SRF/SCR Diagnostic

IO-Link configuration

BERNSTEIN AG . Hans-Bernstein-Straße 1 . 32457 Porta Westfalica
Tel. +49 571 793-0 . info@de.bernstein.eu . www.bernstein.eu

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Contents

1 Definition of terms

Abbreviation	Meaning	Function
SRF	Secure RFID sensor	Sensor
SEU 1	Emergency stop	Sensor
SEU 2	Emergency stop connection box	Sensor
SRF DI	Evaluation	Evaluation device
SCR DI	Safe evaluation	Evaluation device and safety relays

Table 1: Abbreviations

2 Introduction

This document describes the IO-Link communication interface of a BERNSTEIN evaluation device. The structure of the interface, the communication types of IO-Link and the meaning of all information are explained.
The IO-Link communication is exclusively with the evaluation or the safe evaluation of BERNSTEIN.
The sensor information of the connected diagnostic circuits is collected in the evaluation devices and also provided via the IO-Link interface of the evaluation device.

3 Service data SCR DI

The safe evaluation (SCR DI) holds its own data, which can be requested via the IO-Link interface. These data are not provided by an SRF DI evaluation device.
This data from the safe evaluation are divided into service and extended information.

3.1 Service information

The service information is transmitted as a 16-bit value. The content of the transmitted service information is listed in Table 2.

Byte 0								Byte 1							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
E1	E2	Q1	SZOW	EFQ	‘0’	‘0’	‘0’	RFK1	RFK2	RFKe	RE	RF	RFKZ	UB	UW

Table 2: Bit positions in service data

The service information is transmitted as a 16-bit value. The content of the transmitted service information is listed in Table 3.

Bit	Meaning
E1	Status of input 1
E2	Status of input 2
Q1	Status output
SZOW	Safe status without return
EFQ	Input error acknowledgement required
RFK1	Status of return circuit 1
RFK2	Status of return circuit 2
RFKe	Status of external return circuit
RE	Reset expected (yes: 1, no: 0)
RF	Reset function (auto: 1, man: 0)
RFKZ	External return circuit available
UB	Supply voltage OK
UW	Supply voltage warning

Table 3: Meaning of the bits in the status information

3.1.1 E1, E2 – Status of outputs

The bits represent the status of the inputs. If a high or low signal is present at the inputs, the bits in the diagnostic data are set to '1' or '0' accordingly.

3.1.2 Q1 – Status of output

The bits represent the status of the output. If there is a high or low signal at the output, the bit in the diagnostic data is set to '1' or '0' accordingly.

3.1.3 SZOW – Safe status without return

Indicates whether the safe evaluation is in a safe status without return. A voltage reset must be carried out to restore functionality.

3.1.4 EFQ – Input error acknowledgement required

This bit is set when the safe evaluation has detected an input error. This error occurs when the SCR times are violated T_a, T_0 or $T_ü$ (see 3.2.2: SCR times). To acknowledge the fault, both inputs of the safety circuit must be pulled to '0' (opening of the safety circuit).

3.1.5 RFK1, RFK2 – Status of return circuits

The bits represent the status of the return circuits. If a high or low signal is present at the inputs, the bits in the diagnostic data are set to '1' or '0' accordingly.

3.1.6 RFKe – Status of external return circuit

If an external return circuit is configured, then the status of the external return circuit is output. For example, this is needed when monitoring a relay.

3.1.7 RE – Reset expected

The display shows whether the evaluation device is waiting for the input of a reset button. This is the case when the safety circuit is closed and a manual start is configured (yes: 1, no: 0).

3.1.8 RF – Set reset function

The display shows whether the safe evaluation is configured for a manual or automatic start. If a manual start is configured, the input of a reset button is expected (automatically: 1, manual: 0).

3.1.9 RFKZ – External return circuit available

This bit indicates whether monitoring of an external return circuit is configured.

3.1.10 UB – Operating voltage OK

The supply voltage is monitored cyclically. If the voltage is greater than 30 V or less than 19.2 V, an error is detected and the bit is reset.

3.1.11 UW – Supply voltage warning

If the supply voltage deviates from 24 V by ±15 %, a warning is output.

3.2 Extended information

In addition to the service information, the extended information of the safe evaluation can be requested via the interface. Table 4 lists which information is provided.

Value	SRF DI	SCR DI
Supply voltage		X
Temperature		X
SCR times		X
Switching cycles		X

Table 4: Extended information of the safe evaluation

3.2.1 Voltage / temperature

The safe evaluation records data on supply voltage and temperature. The current supply voltage and device temperature can be requested via the interface.

3.2.2 SCR times

For the switching behaviour of the two-channel OSSD outputs,there are specifications for the discrepancy and OFF times of the outputs. Therefore, the outputs must be switched on and off simultaneously in a time frame. If the outputs are switched off, there is a waiting time until the outputs are switched on again.
These times are configured in the evaluation and defined as follows:

- T_a: Maximum offset when switching off the OSSD outputs.
- $T_ü$: Maximum offset when switching on the OSSD outputs.
- T_0: Minimum time that the OSSD outputs must be switched off.

The times are given in 10-ms increments.

3.2.3 Switching cycles

The evaluation device counts the number of switching cycles. The detection takes place for the internal safety relays and for the external return circuit.

4 Diagnostic data of sensors

The information recorded by the connected users in a diagnostic circuit (sensors) is divided into basic and extended information. The information can be requested via the interface of the evaluation device.

4.1 Basic information

The basic information is transmitted as a 16-bit value. The structure of the transmitted basic information is listed in Table 5.

Byte 0								Byte 1							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
QS	RB	BB	FB	CE	BE	SV	EF	MF	Q1	Q2	UF	LS	UW	E1	E2

Table 5: Structure of the basic information

The bits in the basic information have different functions depending on the connected user. The functions of the users are listed in Table 6.

Abbreviation	SRF	SEU
QS	Cross-circuit detected	Cross-circuit detected
RB	Actuator detected	Always '0'
BB	Actuator in the edge area	Status emergency stop 1
FB	Wrong actuator	Status emergency stop 2
CE	For IO-Link without meaning	For IO-Link without meaning
BE	Actuator not taught-in	Actuator not taught-in
SV	For IO-Link without meaning	For IO-Link without meaning
EF	SCR condition violated	SCR condition violated
MF	Restart after reset	Restart after reset
Q1	Status output 1	Status output 1
Q2	Status output 2	Status output 2
UF	Operating voltage OK	Operating voltage OK
UW	Operating voltage warning	Operating voltage warning
LS	Local reset expected	Local reset expected
E1	Status of input 1	Status of input 1
E2	Status of input 2	Status of input 2

Table 6: Meaning of basic information bits

4.1.1 QS – Cross-circuit detected

A connected user cyclically tests its outputs. If a cross-circuit to supply voltage or earth is detected, the corresponding bit in the diagnostic data is set to '1'.

4.1.2 RB - Actuator detected

If an actuator is brought into the detection area of an SRF, this is detected and forwarded. This information is independent of whether a correct actuator code has been received.

4.1.3 BB – Actuator in the edge area

If an actuator is between 13 mm and 15 mm away from the SRF, it is in the edge area of the sensor detection area. In this case, the corresponding bit in the diagnostic data is set to '1'.

4.1.4 FB – Wrong actuator

If an SRF code has been taught in with an actuator code, the sensor can only be switched on using this actuator. If an actuator with an incorrect code is introduced into the detection area of an SRF, this is detected and the corresponding bit in the diagnostic data is set to '1'.

4.1.5 BE - Actuator not taught in

An SRF with high coding must be configured and thus paired with a specific actuator. If an actuator code has not been taught into such a sensor, this is detected and the corresponding bit in the diagnostic data is set to '1'.

4.1.6 EF – SCR condition violated

In sensors with SCR function, the actuating times of the sensor are checked against values that were previously stored in the sensors. If the specified times are violated, the bit is set to '1'.

4.1.7 MF – Restart after voltage reset

The SRF is in a safe condition without return. The SRF can resume its function if a voltage reset is performed.

4.1.8 Q1, Q2 – Status of safety outputs

The bits represent the status of the outputs. If a high or low signal is present at the outputs, the bits in the diagnostic data are set to '1' or '0' accordingly.

4.1.9 UF – Operating voltage OK

If the operating voltage exceeds the value of 30 V or falls below the value of 19.2 V, an error is detected and the corresponding bit is reset.

4.1.10 UW – Operating voltage warning

The supply voltage is monitored cyclically. If the voltage is greater than 30 V or less than 19.2 V, an error is detected and the bit is reset.

4.1.11 LS – Local reset expected

If the function for a local reset is set, a SRF does not switch on its outputs automatically as soon as the actuator has been detected and both inputs are connected with a high signal. To switch on the outputs, an external button must be pressed that is attached to the SRF supply line. The outputs are switched on if actuation occurs within the specified time window.

4.1.12 E1, E2 – Status of outputs

The bits represent the status of the inputs. If a high or low signal is present at the inputs, the bits in the diagnostic data are set to '1' or '0' accordingly.

4.2 Extended information

In addition to the basic information, the extended information of the users (sensors) can be requested via the interface of the evaluation device. However, not every sensor has the same extended information. Table 7 lists which sensor provides which information.

Value	SRF	SEU
Device ID	X	X
Supply voltage	X	X
Distance	X	
Temperature	X	X
Vu counter	X	X
Q counter	X	X
BB counter	X	X
Received company	X	
Extended company	X	
Received ID	X	
Extended ID	X	
Product information	X	X
No. of remaining teach processes	X	X

Table 7: Extended information of the safe evaluation

4.2.1 Device ID

Different users with diagnostic data can be connected to a diagnostic circuit. Therefore, each user sends a device ID, through which the user can be uniquely classified in its function.
The device IDs used are listed in Table 8.

ID	Device
1	SRF
7	SEU Emergency stop
9	SEU connection box

Table 8: Device IDs

4.2.2 Supply voltage

Contains the information about the measured operating voltage value of the respective sensor in volts.

4.2.3 Distance

Contains the information about the measured value of the distance from the actuator to the sensor in per cent.

4.2.4 Temperature

Contains the information about the measured internal temperature value of the respective sensor in degrees Celsius.

4.2.5 Vu counter

The operating voltage is measured periodically and compared with the limits. If the limits are exceeded, the counter is incremented.

4.2.6 Q counter

After detecting an output error (e.g., cross-circuit), a timer of 20 minutes is started. The counter indicates the time in minutes until the SRF outputs are switched off. If an output error has not been detected, then the counter always has the value of 31.

4.2.7 BB counter

The value indicates the duration in which an actuator was found in the edge area of the sensor. The duration is indicated in hours.

4.2.8 Received manufacturer

Information about the manufacturer of the actuator is stored in the actuator memory. The sensor receives and provides this information.

4.2.9 Expected manufacturer

Information about the expected manufacturer of the actuator is stored in the sensor memory. The sensor provides this information.

4.2.10 Received ID

The actuator is coded with an ID. The sensor receives and provides this ID.

4.2.11 Expected ID

The sensor stores an ID that is compared with the ID read out by the actuator. The expected ID can be taught in with relevant sensors (high coding).

4.2.12 Product information

The SRFs can be given different characteristics. The characteristics are set during production and cannot be changed. The possible characteristics are listed in Table 9 and Table 10.

Bit	Meaning
HC	High coding
RS	Can be connected in series
MS	With local reset
MQ	With error-tolerant output

Table 9: Product information bits

Byte 0							
7	6	5	4	3	2	1	0
'0'	'0'	'0'	'0'	HC	RS	MS	MQ

Table 10: Bit position of the product description

4.2.13 Number of remaining teach processes

The number of possible teach processes of an SRF can be limited. This value contains the information about the remaining number of teach processes.

5 Machine description

Additional information can be stored as plain text for each safety circuit. The data is stored in ASCII format.

5.1 Machine name

A name can be issued for each machine, e.g.: MS-12HB 2000. The length is max. 128 characters.

5.2 Machine position

A description of the machine position can be stored for each machine, e.g.: Building 12, next to conveyor belt 4. The length is max. 128 characters.

5.3 Name of safety circuit

A separate name can be issued for each safety circuit. The length is max. 128 characters.

5.4 Additional information about the safety circuit

Additional information or an additional description can be stored for each safety circuit. The length is max. 128 characters.

6 Sensor description

A name and a position can be issued in plain text for each sensor. The information is stored in ASCII format.

6.1 Sensor names

Each sensor can be assigned an individual name. The names are stored in the evaluation device. The length of the name is max. 64 characters.

6.2 Sensor positions

A description of the sensor's position can also be stored for each sensor. This information is stored in the evaluation device. The length of the data is max. 64 characters.

7 Switching cycles of sensors

The evaluation device records the number of switching cycles from each sensor in the chain. The data can be requested using the interface of the evaluation device. The answer is a 32-bit word per sensor.
The number of switching cycles can be reset using the interface of the evaluation device.

8 Length of diagnostic circuit

The expected number of sensors of a safety circuit can be specified using the interface of the evaluation device. The number of sensors in the safety circuit detected by the evaluation device can be requested using the interface.
The expected number and the actual number of sensors are compared and checked in the evaluation device. The evaluation device triggers an error if the number is not identical.

9 System time

The system time can be read out and set with the interface of the evaluation device. The structure of the system time is shown in Table 11.

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5
Year	Month	Day	Hour	Minute	Second

Table 11: System time

10 Data exchange

The data is exchanged synchronously and asynchronously via IO-Link. Messages are output via IO-Link events

10.1 Synchronous data

The synchronous data is transmitted permanently by the SRF. The evaluation device uses the synchronous data to display the SRF at which a change in the basic information has occurred. The 32 possible users in a sensor chain are represented by 32 bits respectively. If a change occurs, the corresponding bit is set to '1'. The connected PLC with the Bernstein application detects this and retrieves the basic information from the evaluation device. The relevant bit is then reset.

Byte 0	Byte 1	Byte 2	Byte 3
Bit [7 ... 0]	Bit [15 ... 8]	Bit [23 ... 16]	Bit [31 ... 24]

Table 12: Order and position of the information in the synchronous data

10.2 Asynchronous data

Besides the change indicators in the synchronous data, all the actual information is present as asynchronous data. This means that this information is only called up on request. This is done using system modules of the respective control system. The index and subindex can be used to access the corresponding data area. The indexes of the data are listed under point 11: IO-Link configuration.

10.3 Events

The events are used to transmit (error) messages from an IO-Link device. The event codes of the evaluation devices are listed under point 12: Event codes.

11 IO-Link configuration

11.1 General information

Device characteristics	
SIO mode	No
Min. Cycle time	10 ms
Baud rate	38.4 kbps (COM2)
Process data	32 Bit (SRF DI) 40 Bit (SCR DI) 192 Bit (SRF DI6)

Process data	
Width	32/40/192 Bit
Alignment	Right
Access	RO
Data type	UINT32

Service data

Index (Hex)	Meaning	Access
0x0010	Manufacturer name	RO
0x0011	Manufacturer text	RO
0x0012	Product name	RO
0x0013	Item number	RO
0x0014	Product description	RO
0x0015	Serial number	RO
0x0016	Hardware revision	RO
0x0017	Software revision	RO
0x0018	App.-specific string	RO

11.2 Basic information SRF/SEU

Basic information of safety circuit

Index (Hex)	Meaning	Access	Sub-indexes	Length	Format
0x40	Basic information circle 1	RO	0x00	64 bytes	UINT16
		RO	0x01 – 0x20	2 bytes	UNIT16
0x41	Basic information circle 2	RO	0x00 – 0x20	64/2 bytes	UINT16
0x42	Basic information circle 3	RO	0x00 – 0x20	64/2 bytes	UINT16
0x43	Basic information circle 4	RO	0x00 – 0x20	64/2 bytes	UINT16
0x44	Basic information circle 5	RO	0x00 – 0x20	64/2 bytes	UINT16
0x45	Basic information circle 6	RO	0x00 – 0x20	64/2 bytes	UINT16

BERNSTEIN AG . Hans-Bernstein-Straße 1 . 32457 Porta Westfalica
Tel. +49 571 793-0 . info@de.bernstein.eu . www.bernstein.eu

11.3 Extended information SRF/SEU

Extended information of safety circuit					
Index (Hex)	**Meaning**	**Access**	**Sub-indexes**	**Length**	**Format**
0x100	Device IDs circuit 1	RO	0x00	32 bytes	UINT8
		RO	0x01 – 0x20	1 byte	UINT8
0x101	Device IDs circuit 2	RO	0x00 – 0x20	1 byte	UINT8
0x101	Device IDs circuit 3	RO	0x00 – 0x20	1 byte	UINT8
0x101	Device IDs circuit 4	RO	0x00 – 0x20	1 byte	UINT8
0x101	Device IDs circuit 5	RO	0x00 – 0x20	1 byte	UINT8
0x101	Device IDs circuit 6	RO	0x00 – 0x20	1 byte	UINT8
0x110	Supply voltage circuit 1	RO	0x00	128 bytes	FLOAT32
		RO	0x01 – 0x20	4 bytes	FLOAT32
0x111	Supply voltage circuit 2	RO	0x00 – 0x20	128/4 bytes	FLOAT32
0x112	Supply voltage circuit 3	RO	0x00 – 0x20	128/4 bytes	FLOAT32
0x113	Supply voltage circuit 4	RO	0x00 – 0x20	128/4 bytes	FLOAT32
0x114	Supply voltage circuit 5	RO	0x00 – 0x20	128/4 bytes	FLOAT32
0x115	Supply voltage circuit 6	RO	0x00 – 0x20	128/4 bytes	FLOAT32
0x120	Distances circuit 1	RO	0x00	128 bytes	FLOAT32
		RO	0x01 – 0x20	4 bytes	FLOAT32
0x121	Distances circuit 2	RO	0x00 – 0x20	128/4 bytes	FLOAT32
0x122	Distances circuit 3	RO	0x00 – 0x20	128/4 bytes	FLOAT32
0x123	Distances circuit 4	RO	0x00 – 0x20	128/4 bytes	FLOAT32
0x124	Distances circuit 5	RO	0x00 – 0x20	128/4 bytes	FLOAT32
0x125	Distances circuit 6	RO	0x00 – 0x20	128/4 bytes	FLOAT32
0x130	Temperatures circuit 1	RO	0x00	128 bytes	FLOAT32
		RO	0x01 – 0x20	4 bytes	FLOAT32
0x131	Temperatures circuit 2	RO	0x00 – 0x20	128/4 bytes	FLOAT32
0x132	Temperatures circuit 3	RO	0x00 – 0x20	128/4 bytes	FLOAT32
0x133	Temperatures circuit 4	RO	0x00 – 0x20	128/4 bytes	FLOAT32
0x134	Temperatures circuit 5	RO	0x00 – 0x20	128/4 bytes	FLOAT32
0x135	Temperatures circuit 6	RO	0x00 – 0x20	128/4 bytes	FLOAT32
0x140	Vu counter	RO	0x00	32 bytes	UINT8
		RO	0x01 – 0x20	1 byte	UINT8
0x141	Counter Vu circuit 2	RO	0x00 – 0x20	32/1 bytes	UINT8
0x142	Counter Vu circuit 3	RO	0x00 – 0x20	32/1 bytes	UINT8
0x143	Counter Vu circuit 4	RO	0x00 – 0x20	32/1 bytes	UINT8
0x144	Counter Vu circuit 5	RO	0x00 – 0x20	32/1 bytes	UINT8
0x145	Counter Vu circuit 6	RO	0x00 – 0x20	32/1 bytes	UINT8
0x150	Q counter	RO	0x00	32 bytes	UINT8
		RO	0x01 – 0x20	1 byte	UINT8
0x151	Counter Q circuit 2	RO	0x00 – 0x20	32/1 bytes	UINT8
0x152	Counter Q circuit 3	RO	0x00 – 0x20	32/1 bytes	UINT8
0x153	Counter Q circuit 4	RO	0x00 – 0x20	32/1 bytes	UINT8
0x154	Counter Q circuit 5	RO	0x00 – 0x20	32/1 bytes	UINT8
0x155	Counter Q circuit 6	RO	0x00 – 0x20	32/1 bytes	UINT8

Index (Hex)	Meaning	Access	Sub-indexes	Length	Format
0x160	Counter BB circuit 1	RO	0x00	32 bytes	UINT8
		RO	0x01 – 0x20	1 byte	UINT8
0x161	Counter BB circuit 2	RO	0x00 – 0x20	32/1 bytes	UINT8
0x162	Counter BB circuit 3	RO	0x00 – 0x20	32/1 bytes	UINT8
0x163	Counter BB circuit 4	RO	0x00 – 0x20	32/1 bytes	UINT8
0x164	Counter BB circuit 5	RO	0x00 – 0x20	32/1 bytes	UINT8
0x165	Counter BB circuit 6	RO	0x00 – 0x20	32/1 bytes	UINT8
0x170	Received manufacturer circuit 1	RO	0x00	32 bytes	UINT8
		RO	0x01 – 0x20	1 byte	UINT8
0x171	Received manufacturer circuit 2	RO	0x00 – 0x20	32/1 bytes	UINT8
0x172	Received manufacturer circuit 3	RO	0x00 – 0x20	32/1 bytes	UINT8
0x173	Received manufacturer circuit 4	RO	0x00 – 0x20	32/1 bytes	UINT8
0x174	Received manufacturer circuit 5	RO	0x00 – 0x20	32/1 bytes	UINT8
0x175	Received manufacturer circuit 6	RO	0x00 – 0x20	32/1 bytes	UINT8
0x180	Extended manufacturer circuit 1	RO	0x00	32 bytes	UINT8
		RO	0x01 – 0x20	1 byte	UINT8
0x181	Extended manufacturer circuit 2	RO	0x00 – 0x20	32/1 bytes	UINT8
0x181	Extended manufacturer circuit 3	RO	0x00 – 0x20	32/1 bytes	UINT8
0x181	Extended manufacturer circuit 4	RO	0x00 – 0x20	32/1 bytes	UINT8
0x181	Extended manufacturer circuit 5	RO	0x00 – 0x20	32/1 bytes	UINT8
0x181	Extended manufacturer circuit 6	RO	0x00 – 0x20	32/1 bytes	UINT8
0x190	Extended ID circuit 1	RO	0x00	64 bytes	UINT16
		RO	0x01 – 0x20	2 bytes	UINT16
0x191	Extended ID circuit 2	RO	0x00 – 0x20	64/2 bytes	UINT16
0x192	Extended ID circuit 3	RO	0x00 – 0x20	64/2 bytes	UINT16
0x193	Extended ID circuit 4	RO	0x00 – 0x20	64/2 bytes	UINT16
0x194	Extended ID circuit 5	RO	0x00 – 0x20	64/2 bytes	UINT16
0x195	Extended ID circuit 6	RO	0x00 – 0x20	64/2 bytes	UINT16
0x1A0	Received ID circuit 1	RO	0x00	64 bytes	UINT16
		RO	0x01 – 0x20	2 bytes	UINT16
0x1A1	Received ID circuit 2	RO	0x00 – 0x20	64/2 bytes	UINT16
0x1A2	Received ID circuit 3	RO	0x00 – 0x20	64/2 bytes	UINT16
0x1A3	Received ID circuit 4	RO	0x00 – 0x20	64/2 bytes	UINT16
0x1A4	Received ID circuit 5	RO	0x00 – 0x20	64/2 bytes	UINT16
0x1A5	Received ID circuit 6	RO	0x00 – 0x20	64/2 bytes	UINT16
0x1B0	Product description circuit 1	RO	0x00	32 bytes	UINT8
		RO	0x01 – 0x20	1 byte	UINT8
0x1B1	Product description circuit 2	RO	0x00 – 0x20	32/1 bytes	UINT8
0x1B2	Product description circuit 3	RO	0x00 – 0x20	32/1 bytes	UINT8
0x1B3	Product description circuit 4	RO	0x00 – 0x20	32/1 bytes	UINT8
0x1B4	Product description circuit 5	RO	0x00 – 0x20	32/1 bytes	UINT8
0x1B5	Product description circuit 6	RO	0x00 – 0x20	32/1 bytes	UINT8
0x1C0	Remain. teach processes circuit 1	RO	0x00	32 bytes	UINT8
		RO	0x01 – 0x20	1 byte	UINT8
0x1C1	Remain. teach processes circuit 2	RO	0x00 – 0x20	32/1 bytes	UINT8
0x1C2	Remain. teach processes circuit 3	RO	0x00 – 0x20	32/1 bytes	UINT8
0x1C3	Remain. teach processes circuit 4	RO	0x00 – 0x20	32/1 bytes	UINT8
0x1C4	Remain. teach processes circuit 5	RO	0x00 – 0x20	32/1 bytes	UINT8
0x1C5	Remain. teach processes circuit 6	RO	0x00 – 0x20	32/1 bytes	UINT8

11.4 Switching cycles SRF/SEU

Read switching cycles					
Index (Hex)	**Meaning**	**Access**	**Sub-indexes**	**Length**	**Format**
0x2000	Switching cycles circuit 1	RO	0x00	128 bytes	UINT32
			0x01 – 0x20	4 bytes	UINT32
0x2001	Switching cycles circuit 2	RO	0x00 – 0x20	128/4 bytes	UINT32
0x2002	Switching cycles circuit 3	RO	0x00 – 0x20	128/4 bytes	UINT32
0x2003	Switching cycles circuit 4	RO	0x00 – 0x20	128/4 bytes	UINT32
0x2004	Switching cycles circuit 5	RO	0x00 – 0x20	128/4 bytes	UINT32
0x2005	Switching cycles circuit 6	RO	0x00 – 0x20	128/4 bytes	UINT32

Delete switching cycles for each user					
Index (Hex)	**Meaning**	**Access**	**Sub-indexes**	**Length**	**Format**
0x2010	Switching cycles circuit 1	WO	1 – 32	1 byte	UINT8
0x2011	Switching cycles circuit 2	WO	1 – 32	1 byte	UINT8
0x2012	Switching cycles circuit 3	WO	1 – 32	1 byte	UINT8
0x2013	Switching cycles circuit 4	WO	1 – 32	1 byte	UINT8
0x2014	Switching cycles circuit 5	WO	1 – 32	1 byte	UINT8
0x2015	Switching cycles circuit 6	WO	1 – 32	1 byte	UINT8

11.5 Machine description

Extended information of safety circuit					
Index (Hex)	**Meaning**	**Access**	**Sub-indexes**	**Length**	**Format**
0x3A00	Name of machine/plant circuit 1	RW	0x00	128 bytes	ASCII
0x3A02	Position of machine/plant circuit 1	RW	0x00	128 bytes	ASCII
0x3A04	Name of safety circuit circuit 1	RW	0x00	128 bytes	ASCII
0x3A05	Additional information circuit 1	RW	0x00	128 bytes	ASCII
0x3B00	Name of machine/plant circuit 2	RW	0x00	128 bytes	ASCII
0x3B02	Position of machine/plant circuit 2	RW	0x00	128 bytes	ASCII
0x3B04	Name of safety circuit circuit 2	RW	0x00	128 bytes	ASCII
0x3B05	Additional information circuit 2	RW	0x00	128 bytes	ASCII
0x3C00	Name of machine/plant circuit 3	RW	0x00	128 bytes	ASCII
0x3C02	Position of machine/plant circuit 3	RW	0x00	128 bytes	ASCII
0x3C04	Name of safety circuit circuit 3	RW	0x00	128 bytes	ASCII
0x3C05	Additional information circuit 3	RW	0x00	128 bytes	ASCII
0x3D00	Name of machine/plant circuit 4	RW	0x00	128 bytes	ASCII
0x3D02	Position of machine/plant circuit 4	RW	0x00	128 bytes	ASCII
0x3D04	Name of safety circuit circuit 4	RW	0x00	128 bytes	ASCII
0x3D05	Additional information circuit 4	RW	0x00	128 bytes	ASCII

Index (Hex)	Meaning	Access	Sub-indexes	Length	Format
0x3E00	Name of machine/plant circuit 5	RW	0x00	128 bytes	ASCII
0x3E02	Position of machine/plant circuit 5	RW	0x00	128 bytes	ASCII
0x3E04	Name of safety circuit circuit 5	RW	0x00	128 bytes	ASCII
0x3E05	Additional information circuit 5	RW	0x00	128 bytes	ASCII
0x3F00	Name of machine/plant circuit 6	RW	0x00	128 bytes	ASCII
0x3F02	Position of machine/plant circuit 6	RW	0x00	128 bytes	ASCII
0x3F04	Name of safety circuit circuit 6	RW	0x00	128 bytes	ASCII
0x3F05	Additional information circuit 6	RW	0x00	128 bytes	ASCII

11.6 Sensor description

Names and positions					
Index (Hex)	**Meaning**	**Access**	**Sub-indexes**	**Length**	**Format**
0x1000	Name and position of sensor 1.01	RW	0x00	128 bytes	ASCII
	Name of sensor 1.01	RW	0x01	64 bytes	ASCII
	Position of sensor 1.01	RW	0x02	64 bytes	ASCII
0x1001	Name and position of sensor 1.02	RW	0x00 – 0x02	128/64 bytes	ASCII
0x1002	Name and position of sensor 1.03	RW	0x00 – 0x02	128/64 bytes	ASCII
…	…	…	…	…	…
0x101E	Name and position of sensor 1.31	RW	0x00 – 0x02	128/64 bytes	ASCII
0x101F	Name and position of sensor 1.32	RW	0x00 – 0x02	128/64 bytes	ASCII
0x1100	Name and position of sensor 2.01	RW	0x00 – 0x02	128/64 bytes	ASCII
…	…	…	…	…	…
0x111F	Name and position of sensor 2.32	RW	0x00 – 0x02	128/64 bytes	ASCII
0x1200	Name and position of sensor 3.01	RW	0x00 – 0x02	128/64 bytes	ASCII
…	…	…	…	…	…
0x121F	Name and position of sensor 3.32	RW	0x00 – 0x02	128/64 bytes	ASCII
0x1300	Name and position of sensor 4.01	RW	0x00 – 0x02	128/64 bytes	ASCII
…	…	…	…	…	…
0x131F	Name and position of sensor 4.32	RW	0x00 – 0x02	128/64 bytes	ASCII
0x1400	Name and position of sensor 5.01	RW	0x00 – 0x02	128/64 bytes	ASCII
…	…	…	…	…	…
0x141F	Name and position of sensor 5.32	RW	0x00 – 0x02	128/64 bytes	ASCII
0x1500	Name and position of sensor 6.01	RW	0x00 – 0x02	128/64 bytes	ASCII
…	…	…	…	…	…
0x151F	Name and position of sensor 6.32	RW	0x00 – 0x02	128/64 bytes	ASCII

11.7 System time

System time					
Index (Hex)	**Meaning**	**Access**	**Sub-indexes**	**Length**	**Format**
0x2100	System time of machine/plant	RW	0x00	6 bytes	BCD

11.8 Length of diagnostic circuit

User					
Index (Hex)	**Meaning**	**Access**	**Sub-indexes**	**Length**	**Format**
0x2020	Number of expected users circuit 1	RW	0x00	1 bytes	UINT8
0x2021	Number of expected users circuit 2	RW	0x00	1 bytes	UINT8
0x2022	Number of expected users circuit 3	RW	0x00	1 bytes	UINT8
0x2023	Number of expected users circuit 4	RW	0x00	1 bytes	UINT8
0x2024	Number of expected users circuit 5	RW	0x00	1 bytes	UINT8
0x2025	Number of expected users circuit 6	RW	0x00	1 bytes	UINT8
0x2026	Number of received users circuit 1	RO	0x00	1 bytes	UINT8
0x2027	Number of received users circuit 2	RO	0x00	1 bytes	UINT8
0x2028	Number of received users circuit 3	RO	0x00	1 bytes	UINT8
0x2029	Number of received users circuit 4	RO	0x00	1 bytes	UINT8
0x202A	Number of received users circuit 5	RO	0x00	1 bytes	UINT8
0x202B	Number of received users circuit 6	RO	0x00	1 bytes	UINT8

11.9 SCR DI Service data

Service data SCR DI					
Index (Hex)	**Meaning**	**Access**	**Sub-indexes**	**Length**	**Format**
0x2110	Status bits	RO	0x00	2 bytes	UINT16
0x2111	Voltage/temperature	RO	0x00	8 bytes	FLOAT32
	Supply voltage value	RO	0x01	4 bytes	FLOAT32
	Temperature value	RO	0x02	4 bytes	FLOAT32
0x2112	SCR times	RO	0x00	6 bytes	UINT16
	Time T_a	RO	0x01	2 bytes	UINT16
	Time T_0	RO	0x02	2 bytes	UINT16
	Time $T_{ü}$	RO	0x03	2 bytes	UINT16
0x2113	Switching cycles	RO	0x00	8 bytes	UINT32
	Safe relay outputs	RO	0x01	4 bytes	UINT32
	External return circuit	RO	0x02	4 bytes	UINT32
0x2114	Emergency operation counter	RO	0x00	1 bytes	UINT8

Service data SCR DI					
Index (Hex)	**Meaning**	**Access**	**Value**	**Length**	**Format**
0x2120	Reset of external return circuit	WO	1	1 byte	UINT8

12 Event codes

All standard event codes are defined in the IO-Link specification. The specification is available to download under IO-Link.com

12.1 Manufacturer-specific

In addition to the event codes defined in the IO-Link specification, there are the following manufacturer-specific event codes.

Manufacturer-specific event codes	
Event code	**Meaning**
0x8CA0	Number of incorrect users in diagnostic circuit 1
0x8CA1	Number of incorrect users in diagnostic circuit 2
0x8CA2	Number of incorrect users in diagnostic circuit 3
0x8CA3	Number of incorrect users in diagnostic circuit 4
0x8CA4	Number of incorrect users in diagnostic circuit 5
0x8CA5	Number of incorrect users in diagnostic circuit 6

BERNSTEIN AG . Hans-Bernstein-Straße 1 . 32457 Porta Westfalica
Tel. +49 571 793-0 . info@de.bernstein.eu . www.bernstein.eu