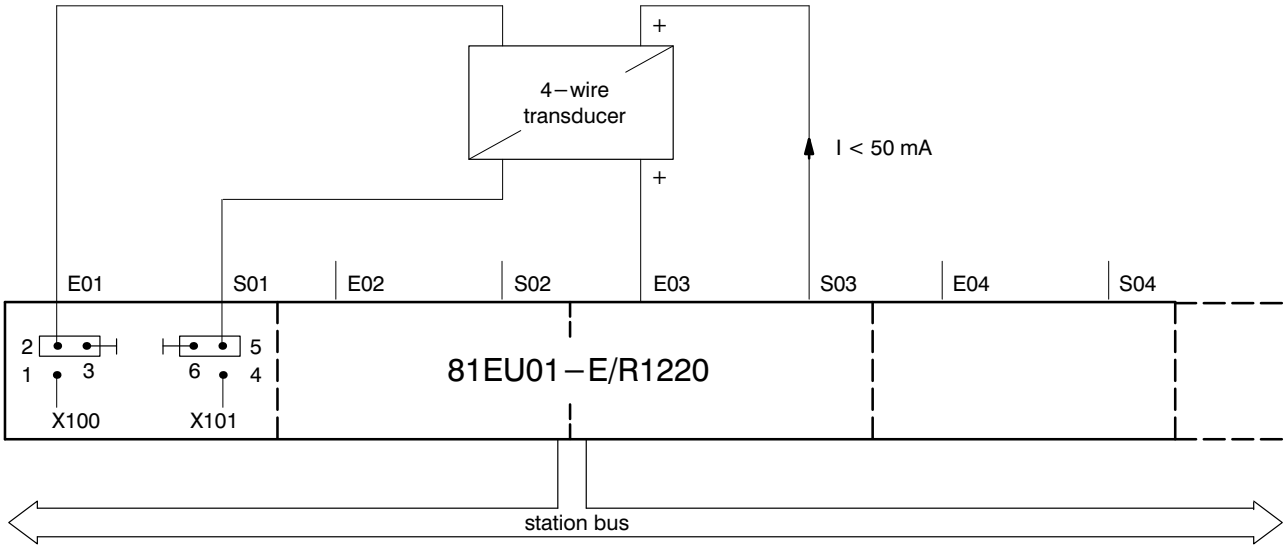
4 – wire transducer with external power supply



Caution:
The return lines of the externally supplied transducers are arranged in parallel and connected with the contacts E01 and S01.

This is permissible only for transducers connected to function units 2 to 16.

4−wire transducer



Caution:
In this mode, merely 2 transducers may be connected per module, since otherwise the specified max. power dissipation would be exceeded.

Module design

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

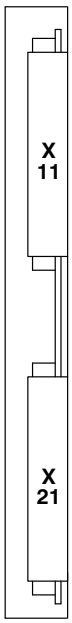
Connector: acc. to DIN 41612

1 x for station bus connection,
48−pole edge connector, type F
(connector X11)

1 x for process connection,
32−pole connector, type F
(connector X21)

Weight: approx. 0.5 kg

View of edge connector side:

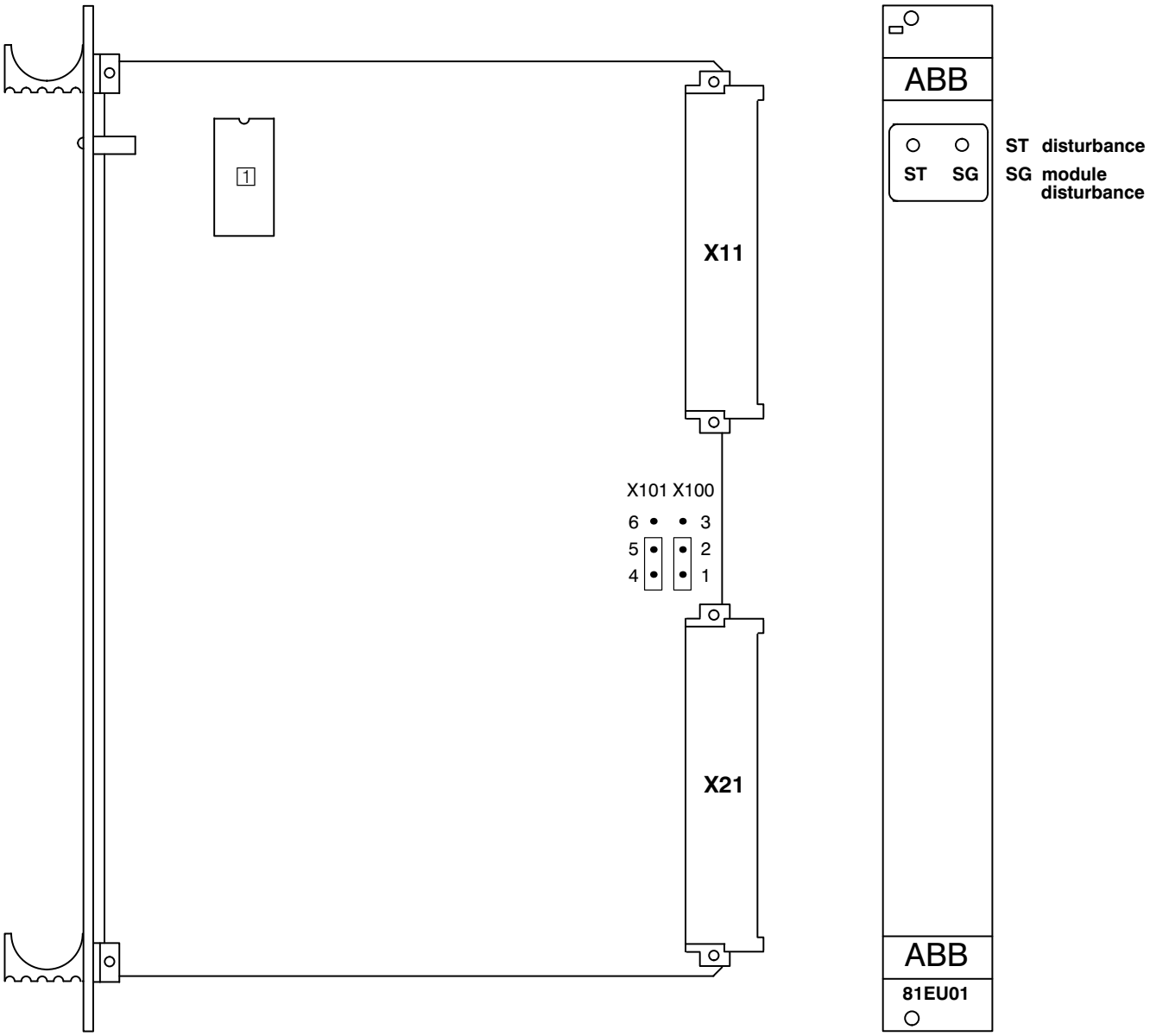


Contact assignment of process connector X21

View of contact side:

	b	*z*
02	E09	E01
04	S09	S01
06	E10	E02
08	S10	S02
10	E11	E03
12	S11	S03
14	E12	E04
16	S12	S04
18	E13	E05
20	S13	S05
22	E14	E06
24	S14	S06
26	E15	E07
28	S15	S07
30	E16	E08
32	S16	S08

Side view and view of module front



1 EPROM programmed, order number: GJR2391542Pxxxx
xxxx = position number indicating the applicable program version.

Technical data

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

Power supply

Operating voltage	+24 V
Current consumption (depending on configuration)	

Configuration	*Basic requirem.*	*+ for each function unit when transmitter active*
NAMUR	140 mA	9 mA
contacts, 24 V	140 mA	2 mA
contacts, 48 V	140 mA	17 mA
2-wire-transducer	140 mA	7 mA + meas. current

Reference potential	0 V
Power dissipation	3.4 ... 11 W depending on the operating voltage and configuration Approximation formula: approx. 3.4 W + 24 V · (n · current per function unit when the transmitter is active). n = number of function units configured

Binary transmitter mode

Single/changeover contacts with 48 V supply from the module, with/without monitoring

Input values

0−signal without monitor	0 ... 10.5 V
0−signal with monitor	6 ... 10.5 V
1−signal	14 ... 51 V
Response range of monitor	0 ... 3 V
Input resistance	10 kOhm + 11 %, − 10 %
Destruction limit	> 55 V
Resistance (forward and return lines)	≤ 100 Ohm

Output values

Output voltage	48 V +/− 5 %
Output current	max. 32 mA
Response time of monitoring function (for use with monitoring)	0.5 s

Contacts or electronic transmitters with 24 V supply from the module, without monitoring

Input values

0−signal	0 ...3 V
1−signal	11.2 ... 30 V
Input resistance	15 kOhm + 13 %, − 10 %
Destruction limit	> 65 V
Resistance (forward and return lines)	≤ 100 Ohm

Output values

Output voltage	US − 5.5 V
Output current	max. 50 mA

Contacts or electronic transmitters with external power supply up to 60 V, without monitoring

Input values

0−signal	0 ... 3 V
1−signal	11.2 ... 60 V
Input resistance	15 kOhm + 13 %, − 10 %
Stat. potential difference compared to reference potential of external power supply	< 0.5 V
Destruction limit	> 65 V
Resistance (forward and return lines)	≤ 100 Ohm

Inductive initiators acc. to NAMUR (DIN 19234), supply from module, with monitor

Input values

Signal change at	1.65 mA
Short−circuit alarm at	≥ 6 mA
Open−circuit alarm at	≤ 0.35 mA
Input resistance	1 kOhm + 13 %, − 10 %
Destruction limit	> 12 V
Resistance (forward and return lines)	≤ 50 Ohm

Output values

Output voltage	8.2 ... 10 V
Output current	max. 10 mA

Analog transmitter mode

Input values

Input current, nominal range	0 ... 20 mA
(corresponds to 0 ... 100 %)	4 ... 20 mA
	0 ... 5 mA
Maximum range	−1 ... 30 mA
Measuring resistor	50 Ohm
Destruction limits	+/− 50 mA
Resistance (forward and return lines)	≤ 100 Ohm

Accuracy

Accuracy related to 100 % (over temperature range 0 to 70 °C, aging, voltage range)	< 0.3 %
Errors on delivery	< 0.1 %
Quantization error	< 0.02 %
Linearity error	< 0.1 %
Response to temperature changes	< 50 ppm/K (typ. 30 ppm/K)
Errors by digital linearization	1 LSB
Resolution, at 0 ... 20 mA	12 bits
at 4 ... 20 mA	12 bits
at 0 ... 5 mA	10 bits
Common−mode rejection	120 dB
Normal−mode rejection at 16 2/3, 50 and 60 Hz	50 dB

Transducer supply

Output voltage (at I ≤ 25 mA)	US − 4.5 V
Output voltage (at I ≤ 50 mA)	US − 5.5 V
Output current	max. 50 mA

Times

Processing time

For complete module
(without ZIP function blocks):

– Binary transmitters	5 ms
– Analog transmitters	80 ms
– Temperature measurements	320 ms

Time requirement if 16 ZIP function blocks are used

– Binary transmitters	5 ms
– Analog transmitters	200 ms
– Temperature measurements	800 ms

Bounce suppression time

When binary transmitters are used: $n \cdot 5$ ms

Response time

When binary transmitters are used: $n \cdot 5 \text{ ms} + 3 \text{ ms}$

Counting frequency

Bounce–free contacts	(n = 1)	max. 25 Hz
Others	(n = 2 ... 10)	max. $\frac{100}{3 + n}$ Hz

Initialization time

When voltage is switched on or the module is plugged in

Function blocks not used	1 ... 12 s
Function blocks used	2 ... 22 s

Contact resistance

Resistance value	47 kOhm
Power dissipation	$\geq$ 0.25 W
Tolerance	+/– 2 %

Noise immunity (of the process inputs and outputs)

ESD acc. to IEC 801/2	8 kV to front panel
EMC acc. to IEC 801/4	1 kV burst
Destruction acc. to (IEC 801/5), draft doc.: IEC TC 65 (Sec) 137	1 kV to reference potential

ORDERING DATA

Type designation: 81EU01–E/R1220 Order number: GJR2391500R1220

Technical data subject to change without notice!

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