Version: 2014-01-24

CS121 SPI_II / BACS SPI_II

User Manual

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Revision	History	Date
-001	Release	02/2010
-002	New Hardware Type	02/2010
-003	Polling from script version Rev. 002	09/2010

Table of Contents

1. Information of CE Marking of the Assembly Group

1.1 EU Directive EMV

For this assembly group is valid:

Products, which bear the CE marking, accomplish the requirements of the EU Directive „Electromagnetical Compabitility“ and the specified harmonized european standards (EN).
We can allocate the EU Declarations of Conformity at your desire.

1.2 Operating range

The assembly groups are designed for the use into the industrial sector and accomplish the following requirements:

Operating range	Requirement to	
	Transient emissions	Interference resistance
Industry	EN 55011 Kl. A	EN 61000-6-2

1.3 Assembling guideline

The assembly group accomplishs the requirements, if you:

1. adhere to the assembling guidelines at installation and operation.
2. consider the following regulations at the mounting of the device and the operation at switch cabinets.

1.4 Mounting of the device

It is required to install assembly groups into operating rooms or into closed housings (e.g. switch cabinets out of metal or plastic material). In addition it is required to ground the device and the switch cabinet or rather the top-hat rail, where the assembly group was snapped on.

1.5 Operation at switch cabinets

For the protection of the assembly groups, it is required that the personnel discharge themselves electrostatically, prior of the operation at the switch cabinets.

2. Advices for the Manufacturer of Machines

2.1 Introduction

The assembly group CS121_SPI_II is not a machine pursuant the EU Directive „Machines“. Therefore no declaration of conformity is present for this assembly group.

2.2 EU Directive Machines

The EU Directive „Machines“ regulates the requirements for a machine. Here the definition of a machine is the total of connected parts or appliances (see EN 292-1, section 3.1).
The assembly group is a part of of the electrical equipment of a machine. It is required that the manufacturer of the machine has to be involved into the procedure of the declaration of conformity.

3. Introduction

The assembly group CS121_SPI_II serves as adaptation of a serial interface at the ProfibusDP to EN 50 170. It is functioned as gateway in this case of application and operates as ProfibusDP slave. Every norm compliant master is able to operate with it.

The assembly group consists essentially out of the following components:

- Isolated RS485 interface to the ProfibusDP
- Profibus ASIC
- Microprocessor 89C51RD2
- RAM and EPROM
- Optional isolated
- Serial interface (RS232, RS485 and RS422) to the external connected device

4. The Operating Modes of the Gateway

4.1 Data Exchange Mode

The gateway has to be arranged into the data exchange mode, so that a data exchange is possible between the RS-side of the gateway and the field bus. This mode is always active, if the gateway is not to be arranged into configuration-, test- or debug mode. Into the data exchange mode the gateway will execute the recorded script.

5. Functionality of the System

5.1 General explanation

Adapted from the ISO/OSO model, a communication can be partitioned into 7 layers (layer 1 to layer 7).
The gateways of the CS121_SPI_II convert the layer 1 and layer 2 of a customized bus system (RS485 / RS232 / RS422) to the accordant field bus system. Layer 3 to layer 6 are empty, layer 7 will be converted pursuant chapter 8.3.

5.2 Interfaces

The gateway is equipped with the interfaces RS232, RS422 and RS485.

5.3 Possible data lenghts

See the possible data lenghts into the following table:

Input data	max. 244 Bytes	variable: here Maximalwert
Output data	max. 244 Bytes	variable: here Maximalwert
Parameter	8 Bytes	no user parameter *
Configuration data	max. 16 Bytes	configuration dependent *
Diagnosis	max. 8 Bytes	a user diagnosis byte = Error code *

6. Hardware Connections, Switches and Diodes

6.1 Device marking

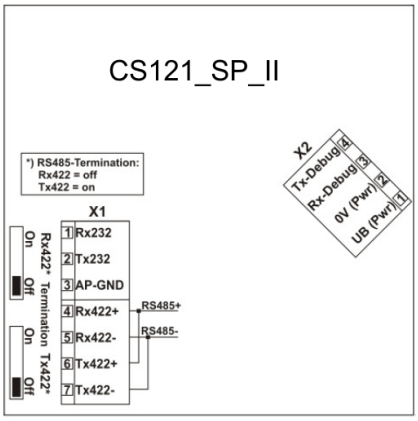


Fig. 1: Connection marking and termination

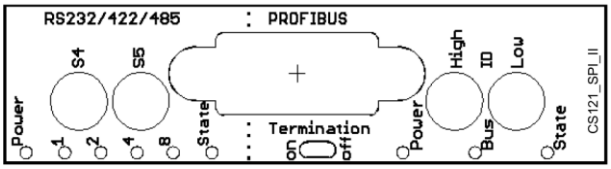


Fig. 2: Front blind: Turn-switch, diodes and termination PB

If the front blind will pop out, so this will have no effect to the function or quality of the device. You can just insert it.

6.2 Connectors

6.2.1 Connectors to the external device (RS-Interface)

The serial interface is available at the upper side of the device.

Pin-adjustment X1 (3pol. + 4pol. screw-connector)

Pin Nr.	Name	Function
1	Rx 232	Receive signal
2	Tx 232	Transfer signal
3	AP-GND	Application Ground
4	Rx 422+ (485+)	Receive signal
5	Rx 422- (485-)	Receive signal
6	Tx 422+ (485+)	Transfer signal
7	Tx 422- (485-)	Transfer signal

For the operation at a 485 interface, it is required to connect the PINs with the marking „485-„.
Also both PINS with the marking „485+“.

6.2.2 Connector power supply

Pin-adjustment X2 (4pol. screw-connector, rear side, back)

Pin Nr.	Name	Function
1	UB (Pwr)	10..33 Volt power supply / DC
2	0 V (Pwr)	0 Volt power supply / DC

6.2.3 ProfibusDP connector

The connector (marking PROFIBUS) is at the front side of the device for the connection to the Profibus.
Pin-adjustment (9pol. D-SUB socket)

Pin Nr.	Name	Function
1	Shield	
2		
3	B	not inverting in-/output signal from Profibus
4	CNTR-P	control signal/repeater
5	M5	DGND, data ground
6	P5	5 V power supply
7		
8	A	inverting in-/output signal from Profibus
9		

6.2.4 Power supply

The device needs a 10-33 VDC power supply, which ensued via the 4pol. screw-connector at the bottom.
Do not connect the devices of the series CS121_SPI_II with AC!

6.3 LED display

The gateway CS121_SPI_II possesses about 9 LEDs with the following relevance:

LED (Bus) Power	green	Power supply Profibus
LED Bus	red	Profibus error
LED (Bus) State	red/green	State interface Profibus
LED Power	green	Power supply serial interface
LED State	red/green	custom/common gateway error
LED 1 / 2 / 4 / 8 (Error No / Select ID)	green	custom/common gateway error

6.3.1 LED “(Bus) Power“

This LED is connected to the power supply (potential separated) of the Profibus side directly.

6.3.2 LED “Bus“

This LED wil be actuated from the Profibus ASIC directly and will be off into the „Data Exchange“ mode.

6.3.3 LED "(Bus) State"

green shiny	Profibus into state data exchange
green flashing	Gateway awaiting configuration data of the Profibus
geen/red flashing	Gateway awaiting Profibus parameter data
red shiny	Common Profibus error

6.3.4 LED "Power"

This LED is connected to the power supply (optional potential separated) of the serial interface (RS232/RS422/RS485) directly.

6.3.5 LED "State"

green shiny	controllable via script
green flashing	controllable via script
green/red flashing	controllable via script
red shiny	common gateway error, controllable via script
red flashing	CS121_SPI_II is into configuration/test mode, controllable via script

6.3.6 LEDs 1 / 2 / 4 / 8 (Error No / Select ID)

If these 4 LEDs are flashing and the „state" LED is shining red, the error number will be binary-coded displayed, pursuant of the table into the chapter „error treatment".

6.4 Switches

The gateway possesses 7 switches with the following functions:

Termination Rx 422	switchable Rx 422-terminating resistance for the serial interface
Termination Tx 422	switchable Tx 422- or RS485- terminating resistance for the serial interface
Coding switch S4	ID High for serial interface, default „0"
Coding switch S5	ID Low for serial interface, default „0"
Termination (Profibus)	switchable ProfibusDP terminating resistance
Coding switch High	ProfibusDP ID (High Byte)
Coding switch Low	ProfibusDP ID (Low Byte)

6.4.1 Termination Rx 422 + Tx 422 (serial interface)

If the gateway will be operating as first or rather last device into a RS485 bus or RS422, it is required to implement a bus termination. Therefor the termination switch has to be into the position ON. The integrated resistance (150Ω) into the gateway will be activated. In any other case, the termination switch has to be into the position OFF. You will find further information about the bus termination into the common RS485 literature.
Please note, if the integrated resistance will be used, that therewith a pull-down resistance (390Ω) to ground and a pull-up resistance to VCC (390Ω) will be enabled.

At RS485 the Tx 422 switch has to be into position ON only.
The Rx 422 switch has to be into position OFF.

6.4.2 Coding switch S4 + S5 (serial interface)

These two switches can be read out via the script command « Get (RS_Switch, Destination »). The value can be used for other functions. This value will be read in at switching on of the gateway or rather after the execution of the script command. The switch setting « EE » (test mode) and « FF » (config mode) are not available at the RS422- or RS485 operation.

6.4.3 Termination (Profibus)

If the gateway will be operating as first or last device into a ProfibusDP, it is required to implement a bus termination. Therfor the activation of a bus terminating resistance into the connector or the integrated resistance (220Ω) into the gateway is required. For that the termination switch has to be into the position ON. In any other case, the termination switch has to be into the position OFF. You will find further information about the bus termination into the common Profibus literature.

Advice: Please detach the bus connector and adjust the switch into the desired position carefully, to enable/disable the bus termination.

6.4.4 Coding switch High + Low (Profibus-ID)

The Profibus-ID (0…7D) of the gateway will be set via these switches into hex. Please take a look into the conversion table of decimal to hex into the appendix for further information. These value will will be read in at switching on of the gateway unique only. This value can be read out or rather evaluated via the script command « Get (field bus-ID, LongTemp »).

7. Start-Up guideline

7.1 Note

The start-up of the CS121_SPI_II should be implemented by qualified personnel only, with consideration of the current safety regulation!

7.2 Components

The following components are required for the start-up of the CS121_SPI_II:

- CS121_SPI_II
- Connection cable from CS121_SPI_II to COM2 port of the CS121

Cable from CS121/COM2 to SPI_II

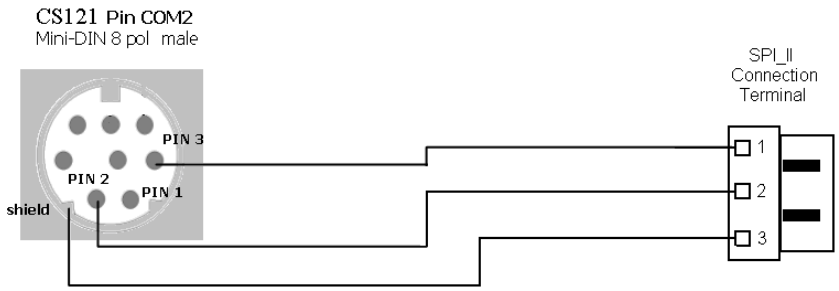


Fig. 3: PIN adjustment of the connection cable

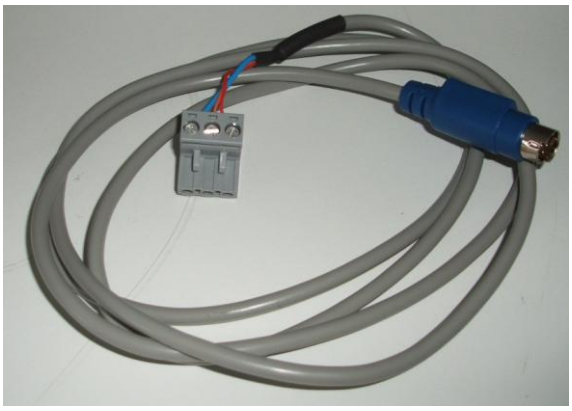


Fig. 4: COM2 Connection cable

- Connector for the Profibus connection to the gateway
- Profibus cable (this cable is already installed generally)
- 12V, 500mA VDC power supply (at most 30V)

Fig. 5: Power Supply

- GSD file
- Operating instructions

7.3 Assembling

The assembly group CS121_SPI_II got the protection class IP20 and therefore is adapted for the usage into switch cabinets.

7.4 Scale drawing CS121_SPI_II

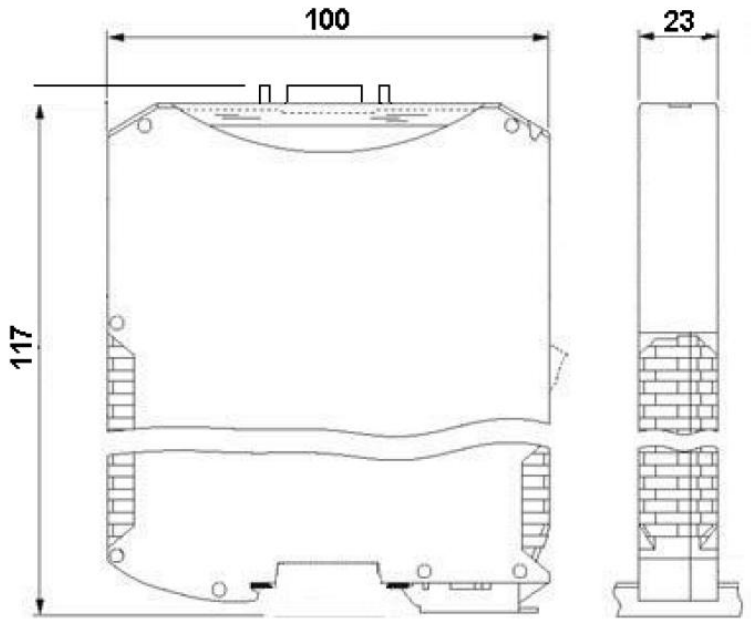


Fig. 6: Scale drawing CS121_SPI_II

7.5 Start-up

To assure a proper operating of the assembly group, it is required to note the following at the start-up:

7.6 Setting of the Profibus address

Approach: Set the Profibus address at the field bus side of the assembly group at both turn-switches with the marking "Profibus-ID High“ and “Profibus-ID Low“.
This setting takes place in hexadecimal.

Example:
The Profibus-ID is 26 decimal = 1A hexadecimal.
It is required to put the switch „Profibus-ID High“ into position 1 and the switch „Profibus-ID Low“ into position A.

If the turn-switch will be put into the position „7E“ (=126) at Profibus side, the gateway will work with a Profibus address, which is stored into the EPROM. This address is 126 into the delivery status and can be changed from a Profibus master only via the Profibus itself.

The address 126 is reserved into the Profibus for this purpose, that means that a slave with this address will never be able to exchange data, but rather can be configured with a new ID.
If the turn-switch will be put at a value between 0...125, the gateway will work with this Profibus-ID. An adjustment via master is not possible.

Attention:
The defined Profibus address has to match with the projected address!
The address will be read-in at the switch on of the gateway only!

7.7 Profibus connection

Connect the device with the Profibus at the interface with the marking „PROFIBUS“.

7.8 Connection of the CS121_SPI_II

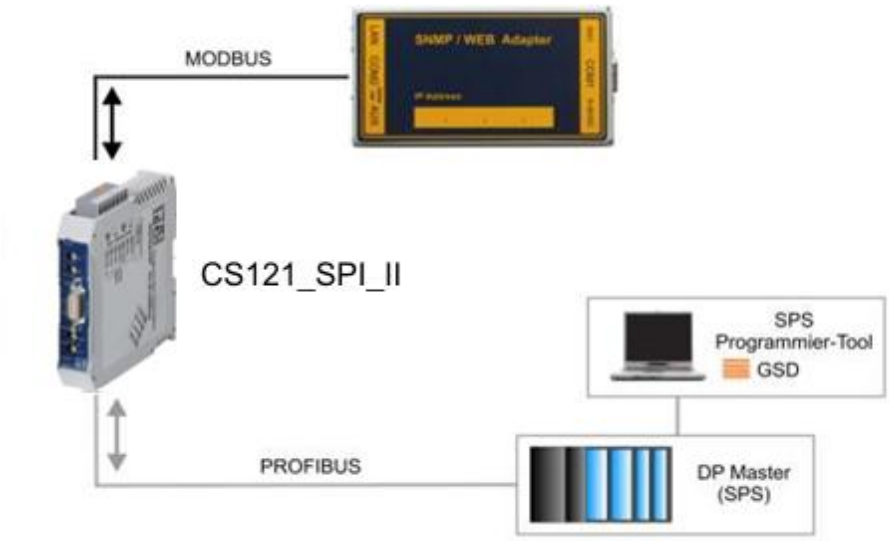


Fig. 7: Connection of the CS121_SPI_II

Connect the RS232 interface of the CS121_SPI_II with the COM 2 port of the CS121 SNMP web-adapter. Enter the following settings via the CS121 web-interface into the menu „COM2 & AUX“:

Parameter into the menu „Network & Security“:

Fig. 8: COM 2 Settings CS121_SPI_II

Click the „Apply“ button into the according menu, after you have finished the configuration. Save your settings via the menu Save Configuration“
→ „Save, Exit and Reboot“.

7.9 Connection of the power supply

Connect the enclosed power supply at the CS121_SPI_II gateway.

7.10 Shield connection

Ground the top-hat rail, on which the assembly group was attached.

7.11 Projection

Use an arbitrary projection tool for the projection.

8. Protocol Modbus-RTU Master into the CS121_SP_II

8.1 Advices

→ We used the word „Modbus“ in the following description in reference to „Modbus-RTU“.

→ The terms „Input“ and „Output“ are always seen out of the sight of the gateway. That means, the field bus input data are the data, which will be send from the field bus master to the gateway.

→ The available modules are into the GSD-File „DAGW2079.GSD“ deposited.

8.2 CS121_SPI_II as Modbus-Master

8.2.1 Preparation

Due to the fact that the Modbus is working with a variable data format, dependent to the desired function and data lenght, but the field bus needs a fixed data lenght, it is required to select it into the GSD-File.
This lenght should be choosen so, that the longest Modbus request or rather answer can be processed.

The operator can select, if the fiel bus requests will be forwarded to the Modbus at „on change“ or „on trigger“.

In the mode „Changing“, the identification of a changing is visible, that the field bus data will be compared to the last transmission and by a changing of a request will occur over the Modbus only.

The mode „Modbus Request On Demand“ requires, that the first byte into the field bus contains a triggerbyte (see chapter 10.5). This byte will not be forwarded to the Modbus and conduces just to start a Modbus transmission. The gateway observes this triggerbyte always and will transfer data to the Modbus only, if this byte has changed. In the reverse direction (to the field bus) the gateway will transfer the amount of received Modbus dataset; after every dataset this byte will be incremented by the gateway.
Is the lenghts byte activated (see chapter 10.6), the gateway will transfer the specified bytes only. The amount of the received Modbus data are deposited at the field bus master. The lenght refers to the bytes „address“ to „data“ (respectively incl.) always without CRC checksum.

8.2.2 Data construction

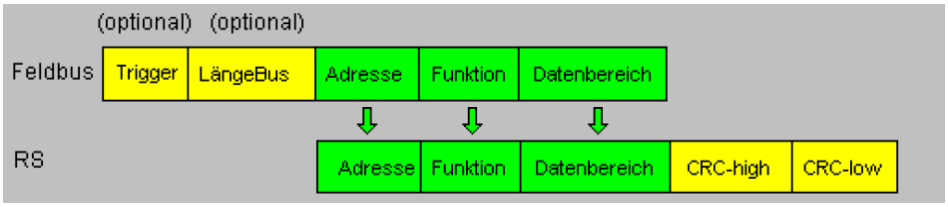


Fig. 9: Data construction

8.2.3 Communication action

The gateway retains always as slave to the field bus and as master to the Modbus. Therefore a data exchange has to be started from the field bus always. The gateway takes the data from the field bus master, which has to be arranged pursuant to the chapter „Data construction“, detects the valid lenght of the Modbus data, if the lenghts byte is not activated, supplemented the CRC checksum and transfers this dataset as request to the Modbus.

The answer of the selected slave will be transfered by the gateway to the field bus master without CRC checksum. Will no answer occur in the defined response time, the gateway will trigger a „timeout error“.

8.3 The lenghts byte

You can define, if the transfer-lenght should be deposited as byte into the in- or rather output dataset (field bus lenghts byte -> active). It will be transfered so much bytes, as defined into this byte in the transfer direction. At the receiving of a telegram, the gateway will be insert the amount of the received signs.

8.4 Example of the polling for the CS121_SPI_II Rev. 002

From script version Rev. 002 it is no longer required, to configure the Modbus polling into the Profibus master.

You will find the revision number of your CS121_SPI_II as button onto the device. The revision number 002 will be delivered from september 2010 by default. The older revisions will be addressed on another way, please take a look into chapter 8.5 for further information.
The CS121_SPI_II gateway is polling by itself accordingly, cyclical to the CS121. At a valid Modbus answer the UPS data will be send with an additional byte and Modbus error byte to the Profibus cyclical.

It is required to select into the module “64 words I/O (consistent) into the Profibus master out of the GSD file UGIC3218”.

For the allocation of the UPS data to the transferred bytes on the Profibus, please take a look into the following table.

Byte	Name	Description	Lenght
1	Counter	Increase at valid answer	1 Byte
2	Modbus Error Byte	Data valid if 0x00 only	1 Byte
3 + 4	OUTP0WER0	Outpower Phase 1 %	1 Word
5 + 6	OUTP0WER1	Outpower Phase 2 %	1 Word
7 + 8	OUTP0WER2	Outpower Phase 3 %	1 Word
9 + 10	BATTCAP	Battery Capacity %	1 Word
11 + 12	INVOLT0	Input Voltage Phase 1 V	1 Word
13 + 14	INVOLT1	Input Voltage Phase 2 V	1 Word
15 + 16	INVOLT2	Input Voltage Phase 3 V	1 Word
17 + 18	TEMPDEG	Temperature C°	1 Word
19 + 20	AUTONOMTIME	Autonomy Time minutes	1 Word
21 + 22	STATUS (e. g. UPS normal = “4”, Powerfail = “12”, Battery test running = “68”, Bypass = “5”)	UPS Status (ASCII HEX) Please note UPSMAN status bytes table below	1 Word
23 + 24	BATTVOLT	Battery Voltage V	1 Word
25 + 26	INFREQ0	Input Frequency Hz Phase 1	1 Word

27 + 28	INFREQ1	Input Frequency Hz Phase 2	1 Word
29 + 30	INFREQ2	Input Frequency Hz Phase 3	1 Word
31 + 32	CNT_PF	Powerfail Counter	1 Word
33 + 34	Alarm Battery Bad	1 = active; 0 = not active	1 Word
35 + 36	Alarm: On Battery	1 = active; 0 = not active	1 Word
37 + 38	Alarm: Battery Low	1 = active; 0 = not active	1 Word
39 + 40	Alarm: Battery Depleted	1 = active; 0 = not active	1 Word
41 + 42	Alarm: Over temperature	1 = active; 0 = not active	1 Word
43 + 44	Alarm: Input Bad	1 = active; 0 = not active	1 Word
45 + 46	Alarm: Output Bad	1 = active; 0 = not active	1 Word
47 + 48	Alarm: Output Overload	1 = active; 0 = not active	1 Word
49 + 50	Alarm: On Bypass	1 = active; 0 = not active	1 Word
51 + 52	Alarm: Bypass Bad	1 = active; 0 = not active	1 Word
53 + 54	Alarm: Output Off as requested.	1 = active; 0 = not active	1 Word
55 + 56	Alarm: UPS Off as requested.	1 = active; 0 = not active	1 Word
57 + 58	Alarm: Charger Failed	1 = active; 0 = not active	1 Word
59 + 60	Alarm: UPS Output Off	1 = active; 0 = not active	1 Word
61 + 62	Alarm: UPS System Off	1 = active; 0 = not active	1 Word
63 + 64	Alarm: Fan Failure	1 = active; 0 = not active	1 Word
65 + 66	Alarm: fuse failure	1 = active; 0 = not active	1 Word

67 + 68	Alarm: general fault	1 = active; 0 = not active	1 Word
69 + 70	Alarm: diagnose test failed	1 = active; 0 = not active	1 Word
71 + 72	Alarm: communication lost	1 = active; 0 = not active	1 Word
73 + 74	Alarm: awaiting power	1 = active; 0 = not active	1 Word
75 + 76	Alarm: shutdown pending	1 = active; 0 = not active	1 Word
77 + 78	Alarm: shutdown imminent	1 = active; 0 = not active	1 Word
79 + 80	Alarm: test in progress	1 = active; 0 = not active	1 Word
81 + 82	AUX Port 1	1 = active (high) 0 = not active (low)	1 Word
83 + 84	AUX Port 2	1 = active (high) 0 = not active (low)	1 Word
85 + 86	AUX Port 3	1 = active (high) 0 = not active (low)	1 Word
87 + 88	AUX Port 4	1 = active (high) 0 = not active (low)	1 Word
89 + 90	BACS State	see table below BACS_State	1 Word
91 + 92	BACS State 1	see table below BACS_State_1	1 Word
93 + 94	BACS_Alarms	see table below BACS_Alarms	1 Word

UPS Status	Hex-Value	Dec-Value	Description
UPS_SB_BYPASS_MODE	0x0001	1	power piped thru
UPS_SB_SHUTDOWN	0x0002	2	shutdown ups
UPS_SB_OUTPUT_ACT	0x0004	4	inverter on = UPS OK
UPS_SB_BACKUP_MODE	0x0008	8	battery power
UPS_SB_BATTERY_LOW	0x0010	16	low battery err
UPS_SB_OVER_TEMP	0x0020	32	over temp err
UPS_SB_TEST_ACT	0x0040	64	test in progress
UPS_SB_INPUT_HIGH	0x0080	128	over power err

UPS Status	Hex-Value	Dec-Value	Description
UPS_SB_OUTPUT_HIGH	0x0100	256	over load err
UPS_SB_INVERTER_FAILURE	0x0200	512	Inverter error
UPS_SB_BATTERY_BAD	0x0400	1024	Battery error
UPS_SB_ECO_MODE	0x0800	2048	eco - bypass
UPS_SB_INVERTER_WARN	0x1000	4096	eco - bypass
UPS_SB_UPS_FAILED	0x2000	8192	prser flag
UPS_SB_COMM_LOST	0x4000	16384	for snmp
UPS_SB_DVG_ALARM	0x8000	32768	SiteManager/SiteMonitor

BACS_State

BACS_STATE_RUNNING	0x0001
BACS_STATE_CONNECTED	0x0002
BACS_STATE_MODULE_LOST	0x0004
BACS_STATE_DISCHARGING	0x0008
BACS_STATE_CHARGING	0x0010
BACS_STATE_DISCHARGING_STOPPED	0x0020
BACS_STATE_FLOAT_CHARGING	0x0040
BACS_STATE_EQUALIZING	0x0080
BACS_STATE_SYSTEM_FAILURE	0x0100
BACS_STATE_VOLTAGE_OUTOFRANGE	0x0200
BACS_STATE_TEMPERATURE_OUTOFRANGE	0x0400
BACS_STATE_RESISTOR_OUTOFRANGE	0x0800
BACS_STATE_MODULE_ADDRESSING	0x1000
BACS_STATE_MODULE_SEARCHING	0x2000
BACS_STATE_MODULE_INITIALIZING	0x4000
BACS_STATE_MODULE_POLLING	0x8000

BACS_State_1

BACS_STATE_GENERAL_ALARM	0x0001
BACS_STATE_VOLTAGE_DIFF_HIGH	0x0002
BACS_STATE_BATTERY_BREAKER_OPEN	0x0004

BACS_Alarms

BACS_ALARM_GENERAL_ALARM	0x0001
BACS_ALARM_COMMUNICATION_LOST	0x0002
BACS_ALARM_VOLTAGE_HIGH	0x0004
BACS_ALARM_VOLTAGE_LOW	0x0008
BACS_ALARM_TEMPERATURE_HIGH	0x0010
BACS_ALARM_TEMPERATURE_LOW	0x0020
BACS_ALARM_RESISTOR_HIGH	0x0040
BACS_ALARM_RESISTOR_LOW	0x0080
BACS_ALARM_EQUALIZING_ERR	0x0100
BACS_ALARM_VOLTAGE_WARN_HIGH	0x0200
BACS_ALARM_VOLTAGE_WARN_LOW	0x0400
BACS_ALARM_TEMPERATURE_WARN_HIGH	0x0800
BACS_ALARM_TEMPERATURE_WARN_LOW	0x1000
BACS_ALARM_RESISTOR_WARN_HIGH	0x2000
BACS_ALARM_RESISTOR_WARN_LOW	0x4000
BACS_ALARM_MODREV_INCOMPATIBLE	0x8000

8.5 Example of the polling for the CS121 values *prior* Rev. 002

The CS121_SPI_II before Rev. 002 was delivered until August 2010. The CS121 provides the Modbus functions Holdings Register (0x03) and Input Register (0x04). Some customized versions provide write functions too, which can be withdrawn out of the Modbus specification.

For the polling of the Modbus addresses 100 – 142, please use the available modules of the GSD file „DAGW2079.GSD“.

It is required to use several modules for the polling of all values. The usage of several modules is required, because the gateway will transfer the field bus requests to the CS121 only, if the request is different to the previous one.

Default UPS adress description

Note: “Type U/S”: this defines whether the answer has an algebraic sign (math. +/-) or not. U means “unsigned”. S means “signed”, this answer may be positive or negative.

Adress	Type	Function	Name	Description	Lenght
100	U	3/4	OUTP0WER0	Outpower Phase 1 %	1
101	U	3/4	OUTP0WER1	Outpower Phase 2 %	1
102	U	3/4	OUTP0WER2	Outpower Phase 3 %	1
103	U	3/4	BATTCAP	Battery Capacity %	1
104	S	3/4	INVOLT0	Input Voltage Phase 1 V	1
105	S	3/4	INVOLT1	Input Voltage Phase 2 V	1
106	S	3/4	INVOLT2	Input Voltage Phase 3 V	1
107	S	3/4	TEMPDEG	Temperature C°	1
108	S	3/4	AUTONOMTIME	Autonomy Time minutes	1
109	U	3/4	STATUS (e. g. UPS normal = “4”, Powerfail = “12”, Battery test running = “68”, Bypass = “5”)	UPS Status (ASCII HEX) Please note UPSMAN status bytes table below	1
110	S	3/4	BATTVOLT	Battery Voltage V	1
111	U	3/4	INFREQ0	Input Frequency Hz Phase 1	1
112	U	3/4	INFREQ1	Input Frequency Hz Phase 2	1
113	U	3/4	INFREQ2	Input Frequency Hz Phase 3	1
114	U	3/4	CNT_PF	Powerfail Counter	1

115	U	3/4	Alarm Battery Bad	1 = active; 0 = not active	1
116	U	3/4	Alarm: On Battery	1 = active; 0 = not active	1
117	U	3/4	Alarm: Battery Low	1 = active; 0 = not active	1
118	U	3/4	Alarm: Battery Depleted	1 = active; 0 = not active	1
119	U	3/4	Alarm: Over temperature	1 = active; 0 = not active	1
120	U	3/4	Alarm: Input Bad	1 = active; 0 = not active	1
121	U	3/4	Alarm: Output Bad	1 = active; 0 = not active	1
122	U	3/4	Alarm: Output Overload	1 = active; 0 = not active	1
123	U	3/4	Alarm: On Bypass	1 = active; 0 = not active	1
124	U	3/4	Alarm: Bypass Bad	1 = active; 0 = not active	1
125	U	3/4	Alarm: Output Off as requested.	1 = active; 0 = not active	1
126	U	3/4	Alarm: UPS Off as requested.	1 = active; 0 = not active	1
127	U	3/4	Alarm: Charger Failed	1 = active; 0 = not active	1
128	U	3/4	Alarm: UPS Output Off	1 = active; 0 = not active	1
129	U	3/4	Alarm: UPS System Off	1 = active; 0 = not active	1
130	U	3/4	Alarm: Fan Failure	1 = active; 0 = not active	1
131	U	3/4	Alarm: fuse failure	1 = active; 0 = not active	1
132	U	3/4	Alarm: general fault	1 = active; 0 = not active	1
133	U	3/4	Alarm: diagnose test failed	1 = active; 0 = not active	1
134	U	3/4	Alarm: communication lost	1 = active; 0 = not active	1

135	U	3/4	Alarm: awaiting power	1 = active; 0 = not active	1
136	U	3/4	Alarm: shutdown pending	1 = active; 0 = not active	1
137	U	3/4	Alarm: shutdown imminent	1 = active; 0 = not active	1
138	U	3/4	Alarm: test in progress	1 = active; 0 = not active	1
139	U	3/4	AUX Port 1	1 = active (high) 0 = not active (low)	1
140	U	3/4	AUX Port 2	1 = active (high) 0 = not active (low)	1
141	U	3/4	AUX Port 3	1 = active (high) 0 = not active (low)	1
142	U	3/4	AUX Port 4	1 = active (high) 0 = not active (low)	1
143	U	3/4	Sensormanager/SMTCOM sensor 1	Analog value	1
144	U	3/4	Sensormanager/SMTHCOM sensor 2	Analog value	1
145	U	3/4	Sensormanager sensor 3	Analog value	1
146	U	3/4	Sensormanager sensor 4	Analog value	1
147	U	3/4	Sensormanager sensor 5	Analog value	1
148	U	3/4	Sensormanager sensor 6	Analog value	1

149	U	3/4	Sensormanager sensor 7	Analog value	1
150	U	3/4	Sensormanager sensor 8	Analog value	1

Example:

Request address 100 – 113 with module -> 16 words I/O (consistently)

```
0x01 0x04 0x00 0x64 0x00 0x12 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00
0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00
```

The first 6 bytes contain the request, the other bytes will be filled up with 0x00. The checksum calculation will be arranged from the CS121_SPI_II automatically and attached.

```
Byte 1 = Slave address, is always 1 at the CS121
Byte 2 = Modbus Function Code, the CS121 provides 0x03 or 0x04
Byte 3 = High byte of the start address, first measuring value, the CS121 starts with 0x64 (100 dez.)
Byte 4 = Low byte of the start address, first measuring value, the  CS121 starts 0x64 (100 dez.)
Byte 5 = High byte of the amount of the requested values, dependent of the used module of the GSD file
Byte 6 = Low byte of the amount of the requested values, dependent of the used module of the GSD file

Answer
0x01 0x04 0x12 0x00 0x63 0x00 0x58 0x00 0x4D 0x00 0x64 0x00 0xE6 0x00 0xE7 0x00 0xE8 0x00 0x17 0x00
0x0F 0x00 0x04 0x00 0xE9 0x00 0x32 0x00 0x00 0x00 0x00 0x00
```

Attention: Please note at the amount of the polling values, that the input buffer will not overflow at the answer!

```
Byte 1 = Slave address
Byte 2 = Modbus Function Code
Byte 3 = Amount of the following data words
Byte 4 = High byte of the first value of the CS121 (100 dez.)
Byte 5 = High byte of the first value of the CS121 (100 dez.)
Byte 6 = High byte of the second value of the CS121 (101 dez.)
Byte 7 = High byte of the second value of the CS121 (101 dez.)
etc.
```

It is required to define a loop into the Profibus master programming, that the content of the request will change. E.g. request: Modbus address 100 – 113, request: Modbus address 114 – 126 or rather further, if more values are essential.

9. Error Treatment

9.1 Error treatment by the CS121_SPI_II

Detects the gateway an error, so it will be signalized via the LED state (red shining). Coincident the error number will be displayed pursuant of the following table via the LEDs « Error No ».
You can distinguish two error categories :
Heavy errors (1-5) : It is required to reset the gateway. If the error will occur again, it is required to exchange it and to send it for reparation.
Warnings (6-15) : These warnings will be displayed for one minute for your information only and will be reset automatically, but if these warnings will occur frequently, please advise the customer service.
The flashing frequency is 0,5 Hertz at custom errors. The error will be displayed as long as the « Set Warning Time » was defined.
The displays are not valid into configuration mode and for internal purpose only.

LED8	LED4	LED2	LED1	Error number/ID	Error description
0	0	0	0	0	Reserved
0	0	0	1	1	Hardware error
0	0	1	0	2	EPROM error

0	0	1	1	3	Internal storage error
0	1	0	0	4	Field bus Hardware error or wrong field bus ID
0	1	0	1	5	Script error
0	1	1	0	6	Reserved
0	1	1	1	7	RS send buffer overflow
1	0	0	0	8	RS receiving buffer overflow
1	0	0	1	9	RS timeout
1	0	1	0	10	Common field bus error
1	0	1	1	11	Parity- or frame check error
1	1	0	0	12	Reserved
1	1	0	1	13	Field bus configuration error
1	1	1	0	14	Field bus data buffer overflow
1	1	1	1	15	Reserved

10. Assembling Guideline

10.1 Assembling of the assembly group

The assembly group with the at most dimensions (23x111x117mm WxHxT) was developed for the switch cabinet insertion (IP20) and can be attached onto a top-hat rail (EN50022) only.

10.1.1 Assembling

- The assembly group should be fitted from above into the top-hat rail and pivotted to bottom until the assembly group is engaged.
- You can string other assembly groups left and/or right beside your assembly group.
- The top-hat rail has to be connected to the potential equalization rail of the switch cabinet. It is required, that the connection wire has a cross section of at least 10qmm.

10.1.2 Dismantling

- At first it is required to stake out the power supply- and signal cables.
- Afterwards press the assembly group above and pan it out of the top-hat rail.

Vertical assembling
It is also possible to mount the top-hat rail vertical, so that the assembly group will be mounted 90°C turned.

10.2 Wiring

10.2.1 Mounting technology

You can appoint the following mounting technologies:

- Default screw-/plug connection (power supply + RS)
- 9pol. D-SUB connector (ProfibusDP)

a) Every point of attachment is clampable at the default screw terminal.

Allowed cross sections of the cable:

- Flexible cable with wire end ferrule: 1 x 0,25 ... 1,5 mm²
- Massive cable: 1 x 0,25 ... 1,5 mm²
- Locking torque: 0,5 ... 0,8 Nm

b) The pluggable terminal strip is acombination out of a default screw terminal and a plug connector.

c) The 9pol. D-SUB connector is secured via 2 screws with “4-40-UNC“- thread. Use a screwdriver (3,5mm), locking torque: 0,2 ...0,4 Nm.

10.2.2 Power supply

The device should be supplied with 10..33VDC.

- Connect the power supply to the 4pol. plug screw terminal according the marking of the device.

10.2.3 Connection of the potential equalization

The connection to the potential equalization will happen during the attachment onto the top-hat rail.

10.3 Communcation interface ProfibusDP

10.3.1 Bus wiring with copper cable

This interface is at the top of the assembly group in the form of a 9pol. D-SUB socket at the front side of the device.

- Plug the Profibus connector onto the D-SUB socket with the marking "ProfibusDP".
- Tighten the securing screws of the connector with a screwdriver.
- If the gateway will be operating as first or rather last device into a Profibus, it is required to implement a bus termination. Therefor the termination switch has to be into the position ON. In any other case, the termination switch has to be into the position OFF.

10.4 Wiring, shielding and activities against interfering voltage

This chapter describes the wiring of bus-, signal- and supply cables with the goal to assure an EMV-like assembling.

10.4.1 General to the wiring

- inside and outside of cabinets
For an EMV-like assembling of cables, it is appropriate to arrange the cables into the following groups and to lay them separate.

⇒ Group A:
- shielded bus- and data cables, e.g. for ProfibusDP, RS232, printers etc.
- shielded analog cables
- unshielded cables for DC ≥ 60 V
- unshielded cables for AC ≥ 25 V
- Coaxial transmission line for monitors

⇒ Group B:
- unshielded cables for DC ≥ 60 and ≥ 400 V
- unshielded cables for AC ≥ 24 V and ≥ 400 V

⇒ Group C: • unshielded cables for DC > 400 V

See the following table for the requirements.

	Group A	**Group B**	**Group C**
Group A	1	2	3
Group B	2	1	3
Group C	3	3	1

Table: Cable regulations dependent of the combination of cable groups:

1) Cables can be layed together in bundles or wireways.

2) Cables have to be layed into separate bundles or wireways (without minimum distance).

3) Cables have to be layed into separate bundles or wireways into cabinets, but have to be layed into separate wireways with at least 10cm distance into facilities.

10.4.2 Shielding of cables

The shielding is an activity for the weakening of magnetical or electrical interfering fields.
Error currents onto the shielding of cables will be derived to the ground via the shield rail. So that these error currents will not become a disturbance source, a connection with low impedance to the grounding conductor is essential.
Use cables with braid preferably only. The coverage tightness should be more than 80%. Avoid cables with shielding foil, because the foil can be damaged during the attachment and a decrease of the shielding effect would be present.
Generally the shieldings of cables should be always disposed both-sided, but you just achieve an absorbability of lower frequencies. A one-sided shielding might be better, if:

- the laying of a potential equalization cable can not be done
- analog signals (some mV or rather mA) will be transferred
- shielding foils will be used

Use always metallized connectors for data cables with serial couplings. Attach the shielding of the data cable at the connector cabinet.
An equalization current can be flow over the both-sided connected shielding by potential differencies between the grounding points. In this case, please lay an additonally potential equalization cable. Please note the following by the shielding conditioning:

- Use metal cable clamps for the attachment of the braid. The clamps should surround the shielding extensive and execute close contact.
- Lay the shielding right after the entrance of the cable into the cabinet onto a shielding-rail. Carry the shielding until the assembly group on, but do not reissue it! !

11. ProfibusDP

11.1 Description of the DPV1-/DPV2 functions

11.1.1 DPV1

The DPV1 extension persists out of the following functions:

1. Acyclic data exchange with class1-master (e.g. SPS)

This function is optional for a DPV1 slave only. Our gateways support these functions by default. The class1-master can read and write data from the slave acyclic via this function. These data will be widespread into the gateway from the script. The channel for the acyclic data exchange will be set during the parameterization.

2. Acyclic data exchange with class2-master (e.g. control pane)

This function is optional for a DPV1 slave only. Our gateways support these functions by default. The class1-master can read and write data from the slave acyclic via this function. These data will be widespread into the

gateway from the script. The channel for the acyclic data exchange will be established prior of the exchange and closed afterwards.

3. Alarmhandling

The alarms are optional too. If activated, they replace the device specific diagnosis. Our gateways does not support alarms yet.

Every DPV1 slave has to support the extended parameterization, because it will be defined into octet 8 of the parameter telegram, if a DPV0 or a DPV1 is connected.
You can use a DPV1 slave at a DPV0 master, if the DPV1 functions are disabled.

11.1.2 DPV2

The DPV2 extension persists out of the following functions:

*1. **Iso**chron **M**ode (IsoM)*

The isochron mode is the synchronous behaviour of a bus system. This function is optional for a DPV2 slave and can be activated via the GSD file. Our gateway does not support the mode yet.

*2. **D**ata E**x**change **B**roadcast (DxB)*

The data exchange broadcast is the communication between slaves (lateral transport). This function is optional for a DPV2 slave and can be activated via the GSD file. Our gateway supports the function of the „Publisher“ (transfer data to other slaves) only. The function „Subscriber“ (receive data from other slaves) is not supported yet

3. Up- und Download

These function is for a DPV2 slave too, but is not supported of our gateway yet.

4. Time Snchronization (Time stamp)

These function is for a DPV2 slave too, but is not supported of our gateway yet.

5. Redundancy concept

These function is for a DPV2 slave too, but is not supported of our gateway yet.

11.2 Display of the data in ProfibusDP

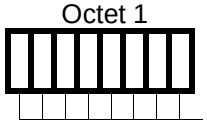
Every norm compliant ProfibusDP master can exchange data with the gateway. You can use very simple master activations, because of the data establishment

11.2.1 Configuration telegram

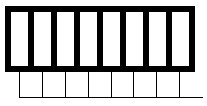
The master has to send a configuration telegram to the according slave after the parameterization. The slave will get the information of the lenght of the in-/output data via the configuration telegram. If the user has set the flag „lenght byte“ into the CS121_SPI_II, are these the at most data lenghts, otherwise the actual lenghts.

The configuration telegram will be composed into the projection tool, where the user can indicate the address range, in which the reference data are discarded.

You can write up to 16 bytes or rather words into one octet of the data unit (DU). You can combine the in-/outputs in an octet, if they got the same format. Otherwise you can use as many octets as you want to use for different bytes/words. Detect the assembly group during the overhaul, that the maximum in-/outputdata lenghts were exceeded, the wrong configuration will be reported to the master at future polling diagnosis. It is not ready for the data traffic.



Configuration byte 1



	Configuration byte x
Octet 2	0

Construction of an octet into the configuration telegram

Data lenght
00 = 1 byte/word
15 = 16 bytes/words

In-/Output
00 = Specified identification format
01 = Input
10 = Output
11 = In-/Output

0 = Byte, 1 = Word

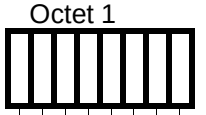
0 = Consistent via byte/word

1 = Consistency overall lenght

11.2.2 Diagnosis

Diagnosis data are prior-ranking data. The gateway generates an external diagnosis, if an internal error was detected.
Display of the messages into the external diagnosis byte:
The diagnosis information of a DP slave persists out of default diagnosis information (6 bytes) and an user specified diagnosis information (error number).
Telegram for the diagnosis request:

Octet 1 0



Diagnosis station not existent (master setting)

Diagnosis station not_ready: Slave is not ready for data exchange

Diagnosis cfg_Fault: Configuration data are not matching

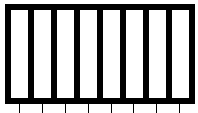
Diagnosis ext_diag: Slave got external diagnosis data

Diagnosis not supported: Requested function is not supported by the slave

Diagnosis invalid_slave_response (slave setting at 0 steady)

Diagnosis prm_fault: Wrong parameterization (identification number etc.)

Diagnosis master_lock (master setting): Slave was parameterized from other master



Diagnosis Prm_req: New slave parameterization is required

Diagnosis Stat_diag: Statical diagnosis (byte diag-bits)

Steady at 1

Diagnosis WD_ON: Approach monitoring active

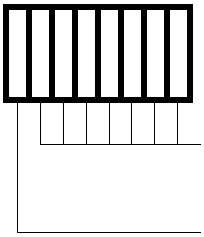
Diagnosis freeze_mode: Freeze command received

Sync_mode: Sync command received

reserved

Diagnosis deactivated (master setting)

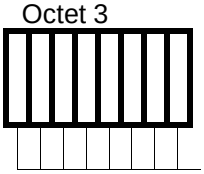
Octet 2 0



reserved

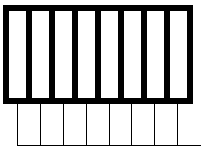
Diagnosis ext_overflow

Octet 3 0



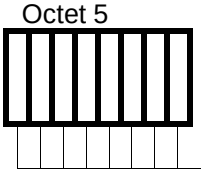
Diagnosis master_add: Master address after parameterization (FF without parameterization)

Octet 4 0



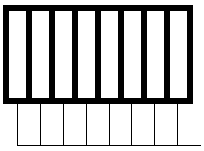
Ident number high byte

Octet 5 0



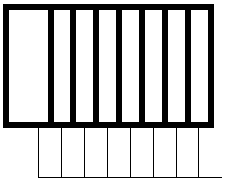
Ident number low byte

Octet 6 0



External diagnosis: Head data lenght

Octet 7 0



CS121_SPI_II error number

Octet 8 0

11.2.3 Diagnosis into DPV1

The external diagnosis from DPV0 (old PB) is used in a different way from DPV1. Alarms and state messages will be transferred by DPV1. It was required to adjust the DPV1, because we have transferred the gateway error numbers into the external diagnosis. We added the 3 bytes „0x81, 0x00, 0x00“ prior of the proper error message, to be compatible to the DPV1 master. Therefore the DPV1 master is able to detect our gateway error as state message.

Therefore a different display of our gateway-error is shown into the PB: At DPV0 the error-number will be transferred as 1 byte external diagnosis. If DPV1 is enabled via the GSD file into the gateway, the error-number will be transferred as 1 byte state message.
In this case, that DPV1 is enbled and a master is connected, which does not support the the alarms and state mesages, the gateway-error-number will appear as 4 byte external diagnosis. The 4th byte contains the error-number, so you can ignore the other 3 bytes (0x81, 0x00, 0x00).

11.2.4 Data exchange

After the master will detect into the diagnosis, that the slave is ready for the data exchange, the master will send data exchange telegrams. The data of the in- or rather output direction will be discarded from the master into the address range, which was stated at the projection or it is required, that the control program gets/allocates the data via specified components.

12. Technical data

12.1 Device data

Please take a look into the following table for the technical data of the assembly group.

Nr.	Parameter	Data	Explanation
1	Site	Switch cabinet	Top-hat rail assembling
2	Safety class	IP20	Contaminant and water protection IEC 529 (DIN 40050)
4	Durability	10 years	
5	Dimensions of the housing	23 x 111 x 117 mm (incl. Screw terminals) 23 x 100 x 117 mm (without them)	W x H x D
6	Fitting position	any	
7	Weight	130 g	
8	Operating temperature	-20ºC ... +70ºC	
9	Storage/transport temperature	-40ºC ... +70ºC	
10	Operating air pressure bei Transport	795 hPa ... 1080hPa 660 hPa ... 1080hPa	
11	Altitude of site	2000 m 4000 m	Without reservations With reservations - Ambient temperature ≤ 40ºC
12	Rel. humidity	Max. 80 %	Not condensating
14	External power supply	10...33V DC	Default power supply (DIN 19240)
15	Current consumption at 24VDC	Typ. 120 mA max 150 mA	At 10,8V: typ. 350 mA
16	Power supply at the Profibus interface	5V DC / max. 50 mA	(Max. 50 mA at < 30°C ambient temperature)
17	Reverse battery protection	yes	Device does not work
18	Differential protection	yes	
19	Overload protection	Poly-Switch	Thermal fuse
20	Subvoltage detection	≤ 9V DC	
21	Powerfailure bridging	≥ 5 ms	Device is working

12.2 Interface data

Nr.	**Interface marking, physical interface**	**ProfibusDP** **RS485**	**RS232-C** **RS232-C**	**RS485/RS422** **RS485/RS422**
1	Norm	EIA default	DIN 66020	EIA default
2	Transmission method	symmetric asynchronous serial half duplex → Difference signal	asymmetric asynchronous serial full duplex → Gauge	symmetric asynchronous serial half duplex/ full duplex at RS422 → Difference signal
3	Transmission method	Master / Slave	Master / Slave	Master / Slave
4	Attendance: - Sender - Receiver	32 32	1 1	32 32
5	Kabel lenght: - maximal -baudrate dependent	1200 m 93,75 kBd → 1200 m 187,5 kBd → 1000 m 500 kBd → 400 m 1,5 MBd → 200 m > 1,5 MBd → 100 m	15 m no	1200 m < 93,75 kBd → 1200 m 312, kBd → 500 m 625 kBd → 250 m
6	Bus-Topology	Line	Point to point	Line
7	Data rate: - maximal -Default values	12 Mbit/s 9,6 kBit/s 19,2 kBit/s 93,75 kBit/s 187,5 kBit/s 500 kBit/s 1,5 Mbit/s 3 MBit/s 6 MBit/s 12 Mbit/s	120 kBit/s 2,4 k/B 4,8 k/B 9,6 kBit/s 19,2 kBit/s 38,4 kBit/s	625 kBaud 2,4 kBit/s 4,8 kBit/s 9,6 kBit/s 19,2 kBit/s 57,6 kB 312,5 kB 625 kB
8	Sender: - Stress -max. voltage -Signal without stress -Signal with stress	54 Ω - 7 V ... 12 V ± 5 V ± 1,5 V	3 ... 7 kΩ ± 25 V ± 15 V ± 5 V	54 Ω - 7 V ... 12 V ± 5 V ± 1,5 V
9	Receiver: -Input resistance -max. input signal - Sensitivity	12 Ω - 7 V ... 12 V ± 0,2 V	3 ... 7 Ω ± 15 V ± 3 V	12 Ω - 7 V ... 12 V ± 0,2 V
10	Transmission range (SPACE): - voltage gauge - Logic gauge	- 0,2 ... + 0,2 V 0	+ 3 ... + 15 V 0	- 0,2 ... + 0,2 V 0
11	Transmission break (MARK): -voltage gauge - Logic gauge	+ 1,5 ... +5 V 1	- 3 ... –15 V 1	+ 1,5 ... +5 V 1

Appendix

A Transmittal of a device

At the transmittal of a device, it is required to send us a broad description of the malfunction. We need the following details:

- Which error-number was displayed?
- What is the value of the power supply (±0,5V) with connected gateway?
- What were the last activities at the device (programming, error at switch on etc.)?

If you have any queries, send us an email to support@generex.de.

B Figures