

EP010

Modbus/FBP Interface

User and Operator Manual



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1. INTRODUCTION

This is the User and Operator Manual for the EP010, the generic ABB SACE Modbus / Field-BusPlug Interface.

It contains two sections:

1. information independent from the device connected to the Modbus port (in the following 'device')
2. information dependent from the device

1.1 Applicability

This document applies to all the EP010 versions.

1.2 Acronyms and Definitions

1.2.1 Acronyms

CB	Circuit Breaker
EDS	(DeviceNet) Electronic Data Sheet
FBP	FieldBusPlug
GSD	(Profibus) Gerätestammdaten
	En: device data base (literal) or Generic Station Description
HMI	Human Machine Interface
LED	Light Emitting Diode
RX	Transmission
TX	Reception
WD	Watchdog

1.2.2 Definitions

Device	a device connected to the EP010 Modbus port
Interface	the EP010

1.3 Bibliography

- [1] <http://www.abb.com>
Products & Services – ABB Product Guide – Low Voltage Products – Support: Documentations – Control Products – Fieldbus Devices

2. DEVICE INDEPENDENT SECTION

2.1 Purpose and connection of EP010

The Modbus/Fieldbus Interface EP010 establishes together with the FieldBusPlug a connection between a field bus and the device connected to the EP010 Modbus port.

In particular, EP010 acts as a communication gateway between FieldBusPlug and Modbus device.

Power supply for EP010 comes directly from the FieldBusPlug. The connected device, however, must have its own power supply.

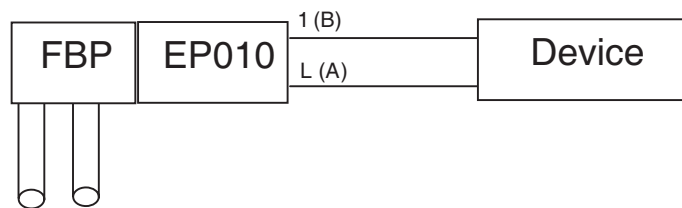


Figure 1. Concept Diagram

2.2 EP010 description

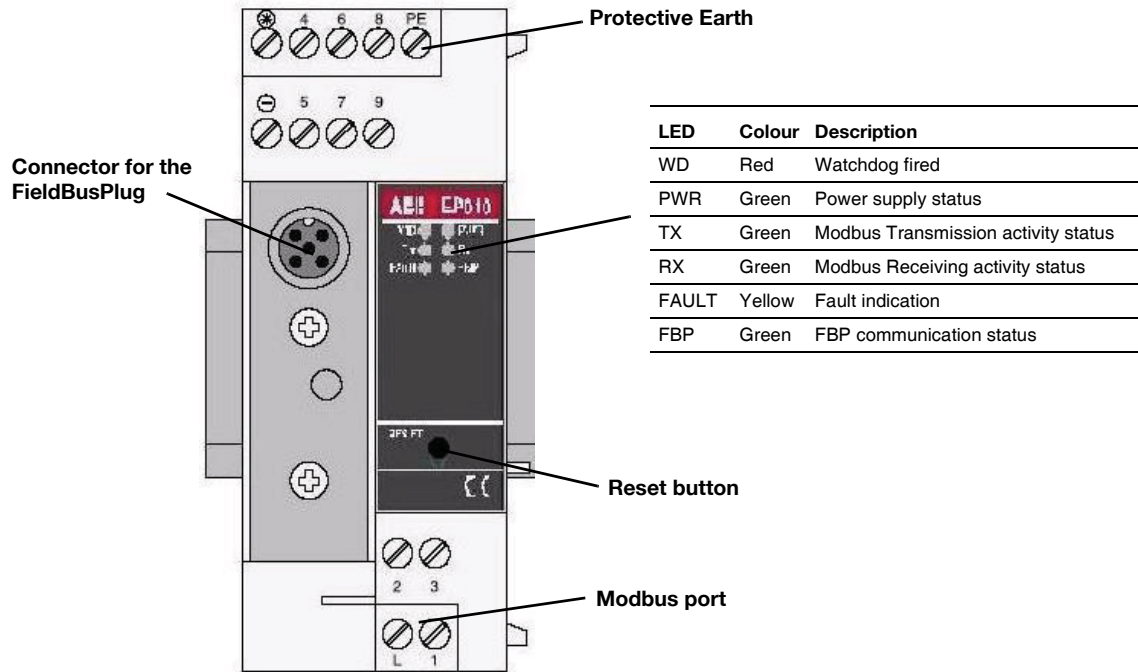


Figure 2. Terminals, indicators and operating elements on the front plate

2.2.1 FieldBusPlug connector



Figure 3. FBP port socket

Table 1. FBP port pins

PIN	DESCRIPTION
1	+24 V DC (standard power supply unit)
2	Diagnostic request trigger
3	0 V DC (standard power supply unit)
4	Serial data (TX)
5	Serial data (RX)



Wrong power supply polarity or swap between bus lines and power supply lines can cause a destruction of the EP010!

The FieldBusPlug is plugged into this connector and fixed using the supplied fixing screw.

2.2.2 Modbus terminals



Figure 4. Modbus port terminals

The Modbus Port is the lowest terminal box of the EP010, with the following meaning:

Table 2. Modbus port terminals

TERMINAL NAME	MODBUS CABLE
L (left)	A
1 (right)	B



Total length of the Modbus cable from EP010 to connected device has to be less or equal to 1 m.

2.2.3 LEDs

The TX/RX communication status of the Modbus port is indicated by green LEDs. LED on means:

- TX: Modbus message sending
- RX: Modbus message receiving

They switch according to the communication messages traffic.

The presence of the power supply from the FBP is indicated by a green LED (PWR).

If the unit detects an error, this is indicated by a red LED (WD) or by a yellow LED (FAULT).

2.3 Electrical connections



Installation and maintenance have to be performed according to the technical rules, codes and relevant standards e.g. EN 60204 part 1 by skilled electricians only.

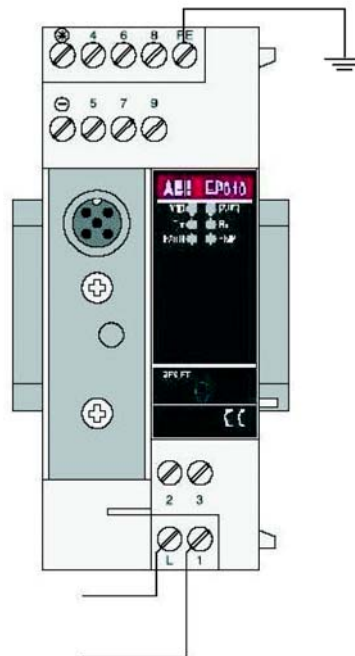


Figure 5. Connections

Power supply (24V DC) for EP010 comes from the FBP. Connected Modbus device, however, must be independently powered.

2.3.1 Earthing

Terminal PE has to be connected to earth.

2.4 Addressing

2.4.1 EP010 addressing

EP010 doesn't need any addressing operation, since it is automatically addressed by FieldBusPlug when connected.

2.4.2 FieldBusPlug addressing

An address must be set on every FieldBusPlug. The possibilities for setting the address vary depending on the type of field bus. Once the address is set, it is stored in the FieldBusPlug, even in case of supply voltage breakdown.

The following methods can be used for addressing:

2.4.2.1 Addressing using a handheld programming unit

The address is set on the FieldBusPlug by means of the programming unit.

The ABB FBP Addressing Interface (CAS21-FBP.0, Order n. 1SAJ929003R0001) is the requested handheld programming unit.

2.4.2.2 Addressing via the field bus

In this case, the address is transmitted from the controller to the FieldBusPlug via the field bus (refer to corresponding FBP FieldBusPlug description, see [1] <http://www.abb.com> Products & Services – ABB Product Guide –Low Voltage Products – Support: Documentations – Control Products – Fieldbus Devices).

2.4.3 Modbus device addressing

See Table 3. Device communication parameters for details.

2.5 Replacement of a defective EP010

A defective EP010 can be replaced without any problems. After disconnecting Modbus cables and the FieldBusPlug, the EP010 can be dismantled and replaced.



Remember that the address associated to the device via the EP010 is stored into the FBP. Therefore, after installation, the new EP010 takes on the same address as the replaced one.

2.6 Technical data

2.6.1 General data

Total dissipation max.	432 mW
Conductor cross section of the connection terminals	max. 2.5 mm ²

2.6.2 Power supply for EP010

Supply voltage	24 V DC via FieldBusPlug
Current consumption	via FieldBusPlug max. 18 mA

2.6.3 Connection of the FieldBusPlug

Mounting	Plug connection, fastening with supplied screw	
Suitable ABB FieldBusPlug types	DeviceNet	yes
	PROFIBUS DP	yes (PDP22-FBP only)



EP010 supports only the “long serial protocol” to communicate with the FBP. Therefore, the AS-i P and AS-i Fieldbus Plugs cannot be used with EP010.

When a Profibus FBP is used, the relevant GSD file is required.

When a DeviceNet FBP is used, the relevant EP010 EDS file associated to the connected device is required.

They can be downloaded from the ABB web site.

2.6.4 Connection to a Modbus device

Device communication parameters have to be:

Table 3. Device communication parameters

Slave Address	247 (0xF7)
Baudrate	19200
Parity	Even
Stop bits	1
Addressing Type (where applicable)	Standard

2.6.5 LED displays

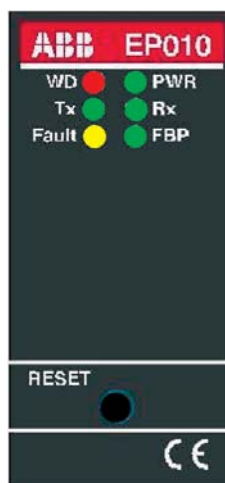


Figure 6. Human Machine Interface (HMI)

The PWR LED is switched ON when the power supply, coming from the FBP, is applied, so it means also 'FBP connected'.

2.6.6 Mechanical data

Mounting on DIN rail according to DIN EN 50022-35

The DIN rail is positioned aligned between the top edge and the lower edge of the unit.

Width x Height x Depth	36 x 90 x 62 mm
Wiring method	screw terminals
Mounting position	preferred orientation of connecting terminals up- and downwards
Conductor cross section	max. 2.5 mm ²
Weight	0.102 kg
Dimensions for mounting	refer to the following figure

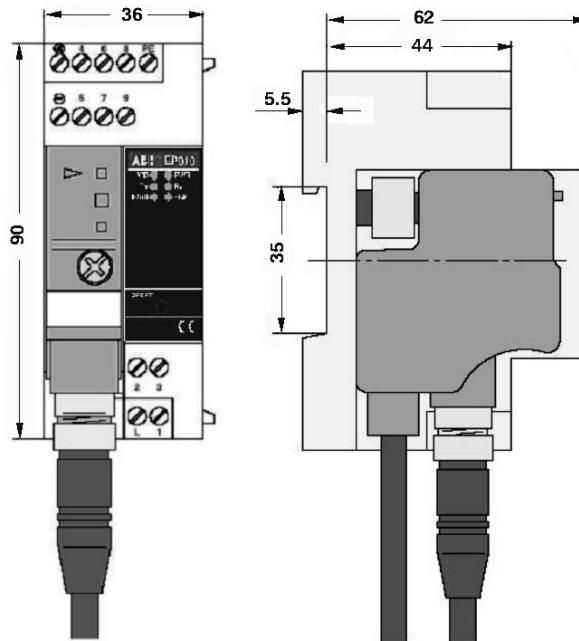


Figure 7. Dimensions for mounting

2.7 Identification

Serial number is used to identify the version of EP010 and the Modbus Device which can be connected to it.

Serial Number (S/N) has the following format:

A	N1	N2	N3	N4	F	R	R	G
---	----	----	----	----	---	---	---	---

Where 'RR' (two digits) is the version of EP010, while 'G' (one character) is related to the connectable Modbus device.

Important: at the end of start-up, the WD LED flashes at 0.5 Hz a number of times that's device dependent. This way, the type of device that can be connected to an EP010 unit can be immediately identified in field.

Value of G field and number of WD LED flashes for each device type is reported in the relevant chapter of the device-dependent section of this manual.

2.8 Product Specification

2.8.1 Start-up

At power up or after a reset, beginning with all the LEDs switched OFF, a diagnostic process starts and the following sequence is performed:

Table 4. Start-up LEDs sequence

Step	LED	Color	ON
1	WD	Red	Power-on
2	RX	Green	RAM and Code Tests passed
3	FBP	Green	External clock ready
4	FAULT	Yellow	Diagnostic completed
5	TX	Green	Ready

Then all LEDs stay ON for about 500 ms. After this time:

1. All the LEDs are switched OFF
2. The WD LED flashes a number of times depending on the device that can be connected on the Modbus Port.
3. The EP010 enters the Run state.

2.8.2 Run state

The table reports the normal behaviour of the LEDs in this state

Table 5. Normal LEDs behaviour

LED	Color	ON	OFF	FLASHING
PWR	Green	FBP connected	FBP disconnected (1)	
WD	Red	Watchdog expired		
TX	Green		EP010 doesn't communicate with FBP	EP010 communicates with FBP AND sends Modbus query to device
RX	Green		EP010 doesn't communicate with FBP OR gets no response from device (if TX flashes)	EP010 communicates with FBP AND receives Modbus response from device
FAULT	Yellow			See Diagnostics & Troubleshooting
FBP	Green		FBP doesn't communicate with EP010	FBP communicates with EP010

(1) If the FBP is disconnected, the EP010 is powered off.

After a failure has been detected and signalled, the FAULT LED continues flashing until:

1. The FBP is communicating with the EP010 (and then the EP010 is communicating with the device using the Modbus port) and the fault is removed OR
2. The EP010 is powered off (i.e. the FBP is disconnected) or reset

While in run state, EP010 can be in one of the following conditions:

1. FBP communicating with EP010, connected Modbus device responding (see 2.8.2.2 *Communication with the Modbus device*): this is the normal working condition
2. FBP not communicating (see 2.8.2.1 *Communication with the FBP*)
3. FBP communicating, device not responding (see 2.9.1 *Diagnostics*) (see 2.9.2 *Troubleshooting*).

2.8.2.1 Communication with the FBP

Status of the communication between EP010 and FBP is indicated by the FBP green LED: flashing means communication is working, OFF means no communication.

2.8.2.2 Communication with the Modbus device

EP010 works by polling the connected device, i.e., sending Modbus telegrams (queries) to the Modbus device and receiving responses (response telegrams) from it.

Modbus RTU query sending from EP010 to the device is **started** when the FBP communication between FBP and the EP010 is started.

Modbus RTU communication between EP010 and the device (i.e. stop query sending) is **stopped** when the communication between the FBP and the EP010 is stopped.

EP010 considers Modbus device to be 'disconnected' when there is a checksum (CRC) error in a response telegram, or there is no response after 4 attempts (retries) to send the same query. When this happens, EP010 stops asking the device for data, and it starts sending probe queries ("Report Slave ID") to check when the device resumes communication, then starts polling data again.



When the communication between the EP010 and the device fails, the EP010 data are neither updated nor reset: they are frozen until the communication has been restored.

2.8.3 Command interface

It's possible to issue a command to the EP010 using two different interfaces:

1. Cyclic, realized with an Analog Input process variable
2. Acyclic, realized with a Parameter (parameter number 1)

The cyclic interface sends continually the command while the acyclic one send it once.

Both interfaces use the following format:

Table 6. Command format

WORD	DESCRIPTION
1 st (Least Significant Word)	Command value
2 nd (Most Significant Word)	Command parameter

At the moment, the 'Command parameter' is not used and it's not evaluated by the EP010. Its value doesn't care.

2.8.4 Permanent (non volatile) information saving

No information is permanently saved by the EP010.

2.8.5 Performance data and conditions

Start-up time	max. 3 [s]
Modbus polling rate	max. 52 [ms/query]

2.9 Diagnostics & Troubleshooting

2.9.1 Diagnostics

There are two different type of diagnostic information:

1. Local, by FAULT LED flashing
2. Remote, by diagnostic information available from FBP

When the FAULT LED flashes at least one of the following conditions is verified:

Table 7. Diagnostic codes

#	Meaning	Description
1.	No device communication	No device physically connected OR message CRC error
2.	Wrong device connected	The connected device Slave ID is NOT the right one
3.	Device not initialised	The connected device has not been correctly initialised at the end of manufacturing (where applicable - see device dependent sections)
4.	Internal configuration map error	Software configuration tables bug
5.	Wrong parameter number	The requested parameter number doesn't exist (only for writing operation)
6.	Wrong parameter value	The parameter value is not allowed (only for writing operation)
7.	Acyclic command not executed	The command is correctly received by the EP010 from the acyclic section but it's not possible to send it to the device (e.g. the device is not connected).
8.	Watchdog fault	Start-up diagnostics
9.	Modbus UART fault	Start-up diagnostics
10.	RS 485 driver fault	Start-up diagnostics
11.	Cyclic command wrong value	The cyclic command value is not correct
12.	Cyclic command not executed	The command is correctly received by the EP010 from the cyclic section but it's not possible to send it to the device (e.g. the device is not connected).

The exact failure cause can be read from FBP (see also next paragraph).



Please note that **NO** communication between FBP and EP010 is active if there is a failure on the relevant serial channel (UART).

2.9.2 Troubleshooting

Depending on the status and behaviour of the LEDs it's possible to get locally some information:

Table 8. Troubleshooting

#	Symptom	Diagnosis
1.	Some or all LEDs still ON after start-up sequence	SW/HW bug
2.	- TX LED flashes (very fast) and - FAULT LED flashes at 2 Hz and - FBP LED flashes at 2 Hz	No response from the device
3.	FAULT LED flashes at 2 Hz	- Previously detected fault and - no communication with the FBP

NOTE: the PWR LED is always ON if EP010 is powered.

3. DEVICE DEPENDENT SECTION

3.1 PR222DS/PD

This user manual applies to the following EP010 SW versions:

1. PR222DS/PD FBP Interface v01.00 or higher

Order Code	Description	S/N Product Type field (G)	WD LED number of flash	FBP Product Code
1SDA059469R1	PR222DS/PD FBP Interface	A	1	20001 (0x4E21)

3.1.1 Wiring

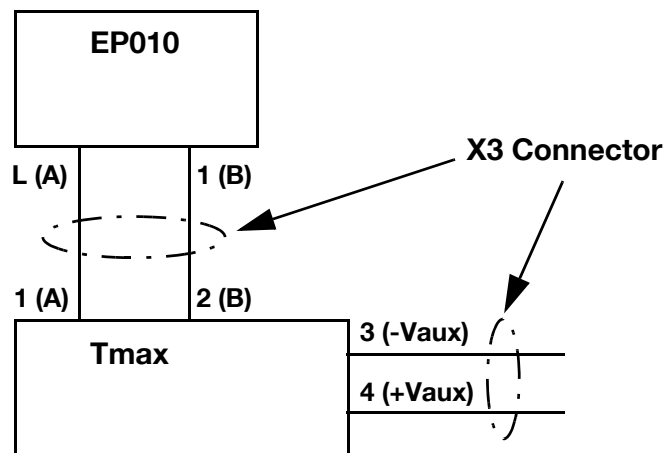


Figure 8. EP010 – PR222DS/PD wiring diagram

3.1.2 Information available

3.1.2.1 Digital input

3.1.2.1.1 Structure

Bit No.	7	6	5	4	3	2	1	0
Byte No.0	Any Trip	Any Alarm	Test Unit connected	Self Supply	Electronic Trip Test	CB command executed	Electronic parameters changed	Manual parameters changed
Byte No.1	Manual/Electronic Parameters Settings	Programmng Fail	Programming OK	Operating Mode Local/Remote	Other Trip	Trip Command Fail	CB Open/Close d	CB Tripped
Byte No.2	L alarm	L pre-alarm	Trip data available	Serial parameters unknown	Nominal current unknown	AUX-E error	EEPROM parameters error	Manual parameters error
Byte No.3	General Purpose I/O	General Purpose I/O	General Purpose I/O	General Purpose I/O	General Purpose I/O	MOE-E overheated	G alarm	S alarm
Byte No.4	Electronic parameters changed	Manual parameters changed	MOE-E unknown	Wink Status	G tripped	I tripped	S tripped	L tripped
Byte No.5	CB Open/Closed	CB Tripped	Any Trip	Any Alarm	Test Unit connected	Self Supply	Electronic Trip Test	CB command executed
Byte No.6	EEPROM parameters error	Manual parameters error	Manual/Electronic Parameters Settings	Programmng Fail	Programmng OK	Operating Mode Local/Remote	Other Trip	Trip Command Fail
Byte No.7	G alarm	S alarm	L alarm	L pre-alarm	Trip data available	Serial parameters unknown	Nominal current unknown	AUX-E error
Byte No.8	S tripped	L tripped	General Purpose I/O	General Purpose I/O	General Purpose I/O	General Purpose I/O	General Purpose I/O	MOE-E overheated
Byte No.9	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED	G tripped	I tripped

3.1.2.1.2 Details

BINARY INPUT	#	Name / Description	Coding / Range	Notes
Number of variables 74 Number of bytes 10	0	Manual parameters changed	1 = Parameters changed	Reset after read
	1	Electronic parameters changed	1 = Parameter changed	Reset after read
	2	CB command executed	1 = CB command executed	Reset after read
	3	Electronic Trip Test	1 = Trip	Reset after read
	4	Self Supply	0 = OFF 1 = ON	Reset after read
	5	Test Unit connected	1 = Test Unit connected	Reset after read
	6	Any Alarm	1 = Any alarm	OR of alarms, pre-alarms
	7	Any Trip	1 = Any trip	OR of trips
	8	CB Tripped	1 = CB tripped	
	9	CB Open/Closed	0 = CB Open 1 = CB Closed	
	10	Trip Command Fail	1 = Trip command failed	
	11	Other Trip	1 = Trip	
	12	Operating Mode Local/Remote	0 = Remote 1 = Local	
	13	Programming OK	1 = Programming OK	
	14	Programmng Fail	1 = Programming Failed	
	15	Manual/Electronic Parameters Settings	0 = Electronic 1 = Manual	
	16	Manual parameters error	1 = Error	
	17	EEPROM parameters error	1 = Error	
	18	AUX-E error	1 = Error	
	19	Nominal current unknown	1 = Unknown	
	20	Serial parameters unknown	1 = Unknown	
	21	Trip data available	1 = Available	
	22	L pre-alarm	1 = Pre-alarm	
	23	L alarm	1 = Alarm	
	24	S alarm	1 = Alarm	
	25	G alarm	1 = Alarm	
	26	MOE-E overheated	1 = Overheated	
	27	General Purpose I/O	1 = Closed 0 = Open	NOT USED, FUTURE EXTENSIONS
	28	General Purpose I/O	1 = Closed 0 = Open	NOT USED, FUTURE EXTENSIONS
	29	General Purpose I/O	1 = Closed 0 = Open	NOT USED, FUTURE EXTENSIONS
	30	General Purpose I/O	1 = Closed 0 = Open	NOT USED, FUTURE EXTENSIONS
	31	General Purpose I/O	1 = Closed 0 = Open	NOT USED, FUTURE EXTENSIONS
	32	L tripped	1 = Trip	
	33	S tripped	1 = Trip	
	34	I tripped	1 = Trip	
	35	G tripped	1 = Trip	
	36	Wink Status	0 = OFF 1 = ON	

BINARY INPUT	#	Name / Description	Coding / Range	Notes
	37	MOE-E unknown	1 = Unknown	
	38	Manual parameters changed	1 = Parameters changed	TRIP REPORTS start here!
	39	Electronic parameters changed	1 = Parameter changed	
	40	CB command executed	1 = CB command executed	
	41	Electronic Trip Test	1 = Trip	
	42	Self Supply	0 = OFF 1 = ON	
	43	Test Unit connected	1 = Test Unit connected	
	44	Any Alarm	1 = Any alarm	
	45	Any Trip	1 = Any trip	
	46	CB Tripped	1 = CB tripped	
	47	CB Open/Closed	0 = CB Open 1 = CB Closed	
	48	Trip Command Fail	1 = Trip command failed	
	49	Other Trip	1 = Trip	
	50	Operating Mode Local/Remote	0 = Remote 1 = Local	
	51	Programming OK	1 = Programming OK	
	52	Programmng Fail	1 = Programming Failed	
	53	Manual/Electronic Parameters Settings	0 = Electronic 1 = Manual	
	54	Manual parameters error	1 = Error	
	55	EEPROM parameters error	1 = Error	
	56	AUX-E error	1 = Error	
	57	Nominal current unknown	1 = Unknown	
	58	Serial parameters unknown	1 = Unknown	
	59	Trip data available	1 = Available	
	60	L pre-alarm	1 = Pre-alarm	
	61	L alarm	1 = Alarm	

3.1.2.2 Analog input

3.1.2.2.1 Structure

Bit No.	15...8	7...0
	MSB	LSB
Word 0	L1 run time current (most significant byte)	L1 run time current (least significant byte)
Word 1	L2 run time current (most significant byte)	L2 run time current (least significant byte)
Word 2	L3 run time current (most significant byte)	L3 run time current (least significant byte)
Word 3	N run time current (most significant byte)	N run time current (least significant byte)
Word 4	Ground run time current (most significant byte)	Ground run time current (least significant byte)
Word 5	L1 trip current (most significant byte)	L1 trip current (least significant byte)
Word 6	L2 trip current (most significant byte)	L2 trip current (least significant byte)
Word 7	L3 trip current (most significant byte)	L3 trip current (least significant byte)
Word 8	N trip current (most significant byte)	N trip current (least significant byte)
Word 9	Ground trip current (most significant byte)	Ground trip current (least significant byte)
Word 10	CB number of operations (most significant byte)	CB number of operations (least significant byte)
Word 11	CB number of protections trips (most significant byte)	CB number of protections trips (least significant byte)
Word 12	L number of trips (most significant byte)	L number of trips (least significant byte)
Word 13	S number of trips (most significant byte)	S number of trips (least significant byte)
Word 14	I number of trips (most significant byte)	I number of trips (least significant byte)
Word 15	G number of trips (most significant byte)	G number of trips (least significant byte)

3.1.2.2.2 Details

ANALOG INPUT	#	Name / Description	Range	Coding	Units	Multiplier for Length [bytes] range	Notes
Number of variables	16	0	L1 run time current		A In	2	see note 1
Number of bytes	32	1	L2 run time current		A In	2	see note 1
		2	L3 run time current		A In	2	see note 1
		3	N run time current		A In	2	see note 1
		4	Ground run time current		A In	2	see note 1
		5	L1 trip current		A In	2	see note 1
		6	L2 trip current		A In	2	see note 1
		7	L3 trip current		A In	2	see note 1
		8	N trip current		A In	2	see note 1
		9	Ground trip current		A In	2	see note 1
		10	CB number of operations			2	
		11	CB number of protections trips			2	
		12	L number of trips			2	
		13	S number of trips			2	
		14	I number of trips				
		15	G number of trips				

Note 1

Their values are expressed as percentage of I_N if the Nominal current is not set (i.e. the event 'Nominal current unknown' =1, see Digital inputs), otherwise (i.e. the event 'Nominal current unknown'=0) in Ampere.

Example: value read 150

- Nominal current unknown -> $1.5 I_N$

- Nominal current known -> 1.5 A

3.1.2.3 Analog output

3.1.2.3.1 Structure

Bit No.	15...8	7...0
	MSB	LSB
Word 0	Command info - value (most significant byte of 2 bytes)	Command info - value (least significant byte of 2 bytes)
Word 1	Command info - parameter (most significant byte of 2 bytes)	Command info - parameter (least significant byte of 2 bytes)

3.1.2.3.2 Details

ANALOG INPUT	#	Name / Description	Range	Coding	Length [bytes]	Notes
Number of variables	2	0	(Cyclic) Command info - value	No command	0 2	see note 1
			CB Open		1	
			CB Close		2	
			CB Reset		3	
			Trip Reset		4	
Number of bytes	4	1	(Cyclic) Command info - parameter	Don't care	2	see note 1

Note 1

When you want to send commands, write these 2AO at the same time, putting a dummy value for the "Command info - parameter".

3.1.2.4 Diagnostics

3.1.2.4.1 Structure

Word No.	Bit No.	7	6	5	4	3	2	1	0
Word 0	Byte no. 0	Diagnostics present	Acyclic command not executed	Wrong parameter value	Wrong parameter number	Internal configuration map error	Device no initialized	Wrong device connected	No device communication
	Byte no. 1	NOT USED	NOT USED	NOT USED	Cyclic command not executed	Cyclic command wrong value	RS 485 driver fault	Modbus UART fault	Watchdog fault

3.1.2.4.2 Details

DIAGNOSTICS	#	Name / Description	Coding	Notes	
Number of variables	1	0	No device communication	See Table 7.	
Number of bytes	2	1	Wrong device connected	See Table 7.	
		2	Device not initialized	See Table 7.	
		3	Internal configuration map error	See Table 7.	
		4	Wrong parameter number	See Table 7.	
		5	Wrong parameter value	See Table 7.	
		6	Command not executed	See Table 7.	
		7	Diagnostics present	1 = Diagnostics present	
		8	Watchdog fault		See Table 7.
		9	Modbus UART fault		See Table 7.
		10	RS 485 driver fault		See Table 7.
		11	Cyclic command wrong value		See Table 7.
		12	Cyclic command not executed		See Table 7.
		13	NOT USED		
		14	NOT USED		
		15	NOT USED		

3.1.2.5 Parameters

3.1.2.5.1 Details

Param. No.	length in bytes	Typ	Parameter	Range	Coding	Multiplier for Range (see note 1)	Default value	Notes
1	4	r/w	Command info:					
			byte 0-1: command value	No command CB Open CB Close CB Reset Trip Reset	0 1 2 3 4		0	
			byte 2-3: command parameter	Don't care			0	
2	2	r	Protection L manual trip level	{0.4 ... 1}, step 0.02		100	0.4	
3	2	r	Protection L manual trip delay	T4-320 T5-630 T5-600 UL: 3 6 9 12 T4 - T5: 3 6 9 18 S6: 3 6 9 18		10		
4	2	r	Protection S manual trip level	0 (Disabled) 0.6 1.2 1.8 3 3.6 4.2 5.8 6.4 7 7.6 8.2 8.8 9.4 10		10	0	
5	2	r	Protection S manual trip delay	0.05 0.1 0.25 0.5		100	0.05	
6	2	r	Protection I manual trip level	T4-320 T5-630 T5-600 UL: 0 (Disabled) 1.5 2.5 3 4 4.5 5 5.5 6.5 7 7.5 8 9 9.5 10 10 T4 - T5: 0 (Disabled) 1.5 2.5 3 4 4.5 5 5.5 6.5 7 7.5 8 9 9.5 10.5 12 S6: 0 (Disabled) 1.5 2.5 3 4 4		10	0	
7	2	r	Protection G manual trip level	0 (Disabled) 0.2 0.25 0.45 0.55 0.75 0.8 1		100	0	
8	2	r	Protection G manual trip delay	0.1 0.2 0.4 0.8		100	0.1	
9	2	r	First bit field:					
			0: Neutral selection	50% 100 %	0 1		1	
			1: Neutral enabling	Off (Disabled) On (Enabled)	0 1		Off	
			2: Protection S manual disable	Enabled Disabled	0 1		Disabled	
			3: Protection S manual curve type	Definite Time Inverse Time	0 1		Definite Time	
			4: Protection I manual disable	Enabled Disabled	0 1		Disabled	
			5: Protection G manual disable	Enabled Disabled	0 1		Disabled	
			6 - 15: not used					
10	2	r	Date of test (DD/MM/YYYY)					
			byte 0-1: day	{1 ... 31}				
			byte 2-3: month	{1 ... 12}				
			byte 4-5: year	{0 ... 65535}				
11	2	r	Protection L electronic trip level	{0.4 ... 1}, step 0.01		100	1	
12	2	r	Protection L electronic trip delay	T4-320 T5-630 T5-600 UL: {3 ... 12}, step 0.5 T4 - T5: {3 ... 18}, step 0.5 S6: {3 ... 18}, step 0.5		10	18	
13	2	r	Protection S electronic trip level	{0.6 ... 10}, step 0.1		10	10	
14	2	r	Protection S electronic trip delay	{0.05 ... 0.5}, step 0.01		100	0.05	
15	2	r	Protection I electronic trip level	T4-320 T5-630 T5-600 UL: {1.5 ... 10}, step 0.1 T4 - T5: {1.5 ... 12}, step 0.1 S6: {1.5 ... 12}, step 0.1		10	4	
16	2	r	Protection G electronic trip level	{0.2 ... 1}, step 0.01		100	1	
17	2	r	Protection G electronic trip delay	{0.1 ... 0.8}, step 0.01		100	0.8	
18	2	r	First bit field:					
			0: Protection L electronic pre-alarm disable	Enabled Disabled	0 1		Enabled	
			0 1: Protection S electronic disable	Enabled Disabled	0 1		Disabled	
			2: Protection S electronic curve type	Definite Time Inverse Time	0 1		Inverse Time	
			0 3: Protection I electronic disable	Enabled Disabled	0 1		Enabled	
			0 4: Protection G electronic disable	Enabled Disabled	0 1		Disabled	
			5 - 15: not used					
19	2	r	Product execution	LSI LSIG SI	0 1 2		LSI	
20	8	r	Protection Unit serial number HI		1 byte for character (ASCII)			see Note 2
21	8	r	Protection Unit serial number LO		1 byte for character (ASCII)			see Note 2
22	2	r	Communication Parameters bitfield:					
			r 0 - 7: Slave Address	{1 ... 247}			247	
			r 8: Baud rate	9600 19200	0 1			
			r 9 - 10: Parity	Even Odd None	00 01 10		Even	
			r 11: Addressing type	ABB Standard	0 1		Standard	

Note 1

If you Multiplier is present, divide the data got from the device (Coding) by this multiplier to get the actual value (Range).

Note 2

FOR DEVICENET: bytes inside every word are swapped. To get the right values, they have to be swapped. Moreover, the information is truncated to 4 bytes.

FOR PROFIBUS: to get the right values, words have to be rotated. Only the number of words calculated from the 'Length in bytes' field (i.e. 'Length in bytes /2) have to be rotated.

Param. No.	length in bytes	Typ	Parameter	Range	Coding	Multiplier for Range (see note 1)	Default value	Notes
Note 3								
FOR DEVICENET: bytes order is according to the Intel format (little endian).								
Example:	00	00	00	01	(hex)	RIGHT		
	00	01	00	0B	(hex)	RIGHT		
	00	00	01	00	(hex)	WRONG		
	00	01	00	00	(hex)	RIGHT (dummy command)		
	01	00	00	00	(hex)	RIGHT (dummy command)		
FOR PROFIBUS: bytes order is according to the Motorola format (big endian).								
Example:	00	01	00	00	(hex)	RIGHT		
	00	0B	00	01	(hex)	RIGHT		
	01	00	00	00	(hex)	WRONG		
	00	00	01	00	(hex)	RIGHT (dummy command)		
	00	00	00	01	(hex)	RIGHT (dummy command)		

3.1.2.6 Example: PROFIBUS DP data structure

Data type	Group	Example	Quantity/Presentation	Direction
Cyclic data exchange	DI = digital input	Status, alarms, trips ...	74 single Bits in 15 Bytes	read
	AI = analog input	Run-time measures	16 Words	read
	DO = digital outout	Not available	-	-
	AO = analog output	Commands	2 Words	write
Other basic data transfer	Diagnosis	Faults and warnings	11 single Bits in 1 Word	read
	Configuration, identification	Not available	-	-
	Bus specific data	Not available	-	-
	Block parameters	Not available	-	-
Acyclic data exchange	Single parameters	Device configuration, Protection parameters ...	27 single parameters of different enghts (2, 4, 6 or 8 Bytes)	read/write



Remarks:

Diagnosis: The diagnosis telegrams of the PROFIBUS DP slaves start with additional 2 bytes that concern the number of diagnosis bytes and status of the slave.

Configuration: Modern fieldbuses such as PROFIBUS DP-V0, -V1 and DeviceNet fix the Configuration data using the appropriate configuration files (e.g. "xxx.GSD", "xxx.EDS") and write it automatically into the FieldBusPlug during power up.

Most of the FieldBusPlug types compare the Configuration data sent by the EP010 with the Configuration data received from the fieldbus. When the result of the comaprison is ok, parameters can be downloaded and the operation can start.

The Configuration data set contains the product code.

Additional to the above named data the FieldBusPlug - only the FieldBus-Plug, not the EP010 - can send on request identification data such as vendor name, slave address and data baud rate as defined in the appropriate FieldBus standard.

Parameters: Depending on the fieldbus type the parameters can be:
 - written as parameter block - only complete block - (e.g. PROFIBUS DP-V0) or
 - written and read as single parameters (e.g. PROFIBUS DP-V1, DeviceNet)

3.1.3 Performance data and conditions

Trip Reports and Currents refresh rate max. 2 [s]

Parameters refresh rate max. 20 [s]

3.2 PR122/3 with PR120/D and PR332/3 with PR330/D

This user manual applies to the following EP010 SW versions:

1. PR122/3 and PR332/3 FBP Interface v02.00 or higher, but it's backward compatible with the PR122/3 FBP Interface v01.xx

Order Code	Description	S/N Product Type field (G)	WD LED number of flash	FBP Product Code
1SDA060198R1	PR122/3 and PR332/3 FBP Interface	B	2	20002 (0x4E22)

3.2.1 Wiring

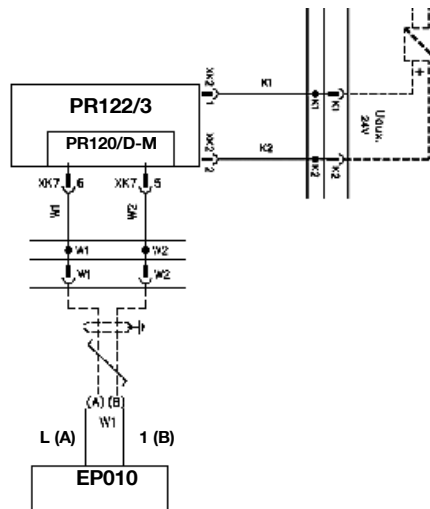


Figure 9. EP010 – PR122/3 wiring diagram

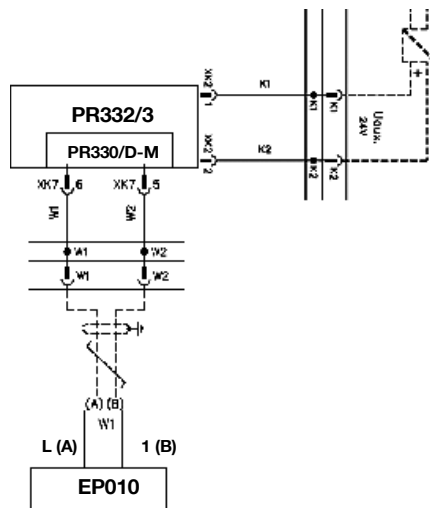


Figure 10. EP010 – PR332/3 with PR330/D-M wiring diagram

3.2.2 Information available

The device type (PR122, PR123, PR332 or PR333) can be read from Parameter n. 2.

3.2.2.1 Digital input

3.2.2.1.1 Structure

Bit No.	7	6	5	4	3	2	1	0
Byte No.0	CB connected / isolated	CB tripped	Any Trip	Any Alarm / Timing / Warning	Signalling Hreset	Waveform available (PR123 only)	Historical Measures Update	Parameters changed
Byte No.1	Programming Fail	Programming OK	Local / Remote Operating Mode	Trip command fail	Springs charged/ discharged	No communic on Local Bus	CB undefined	CB open/closed
Byte No.2	Signalling module present	BT unit present (No PR332/3)	Test Unit connected	Test Session	System Bus programming session	Local Bus programming session	Test Bus programming session	Internal Bus programming session
Byte No.3	Wink ON	ActiveDualSet (PR123 only)	Datalogger stopped	Datalogger Triggered	Waiting Trigger	Display Off for high temp	Voltage unit present	Dialog unit present
Byte No.4	L Timing	L Pre-alarm	Contact Wear Alarm	Contact Wear Pre-alarm	Harmonic distortion > 2.1	Waveform session status (PR123 only)	KK function	Signalling Module Input Status (No PR332/3)
Byte No.5	T Alarm	T Pre-alarm	G Ext Alarm (Blocked Trip)	G Ext Timing	G Alarm (Blocked Trip)	G Timing	S2 Timing (PR123 only)	S Timing
Byte No.6	OV Alarm (Blocked Trip)	OV Timing	UV Alarm (Blocked Trip)	UV Timing	U Alarm (Blocked Trip)	U Timing	D Timing (PR123 only)	T Alarm (Blocked Trip)
Byte No.7	OF Alarm (Blocked Trip)	OF Timing	UF Alarm (Blocked Trip)	UF Timing	RP Alarm (Blocked Trip)	RP Timing	RV Alarm (Blocked Trip)	RV Timing
Byte No.8	N Sensor Error	L3 Sensor Error	L2 Sensor Error	L1 Sensor Error	LC2 Alarm	LC1 Alarm	lw Warning	Frequency Error
Byte No.9	Invalid Date	Phase Cycle Error	Power Factor Error	Internal Error	Key Plug Error	Rating Plug Error	Trip Coil Error	GTe Sensor Error
Byte No.10	Local bus Relè 6 contact	NOT USED	Local bus Relè 4 contact	Local bus Relè 3 contact	Local bus Relè 2 contact	Local bus Relè 1 contact	CB Status Error	Configuration Error
Byte No.11	S zone selectivity output	S zone selectivity input	Relè P4 contact (No PR332/3)	Relè P3 contact (No PR332/3)	Relè P2 contact (No PR332/3)	Relè P1 contact	Local bus Relè 8 contact	Local bus Relè 7 contact
Byte No.12	G tripped	linst tripped	I tripped	S2 tripped (PR123 only)	S tripped	L tripped	G zone selectivity output input	G zone selectivity input
Byte No.13	RP tripped	RV tripped	OV tripped	UV tripped	UN tripped	D tripped (PR123 only)	T tripped	G ext tripped
Byte No.14	NOT USED	NOT USED	Hardware Error Trip	External Input Trip (No PR332/3)	Simulated Trip from Test Unit	Electronic Trip Test	OF tripped	UF tripped

3.2.2.1.2 Details

BINARY INPUT	#	Name / Description	Coding / Range	Notes
Number of variables	118	0 Parameters changed	1 = Parameters changed	Reset after read
Number of bytes	15	1 Historical Measures Update	1 = Historical Measure updated	Reset after read
	2	Waveform available	1 = Waveform available	Reset after read
	3	Signalling Reset	1 = Signalling reset	Reset after read
	4	Any Alarm / Timing / Warning	1 = Any alarm	OR of alarms, pre-alarms, timing, alarms (blocked trips), warning, errors.
	5	Any Trip	1 = Any trip	OR of Trips (latched)
	6	CB tripped	1 = CB tripped	
	7	CB connected / isolated	0 = Isolated 1 = Connected	
	8	CB open/closed	0 = Open 1 = Closed	
	9	CB undefined	1 = Undefined	
	10	No communic on Local Bus	1 = No communication on LB	
	11	Springs charged/discharged	0 = Discharged 1 = Charged	
	12	Trip command fail	1 = Trip command failed	
	13	Local / Remote Operating Mode	0 = Local 1 = Remote	
	14	Programming OK	1 = Programming OK	
	15	Programming Fail	1 = Programming Failed	
	16	Internal Bus programming session	1 = Bus Internal session open	
	17	Test Bus programming session	1 = Bus Test session open	
	18	Local Bus programming session	1 = Bus Local session open	
	19	System Bus programming session	1 = Bus System session open	
	20	Test Session	1 = Test session open	
	21	Test Unit connected	1 = Test unit connected	
	22	BT unit present	1 = BT unit present	No PR332/3
	23	Signalling module present	1 = Signaling module present	
	24	Dialog unit present	1 = Dialog unit present	
	25	Voltage unit present	1 = Measuring unit present	
	26	Display Off for high temp	1 = Display Off	
	27	Waiting Trigger	1 = Waiting trigger	
	28	Datalogger Triggered	1 = Triggered	
	29	Datalogger stopped	1 = Stopped	
	30	ActiveDualSet	0 = SET A 1 = SET B	PR123/PR333 Only
	31	Wink ON	0 = OFF 1 = ON	
	32	Signalling Module Input Status	0 = Not active 1 = Active	No PR332/3
	33	KK function	*0 = OFF 1 = ON	
	34	Waveform session status	1 = Busy	PR123/PR333 Only
	35	Harmonic distortion > 2.1	1 = Harmonic distortion > 2.1	
	36	Contact Wear Pre-alarm	1 = Pre-alarm	
	37	Contact Wear Alarm	1 = Alarm	
	38	L Pre-alarm	1 = Pre-alarm	
	39	L Timing	1 = Timing	
	40	S Timing	1 = Timing	
	41	S2 Timing	1 = Timing	PR123/PR333 Only
	42	G Timing	1 = Timing	
	43	G Alarm (Blocked Trip)	1 = Alarm (Blocked Trip)	
	44	G Ext Timing	1 = Timing	
	45	G Ext Alarm (Blocked Trip)	1 = Alarm (Blocked Trip)	
	46	T Pre-alarm	1 = Pre-alarm	

BINARY INPUT	#	Name / Description	Coding / Range	Notes
	47	T Alarm	1 = Alarm	
	48	T Alarm (Blocked Trip)	1 = Alarm (Blocked Trip)	
	49	D Timing	1 = Timing	PR123/PR333 Only
	50	U Timing	1 = Timing	
	51	U Alarm (Blocked Trip)	1 = Alarm (Blocked Trip)	
	52	UV Timing	1 = Timing	
	53	UV Alarm (Blocked Trip)	1 = Alarm (Blocked Trip)	
	54	OV Timing	1 = Timing	
	55	OV Alarm (Blocked Trip)	1 = Alarm (Blocked Trip)	
	56	RV Timing	1 = Timing	
	57	RV Alarm (Blocked Trip)	1 = Alarm (Blocked Trip)	
	58	RP Timing	1 = Timing	
	59	RP Alarm (Blocked Trip)	1 = Alarm (Blocked Trip)	
	60	UF Timing	1 = Timing	
	61	UF Alarm (Blocked Trip)	1 = Alarm (Blocked Trip)	
	62	OF Timing	1 = Timing	
	63	OF Alarm (Blocked Trip)	1 = Alarm (Blocked Trip)	
	64	Frequency Error	1 = Error	
	65	Iw Warning	1 = Warning	
	66	LC1 Alarm	1 = Alarm	
	67	LC2 Alarm	1 = Alarm	
	68	L1 Sensor Error	1 = Error	
	69	L2 Sensor Error	1 = Error	
	70	L3 Sensor Error	1 = Error	
	71	N Sensor Error	1 = Error	
	72	GTe Sensor Error	1 = Error	
	73	Trip Coil Error	1 = Error	
	74	Rating Plug Error	1 = Error	
	75	Key Plug Error	1 = Error	
	76	Internal Error	1 = Error	"Temperature Sensor Error" if SW version < 1.10
	77	Power Factor Error	1 = Error	
	78	Phase Cycle Error	1 = Error	
	79	Invalid Date	1 = Error	
	80	Configuration Error	1 = Error	
	81	CB Status Error	1 = Error	
	82	Local bus Relè 1 contact	0 = Open 1 = Closed	
	83	Local bus Relè 2 contact	0 = Open 1 = Closed	
	84	Local bus Relè 3 contact	0 = Open 1 = Closed	
	85	Local bus Relè 4 contact	0 = Open 1 = Closed	
	86	NOT USED		
	87	Local bus Relè 6 contact	0 = Open 1 = Closed	
	88	Local bus Relè 7 contact	0 = Open 1 = Closed	
	89	Local bus Relè 8 contact	0 = Open 1 = Closed	
	90	Relè P1 contact	0 = Open 1 = Closed	
	91	Relè P2 contact	0 = Open 1 = Closed	No PR332/3
	92	Relè P3 contact	0 = Open 1 = Closed	No PR332/3
	93	Relè P4 contact	0 = Open 1 = Closed	No PR332/3
	94	S zone selectivity input	1 = Input active	
	95	S zone selectivity output	1 = Output active	
	96	G zone selectivity input	1 = Input active	
	97	G zone selectivity output	1 = Output active	
	98	L tripped	1 = Trip	
	99	S tripped	1 = Trip	
	100	S2 tripped	1 = Trip	PR123/PR333 Only
	101	I tripped	1 = Trip	
	102	Iinst tripped	1 = Trip	
	103	G tripped	1 = Trip	
	104	G ext tripped	1 = Trip	
	105	T tripped	1 = Trip	
	106	D tripped	1 = Trip	PR123/PR333 Only
	107	UN tripped	1 = Trip	
	108	UV tripped	1 = Trip	
	109	OV tripped	1 = Trip	
	110	RV tripped	1 = Trip	
	111	RP tripped	1 = Trip	
	112	UF tripped	1 = Trip	
	113	OF tripped	1 = Trip	
	114	Electronic Trip Test	1 = Trip	
	115	Simulated Trip from Test Unit	1 = Trip	
	116	External Input Trip	1 = Trip	No PR332/3
	117	Hardware Error Trip	1 = Trip	
	118	NOT USED		
	119	NOT USED		

3.2.2.2 Analog input

3.2.2.2.1 Structure

Bit No.	15...8	7...0	Notes
	MSB	LSB	
Word 0	Maximum current (most significant byte of 4 bytes)	Maximum current (2nd most significant byte of 4 bytes)	see note 1
Word 1	L1 run time current (3rd most significant byte of 4 bytes)	L1 run time current (least significant byte of 4 bytes)	see note 1
Word 2	L2 run time current (3rd most significant byte of 4 bytes)	L2 run time current (least significant byte of 4 bytes)	see note 1
Word 3	L3 run time current (3rd most significant byte of 4 bytes)	L3 run time current (least significant byte of 4 bytes)	see note 1
Word 4	Neutral run time current (3rd most significant byte of 4 bytes)	Neutral run time current (least significant byte of 4 bytes)	see note 1
Word 5	Internal Rog Ground run time current (3rd most significant byte of 4 bytes)	Internal Rog Ground run time current (least significant byte of 4 bytes)	see note 1
Word 6	V0 residual voltage (most significant byte of 2 bytes)	V0 residual voltage (least significant byte of 2 bytes)	
Word 7	V12 line to line voltage (most significant byte of 2 bytes)	V12 line to line voltage (least significant byte of 2 bytes)	
Word 8	V23 line to line voltage (most significant byte of 2 bytes)	V23 line to line voltage (least significant byte of 2 bytes)	
Word 9	V31 line to line voltage (most significant byte of 2 bytes)	V31 line to line voltage (least significant byte of 2 bytes)	
Word 10	Total active power (3st most significant byte of 4 bytes)	Total active power (least significant byte of 4 bytes)	LSW (see note 2)
Word 11	Total active power (most significant byte of 4 bytes)	Total active power (2nd most significant byte of 4 bytes)	MSW (see note 2)
Word 12	Total reactive power (3st most significant byte of 4 bytes)	Total reactive power (least significant byte of 4 bytes)	
Word 13	Total reactive power (most significant byte of 4 bytes)	Total reactive power (2nd most significant byte of 4 bytes)	
Word 14	CB number of operations (most significant byte of 2 bytes)	CB number of operations (least significant byte of 2 bytes)	
Word 15	CB number of protection trips (most significant byte of 2 bytes)	CB number of protection trips (least significant byte of 2 bytes)	

3.2.2.2.2 Details

ANALOG INPUT	#	Name / Description	Range (see note 3)	Coding (see note 3)	Units	Multiplier for range (see note 4)	Length [bytes]	Notes
Number of variables	14	0	Maximum current	$I < 216$ $I \geq 216$			2	see note 1
Number of bytes	34	1	L1 run time current		A		2	see note 1
		2	L2 run time current		A		2	see note 1
		3	L3 run time current		A		2	see note 1
		4	N run time current		A		2	see note 1
		5	Internal Rog Ground run time current		A		2	see note 1
		6	V0 residual voltage	not available $V < 5.7 \text{ V}$ $V > 922 \text{ V}$	"216-1 0 9220			
"		V 10		2		see note 5		
		7	V12 line to line voltage	not available $V < 5.7 \text{ V}$ $V > 922 \text{ V}$	216-1 0 9220	V 10	2	see note 5
		8	V23 line to line voltage	not available $V < 5.7 \text{ V}$ $V > 922 \text{ V}$	216-1 0 9220	V 10	2	see note 5
		9	V31 line to line voltage	not available $V < 5.7 \text{ V}$ $V > 922 \text{ V}$	216-1 0 9220	V 10	2	see note 5
		10	Total active power	not available $\text{abs}(P) < 0.5 \ln * 5.7 \text{ V}$ $P \geq 16 \ln * 922 \text{ V}$ $P \leq -16 \ln * 922 \text{ V}$	231-1 0 16ln*9220 -16ln*9220	kW 10	4	"see note 2
see note 6"		11	Total reactive power	not available $\text{abs}(P) < 0.5 \ln * 5.7 \text{ V}$ $P \geq 16 \ln * 922 \text{ V}$ $P \leq -16 \ln * 922 \text{ V}$	231-1 0 16ln*9220 -16ln*9220	kVAR 10	4	see note 2 see note 6
		12	CB number of operations				2	

ANALOG INPUT	#	Name / Description	Range (see note 3)	Coding (see note 3)	Units	Multiplier for range (see note 4)	Length [bytes]	Notes
	13	CB number of protections trips					2	

Note 1

Currents from the PR122/3 and PR332/3 are usually 4 bytes values. Here they are represented as 2 bytes values so this is the convention used: "Maximum current" contains the 2 most significant bytes (i.e. most significant word, MSW) of the highest current taken from phase, neutral and internal ground current.
If this value is different from 0 you can deduce that one of the currents above has a value higher than 2^{16} .
"L1/L2/L3/N and Internal Rog Ground run time current" contains the 2 least significant bytes (i.e. least significant word, LSW) of phase, neutral and internal ground current.
To get the exact value you have to check "Maximum current" as well and see whether it is different from 0 or not

Note 2

Powers from the PR122/3 and PR332/3 are usually 4 bytes (2 words) values. When you ask for these 2 words together, the answer telegram will contain first the least significant word (LSW) and then the most significant one (MSW).
To get the total power value, both words have to be assembled together in the right order.

Note 3

'Range' and 'Coding' fields specify how to interpret data for peculiar cases (out of range values, minimum, maximum values etc.)
For all the other cases consider the formula $\text{Range} = \text{Coding} / \text{Multiplier}$ (see note 4)

Note 4

If the Multiplier is present, divide the data got from the device (Coding) by this multiplier to get the actual value (Range).

Note 5

If PR122/3 SW version < 1.10 consider the following Range / Coding:

Range	Coding
not available	$2^{16}-1$
$V < 1.6 \text{ V}$	0
$V > 150 \cdot \sqrt{3}$	$1500 \cdot \sqrt{3}$

Note 6

If PR122/3 SW version < 1.10 consider the following Range / Coding:

Range	Coding
not available	$2^{16}-1$
$\text{abs}(P) < 0.1 \ln * 1.6 \text{ V}$	0
$P \geq 16 \ln * 150 * \sqrt{3} \text{ V}$	$16 \ln * 1500 * \sqrt{3}$
$P \leq -16 \ln * 150 * \sqrt{3} \text{ V}$	$-16 \ln * 1500 * \sqrt{3}$

3.2.2.3 Analog output

3.2.2.3.1 Structure

Bit No.	15...8	7...0
	MSB	LSB
Word 0	Command info - value (most significant byte of 2 bytes)	Command info - value (least significant byte of 2 bytes)
Word 1	Command info - parameter (most significant byte of 2 bytes)	Command info - parameter (least significant byte of 2 bytes)

3.2.2.3.2 Details

ANALOG OUTPUT	#	Name / Description	Range	Coding	Length [bytes]	Notes
Number of variables	2	0 (Cyclic) Command info - value	No command	1	2	see note 1 see note 2
			CB Open	2		
			CB Close	3		
			CB Reset/Trip Reset	4		
			Reset Signalling	5		
			Reset history measurements	7		
			Reset energy counters/Reset Events log	8		
			Restart trigger Datalogger	9		
			Stop Datalogger	10		
			Start Harmonics Acquisition	11		
			Stop Harmonics Acquisition	12		
			Number of bytes	4		
Only for 'Start Harmonics Acquisition' command:						
L1	1					
L2	2					
L3	3					
NE	4					
V1	5					
V2	6					
V3	7					

Note 1

When you want to send commands, write these 2 AO at the same time, putting a dummy value for the "Command info - parameter"

Note 2

After a 'Start Harmonics Acquisition' command, the new harmonics data are available when the DI 'Waveform available' (# 2) is set. If the acquisition is temporarily not possible, the DI 'Waveform session status' (# 34) is set.

3.2.2.4 Diagnostics

3.2.2.4.1 Structure

Word No.	Bit No.	7	6	5	4	3	2	1	0
Word 0	Byte no. 0	Diagnostics present	Acyclic command not executed	Wrong parameter value	Wrong parameter number	Internal configuration map error	Device no initialized	Wrong device connected	No device communication
	Byte no. 1	NOT USED	NOT USED	NOT USED	Cyclic command not executed	Cyclic command wrong value	RS 485 driver fault	Modbus UART fault	Watchdog fault

3.2.2.4.2 Details

DIAGNOSTICS	#	Name / Description	Coding	Notes	
Number of variables	1	0	No device communication	See Table 7.	
Number of bytes	2	1	Wrong device connected	See Table 7.	
		2	Device not initialized	See Table 7.	
		3	Internal configuration map error	See Table 7.	
		4	Wrong parameter number	See Table 7.	
		5	Wrong parameter value	See Table 7.	
		6	Command not executed	See Table 7.	
		7	Diagnostics present	1 = Diagnostics present	
		8	Watchdog fault		See Table 7.
		9	Modbus UART fault		See Table 7.
		10	RS 485 driver fault		See Table 7.
		11	Cyclic command wrong value		See Table 7.
		12	Cyclic command not executed		See Table 7.
		13	NOT USED		
		14	NOT USED		
		15	NOT USED		

3.2.2.5 Parameters

3.2.2.5.1 Details

Param. No.	length in bytes	Typ	Parameter	Range	Coding	Units	Multiplier for Range (see note 1)	Default value	Notes					
1	4	r/w	Command info byte 0-1: command value	No command	0			0	see note 2 in sheet 'Analog outputs'					
					1	CB Open								
					2	CB Close								
					3	CB Reset								
					4	Trip Reset								
					5	Reset Signalling								
					6	Reset history measurements								
					7	Reset energy counters								
					8	Reset Events log								
					9	Restart trigger Datalogger								
					10	Stop Datalogger								
					11	Start Harmonics Acquisition								
1	4	r/w	byte 2-3: command parameter	Don't care Only for 'Start Harmonics Acquisition' command:	0			0						
					1	L1								
					2	L2								
					3	L3								
					4	NE								
					5	V1								
					6	V2								
					7	V3								
					2	2	r	Slave ID		0x51 (PR122)				
										0x52 (PR123)				
										0x55 (PR332)				
										0x56 (PR333)				
3	2	r	SW version	MM.mm	MSB = MM, LSB = mm									
4	2	r	Product Standard reference	IEC				IEC						
				UL1066										
				UL489										
5	2	r	Tri/Tetra poles	3 poles	0			3 poles						
				4 poles										
				2 poles										
6	2	r	In (nominal current)	250		A		250	'2 poles' PR332/3 only					
				400										
				630										
				800										
				1000										
				1250										
				1600										
				2000										
				2500										
				3200										
				4000										
5000														
6300														
7	2	r	CB type	PR122/3: See table 9 PR332/3: See table 10										
8	8	r	CB Serial Number 1		1 byte for character (ASCII)			see Note 2						
9	8	r	CB Serial Number 2		1 byte for character (ASCII)			see Note 2						
10	2	r	Datalogger max file	{0 ... 3}				0						
11	2	r	Datalogger max address	{0 ... 65535}				0						
12	2	r	Datalogger Trigger	None (free running)	0			None						
				Any Alarm										
				L Timing										
				Any Trip										
				Custom										
13	2	r	Day of Dlog trigger	Number of days from 31/12/1999										
14	2	r	Hour & minute of Dlog trigger			h.min								
15	2	r	Second of Dlog trigger	{0 ... 59}			s							
16	2	r	Millisecond of Dlog trigger	{0 ... 999}			ms							
17	6	r	CB name 1		1 byte for character (ASCII)			see Note 2						
18	6	r	CB name 2		1 byte for character (ASCII)			see Note 2						
19	2	r	Product execution	LI	0			LI						
				LSI										
				LSIG										
				LSIRc										
20	8	r	Relay Serial Number 1		1 byte for character (ASCII)			see Note 2						
21	8	r	Relay Serial Number 2		1 byte for character (ASCII)			see Note 2						
22	2	r	Unit configuration	0:										
				Rc range (SW version < 2.00)										
				Rc range 0.3...3[A] (Idn = 1A)										
				Rc range 3...30[A] (Idn = 10A)										
				not used (SW version >= 2.00)										
				1: Local Bus Unit										
				Absent										
				Present										
				2: VT										
				Absent										
				Present										
				3: NeutralProtection										
				OFF										
				ON										
				4: PowerDir										
Top														
Bottom														
5: NeutralVoltage														
Absent														
Present														
6: Operating mode														
Local														
Remote														
7-15: not used														
23	2	r	Language	ENG	0			English						
				ITA										
				FRA										
				GER										
				SPA										

Param. No.	length in bytes	Typ	Parameter	Range	Coding	Units	Multiplier for Range (see note 1)	Default value	Notes
24	2	r	Neutral selection	50%	0			1	
				100%	1				
				150%	2				
				200%	3				
25	2	r	Ext. ground toroid	100	0	A		100	
				250	1				
				400	2				
				800	3				
26	2	r	Nominal voltage Un	See table 11	0			100	
27	2	r	VT secondary voltage	100	0	V		100	
				110	1				
				115	2				
				120	3				
				200	4				
				230	5				
28	2	r	Net Frequency	50	0	Hz		50	
				60	1				
29	2	r	Plant Configuration	3P	0			3P	
				3P+N	1				
30	2	r	Slave Address	(1 ... 247)	0			247	
31	2	r	Addressing Type	Standard	0				Standard
32	2	r	Baud rate	9600	0			19200	
				19200	1				
33	2	r	Protocol Type	E,8,1	0			E,8,1	
				O,8,1	1				
				N,8,2	2				
				N,8,1	3				
34	2	r	Ext Toroid Type	None	0			None	
				Source Ground Return	1				
				Rc	2				
35	2	r	Configuration	0: Parameter Set	Set A	0			PR123/PR333 only
					Set B	1			
				1: Dual Setting	OFF	0			PR123/PR333 only
					ON	1			
				2: Harmonic Distorsion Warning	OFF	0			
					ON	1			
				3: Phase Rotation Warning	OFF	0			PR123/PR333 only
					ON	1			
				4: Phase Rotation Cycle	123	0			PR123/PR333 only
					321	1			
				5: CosFi Module Warning	OFF	0			PR123/PR333 only
					ON	1			
				6: Dualset CB Close	Disable	0			PR123/PR333 only
					Set B on CB close	1			
				7: Dualset Vaux	Disable	0			PR123/PR333 only
	Set B on Vaux OFF	1							
8: Dualset Local Bus disable	Disable	0							
	Set B on Local Bus Digital Input ON	1							
	9-15: not used								
36	2	r	Measurement store time	(5 ... 120), step 5		min		5	
37	2	r	Loc Bus Relais Unit Contact config	0: Relè K51/1	Not Latched	0			
					Latched	1			
				1: Relè K51/2	Not Latched	0			
					Latched	1			
				2: Relè K51/3	Not Latched	0			
					Latched	1			
				3: Relè K51/4	Not Latched	0			
					Latched	1			
				4: Relè K51/6	Not Latched	0			
					Latched	1			
				5: Relè K51/7	Not Latched	0			
					Latched	1			
				6: Relè K51/8	Not Latched	0			
					Latched	1			
				7: Contact K51/1	NO	0			
	NC	1							
8: Contact K51/2	NO	0							
	NC	1							
9: Contact K51/3	NO	0							
	NC	1							
10: Contact K51/4	NO	0							
	NC	1							
11: Contact K51/6	NO	0							
	NC	1							
12: Contact K51/7	NO	0							
	NC	1							
13: Contact K51/8	NO	0							
	NC	1							
	14-15: not used								
38	2	r	Loc Bus Relais 1 Function	None	0			None	
				L prealarm	1				
				L timing	2				
				S timing	3				
				L trip	4				
				S trip	5				
				I trip	6				
				G trip I	7				
				Any trip	8				
				Any Alarm	9				
				LC1	10				
				LC2	11				
Custom	(256 ... 65535)								
39	2	r	Loc Bus Relais 1 Delay	(0.00 ... 100.00), step 0.01		s	100	0	
40	2	r	Loc Bus Relais 2 Function	None	0			None	
				L prealarm	1				
				L timing	2				
				S timing	3				
				L trip	4				
				S trip	5				
I trip	6								

Param. No.	length in bytes	Typ	Parameter	Range	Coding	Units	Multiplier for Range (see note 1)	Default value	Notes
				G trip	7				
				Any trip	8				
				Any Alarm	9				
				LC1	10				
				LC2	11				
				Custom	(256 ... 65535)				
41	2	r	Loc Bus Relais 2 Delay	(0.00 ... 100.00), step 0.01		s	100	0	
42	2	r	Loc Bus Relais 3 Function	None	0			None	
				L prealarm	1				
				L timing	2				
				S timing	3				
				L trip	4				
				S trip	5				
				I trip	6				
				G trip	7				
				Any trip	8				
				Any Alarm	9				
				LC1	10				
				LC2	11				
				Custom	(256 ... 65535)				
43	2	r	Loc Bus Relais 3 Delay	(0.00 ... 100.00), step 0.01		s	100	0	
44	2	r	Loc Bus Relais 4 Function	None	0			None	
				L prealarm	1				
				L timing	2				
				S timing	3				
				L trip	4				
				S trip	5				
				I trip	6				
				G trip	7				
				Any trip	8				
				Any Alarm	9				
				LC1	10				
				LC2	11				
				Custom	(256 ... 65535)				
45	2	r	Loc Bus Relais 4 Delay	(0.00 ... 100.00), step 0.01		s	100	0	
46	2	r	Loc Bus Relais 6 Function	None	0			None	
				L prealarm	1				
				L timing	2				
				S timing	3				
				L trip	4				
				S trip	5				
				I trip	6				
				G trip	7				
				Any trip	8				
				Any Alarm	9				
				LC1	10				
				LC2	11				
				Custom	(256 ... 65535)				
47	2	r	Loc Bus Relais 6 Delay	(0.00 ... 100.00), step 0.01		s	100	0	
48	2	r	Loc Bus Relais 7 Function	None	0			None	
				L prealarm	1				
				L timing	2				
				S timing	3				
				L trip	4				
				S trip	5				
				I trip	6				
				G trip	7				
				Any trip	8				
				Any Alarm	9				
				LC1	10				
				LC2	11				
				Custom	(256 ... 65535)				
49	2	r	Loc Bus Relais 7 Delay	(0.00 ... 100.00), step 0.01		s	100	0	
50	2	r	Loc Bus Relais 8 Function	None	0			None	
				L prealarm	1				
				L timing	2				
				S timing	3				
				L trip	4				
				S trip	5				
				I trip	6				
				G trip	7				
				Any trip	8				
				Any Alarm	9				
				LC1	10				
				LC2	11				
				Custom	(256 ... 65535)				
51	2	r	Loc Bus Relais 8 Delay	(0.00 ... 100.00), step 0.01		s	100	0	
52	2	r	P Relays Contact config						
			0: Relay P1	Not Latched	0				
				Latched	1				
			1: Relay P2	Not Latched	0				
				Latched	1				
			2: Relay P3	Not Latched	0				
				Latched	1				
			3: Relay P4	Not Latched	0				
				Latched	1				
			4: Contact P1	NO	0				
				NC	1				
			5: Contact P2	NO	0				
				NC	1				
			6: Contact P3	NO	0				
				NC	1				
			7: Contact P4	NO	0				
				NC	1				
			8-15: not used						
53	2	r	P1 Function	None	0			None	
				L prealarm	1				
				L timing	2				
				S timing	3				
				L trip	4				
				S trip	5				
				I trip	6				
				G trip	7				

Param. No.	length in bytes	Typ	Parameter	Range	Coding	Units	Multiplier for Range (see note 1)	Default value	Notes
				Any trip	8				
				Any Alarm	9				
				LC1	10				
				LC2	11				
				Custom	(256 ... 65535)				
54	2	r	P1 Delay	(0.00 ... 100.00), step 0.01		s	100	0	
55	2	r	P2 Function	None	0			None	No PR332/3
				L prealarm	1				
				L timing	2				
				S timing	3				
				L trip	4				
				S trip	5				
				I trip	6				
				G trip	7				
				Any trip	8				
				Any Alarm	9				
				LC1	10				
				LC2	11				
				Custom	(256 ... 65535)				
56	2	r	P2 Delay	(0.00 ... 100.00), step 0.01		s	100	0	No PR332/3
57	2	r	P3 Function	None	0			None	No PR332/3
				L prealarm	1				
				L timing	2				
				S timing	3				
				L trip	4				
				S trip	5				
				I trip	6				
				G trip	7				
				Any trip	8				
				Any Alarm	9				
				LC1	10				
				LC2	11				
				Custom	(256 ... 65535)				
58	2	r	P3 Delay	(0.00 ... 100.00), step 0.01		s	100	0	No PR332/3
59	2	r	P4 Function	None	0			None	No PR332/3
				L prealarm	1				
				L timing	2				
				S timing	3				
				L trip	4				
				S trip	5				
				I trip	6				
				G trip	7				
				Any trip	8				
				Any Alarm	9				
				LC1	10				
				LC2	11				
				Custom	(256 ... 65535)				
60	2	r	P4 Delay	(0.00 ... 100.00), step 0.01		s	100	0	No PR332/3
61	2	r	Programmable Input config	Active High	0			Active High	No PR332/3
				Active Low	1				
62	2	r	Programmable Input Function	Generic	0			Generic	No PR332/3
				External TRIP	1				
				Trip reset	2				
				Set B (PR123 only)	3				
				Dial Local	4				
				Reset Signalling Module	5				
				Energy reset	6				
63	2	r	Programmable Input Delay	(0.00 ... 100.00), step 0.01		s	100	0	No PR332/3
64	2	r	Data Logger Config	OFF	0			OFF	
				ON	1				
65	2	r	Data Logger Trigger Type	None (free running)	0			None	
				Any Alarm	1				
				L Timing	2				
				Any Trip	3				
				Custom	(256 ... 65535)				
66	2	r	Data Logger Stop Delay	(0.00 ... 10.00), step 0.01		s	100	0	
67	2	r	Data Logger Frequency	1200	0	Hz		600	
				2400	1				
				4800	2				
				Custom	3				
68	2	r	CosFI Module Threshold	(0.50 ... 0.95), step 0.01			100	0.5	PR123/PR333 only
69	6	r	CB TAG name 1		1 byte for character (ASCII)				see Note 2
70	4	r	CB TAG name 2		1 byte for character (ASCII)				see Note 2
71	6	r	User data 1		1 byte for character (ASCII)				see Note 2
72	4	r	User data 2		1 byte for character (ASCII)				see Note 2
73	4	r	Dual set CB close time	(0.20 ... 50.00), step 0.10		s	100	0.20	PR123/PR333 only
74	2	r	Date of installation CB	Number of days from 31/12/1999					
75	2	r	Date of last maint CB	Number of days from 31/12/1999					
76	2	r	Prot L configuration						
			0-3: not used						
			4: Thermal mem	OFF	0				
				ON	1				
			5-15: not used						
77	2	r	Prot L curve type	I _{2t} = k	0			I _{2t} = k1	
				0.14/(0.02-1)	1				
				13.5 ^b /(i-1)	2				
				80 ^b /(i ₂ -1)	3				
78	2	r	Prot L threshold	(0.40 ... 1.00), step 0.01		in	100	0.4	
79	2	r	Prot L time	(3 ... 144), step 3		s	100	3	
80	2	r	Prot L threshold IEC255	(0.40 ... 1.00), step 0.01		in	100	0.4	
81	2	r	Prot L time IEC255	(3 ... 144), step 3		s	100	3	
82	2	r	Prot S configuration						
			0: Prot enable/disable	Disable	0				
				Enable	1				
			1: not used						
			2: Start Up Th	OFF	0				
				ON	1				
			3: Zone sel	OFF	0				
				ON	1				
			4: Thermal mem	OFF	0				
				ON	1				
			5-15: not used						

Param. No.	length in bytes	Typ	Parameter	Range	Coding	Units	Multiplier for Range (see note 1)	Default value	Notes
83	2	r	Prot S curve type	T=k I2t = k	0 1			T=k	
84	2	r	Prot S threshold T=k/I2	{0.6 ... 10.0}, step 0.1		In	100	0.6	
85	2	r	Prot S time T=k/I2	{0.05 ... 0.8}, step 0.01		s	100	0.05	
86	2	r	Prot S threshold T=k	{0.6 ... 10.0}, step 0.1		In	100	0.6	
87	2	r	Prot S time T=k	{0.05 ... 0.8}, step 0.01		s	100	0.05	
88	2	r	Prot S start up threshold	{0.6 ... 10.0}, step 0.1		In	100	0.6	
89	2	r	Prot S start up time	{0.10 ... 1.50}, step 0.01 (SW version < 1.10) {0.10 ... 30.00}, step 0.01 (SW version >= 1.10)		s	100	0.1	
90	2	r	Prot S zone selectivity time	{0.04 ... 0.20}, step 0.01		s	100	0.04	
91	2	r	Prot S2 configuration						PR123/PR333 only
			0: Prot enable/disable	Disable Enable	0 1				PR123/PR333 only
			1: not used						PR123/PR333 only
			2: Start Up Th	OFF ON	0 1				PR123/PR333 only
			3: Zone sel	OFF ON	0 1				PR123/PR333 only
			4-15: not used	*OFF	1				PR123/PR333 only
92	2	r	Prot S2 threshold T=k	{0.6 ... 10.0}, step 0.1		In	100	0.6	PR123/PR333 only
93	2	r	Prot S2 time T=k	{0.05 ... 0.8}, step 0.01		s	100	0.05	PR123/PR333 only
94	2	r	Prot S2 start up threshold	{0.6 ... 10.0}, step 0.1		In	100	0.6	PR123/PR333 only
95	2	r	Prot S2 start up time	{0.10 ... 1.50}, step 0.01 (SW version < 1.10) {0.10 ... 30.00}, step 0.01 (SW version >= 1.10)		s	100	0.1	PR123/PR333 only
96	2	r	Prot S2 zone selectivity time	{0.04 ... 0.20}, step 0.01		s	100	0.04	PR123/PR333 only
97	2	r	Prot D configuration						
			0: Prot enable/disable	Disable Enable	0 1				
			1: not used						
			2: Start Up Th	OFF ON	0 1				
			3: Zone sel	OFF ON	0 1				
			4-15: not used						
98	2	r	Prot D threshold	{0.6 ... 10.0}, step 0.1		In	100	0.6	PR123/PR333 only
99	2	r	Prot D time Forward	{0.2 ... 0.8}, step 0.01		s	100	0.2	PR123/PR333 only
100	2	r	Prot D time Backward	{0.2 ... 0.8}, step 0.01		s	100	0.2	PR123/PR333 only
101	2	r	Prot D start up threshold	{0.6 ... 10.0}, step 0.1		In	100	0.6	PR123/PR333 only
102	2	r	Prot D start up time	{0.10 ... 1.50}, step 0.01 (SW version < 1.10) {0.10 ... 30.00}, step 0.01 (SW version >= 1.10)		s	100	0.1	PR123/PR333 only
103	2	r	Prot D zone selectivity time	{0.13 ... 0.50}, step 0.01		s	100	0.13	PR123/PR333 only
104	2	r	Prot I configuration						
			0: Prot enable/disable	Disable Enable	0 1				
			1: not used						
			2: Start Up Th	OFF ON	0 1				
			3-15: not used						
105	2	r	Prot I threshold	{1.5 ... 15}, step 0.1		In	100	1.5	
106	2	r	Prot I start up threshold	{1.5 ... 15}, step 0.1		In	100	1.5	
107	2	r	Prot I start up time	{0.10 ... 1.50}, step 0.01 (SW version < 1.10) {0.10 ... 30.00}, step 0.01 (SW version >= 1.10)		s	100	0.1	
108	2	r	Prot G configuration						
			0: Prot enable/disable	Disable Enable	0 1				
			1: not used						
			2: Start Up Th	OFF ON	0 1				
			3: Zone sel	OFF ON	0 1				
			4-15: not used						
109	2	r	Prot G curve type	T=k I2t = k	0 1			T=k	
110	2	r	Prot G threshold T=k/I2	{0.20 ... 1.00}, step 0.02		In	100	0.2	
111	2	r	Prot G time T=k/I2	{0.10 ... 1.00}, step 0.05		s	100	0.1	
112	2	r	Prot G threshold T=k	{0.20 ... 1.00}, step 0.02		In	100	0.2	
113	2	r	Prot G time T=k	{0.10 ... 1.00}, step 0.05		s	100	0.1	
114	2	r	Prot G start up threshold	{0.20 ... 1.00}, step 0.02		In	100	0.2	
115	2	r	Prot G start up time	{0.10 ... 1.50}, step 0.01 (SW version < 1.10) {0.10 ... 30.00}, step 0.01 (SW version >= 1.10)		s	100	0.1	
116	2	r	Prot G zone selectivity time	{0.04 ... 0.20}, step 0.01		s	100	0.04	
117	2	r	Prot Ext G configuration						
			0: Prot enable/disable	Disable Enable	0 1				
			1: not used						
			2: Start Up Th	OFF ON	0 1				
			3: Zone sel	OFF ON	0 1				
			4-15: not used						
118	2	r	Prot Ext G curve type	T=k I2t = k				T=k	
119	2	r	Prot Ext G threshold T=k/I2	{0.20 ... 1.00}, step 0.02 (SW version < 1.10) {0.10 ... 1.00}, step 0.02 (SW version >= 1.10)		In	100	0.2	
120	2	r	Prot Ext G time T=k/I2	{0.10 ... 1.00}, step 0.05		s	100	0.1	
121	2	r	Prot Ext G threshold T=k	{0.20 ... 1.00}, step 0.02 (SW version < 1.10) {0.10 ... 1.00}, step 0.02 (SW version >= 1.10)		In	100	0.2	
122	2	r	Prot Ext G time T=k	{0.10 ... 1.00}, step 0.05		s	100	0.1	

Param. No.	length in bytes	Typ	Parameter	Range	Coding	Units	Multiplier for Range (see note 1)	Default value	Notes
123	2	r	Prot Ext G start up threshold	{0.20 ... 1.00}, step 0.02 (SW version < 1.10) {0.10 ... 1.00}, step 0.02 (SW version >= 1.10)*		In	100	0.2	
124	2	r	Prot Ext G start up time	{0.10 ... 1.50}, step 0.01 (SW version < 1.10) {0.10 ... 30.00}, step 0.01 (SW version >= 1.10)		s	100	0.1	
125	2	r	Prot Ext G zone selectivity time	{0.04 ... 0.20}, step 0.01		s	100	0.04	
126	2	r	Prot U configuration						
			0: Prot enable/disable	Disable	0				
				Enable	1				
			1: Trip enable/disable	Disable	0				
				Enable	1				
			2-4: not used						
			5: not used (SW version < 1.10)						
			Current/Voltage selection (SW version >= 1.10)	Current selection	0				
				Voltage selection	1				
			6-15: not used						
127	2	r	Prot U threshold	{2 ... 90}, step 1		%		5	
128	2	r	Prot U time	{0.5 ... 60}, step 0.5		s	100	0.5	
129	2	r	Prot UV configuration						
			0: Prot enable/disable	Disable	0				
				Enable	1				
			1: Trip enable/disable	Disable	0				
				Enable	1				
			2-15: not used						
130	2	r	Prot UV threshold	{0.50 ... 0.95}, step 0.01		Un	100	0.50	
131	2	r	Prot UV time	{0.1 ... 5.0}, step 0.1		s	100	0.1	
132	2	r	Prot OV configuration						
			0: Prot enable/disable	Disable	0				
				Enable	1				
			1: Trip enable/disable	Disable	0				
				Enable	1				
			2-15: not used						
133	2	r	Prot OV threshold	{1.05 ... 1.20}, step 0.01		Un	100	1.05	
134	2	r	Prot OV time	{0.1 ... 5.0}, step 0.1		s	100	0.1	
135	2	r	Prot RV configuration						
			0: Prot enable/disable	Disable	0				
				Enable	1				
			1: Trip enable/disable	Disable	0				
				Enable	1				
			2-15: not used						
136	2	r	Prot RV threshold	{0.10 ... 0.40}, step 0.05		Un	100	0.1	
137	2	r	Prot RV time	{0.5 ... 30.0}, step 0.5		s	100	0.5	
138	2	r	Prot RP configuration						
			0: Prot enable/disable	Disable	0				
				Enable	1				
			1: Trip enable/disable	Disable	0				
				Enable	1				
			2-15: not used						
139	2	r	Prot RP threshold	{-0.10 ... -0.30}, step -0.02		Pnt	100	-0.10	
140	2	r	Prot RP time	{0.5 ... 25.0}, step 0.1		s	100	0.5	
141	2	r	Prot UF configuration						
			0: Prot enable/disable	Disable	0				
				Enable	1				
			1: Trip enable/disable	Disable	0				
				Enable	1				
			2-15: not used						
142	2	r	Prot UF threshold	{0.90 ... 0.99}, step 0.01		Fn	100	0.9	
143	2	r	Prot UF time	{0.5 ... 3.0}, step 0.1		s	100	0.5	
144	2	r	Prot OF configuration						
			0: Prot enable/disable	Disable	0				
				Enable	1				
			1: Trip enable/disable	Disable	0				
				Enable	1				
			2-15: not used						
145	2	r	Prot OF threshold	{1.01 ... 1.10}, step 0.01		Fn	100	1.01	
146	2	r	Prot OF time	{0.5 ... 3.0}, step 0.1		s	100	0.5	
147	2	r	Prot OT configuration						
			0: not used						
			1: Trip enable/disable	Disable	0				
				Enable	1				
			2-15: not used						
148	2	r	Load control configuration						
			0: lw Th enable/disable	Disable	0				
				Enable	1				
			1: LC1 Th enable/disable	Disable	0				
				Enable	1				
			2: LC2 Th enable/disable	Disable	0				
				Enable	1				
			3-15: not used						
149	2	r	Warning current lw	{0.30 ... 10.00}, step 0.05		In	100	0.30	
150	2	r	LC1 threshold	{50 ... 100}, step 1		%I1		50	
151	2	r	LC2 threshold	{50 ... 100}, step 1		%I1		50	
152	2	r	Prot Rc configuration						
			0: Prot enable/disable (SW version < 1.10)	Disable	0				
				Enable	1				
			not used (SW version >= 1.10)						
			1: Trip enable/disable (SW version < 1.10)	Disable	0				
				Enable	1				
			not used (SW version >= 1.10)*						
			2-15: not used						
153	2	r	Prot Rc threshold	3 5 7 10 20 30	0 1 2 3 4 5	A		3	
154	2	r	Prot Rc time	0.06	0	s		0.06	

Param. No.	length in bytes	Typ	Parameter	Range	Coding	Units	Multiplier for Range (see note 1)	Default value	Notes
				0.10	1				
				0.20	2				
				0.30	3				
				0.40	4				
				0.50	5				
				0.80	6				
				if SW version < 1.10, also:					
				1.00	7				
				3.00	8				
				4.80	9				
155	2	r	Prot L configuration 0-3: not used 4: Thermal mem 5-15: not used	OFF ON	0 1				PR123/PR333 only PR123/PR333 only PR123/PR333 only PR123/PR333 only
156	2	r	Prot L curve type	I2t = k 0,14/(0,02-1) 13,5*b/(i-1) 80*b/(i2-1)	0 1 2 3		I2t = k1		PR123/PR333 only
157	2	r	Prot L threshold	{0.40 ... 1.00}, step 0.01		In	100	0.4	PR123/PR333 only
158	2	r	Prot L time	{3 ... 144}, step 3		s	100	3	PR123/PR333 only
159	2	r	Prot L threshold IEC255	{0.40 ... 1.00}, step 0.01		In	100	0.4	PR123/PR333 only
160	2	r	Prot L time IEC255	{3 ... 144}, step 3		s	100	3	PR123/PR333 only
161	2	r	Prot S configuration 0: Prot enable/disable 1: not used 2: Start Up Th 3: Zone sel 4: Thermal mem 5-15: not used	Disable Enable OFF ON OFF ON OFF ON	0 1 0 1 0 1 0 1			PR123/PR333 only PR123/PR333 only PR123/PR333 only PR123/PR333 only PR123/PR333 only PR123/PR333 only	
162	2	r	Prot S curve type	T=k I2t = k	0 1			T=k	PR123/PR333 only
163	2	r	Prot S threshold T=k/I2	{0.6 ... 10.0}, step 0.1		In	100	0.6	PR123/PR333 only
164	2	r	Prot S time T=k/I2	{0.05 ... 0.8}, step 0.01		s	100	0.05	PR123/PR333 only
165	2	r	Prot S threshold T=k	{0.6 ... 10.0}, step 0.1		In	100	0.6	PR123/PR333 only
166	2	r	Prot S time T=k	{0.05 ... 0.8}, step 0.01		s	100	0.05	PR123/PR333 only
167	2	r	Prot S start up threshold	{0.6 ... 10.0}, step 0.1		In	100	0.6	PR123/PR333 only
168	2	r	Prot S start up time	{0.10 ... 1.50}, step 0.01 (SW version < 1.10) {0.10 ... 30.00}, step 0.01 (SW version >= 1.10)		s	100	0.1	PR123/PR333 only
169	2	r	Prot S zone selectivity time	{0.04 ... 0.20}, step 0.01		s	100	0.04	PR123/PR333 only
170	2	r	Prot S2 configuration 0: Prot enable/disable 1: not used 2: Start Up Th 3: Zone sel 4: Thermal mem 5-15: not used	Disable Enable OFF ON OFF ON OFF ON	0 1 0 1 0 1 0 1			PR123/PR333 only PR123/PR333 only PR123/PR333 only PR123/PR333 only PR123/PR333 only PR123/PR333 only PR123/PR333 only	
171	2	r	Prot S2 threshold T=k	{0.6 ... 10.0}, step 0.1		In	100	0.6	PR123/PR333 only
172	2	r	Prot S2 time T=k	{0.05 ... 0.8}, step 0.01		s	100	0.05	PR123/PR333 only
173	2	r	Prot S2 start up threshold	{0.6 ... 10.0}, step 0.1		In	100	0.6	PR123/PR333 only
174	2	r	Prot S2 start up time	{0.10 ... 1.50}, step 0.01 (SW version < 1.10) {0.10 ... 30.00}, step 0.01 (SW version >= 1.10)		s	100	0.1	PR123/PR333 only
175	2	r	Prot S2 zone selectivity time	{0.04 ... 0.20}, step 0.01		s	100	0.04	
176	2	r	Prot D configuration 0: Prot enable/disable 1: not used 2: Start Up Th 3: Zone sel 4: Thermal mem 5-15: not used	Disable Enable OFF ON OFF ON OFF ON	0 1 0 1 0 1 0 1			PR123/PR333 only PR123/PR333 only PR123/PR333 only PR123/PR333 only PR123/PR333 only PR123/PR333 only PR123/PR333 only	
177	2	r	Prot D threshold	{0.6 ... 10.0}, step 0.1		In	100	0.6	PR123/PR333 only
178	2	r	Prot D time Forward	{0.2 ... 0.8}, step 0.01		s	100	0.2	PR123/PR333 only
179	2	r	Prot D time Backward	{0.2 ... 0.8}, step 0.01		s	100	0.2	PR123/PR333 only
180	2	r	Prot D start up threshold	{0.6 ... 10.0}, step 0.1		In	100	0.6	PR123/PR333 only
181	2	r	Prot D start up time	{0.10 ... 1.50}, step 0.01 (SW version < 1.10) {0.10 ... 30.00}, step 0.01 (SW version >= 1.10)		s	100	0.1	PR123/PR333 only
182	2	r	Prot D zone selectivity time	{0.13 ... 0.50}, step 0.01		s	100	0.13	PR123/PR333 only
183	2	r	Prot I configuration 0: Prot enable/disable 1: not used 2: Start Up Th 3-15: not used	Disable Enable ON OFF	0 1 1 0				PR123/PR333 only PR123/PR333 only PR123/PR333 only PR123/PR333 only
184	2	r	Prot I threshold	{1.5 ... 15}, step 0.1		In	100	1.5	PR123/PR333 only
185	2	r	Prot I start up threshold	{1.5 ... 15}, step 0.1		In	100	1.5	PR123/PR333 only
186	2	r	Prot I start up time	{0.10 ... 1.50}, step 0.01 (SW version < 1.10) {0.10 ... 30.00}, step 0.01 (SW version >= 1.10)		s	100	0.1	PR123/PR333 only
187	2	r	Prot G configuration 0: Prot enable/disable 1: Trip enable/disable 2: Start Up Th	Disable Enable Disable ON	0 1 0 1				PR123/PR333 only PR123/PR333 only PR123/PR333 only PR123/PR333 only

Param. No.	length in bytes	Typ	Parameter	Range	Coding	Units	Multiplier for Range (see note 1)	Default value	Notes
			3: Zone sel	OFF ON	0 1				PR123/PR333 only
			4-15: not used	OFF	0				PR123/PR333 only
188	2	r	Prot G curve type	T=k I2t = k	0 1			T=k	PR123/PR333 only
189	2	r	Prot G threshold T=k/2	{0.20 ... 1.00}, step 0.02		In	100	0.2	PR123/PR333 only
190	2	r	Prot G time T=k/2	{0.10 ... 1.00}, step 0.05		s	100	0.1	PR123/PR333 only
191	2	r	Prot G threshold T=k	{0.20 ... 1.00}, step 0.02		In	100	0.2	PR123/PR333 only
192	2	r	Prot G time T=k	{0.10 ... 1.00}, step 0.05		s	100	0.1	PR123/PR333 only
193	2	r	Prot G start up threshold	{0.20 ... 1.00}, step 0.02		In	100	0.2	PR123/PR333 only
194	2	r	Prot G start up time	{0.10 ... 1.50}, step 0.01 (SW version < 1.10) {0.10 ... 30.00}, step 0.01 (SW version >= 1.10)		s	100	0.1	PR123/PR333 only
195	2	r	Prot G zone selectivity time	{0.04 ... 0.20}, step 0.01		s	100	0.04	
196	2	r	Prot Ext G configuration						PR123/PR333 only
			0: Prot enable/disable	Disable Enable	0 1				PR123/PR333 only
			1: Trip enable/disable	Disable Enable	0 1				PR123/PR333 only
			2: Start Up Th	ON OFF	1 0				PR123/PR333 only
			3: Zone sel	ON OFF	1 0				PR123/PR333 only
			4-15: not used						PR123/PR333 only
197	2	r	Prot Ext G curve type	T=k I2t = k				T=k	PR123/PR333 only
198	2	r	Prot Ext G threshold T=k/2	{0.20 ... 1.00}, step 0.02 (SW version < 1.10) {0.10 ... 1.00}, step 0.02 (SW version >= 1.10)		In	100	0.2	PR123/PR333 only
199	2	r	Prot Ext G time T=k/2	{0.10 ... 1.00}, step 0.05		s	100	0.1	PR123/PR333 only
200	2	r	Prot Ext G threshold T=k	{0.20 ... 1.00}, step 0.02 (SW version < 1.10) {0.10 ... 1.00}, step 0.02 (SW version >= 1.10)		In	100	0.2	PR123/PR333 only
201	2	r	Prot Ext G time T=k	{0.10 ... 1.00}, step 0.05		s	100	0.1	PR123/PR333 only
202	2	r	Prot Ext G start up threshold	{0.20 ... 1.00}, step 0.02 (SW version < 1.10) {0.10 ... 1.00}, step 0.02 (SW version >= 1.10)		In	100	0.2	PR123/PR333 only
203	2	r	Prot Ext G start up time	{0.10 ... 1.50}, step 0.01 (SW version < 1.10) {0.10 ... 30.00}, step 0.01 (SW version >= 1.10)		s	100	0.1	PR123/PR333 only
204	2	r	Prot Ext G zone selectivity time	{0.04 ... 0.20}, step 0.01		s	100	0.04	PR123/PR333 only
205	2	r	Prot U configuration						PR123/PR333 only
			0: Prot enable/disable	Disable Enable	0 1				PR123/PR333 only
			1: Trip enable/disable	Disable Enable	0 1				PR123/PR333 only
			2-4: not used						PR123/PR333 only
			5: not used (SW version < 1.10)						PR123/PR333 only
			Current/Voltage selection (SW version >= 1.10)	Current selection Voltage selection	0 1				PR123/PR333 only
			6-15: not used						PR123/PR333 only
206	2	r	Prot U threshold	{2 ... 90}, step 1		%		5	PR123/PR333 only
207	2	r	Prot U time	{0.5 ... 60}, step 0.5		s	100	0.5	PR123/PR333 only
208	2	r	Prot UV configuration						PR123/PR333 only
			0: Prot enable/disable	Disable Enable	0 1				PR123/PR333 only
			1: Trip enable/disable	Disable Enable	0 1				PR123/PR333 only
			2-15: not used						PR123/PR333 only
209	2	r	Prot UV threshold	{0.50 ... 0.95}, step 0.01		Un	100	0.50	PR123/PR333 only
210	2	r	Prot UV time	{0.1 ... 5.0}, step 0.1		s	100	0.1	PR123/PR333 only
211	2	r	Prot OV configuration						PR123/PR333 only
			0: Prot enable/disable	Disable Enable	0 1				PR123/PR333 only
			1: Trip enable/disable	Disable Enable	0 1				PR123/PR333 only
			2-15: not used						PR123/PR333 only
212	2	r	Prot OV threshold	{1.05 ... 1.20}, step 0.01		Un	100	1.05	PR123/PR333 only
213	2	r	Prot OV time	{0.1 ... 5.0}, step 0.1		s	100	0.1	PR123/PR333 only
214	2	r	Prot RV configuration						PR123/PR333 only
			0: Prot enable/disable	Disable Enable	0 1				PR123/PR333 only
			1: Trip enable/disable	Disable Enable	0 1				PR123/PR333 only
			2-15: not used						PR123/PR333 only
215	2	r	Prot RV threshold	{0.10 ... 0.40}, step 0.05		Un	100	0.1	PR123/PR333 only
216	2	r	Prot RV time	{0.5 ... 30.0}, step 0.5		s	100	0.5	PR123/PR333 only
217	2	r	Prot RP configuration						PR123/PR333 only
			0: Prot enable/disable	Disable Enable	0 1				PR123/PR333 only
			1: Trip enable/disable	Disable Enable	0 1				PR123/PR333 only
			2-15: not used						PR123/PR333 only
218	2	r	Prot RP threshold	{-0.10 ... -0.30}, step -0.02		Pnt	100	-0.10	PR123/PR333 only
219	2	r	Prot RP time	{0.5 ... 25.0}, step 0.1		s	100	0.5	PR123/PR333 only
220	2	r	Prot UF configuration						PR123/PR333 only
			0: Prot enable/disable	Disable Enable	0 1				PR123/PR333 only
			1: Trip enable/disable	Disable Enable	0 1				PR123/PR333 only
			2-15: not used						PR123/PR333 only
221	2	r	Prot UF threshold	{0.90 ... 0.99}, step 0.01		Fn	100	0.9	PR123/PR333 only
222	2	r	Prot UF time	{0.5 ... 3.0}, step 0.1		s	100	0.5	PR123/PR333 only
223	2	r	Prot OF configuration						PR123/PR333 only
			0: Prot enable/disable	Disable Enable	0 1				PR123/PR333 only

Param. No.	length in bytes	Typ	Parameter	Range	Coding	Units	Multiplier for Range (see note 1)	Default value	Notes
			1: Trip enable/disable	Disable Enable	0 1				PR123/PR333 only
			2-15: not used						PR123/PR333 only
224	2	r	Prot OF threshold	{1.01 ... 1.10}, step 0.01		Fn	100	1.01	PR123/PR333 only
225	2	r	Prot OF time	{0.5 ... 3.0}, step 0.1		s	100	0.5	PR123/PR333 only
226	2	r	Prot OT configuration						PR123/PR333 only
			0: not used						PR123/PR333 only
			1: Trip enable/disable	Disable Enable	0 1				PR123/PR333 only
			2-15: not used						PR123/PR333 only
227	2	r	Load control configuration						PR123/PR333 only
			0: lw Th enable/disable	Disable Enable	0 1				PR123/PR333 only
			1: LC1 Th enable/disable	Disable Enable	0 1				PR123/PR333 only
			2: LC2 Th enable/disable	Disable Enable	0 1				PR123/PR333 only
			3-15: not used						PR123/PR333 only
228	2	r	Warning current lw	{0.30 ... 10.00}, step 0.05		In	100	0.30	PR123/PR333 only
229	2	r	LC1 threshold	{50 ... 100}, step 1		%I1		50	PR123/PR333 only
230	2	r	LC2 threshold	{50 ... 100}, step 1		%I1		50	PR123/PR333 only
231	2	r	Prot Rc configuration						PR123/PR333 only
			0:						PR123/PR333 only
			Prot enable/disable (SW version < 1.10)	Disable Enable	0 1				PR123/PR333 only
			not used (SW version >= 1.10)*						PR123/PR333 only
			1:						PR123/PR333 only
			Trip enable/disable (SW version < 1.10)	Disable Enable	0 1				PR123/PR333 only
			not used (SW version >= 1.10)*						PR123/PR333 only
			2-15: not used						PR123/PR333 only
232	2	r	Prot Rc threshold	3 5 7 10 20 30	0 1 2 3 4 5	A		3	PR123/PR333 only
233	2	r	Prot Rc time	0.06 0.10 0.20 0.30 0.40 0.50 0.80	0 1 2 3 4 5 6	s		0.06	PR123/PR333 only
				if SW version < 1.10, also:	if SW version < 1.10 also:				
				1.00	7				
				3.00	8				
				4.80"	9				
234	2	r	Total power factor	signed	215-1		100		
235	2	r	Frequency	not available	2 ¹⁶ -1	Hz	10		
				F < FMIN --> FMIN					
				F > FMAX --> FMAX					
236	2	r	V1 line to neutral voltage	not available	2 ¹⁶ -1	V	10		
				V < 5.7 V	0				
				V > 922 V	9220				
237	2	r	V2 line to neutral voltage	not available	2 ¹⁶ -1	V	10		
				V < 5.7 V	0				
				V > 922 V	9220				
238	2	r	V3 line to neutral voltage	not available	2 ¹⁶ -1	V	10		
				V < 5.7 V	0				
				V > 922 V	9220				
239	4	r	Total Active Energy	E < -2 ³¹ E > 2 ³¹ -1	2 ³¹ 2 ³¹ -1	kWh			
240	4	r	Total Reactive Energy	E < -2 ³¹ E > 2 ³¹ -1	2 ³¹ 2 ³¹ -1	kVARh			
241	4	r	Total Apparent Energy	E < -2 ³¹ E > 2 ³¹ -1	2 ³¹ 2 ³¹ -1	kVAh			
242	4	r	Total Apparent Power	not available	2 ³¹ -1	kVA	10		
				abs(P) < 0.5In * 5.7 V	0				
				P >= 16In*922 V	16In*9220				
				P <= -16In*922V	-16In*9220				
243	2	r	Total Harmonic Distortion (THD)			%			
244	2	r	3rd Harmonic ratio			%			
245	2	r	5th Harmonic ratio			%			
246	2	r	7th Harmonic ratio			%			
247	2	r	9th Harmonic ratio			%			
248	2	r	11th Harmonic ratio			%			
249	2	r	13th Harmonic ratio			%			
250	2	r	15th Harmonic ratio			%			
251	2	r	17th Harmonic ratio			%			
252	2	r	19th Harmonic ratio			%			
253	2	r	21st Harmonic ratio			%			
254	2	r	23rd Harmonic ratio			%			
255	2	r	25th Harmonic ratio			%			

Note 1:
If the Multiplier is present, divide the data got from the device (Coding) by this multiplier to get actual value (Range).

Note 2:
FOR DEVICENET ONLY: bytes inside every word are swapped. To get the right values, they have to be swapped. Moreover, the information is truncated to 4 bytes.

Note 3

Param. No.	length in bytes	Typ	Parameter	Range	Coding	Units	Multiplier for Range (see note 1)	Default value	Notes
FOR DEVICENET: bytes order is according to the Intel format (little endian).					FOR PROFIBUS: bytes order is according to the Motorola format (big endian).				
Example:	00 00 00 01	(hex)	RIGHT						
	00 01 00 0B	(hex)	RIGHT						
	00 00 01 00	(hex)	WRONG						
	00 01 00 00	(hex)	RIGHT (dummy command)						
	01 00 00 00	(hex)	RIGHT (dummy command)						
	00 01 00 00	(hex)	RIGHT						
	00 0B 00 01	(hex)	RIGHT						
	01 00 00 00	(hex)	WRONG						
	00 00 01 00	(hex)	RIGHT (dummy command)						
	00 00 00 01	(hex)	RIGHT (dummy command)						

Table 9. CB type PR122/3

Coding	"CB type Pr122/3"	Coding	"CB type Pr122/3"	Coding	"CB type Pr122/3"	Coding	"CB type Pr122/3"
0	E1B800/3P	70	E3H3200/3P	140	E3S-A1200/3P	210	E3V-A3200/3P
1	E1B800/4P	71	E3H3200/4P	141	E3S-A1200/4P	211	E3V-A3200/4P
2	E1B1000/3P	72	E3V800/3P	142	E3S-A1600/3P	212	---
3	E1B1000/4P	73	E3V800/4P	143	E3S-A1600/4P	213	E4H-A/f3200/4P
4	E1B1250/3P	74	E3V1250/3P	144	E3S-A2000/3P	214	---
5	E1B1250/4P	75	E3V1250/4P	145	E3S-A2000/4P	215	E4H-A/f3600/4P
6	E1B1600/3P	76	E3V1600/3P	146	E3S-A2500/3P	216	E4L-A3200/3P
7	E1B1600/4P	77	E3V1600/4P	147	E3S-A2500/4P	217	E4L-A3200/4P
8	E1N800/3P	78	E3V2000/3P	148	E3H-A1200/3P	218	E4L-A3600/3P
9	E1N800/4P	79	E3V2000/4P	149	E3H-A1200/4P	219	E4L-A3600/4P
10	E1N1000/3P	80	E3V2500/3P	150	E3H-A1600/3P	220	---
11	E1N1000/4P	81	E3V2500/4P	151	E3H-A1600/4P	221	E6H-A/f4000/4P
12	E1N1250/3P	82	E3V3200/3P	152	E3H-A2000/3P	222	---
13	E1N1250/4P	83	E3V3200/4P	153	E3H-A2000/4P	223	E6H-A/f5000/4P
14	E1N1600/3P	84	E3L2000/3P	154	E3H-A2500/3P	224	E6L-A4000/3P
15	E1N1600/4P	85	E3L2000/4P	155	E3H-A2500/4P	225	E6L-A4000/4P
16	E2B1600/3P	86	E3L2500/3P	156	E3V-A1200/3P	226	E6L-A5000/3P
17	E2B1600/4P	87	E3L2500/4P	157	E3V-A1200/4P	227	E6L-A5000/4P
18	E2B2000/3P	88	E4S4000/3P	158	E3V-A1600/3P	228	E3L-A800/3P
19	E2B2000/4P	89	E4S4000/4P	159	E3V-A1600/4P	229	E3L-A800/4P
20	E2N1000/3P	90	---	160	E3V-A2000/3P	230	E3L-A1200/3P
21	E2N1000/4P	91	E4S/f4000/4P	161	E3V-A2000/4P	231	E3L-A1200/4P
22	E2N1250/3P	92	E4H3200/3P	162	E3V-A2500/3P	232	E3L-A1600/3P
23	E2N1250/4P	93	E4H3200/4P	163	E3V-A2500/4P	233	E3L-A1600/4P
24	E2N1600/3P	94	---	164	E4S-A3200/3P	234	E3L-A2000/3P
25	E2N1600/4P	95	E4H/f3200/4P	165	E4S-A3200/4P	235	E3L-A2000/4P
26	E2N2000/3P	96	E4H4000/3P	166	E4S-A3600/3P	236	E6VL-A4000/3P
27	E2N2000/4P	97	E4H4000/4P	167	E4S-A3600/4P	237	E6VL-A4000/4P
28	E2S800/3P	98	---	168	E4H-A3200/3P	238	E6VL-A5000/3P
29	E2S800/4P	99	E4H/f4000/4P	169	E4H-A3200/4P	239	E6VL-A5000/4P
30	E2S1000/3P	100	E4V3200/3P	170	E4H-A3600/3P		
31	E2S1000/4P	101	E4V3200/4P	171	E4H-A3600/4P		
32	E2S1250/3P	102	E4V4000/3P	172	E4V-A3200/3P		
33	E2S1250/4P	103	E4V4000/4P	173	E4V-A3200/4P		
34	E2S1600/3P	104	E6H4000/3P	174	E4V-A3600/3P		
35	E2S1600/4P	105	E6H4000/4P	175	E4V-A3600/4P		
36	E2S2000/3P	106	E6H5000/3P	176	E6H-A4000/3P		
37	E2S2000/4P	107	E6H5000/4P	177	E6H-A4000/4P		
38	E2L1250/3P	108	---	178	E6H-A5000/3P		
39	E2L1250/4P	109	E6H/f5000/4P	179	E6H-A5000/4P		
40	E2L1600/3P	110	E6H6300/3P	180	E6V-A4000/3P		
41	E2L1600/4P	111	E6H6300/4P	181	E6V-A4000/4P		
42	E3N2500/3P	112	---	182	E6V-A5000/3P		
43	E3N2500/4P	113	E6H/f6300/4P	183	E6V-A5000/4P		
44	E3N3200/3P	114	E6V3200/3P	184	---		
45	E3N3200/4P	115	E6V3200/4P	185	E6H/f4000/4P		
46	E3S1000/3P	116	E6V4000/3P	186	E1N-A800/3P		
47	E3S1000/4P	117	E6V4000/4P	187	E1N-A800/4P		
48	E3S1250/3P	118	E6V5000/3P	188	E1N-A1200/3P		
49	E3S1250/4P	119	E6V5000/4P	189	E1N-A1200/4P		
50	E3S1600/3P	120	E6V6300/3P	190	E2N-A800/3P		
51	E3S1600/4P	121	E6V6300/4P	191	E2N-A800/4P		
52	E3S2000/3P	122	E1B-A800/3P	192	E2S-A800/3P		
53	E3S2000/4P	123	E1B-A800/4P	193	E2S-A800/4P		
54	E3S2500/3P	124	E1B-A1200/3P	194	E2H-A800/3P		
55	E3S2500/4P	125	E1B-A1200/4P	195	E2H-A800/4P		
56	E3S3200/3P	126	E2B-A1600/3P	196	E2H-A1200/3P		
57	E3S3200/4P	127	E2B-A1600/4P	197	E2H-A1200/4P		
58	E3H800/3P	128	E2N-A1200/3P	198	E2H-A1600/3P		
59	E3H800/4P	129	E2N-A1200/4P	199	E2H-A1600/4P		
60	E3H1000/3P	130	E2N-A1600/3P	200	E3S-A800/3P		
61	E3H1000/4P	131	E2N-A1600/4P	201	E3S-A800/4P		
62	E3H1250/3P	132	E2S-A1200/3P	202	E3S-A3200/3P		
63	E3H1250/4P	133	E2S-A1200/4P	203	E3S-A3200/4P		
64	E3H1600/3P	134	E2S-A1600/3P	204	E3H-A800/3P		
65	E3H1600/4P	135	E2S-A1600/4P	205	E3H-A800/4P		
66	E3H2000/3P	136	E3N-A2000/3P	206	E3H-A3200/3P		
67	E3H2000/4P	137	E3N-A2000/4P	207	E3H-A3200/4P		
68	E3H2500/3P	138	E3N-A2500/3P	208	E3V-A800/3P		
69	E3H2500/4P	139	E3N-A2500/4P	209	E3V-A800/4P		

Table 10. CB type PR332/3

Coding	"CB type PR332/3"	Standard	Coding	"CB type PR332/3"	Standard	Coding	"CB type PR332/3"	Standard
0	T7S800/3P	IEC	36	X1B630/3P	IEC	72	X1L800/3P	UL1066
1	T7S800/4P	IEC	37	X1B630/4P	IEC	73	X1L800/4P	UL1066
2	T7S1000/3P	IEC	38	X1B800/3P	IEC	74	X1L1200/3P	UL1066
3	T7S1000/4P	IEC	39	X1B800/4P	IEC	75	X1L1200/4P	UL1066
4	T7S1250/3P	IEC	40	X1B1000/3P	IEC	76	X1B800/3P	UL489
5	T7S1250/4P	IEC	41	X1B1000/4P	IEC	77	X1B800/4P	UL489
6	T7S1600/3P	IEC	42	X1B1250/3P	IEC	78	X1B1200/3P	UL489
7	T7S1600/4P	IEC	43	X1B1250/4P	IEC	79	X1B1200/4P	UL489
8	T7H800/3P	IEC	44	X1B1600/3P	IEC	80	X1B1600/3P	UL489
9	T7H800/4P	IEC	45	X1B1600/4P	IEC	81	X1B1600/4P	UL489
10	T7H1000/3P	IEC	46	X1N630/3P	IEC	82	X1N800/3P	UL489
11	T7H1000/4P	IEC	47	X1N630/4P	IEC	83	X1N800/4P	UL489
12	T7H1250/3P	IEC	48	X1N800/3P	IEC	84	X1N1200/3P	UL489
13	T7H1250/4P	IEC	49	X1N800/4P	IEC	85	X1N1200/4P	UL489
14	T7H1600/3P	IEC	50	X1N1000/3P	IEC	86	X1N1600/3P	UL489
15	T7H1600/4P	IEC	51	X1N1000/4P	IEC	87	X1N1600/4P	UL489
16	T7L800/3P	IEC	52	X1N1250/3P	IEC	88	X1L800/3P	UL489
17	T7L800/4P	IEC	53	X1N1250/4P	IEC	89	X1L800/4P	UL489
18	T7L1000/3P	IEC	54	X1N1600/3P	IEC	90	X1L1200/3P	UL489
19	T7L1000/4P	IEC	55	X1N1600/4P	IEC	91	X1L1200/4P	UL489
20	T7L1250/3P	IEC	56	X1L630/3P	IEC	92	X1V800/3P	UL489
21	T7L1250/4P	IEC	57	X1L630/4P	IEC	93	X1V800/4P	UL489
22	T7L1600/3P	IEC	58	X1L800/3P	IEC	94	X1V1200/3P	UL489
23	T7L1600/4P	IEC	59	X1L800/4P	IEC	95	X1V1200/4P	UL489
24	T7V800/3P	IEC	60	X1L1000/3P	IEC			
25	T7V800/4P	IEC	61	X1L1000/4P	IEC			
26	T7V1000/3P	IEC	62	X1L1250/3P	IEC			
27	T7V1000/4P	IEC	63	X1L1250/4P	IEC			
28	T7V1250/3P	IEC	64	X1B800/3P	UL1066			
29	T7V1250/4P	IEC	65	X1B800/4P	UL1066			
30	T7S1200/3P	UL489	66	X1B1200/3P	UL1066			
31	T7S1200/4P	UL489	67	X1B1200/4P	UL1066			
32	T7H1200/3P	UL489	68	X1N800/3P	UL1066			
33	T7H1200/4P	UL489	69	X1N800/4P	UL1066			
34	T7L1200/3P	UL489	70	X1N1200/3P	UL1066			
35	T7L1200/4P	UL489	71	X1N1200/4P	UL1066			

Table 11.

Coding	Un	Coding	Un	Coding	Un
0	100	8	277	16	550
1	115	9	347	17	600
2	120	10	380	18	660
3	190	11	400	19	690
4	208	12	415	20	910
5	220	13	440	21	950
6	230	14	480	22	1000
7	240	15	500	23	1150

3.2.2.5.2 Example: PROFIBUS DP data structure

Data type	Group	Example	Quantity/Presentation	Direction
Cyclic data exchange	DI = digital input	Status, alarms, trips ...	118 single Bits in 15 Bytes	read
	AI = analog input	Run-time measures	16 Words	read
	DO = digital outout	Not available	-	-
	AO = analog output	Commands	2 Words	write
Other basic data transfer	Diagnosis	Faults and warnings	11 single Bits in 1 Word	read
	Configuration, identification	Not available	-	-
	Bus specific data	Not available	-	-
	Block parameters	Not available	-	-
Acyclic data exchange	Single parameters	Device configuration, Protection parameters ...	233 single parameters of different lengths (2, 4, 6 or 8 Bytes)	read/write



Remarks:

Diagnosis. The diagnosis telegrams of the PROFIBUS DP slaves start with additional 2 bytes that concern the number of diagnosis bytes and status of the slave.

Configuration: Modern fieldbuses such as PROFIBUS DP-V0, -V1 and DeviceNet fix the Configuration data using the appropriate configuration files (e.g. "xxx.GSD", "xxx.EDS") and write it automatically into the FieldBusPlug during power up.

Most of the FieldBusPlug types compare the Configuration data sent by the EP010 with the Configuration data received from the fieldbus. When the result of the comparison is ok, parameters can be downloaded and the operation can start.

The Configuration data set contains the product code.

Additional to the above named data the FieldBusPlug - only the FieldBus-Plug, not the EP010- can send on request identification data such as vendor name, slave address and data baud rate as defined in the appropriate FieldBus standard.

Parameters: Depending on the fieldbus type the parameters can be:
- written as parameter block - only complete block - (e.g. PROFIBUS DP-V0) or
- written and read as single parameters (e.g. PROFIBUS DP-V1, DeviceNet)

3.2.3 Performance data and conditions

Parameters refresh rate max. 20 [s]

4. REVISION HISTORY

4.1 Revision a - 06/10/2004

First release for review.

4.2 Revision b - 17/11/2004

First release.

4.3 Revision c - 06/12/2004

4.3.1 Modified

Figure 1: swapped 'A/-' with 'B/+'

Table 2: swapped 'A/-' with 'B/+'

4.4 Revision d - 21/12/2004

4.4.1 Added

Figure 5: added Protective Earth connection.

4.4.2 Modified

Figure 1 and Table 2: changed 'A/-' with 'A' and 'B/+' with 'B'.

4.5 Revision e - 10/02/2005

4.5.1 Added

Par. 3.1: reference to ABB SACE documentation 'GSD file, doc. n. ITSCE-RE1024001'

Par. 3.2: reference to ABB SACE documentation 'GSD file, doc. n. ITSCE-RE1024001'

Table 14: rows 118 and 119 to complete a byte.

4.5.2 Modified

Par. 3.2.1.1: changed 'Number of bytes: 14' with 'Number of bytes: 15'.

4.6 Revision f - 04/03/2005

4.6.1 Added

Par. 3.1.1: inserted the wiring diagrams.

Par. 3.1.2: inserted Excel file with detailed information available.

Par. 3.1.3: inserted detailed information refresh rate.

Par. 3.2.1: inserted the wiring diagrams.

Par. 3.2.2: inserted Excel file with detailed information available.

Par. 3.2.3: inserted detailed information refresh rate.

4.6.2 Modified

Par. 2.8.5: changed 'Modbus scan rate' with 'Modbus polling rate'. Changed '3000 [ms]' with '3 [s]'.

Par. 3.1: inserted the right EDS file name.

Par. 3.2: inserted the right EDS file name.

4.6.3 Deleted

Tables 9 - 16.

4.7 Revision g - 24/03/2005

4.7.1 Modified

Par. 3.2: new version of the Excel file. Changed the number of bytes of 'CB TAG Name 1 and 2' and 'User Data 1 and 2'.

4.8 Revision h - 06/10/2005

4.8.1 Added

Par. 3.1: added 'FBP Product Code' information.

Par. 3.2: added 'FBP Product Code' information.

4.8.2 Modified

General review for orthographic corrections and clarity.

Changed 'field bus plug' references to 'FieldBusPlug' according to FBP manuals.

Par. 2.4.2.1: changed to simplify.

Par. 3.1.2: changed paragraph structure.

Par. 3.2.2: changed paragraph structure.

4.9 Revision i - 25/08/2006

Applicable to SW v02.xx and above.

4.9.1 Added

Par. 2.1: added 'In particular, EP010 acts as a communication gateway between FieldBusPlug and Modbus device.'

Par. 3.2: added PR332/3

4.9.2 Modified

Par. 2.2: title changed from "Device description" to "EP010 description".

Par. 2.4: changed paragraph structure and content.

Par. 3.2.2: changed the embedded Excel file.

4.10 Revision j - 29/01/2007

Applicable to SW v02.xx and above.

4.10.1 Modified

Table 7: added two new diagnostics.

Par. 3.1.2: changed the embedded Excel file and headings order.

Par. 3.2.2: changed the embedded Excel file and headings order.