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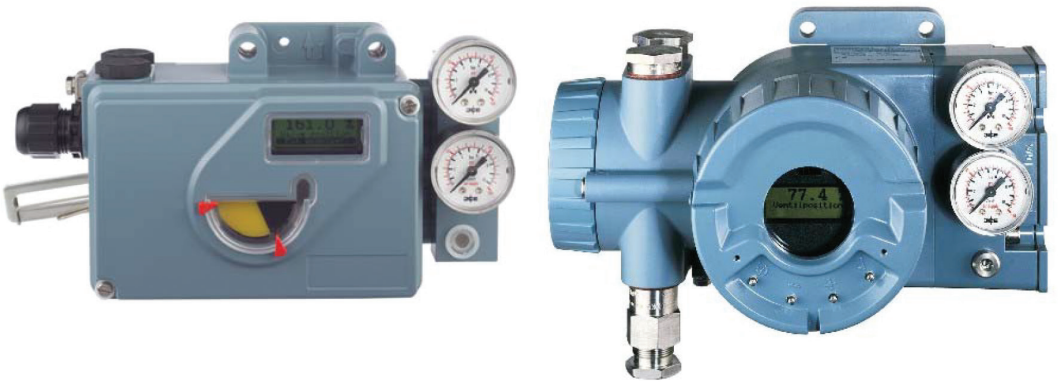
Technical Information 11.2007 TI EVE0105 H(en)

SRD991 Intelligent Positioner

SRD960 Universal Positioner Communication with HART®



HART® FIELD COMMUNICATIONS PROTOCOL

The intelligent positioner SRD991 and the universal positioner SRD960 are designed to operate pneumatic valve actuators and can be operated from control systems (e.g. Foxboro I/A Series System), controllers or PC-based configuration and operation tools via HART communication according HART® Communication Protocol Specification Rev. 5.

FEATURES

- Two-wire system 4 to 20 mA
- Reverse polarity protection
- Operating range 3.6 to 21 mA
- Max. Load 420 Ohm, 8.4 V at 20 mA
- Communication Signal: HART®, 1200 Baud, FSK (Frequency Shift Key) modulated on 4 to 20 mA
- HART communication according HART® Communication Protocol Specification Rev. 5

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1 CONFIGURATION OF SRD991 / SRD960 VIA HART®

1.1 General Information

The intelligent positioner SRD991 and the universal positioner SRD960 with HART® communication capability is normally operated by an analog signal 4 to 20 mA representing the setpoint. The HART communication signal modulated on the 4 to 20 mA signal loop offers cyclic or acyclic communication with a master for configuration and parameterization of the positioner.

How to operate the HART master (e.g. DCS system, HHT, PC50 (FDT), etc.) has to be taken from the according master instruction.

1.2 Initial Setup

Before beginning the initial setup, the positioner should be correctly mounted and electrically ready for operation. **The safety regulations must be observed, as described in MI EVE 0105 D-(en) Chapter 13.**

The positioner is preset with default parameters by the manufacturer, and instrument-specific data are permanently stored. The internal temperature sensor, the position sensor angle and pressure sensors (if applicable) are calibrated.

During the first commissioning the application-specific data must be entered. If no entry is made, the default parameters are retained.

1.3 Application specific Parameter

At first commissioning at least the actuator system respectively the mounting side has to be configured before performing an autostart. This can be done via the local push buttons at the device or via the Parameter POSITION_ LINEARIZATION. How to set it via the local push buttons at menue 1 is described at MI EVE0105 P-(en), Chapter. 8.2. The default value is „Linear actuator, left-hand mounting“.

Autostart can be initiated as well via the local push buttons at the device or via communication (Parameter INSTRUMENT_MODE). How to do it via local push buttons is described in MI EVE0105 D- (en).

2 COMMUNICATION WITH HART® MASTERS

2.1 DD-File

The device description (DD) for the SRD991 and SRD960 are available via the HART® Communication Foundation's HCF DD Library (HCF_KIT-111). They can be used e.g. on the HHT. More information on the HHT is available via Internet at http://www.foxboro-eckardt.com.

More information about the HART® Communication Foundation is available via Internet at. http://www.hartcomm.org/.

2.2 PC50 (FDT)

The Intelligent Field Device Tool (FDT) PC50 supports configuration of all Foxboro Eckardt intelligent transmitters and positioners via HART®-Communication Protocol. More information about PC50 is available via Internet at http://www.foxboro.com/.

2.3 AMS™

The AMS™ device manager supports configuration of all Foxboro Eckardt intelligent transmitters and positioners via HARTHART®-Communication Protocol. More information about the AMS™ device manager is available via Internet at http://www.emersonprocess.com/ams.

2.4 SIMATIC PDM

The diagnostics and parameterization tool for field instrumentation SIMATIC PDM supports configuration of Foxboro Eckardt intelligent level transmitters and positioners via HART®-Communication Protocol. More information SIMATIC PDM is available via Internet at https://pcs.khe.siemens.com.

3 DETAILED COMMAND AND PARAMETER DESCRIPTION

For special applications not covered by the HART master applications supporting the positioner SRD991 and SRD960 as described in Chapter 2, if may be necessary to access the positioner via HART commands. The following subchapters are describing detailed the supported HART commands and the corresponding parameters.

3.1 Universal Commands

All universal commands described in [Ref. 1] are supported:

- #0 Read Unique Identifier
- #1 Read Primary Variable
- #2 Read Loop Current and Percent of Range
- #3 Read Dynamic Variables and Loop Current
- #6 Write Polling Address
- #11 Read Unique Identifier Associated with Tag
- #12 Read Message
- #13 Read Tag, Descriptor, Date
- #14 Read Primary Variable Transducer Information
- #15 Read Primary Variable Output Information
- #16 Read Final Assembly Number
- #17 Writes Message
- #18 Write Tag, Descriptor, Date
- #19 Write Final Assembly Number

3.1.1 Command #0 Read Unique Identifier

This command returns information about the field device including device type, revision levels and device ID.

Request Data Bytes:

Byte	Format	Description
None		

Response Data Bytes:

Byte	Format	Description
0	Unsigned-8	“254”
1	Enum	Manufacturer Identification Code: 0x3F for Foxboro Eckardt
2	Enum	Device Type: 0x04 for SRD991, 0x06 for SRD960
3	Unsigned-8	Minimum Number of Preambles
4	Unsigned-8	Universal Command Major Revision Number: 5
5	Unsigned-8	Device Revision Level: 1
6	Unsigned-8	Software Revision Level
7	Unsigned-5	(Most Significant 5 Bits): Hardware Revision Level
7	Enum	(Least Significant 3 Bits): Physical Signaling Code
8	Unsigned-8	Flags: 0
9-11	Unsigned-24	Device ID.

3.1.2 Command #1 Read Primary Variable

Read the primary variable.

Request Data Bytes:

Byte	Format	Description
None		

Response Data Bytes:

Byte	Format	Description
0	Enum	Primary Variable Units Code: 57 (0x39) for Percent
1-4	Float	Primary Variable: Valve Position

3.1.3 Command #2 Read Loop Current and Percent of Range

Read the loop current and the primary variable in percent.

Request Data Bytes:

Byte	Format	Description
None		

Response Data Bytes:

Byte	Format	Description
0-3	Float	Loop-Current (in mA).
4-7	Float	Primary Variable: Valve Position (in Percent)

3.1.4 Command #3 Read Dynamic Variables and Loop Current

Read the loop current and the four predefined dynamic variables. Request Data Bytes:

Byte	Format	Description
None		

Response Data Bytes:

Byte	Format	Description
0-3	Float	Loop-Current (in mA).
4	Enum	Primary Variable Units Code: 57 (0x39) for Percent
5-8	Float	Primary Variable: Valve Position (in Percent)
9	Enum	Secondary Variable Units Code: 57 (0x39) for Percent
10-13	Float	Secondary Variable: Valve Setpoint (in Percent)
14	Enum	Tertiary Variable Units Code: 57 (0x39) for Percent
15-18	Float	Tertiary Variable: Setpoint digital (in Percent)
19	Enum	Quaternary Variable Units Code: 57 (0x39) for Percent
20-23	Float	Quaternary Variable: Control difference (in Percent)

3.1.5 Command #6 Write Polling Address

Writes the Polling Address to the positioner.

Request Data Bytes:

Byte	Format	Description
1	Unsigned-8	Polling Address: 0 (default) – 15, 16-255 invalid.

Response Data Bytes:

Byte	Format	Description
1	Unsigned-8	Polling Address: 0 (default) – 15, 16-255 invalid.

3.1.6 Command #11 Read Unique Identifier Associated with Tag

This command returns information about the field device including device type, revision levels and device ID.

Request Data Bytes:

Byte	Format	Description
0-5	Packed-ASCII	Tag

Response Data Bytes:

Byte	Format	Description
0	Unsigned-8	“254”
1	Enum	Manufacturer Identification Code: 0x3F for Foxboro Eckardt
2	Enum	Device Type: 0x04 for SRD991, 0x06 for SRD960
3	Unsigned-8	Minimum Number of Preambles
4	Unsigned-8	Universal Command Major Revision Number: 5
5	Unsigned-8	Device Revision Level: 1
6	Unsigned-8	Software Revision Level
7	Unsigned-5	(Most Significant 5 Bits): Hardware Revision Level
7	Enum	(Least Significant 3 Bits): Physical Signaling Code
8	Unsigned-8	Flags: 0
9-11	Unsigned-24	Device ID.

3.1.7 Command #12 Read Message

Read the message contained within the device.

Request Data Bytes:

Byte	Format	Description
None		

Response Data Bytes:

Byte	Format	Description
0-23	Packed-ASCII	Message

3.1.8 Command #13 Read Tag, Descriptor, Date

Read Tag, Descriptor and Date contained within the device.

Request Data Bytes:

Byte	Format	Description
None		

Response Data Bytes:

Byte	Format	Description
0-5	Packed-ASCII	Tag
6-17	Packed-ASCII	Descriptor
18-20	Date	Date

3.1.9 Command #14 Read Primary Variable Transducer Information

Reads the transducer Serial Number, Limits/Minimum Span Units Code, Upper and Lower Transducer Limits and the minimum span for the Primary Variable Transducer.

Request Data Bytes:

Byte	Format	Description
None		

Response Data Bytes:

Byte	Format	Description
0-2	Unsigned-24	Final Assembly Number
3	Enum	Primary Variable Units Code: 57 (0x39) for Percent
4-7	Float	Upper Transducer Limit: 100.0
8-11	Float	Lower Transducer Limit: 0.0
12-15	Float	Minimum Span: 100.0

3.1.10 Command #15 Read Primary Variable Output Information

Reads information associated with PV of the device.

Request Data Bytes:

Byte	Format	Description
None		

Response Data Bytes:

Byte	Format	Description
0	Enum	PV Alarm Selection Code: “251” (not used)
1	Enum	PV Transfer Function Code: “251” (not used)
2	Enum	Primary Variable Units Code: 57 (0x39) for Percent
3-6	Float	PV Upper Range Value: 100.0
7-10	Float	PV Lower Range Value: 0.0
11-14	Float	PV Damping Value: 0.0
15	Enum	Write Protected
16	Enum	Private Label Distributor Code: Default 0x3F for Foxboro Eckardt

3.1.11 Command #16 Read Final Assembly Number

Reads the Final Assembly Number associated with the device

Request Data Bytes:

Byte	Format	Description
None		

Response Data Bytes:

Byte	Format	Description
0-2	Unsigned-24	Final Assembly Number

3.1.12 Command #17 Writes Message

Writes the message into the device.

Request Data Bytes:

Byte	Format	Description
0-23	Packed-ASCII	Message

Response Data Bytes:

Byte	Format	Description
0-23	Packed-ASCII	Message

3.1.13 Command #18 Write Tag, Descriptor, Date

Write Tag, Descriptor and Date into the device.

Request Data Bytes:

Byte	Format	Description
0-5	Packed-ASCII	Tag
6-17	Packed-ASCII	Descriptor
18-20	Date	Date

Response Data Bytes:

Byte	Format	Description
0-5	Packed-ASCII	Tag
6-17	Packed-ASCII	Descriptor
18-20	Date	Date

3.1.14 Command #19 Write Final Assembly Number

Write the Final Assembly Number into the device

Request Data Bytes:

Byte	Format	Description
0-2	Unsigned-24	Final Assembly Number

Response Data Bytes:

Byte	Format	Description
0-2	Unsigned-24	Final Assembly Number

3.2 Common Practice Commands

From the list of common practice commands described in [Ref. 1] the commands

- #38 Reset Configuration Changed Flag
- #42 Perform Master Reset
- #45 Trim Loop Current Zero
- #46 Trim Loop Current Gain
- #48 Read Additional Device Status
- #59 Write Number of Response Preambles are supported.

3.2.1 Command #38 Reset Configuration Changed Flag

Resets the Configuration Changed Response Code Bit #6 of the Device Status Byte.

Request Data Bytes:

Byte	Format	Description
None		

Response Data Bytes:

Byte	Format	Description
None		

3.2.2 Command #42 Perform Master Reset

Postioner sends the Response back and performs afterwards a reset of the microcontroller.

Request Data Bytes:

Byte	Format	Description
None		

Response Data Bytes:

Byte	Format	Description
None		

3.2.3 Command #45 Trim Loop Current Zero

Trims the zero value of the loop current to the requested value. The command tells the positioner the value for the actual applied loop current (e.g. 4mA).

Request Data Bytes:

Byte	Format	Description
0-3	Float	External measured loop current value in mA

Response Data Bytes:

Byte	Format	Description
0-3	Float	External measured loop current value in mA

3.2.2 Command #46 Trim Loop Current Gain

Trims the gain value of the loop current to the requested value. The command tells the positioner the value for the actual applied loop current (e.g. 20mA).

Request Data Bytes:

Byte	Format	Description
0-3	Float	External measured loop current value in mA

Response Data Bytes:

Byte	Format	Description
0-3	Float	External measured loop current value in mA

3.2.3 Command #48 Read Additional Device Status

Returns device status information not included in the response codes.

Request Data Bytes:

Byte	Format	Description
None		

Response Data Bytes:

Byte	Format	Description
0-5	Bits	Device Specific Status (see Chapter 3.7 for more information)

3.2.6 Command #59 Write Number Of Response Preambles

This command sets the number of asynchronous 0xFF preamble bytes to be send by the positioner before the start of a response message. This number includes the two preambles used to detect the start of message. This value may be set to no smaller then 5 and no greaten then 20.

Request Data Bytes:

Byte	Format	Description
0	Unsigned-8	Number of preambles to be send with the response message

Response Data Bytes:

Byte	Format	Description
0	Unsigned-8	Number of preambles to be send with the response message

3.3 Manufacturer Specific Commands

The following commands are manufacturer specific defined by Foxboro Eckardt.

3.3.1 Command #130 Read Parameter - Enumerated

This command is used to read any Enumerated Parameter of the transmitter. A list of all parameters is contained Chapter 3.5.

Request Data Bytes:

Byte	Format	Description
0	Unsigned-8	Parameter Number

Response Data Bytes:

Byte	Format	Description
0	Unsigned-8	Parameter Number
1	Enum	Parameter, described in Byte 0.

3.3.2 Command #131 Write Parameter - Enumerated

This command is used to write any Enumerated Parameter into the transmitter. A list of all parameters is contained Chapter 3.5.

Request Data Bytes:

Byte	Format	Description
0	Unsigned-8	Parameter Number
1	Enum	Parameter, described in Byte 0.

Response Data Bytes:

Byte	Format	Description
0	Unsigned-8	Parameter Number
1	Enum	Parameter, described in Byte 0.

3.3.3 Command #132 Read Parameter - Float

This command is used to read any Float Parameter of the transmitter. A list of all parameters is contained Chapter 3.5.

Request Data Bytes:

Byte	Format	Description
0	Unsigned-8	Parameter Number

Response Data Bytes:

Byte	Format	Description
0	Unsigned-8	Parameter Number
1-4	Float	Parameter, described in Byte 0.

3.3.4 Command #133 Write Parameter - Float

This command is used to write any Float Parameter into the transmitter. A list of all parameters is contained Chapter 3.5.

Request Data Bytes:

Byte	Format	Description
0	Unsigned-8	Parameter Number
1-4	Float	Parameter, described in Byte 0.

Response Data Bytes:

Byte	Format	Description
0	Unsigned-8	Parameter Number
1-4	Float	Parameter, described in Byte 0.

3.3.5 Command #134 Read Parameter - Long

This command is used to read any Long (4 Byte Integer) Parameter of the transmitter. A list of all parameters is contained Chapter 3.5.

Request Data Bytes:

Byte	Format	Description
0	Unsigned-8	Parameter Number

Response Data Bytes:

Byte	Format	Description
0	Unsigned-8	Parameter Number
1-4	Long	Parameter, described in Byte 0.

3.3.6 ommand #135 Write Parameter - Long

This command is used to write any Long (4 Byte Integer) Parameter into the transmitter. A list of all parameters is contained Chapter 3.5.

Request Data Bytes:

Byte	Format	Description
0	Unsigned-8	Parameter Number
1-4	Long	Parameter, described in Byte 0.

Response Data Bytes:

Byte	Format	Description
0	Unsigned-8	Parameter Number
1-4	Long	Parameter, described in Byte 0.

3.3.7 Command #150 Read Actuator Type

This command is used to read the parameter actuator type explicit.

Request Data Bytes:

Byte	Format	Description
None		

Response Data Bytes:

Byte	Format	Description
0	Unsigned-8	Actuator Type

3.3.8 Command #152 Read Analog Input Unit

This command is used to read the unit used for the analog input.

Request Data Bytes:

Byte	Format	Description
None		

Response Data Bytes:

Byte	Format	Description
0	Enum	Analog Input Unit Code: 39 (0x27) for mA

3.3.9 Command #156 Read Analog Setpoint

This command is used to read the parameter Analog Setpoint, which is representing the loop current, explicit.

Request Data Bytes:

Byte	Format	Description
None		

Response Data Bytes:

Byte	Format	Description
0	Enum	Analog Input Unit Code: 39 (0x27) for mA
1-4	Float	Analog Setpoint

3.3.10 Command #158 Read Digital Setpoint

This command is used to read the parameter Digital Setpoint explicit.

Request Data Bytes:

Byte	Format	Description
None		

Response Data Bytes:

Byte	Format	Description
0	Enum	Digital Setpoint Unit Code: 57 (0x39) for Percent
1-4	Float	Digital Setpoint

3.3.11 Command #159 Write Digital Setpoint

This command is used to write the parameter Valve Setpoint explicit.

Request Data Bytes:

Byte	Format	Description
0	Enum	Digital Setpoint Unit Code: 57 (0x39) for Percent
1-4	Float	Digital Setpoint

Response Data Bytes:

Byte	Format	Description
0	Enum	Digital Setpoint Unit Code: 57 (0x39) for Percent
1-4	Float	Digital Setpoint

3.3.12 Command #160 Read Analog Setpoint Range

This command is used to read explicit the parameters Analog Setpoint Low and Analog Setpoint High used for split-range applications.

Request Data Bytes:

Byte	Format	Description
None		

Response Data Bytes:

Byte	Format	Description
0	Enum	Analog Input Unit Code: 39 (0x27) for mA
1-4	Float	Analog Setpoint High
5-8	Float	Analog Setpoint Low

3.3.13 Command #161 Write Analog Setpoint Range

This command is used to write explicit the parameters Analog Setpoint Low and Analog Setpoint High used for split-range applications.

Request Data Bytes:

Byte	Format	Description
0	Enum	Analog Input Unit Code: 39 (0x27) for mA
1-4	Float	Analog Setpoint High
5-8	Float	Analog Setpoint Low

Response Data Bytes:

Byte	Format	Description
0	Enum	Analog Input Unit Code: 39 (0x27) for mA
1-4	Float	Analog Setpoint High
5-8	Float	Analog Setpoint Low

3.3.14 Command #162 Read Instrument Mode

This command is used to read the parameter Instrument Mode explicit.

Request Data Bytes:

Byte	Format	Description
None		

Response Data Bytes:

Byte	Format	Description
0	Enum	Instrument Mode

3.3.15 Command #163 Write Instrument Mode

This command is used to write the parameter Instrument Mode explicit.

Request Data Bytes:

Byte	Format	Description
0	Enum	Instrument Mode

Response Data Bytes:

Byte	Format	Description
0	Enum	Instrument Mode

3.316 Command #164 Read DCS Control Mode

This command is used to read the parameter DCS Control Mode explicit. DCS Control Mode is a Byte free usable by a DCS Host System.

Request Data Bytes:

Byte	Format	Description
None		

Response Data Bytes:

Byte	Format	Description
0	Enum	DCS Control Mode

3.3.17 Command #165 Write DCS Control Mode

This command is used to write the parameter DCS Control Mode explicit. DCS Control Mode is a Byte free usable by a DCS Host System.

Request Data Bytes:

Byte	Format	Description
0	Enum	DCS Control Mode

Response Data Bytes:

Byte	Format	Description
0	Enum	DCS Control Mode

3.3.18 Command #166 Read Setpoint Source

This command is used to read the parameter Setpoint Source explicit.

Request Data Bytes:

Byte	Format	Description
None		

Response Data Bytes:

Byte	Format	Description
0	Enum	Setpoint Source

3.3.19 Command #167 Write Setpoint Source

This command is used to write the parameter Setpoint Source explicit.

Request Data Bytes:

Byte	Format	Description
0	Enum	Setpoint Source

Response Data Bytes:

Byte	Format	Description
0	Enum	Setpoint Source

3.3.20 Command #168 Read Zero Control Signal

This command is used to read the parameter Zero Control Signal explicit.

Request Data Bytes:

Byte	Format	Description
None		

Response Data Bytes:

Byte	Format	Description
0	Enum	Zero Control Signal

3.3.21 Command #169 Write Zero Control Signal

This command is used to write the parameter Zero Control Signal explicit. R

equest Data Bytes:

Byte	Format	Description
0	Enum	Zero Control Signal

Response Data Bytes:

Byte	Format	Description
0	Enum	Zero Control Signal

3.3.22 Command #170 Read Setpoint Characterization

This command is used to read the parameter Setpoint Characterization explicit.

Request Data Bytes:

Byte	Format	Description
None		

Response Data Bytes:

Byte	Format	Description
0	Enum	Setpoint Characterization

3.3.23 Command #171 Write Setpoint Characterization

This command is used to write the parameter Setpoint Characterization explicit.

Request Data Bytes:

Byte	Format	Description
0	Enum	Setpoint Characterization

Response Data Bytes:

Byte	Format	Description
0	Enum	Setpoint Characterization

3.3.24 Command #172 Read Calibration Date

This command is used to read the parameter Calibration Date explicit.

Request Data Bytes:

Byte	Format	Description
None		

Response Data Bytes:

Byte	Format	Description
0-2	Date	Calibration Date

3.3.25 Command #173 Write Calibration Date

This command is used to write the parameter Calibration Date explicit.

Request Data Bytes:

Byte	Format	Description
0-2	Date	Calibration Date

Response Data Bytes:

Byte	Format	Description
0-2	Date	Calibration Date

3.3.26 Command #174 Read Instrument Serial Number

This command is used to read the parameter Instrument Serial Number explicit. This parameter is used to keep the modelcode of the device.

Request Data Bytes:

Byte	Format	Description
None		

Response Data Bytes:

Byte	Format	Description
0-11	Packed-ASCII	Instrument Serial Number

3.3.27 Command #175 Write Instrument Serial Number

This command is used to write the parameter Instrument Serial Number explicit.

Request Data Bytes:

Byte	Format	Description
0-11	Packed-ASCII	Instrument Serial Number

Response Data Bytes:

Byte	Format	Description
0-11	Packed-ASCII	Instrument Serial Number

3.3.28 Command #176 Read Valve Serial Number

This command is used to read the parameter Valve Serial Number explicit.

Request Data Bytes:

Byte	Format	Description
None		

Response Data Bytes:

Byte	Format	Description
0-11	Packed-ASCII	Valve Serial Number

3.3.29 Command #177 Write Valve Serial Number

This command is used to write the parameter Valve Serial Number explicit.

Request Data Bytes:

Byte	Format	Description
0-11	Packed-ASCII	Valve Serial Number

Response Data Bytes:

Byte	Format	Description
0-11	Packed-ASCII	Valve Serial Number

3.3.30 Command #178 Read Actuator Serial Number

This command is used to read the parameter Actuator Serial Number explicit.

Request Data Bytes:

Byte	Format	Description
None		

Response Data Bytes:

Byte	Format	Description
0-11	Packed-ASCII	Actuator Serial Number

3.3.31 Command #179 Write Actuator Serial Number

This command is used to write the parameter Actuator Serial Number explicit.

Request Data Bytes:

Byte	Format	Description
0-11	Packed-ASCII	Actuator Serial Number

Response Data Bytes:

Byte	Format	Description
0-11	Packed-ASCII	Actuator Serial Number

3.3.32 Command #197 Read User Defined Characterization –Position

This command is used to read a pair of values of the “user defined characterization” from the positioner. The positioner allows up to 22 pair of values for the characterization.

Request Data Bytes:

Byte	Format	Description
0	Unsigned-8	Position of pair of values. Range: 0-21

Response Data Bytes:

Byte	Format	Description
0	Unsigned-8	Position of pair of values. Range: 0-21
1	Unsigned-8	Number pair of values. Range: 2-22
2-5	Float	X-Value of specified position in Percent
6-9	Float	Y-Value of specified position in Percent

3.3.33 Command #198 Write User Defined Characterization –Position

This command is used to write a pair of values of the “user defined characterization” into the positioner. The positioner allows up to 22 pair of values for the characterization.

Note: The pairs of values have to be filed in an ascend order concerned to the X-Values.

Request Data Bytes:

Byte	Format	Description
0	Unsigned-8	Position of pair of values. Range: 0-21
1	Unsigned-8	Number pair of values. Range: 2-22
2-5	Float	X-Value of specified position in Percent
6-9	Float	Y-Value of specified position in Percent

Response Data Bytes:

Byte	Format	Description
0	Unsigned-8	Position of pair of values. Range: 0-21
1	Unsigned-8	Number pair of values. Range: 2-22
2-5	Float	X-Value of specified position in Percent
6-9	Float	Y-Value of specified position in Percent

3.3.34 Command #206 Read Additional Message

This command is used to read an additional Message of the transmitter. A list of all parameters is contained Chapter 3.5.

Request Data Bytes:

Byte	Format	Description
0	Unsigned-8	Parameter Number for additional Message

Response Data Bytes:

Byte	Format	Description
0	Unsigned-8	Parameter Number for additional Message
1-24	Packed-ASCII	Message, described in Byte 0.

3.3.35 Command #207 Write Additional Message

This command is used to write an additional Message into the transmitter. A list of all parameters is contained Chapter 3.5.

Request Data Bytes:

Byte	Format	Description
0	Unsigned-8	Parameter Number for additional Message
1-24	Packed-ASCII	Message, described in Byte 0.

Response Data Bytes:

Byte	Format	Description
0	Unsigned-8	Parameter Number for additional Message
1-24	Packed-ASCII	Message, described in Byte 0.

3.3.36 Command #210 Read Valve Diagnosis

Returns valve diagnosis status information. A detailed description of the valve diagnosis bytes is contained in Chapter 3.8.

Request Data Bytes:

Byte	Format	Description
None		

Response Data Bytes:

Byte	Format	Description
0-5	Bits	Valve Diagnosis Status (see Chapter 3.8 for more information)

3.3.37 Command #211 Write Reset Valve Diagnosis

Tells the positioner, which valve diagnosis has to be reset. A detailed description of the command bytes is contained in Chapter 3.8.

Request Data Bytes:

Byte	Format	Description
0	Unsigned-8	Reset Valve Diagnosis Command Byte #0
1	Unsigned-8	Reset Valve Diagnosis Command Byte #1

Response Data Bytes:

Byte	Format	Description
0	Unsigned-8	Reset Valve Diagnosis Command Byte #0
1	Unsigned-8	Reset Valve Diagnosis Command Byte #1

3.3.38 Command #212 Read Position History

Reads one of the position histories. A list of all parameters is contained Chapter 3.5.

Request Data Bytes:

Byte	Format	Description
0	Unsigned-8	Parameter Number for the position history

Response Data Bytes:

Byte	Format	Description
0	Unsigned-8	Parameter Number for the position history
1-10	Unsigned-8s	Position History

3.3.39 Command #213 Read Response History

Reads one of the response histories. A list of all parameters is contained Chapter 3.5.

Request Data Bytes:

Byte	Format	Description
0	Unsigned-8	Parameter Number for the response history

Response Data Bytes:

Byte	Format	Description
0	Unsigned-8	Parameter Number for the response history
1-5	Unsigned-8s	Response History

3.3.40 Command #214 Read EGUNMS

Reads the parameter EGUNMS contained within the device.

Request Data Bytes:

Byte	Format	Description
None		

Response Data Bytes:

Byte	Format	Description
0-11	ASCII	EGUNMS

3.3.41 Command #215 Write EGUNMS

Writes the parameter EGUNMS contained within the device.

Request Data Bytes:

Byte	Format	Description
0-11	ASCII	EGUNMS

Response Data Bytes:

Byte	Format	Description
0-11	ASCII	EGUNMS

3.3.42 Command #216 Read ECEP NR

Reads the ECEP NR contained within the device.

Request Data Bytes:

Byte	Format	Description
None		

Response Data Bytes:

Byte	Format	Description
0-7	ASCII	ECEP NR

3.3.43 Command #217 Write ECEP NR

Writes the ECEP NR contained within the device.

Request Data Bytes:

Byte	Format	Description
0-7	ASCII	ECEP NR

Response Data Bytes:

Byte	Format	Description
0-7	ASCII	ECEP NR

3.3.44 Command #218 Read Load Factor Average History

Reads one of the load factor average histories. A list of all parameters is contained Chapter 3.5.

Request Data Bytes:

Byte	Format	Description
0	Unsigned-8	Parameter Number for the load factor average history

Response Data Bytes:

Byte	Format	Description
0	Unsigned-8	Parameter Number for the load factor average history
1-7	Unsigned-8s	Load factor average History

3.3.45 Command #219 Read Alarm Link

Reads the 8 byte long alarm link structure. A detailed description of the alarm link bytes is contained in Chapter **XXX**

Request Data Bytes:

Byte	Format	Description
None		

Response Data Bytes:

Byte	Format	Description
0-7	Bits	Alarm Link Byte 0…7 (see Chapter ***XXX*** for more information)

3.3.46 Command #220 Write Alarm Link

Writes the 8 byte long alarm link structure. A detailed description of the alarm link bytes is contained in Chapter **XXX**

Request Data Bytes:

Byte	Format	Description
0-7	Bits	Alarm Link Byte 0…7 (see Chapter ***XXX*** for more information)

Response Data Bytes:

Byte	Format	Description
0-7	Bits	Alarm Link Byte 0…7(see Chapter ***XXX*** for more information)

3.3.47 Command #222 Write Write Protect

This command is used to set or reset the write protection of the positioner.

Request Data Bytes:

Byte	Format	Description
0	ENUM	Write Protect

Response Data Bytes:

Byte	Format	Description
0	ENUM	Write Protect

3.3.48 Command #223 Write Factory Settings

This command is used to reset the configuration data of the positioner to factory default configuration.

Request Data Bytes:

Byte	Format	Description
0	ENUM	Factory Setting

Response Data Bytes:

Byte	Format	Description
0	ENUM	Factory Setting

3.4 Response Codes

For the commands described in the chapters 3.1 until 3.3 the following response codes can be send by the positioner.

Response Codes:

Code	Class	Description
0	Success	No Command-Specific Errors
1		Undefined
2	Error	Invalid Selection
3	Error	Passed Parameter Too Large
4	Error	Passed Parameter Too Small
5	Error	Too Few Data Bytes Received
6		Undefined
7	Error	In Write Protect Mode
16	Error	Access Restricted
17-31		Undefined
32	Error	Device Busy
33-63		Undefined
64	Error	Command not implemented
65-127		Undefined

3.5 List of all Parameters

All the parameters of the intelligent positioner SRD991 and universal positioner SRD960 can be accessed via the commands described in the previous chapters. Following is a summary of all parameters together with the parameter number, which can be used by the universal read- and write commands like command #130, #131, etc.

Param. Number (dec.)	Name	Valid Commands	Len in Bytes	Access	Range	Default
00	Undefined	-	-	-	-	-
01	ELECTRONICS_TEMP_ UNITS	130, 131	1	r,w	32= Celsius 33= Fahrenheit	Celsius
02	ELECTRONICS_TEMP	132	4	r	-	-
03	ELECTRONICS_TEMP_LL	132	4	r	-	-40
04	ELECTRONICS_TEMP_UL	132	4	r	-	80
05	CONTROL_DIFFERENCE	3, 132	4	r	-	-
06	ANALOG_OUTPUT	132	4	r	-	-
07	TRAVEL_POSITION	132	4	r	-	-
08	TOTAL_VALVE_TRAVEL	134, 135	4	r,w	-	-
09	TRAVEL_SPAN	132, 133	4	r,w	-	-
10	TRAVEL_RATE_DEC	132, 133	4	r,w	-	0.4
11	TRAVEL_RATE_INC	132, 133	4	r,w	-	0.4
12	CONTROL_P_INC	132, 133	4	r,w	-	2.0
13	CONTROL_I_INC	132, 133	4	r,w	-	2.7
14	CONTROL_D_INC	132, 133	4	r,w	-	0.0
15	CYCLE_COUNT	134, 135	4	r	-	-
16	CYCLE_COUNT_LIMIT	134, 135	4	r,w	-	90000000
17	TRAVEL_SUM_DEADBAND	132, 133	4	r,w	-	1.0
18	CONTROL_DIFF_LIMIT	132, 133	4	r,w	-	5.0
19	CONTROL_DIFF_TIME	132, 133	4	r,w	-	60
20	CONTROL_GAP	132, 133	4	r,w	-	0.1
21	CUTOFF_0%	132, 133	4	r,w	-	0.0
22	CUTOFF_HYSTERESES	132, 133	4	r,w	-	0.005
23	POS_VALVE_HI_ALARM	132, 133	4	r,w	-	110
24	POS_VALVE_HIHI_ALARM	132, 133	4	r,w	-	110
25	TRAVEL_LIMIT_UP	132, 133	4	r,w	-	100
26	TRAVEL_LIMIT_LOW	132, 133	4	r,w	-	0
27	POS_VALVE_LO_ALARM	132, 133	4	r,w	-	-10
28	POS_VALVE_LOLO_ ALARM	132, 133	4	r,w	-	-10
29	VALVE_TYPE	130, 131	1	r,w	1= Globe 2= Rotary 3= Butterfly 4= Ball 5= Diaphragm	Globe
30	VALVE_ACTION	130, 131	1	r,w	1= Singe acting 2= Double acting	Singe acting
31	ALARM_HYSTERESES	132, 133	4	r,w	-	1.0
32	ACTUATOR_SPRING	130, 131	1	r,w	0= Not initialized 1= Spring closes 2= Spring opens 3= No spring	Spring closes
33	CONTROL_ALGORITHM	130, 131	1	r,w	0= PID	PID
34	OUTPUT_UNITS	130, 131	1	r,w	39= mA	mA
35	LINE_FREQUENCY	130, 131	1	r,w	0= 50 Hz 1= 60 Hz	50 Hz
36	TOT_VALVE_TRAV_LIM	134, 135	4	r,w	-	90000000
37	ACT_STROKE_TIME_INC	132	4	r	-	1.0
38	ACT_STROKE_TIME_DEC	132	4	r	-	1.0
39	Reserved	-	-	-	-	-
40	STATUS_AUTOINIT	130	1	r	0= OK	-

					1= Error 2= Not ready 0x10…11= Endpoints det.. 0x20…2F= Param. I/P-M. 0x30…3F= Contr. Param. 0x40…42= Meas. Stroket.	
41	Reserved	-	-	-	-	-
42	ACTUATOR_TYPE	130, 150	1	r	0= Electro Pneumatic	Electro Pneumatic
43… 46	Reserved	-	-	-	-	-
47	ANALOG_SETPOINT	132, 156	4	r	-	-
48	VALVE_SETPOINT	3, 132	4	r	-	-
49	ANALOG_SETPOINT_HIGH	132, 133, 160, 161	4	r,w	4 - 20	20
50	ANALOG_SETPOINT_LOW	132, 133, 160, 161	4	r,w	4 - 20	4
51… 52	Reserved	-	-	-	-	-
53	INSTRUMENT_MODE	130, 131, 162, 163	1	r,w	0= OFFLINE 1= ONLINE 2= FAILSAFE 3= DIAGNOSIS 4= CALIBRATION 5= INITIALIZATION 6= FAILURE	-
54	DCS_CONTROL_MODE	130, 131	1	r,w	-	-
55	SETPOINT_SOURCE	130, 131, 166, 167	1	r,w	1= LOCAL USER 2= DIGITAL 3= ANALOG	ANALOG
56	ZERO_CONTROL_SIGNAL	130, 131, 168, 169	1	r,w	0= Normal 1= Invert	Normal
57	SETPOINT_ CHARACTERIZATION	130, 131, 170, 171	1	r,w	0= Linear 1= Equal percent 1:50 2= Invers Eq. Perc. 1:50 3= Characterization Curve	Linear
58	VALVE_POSITION	1, 2, 3, 132	4	r	-	-
59	Reserved	-	-	-	-	-
60	TRAVEL_POSITION_UNITS	130, 131	1	r,w	47= Inch 49= mm 242= Degree (0...360)	Degree
61	MESSAGE	12, 17, 206, 207	24	r,w	-	Message 1
62… 69	Reserved	-	-	-	-	-
70	FACTORY_ SETTING	131, 223	1	w	4= Restore Factory Settings	-
71	POWER_UP_ACTION	130, 131	1	r,w	1= ONLINE 2= FAILS.	1= ONLINE
72	BININ_CONFIG	130, 131	1	r,w	0x01=Switch 1: Goto 0% 0x02=Switch 2: Goto 100% 0x04=Switch 1: Indication at additional Status 0x08=Switch 2: Indication at additional Status.	0x0F
73	BININ_STAT	130, 131	1	r	0x01=Switch 1 0x02=Switch 2 0x80=Setpoint change forced	-
74… 78	Reserved	-	-	-	-	-
79	FRAMES	134, 135	4	r,w	-	-
80	GAP_ERRORS	134, 135	4	r,w	-	-
81	RESPONSE_TIMEOUTS	134, 135	4	r,w	-	-
82	CHECKSUM_ERRORS	134, 135	4	r,w	-	-
83	NOISE_ERRORS	134, 135	4	r,w	-	-

84	UART_ERRORS	134, 135	4	r,w	-	-
85	PARITY_ERRORS	134, 135	4	r,w	-	-
86	POSITION_ LINEARIZATION	130, 131	1	r,w	2= Linear/Left Mounted 3= Rotary counter clockwise 6= Linear/Right Mounted 7= Rotary clockwise	Linear/Left Mounted
87… 88	Reserved	-	-	-	-	-
89	CUTOFF_100%	132, 133	4	r,w	-	100.0
90	Reserved	-	-	-	-	-
91	DEVICE_OPTIONS	130, 131	1	r,w	0x01=Ext. Position Feedb. 0x02=Int. Press. Sensors 0x04=Ext. Binary Inputs 0x08=Ext. Binary Outputs 0x10=Ext. Sensor 0x20=Ext. Position Sensor 0x40=4 State Output	At factory
92… 94	Reserved	-	-	-	-	-
95	FSAVE_CONFIG	130, 131	1	r,w	0= Safety Position 1= Hold last Value 2= Failsafe Value	Hold last Value
96	FSAVE_TIME	132, 133	4	r,w	-	30
97	FSAVE_VALUE	132, 133	4	r,w	-	0.0
98	LOCAL_OP_ENA	130, 131	1	r,w	0= enable 1= disable	enable
99	SIMULATION_ENABLE	130, 131	1	r,w	0= disable 1= enable	disable
100	SIMULATION_VALUE	132, 133	4	r,w	-	-
101… 102	Reserved	-	-	-	-	-
103	MESSAGE_2	206, 207	24	r,w	-	Message 2
104	MESSAGE_3	206, 207	24	r,w	-	Message 3
105	MESSAGE_4	206, 207	24	r,w	-	Message 4
106	MESSAGE_5	206, 207	24	r,w	-	Message 5
107… 108	Reserved	-	-	-	-	-
109	CONTROL_P_DEC	132, 133	4	r,w	-	15
110	CONTROL_I_DEC	132, 133	4	r,w	-	7.5
111	CONTROL_D_DEC	132, 133	4	r,w	-	0.0
112… 113	Reserved	-	-	-	-	-
114	SENSOR1_VALUE	132	4	r	-	-
115	SENSOR1_UNITS	130, 131	1	r,w	6= psi 7= bar 12= kPa	7= bar
116… 117	Reserved	-	-	-	-	-
118	SENSOR2_VALUE	132	4	r	-	-
119	SENSOR2_UNITS	130, 131	1	r,w	6= psi 7= bar 12= kPa	7= bar
120	HARDWARE_ REVISION	130	1	r	-	3
121	FACTORY_CODE	130	1	r	-	-
122	LOW_PRESSURE_LIMIT	132, 133	4	r,w	-	0.5 bar
123… 124	Reserved	-	-	-	-	-
125	BINOUT1_CONFIG	130, 131	1	r,w	0x01=Hi Alarm 0x02=Lo Alarm 0x04=HiHi Alarm 0x08=LoLo Alarm 0x40=Binary (0/40mA) 0x80=Output inverted	0x08
126	BINOUT2_CONFIG	130, 131	1	r,w	0x01=Hi Alarm 0x02=Lo Alarm 0x04=HiHi Alarm	0x04

					0x08=LoLo Alarm 0x40=Binary (0/40mA) 0x80=Output inverted	
127	SENSOR3_VALUE	132	4	r	-	-
128	SENSOR3_UNITS	130, 131	1	r,w	6= psi 7= bar 12= kPa	7= bar
129… 131	Reserved	-	-	-	-	-
132	LCD_CONFIG	130, 131	1	r,w	0x00… 0x0F=Language No. 1-16 0x10=LCD display flipped 0x20=reserved 0x40=reserved 0x80=LCD switched on	-
133… 134	Reserved	-	-	-	-	-
135	LIFETIME	134, 135	4	r,w	-	-
136	SERVICETIME	134, 135	4	r,w	-	-
137	SERVICETIME_LIMIT	134, 135	4	r,w	-	-
138	Reserved	-	-	-	-	-
139	MIN_TEMP	132	4	r	-	-
140	MAX_TEMP	132	4	r	-	-
141	Reserved	-	-	-	-	-
142	RESPONSE_STATUS	130	-	r	0x00=Offline 0x01=Steady 0x02=Transient 0x04=Offset 0x08=Unstable	-
143	LOAD_FACTOR	132	4	r	-	-
144	SPRING_START	132, 133	4	r,w	-	1.2
145	SPRING_END	132, 133	4	r,w	-	2.0
146	SPRING_UNIT	130, 131	1	r,w	6= psi 7= bar 12= kPa	7= bar
147	LOAD_FACTOR_LL	132, 133	4	r,w	-	-1.1
148	LOAD_FACTOR_UL	132, 133	4	r,w	-	1.1
149	TIMESCALE_HISTORY_2	130, 131	1	r,w	1–24h	24
150	TIMESCALE_HISTORY_3	130, 131	1	r,w	1–30 days	30
151	TIMESCALE_HISTORY_4	130, 131	1	r,w	1-60 months	12
152	POSITION_HISTORY_1	212	10	r	-	-
153	POSITION_HISTORY_2	212	10	r	-	-
154	POSITION_HISTORY_3	212	10	r	-	-
155	POSITION_HISTORY_4	212	10	r	-	-
156	RESPONSE_HISTORY_1	213	5	r	-	-
157	RESPONSE_HISTORY_2	213	5	r	-	-
158	RESPONSE_HISTORY_3	213	5	r	-	-
159	RESPONSE_HISTORY_4	213	5	r	-	-
160	PST_CONFIG	130, 131	1	r,w	0x00=Off 0x01=On	Off
161	PST_STATUS	130	1	r	0x00=Not yet performed 0x01=Perfomed OK 0x02=Test running 0x04=Test not possible 0x80=Performed with error	Not yet performed
162	PST_TIME_INTERVAL	134, 135	4	r,w	-	240
163	PST_SETPOINT_CHANGE	132, 133	4	r,w	-	5
164	PST_DURATION_TIME	132, 133	4	r,w	0-655s	30
165	PST_COMMAND	131	1	w	0x00=No action 0x01=Run test immediately	-
166	LOAD_FACTOR_MIN	132	4	r	-	-
167	LOAD_FACTOR_MAX	132	4	r	-	-
168… 170	Reserved	-	-	-	-	-
171	POSITIONER_ACTION	130, 131	1	r,w	1= Single	Single

					2= Double 3= Spool -	
172… 173	Reserved	-	-	-		-
174	LOAD_FACTOR_AVERAGE	132	4	r	-	-
175	AIR_SUPPLY_PRESSURE	132, 133	4	r,w	-	6.0
176	LOAD_FACTOR_REF_AVG	132, 133	4	r,w	-	-
177	LOAD_FACTOR_REF_TIME	134, 135	4	r,w	-	-
178	LOAD_FACTOR_AVG_ HISTORY_3	218	7	r	-	-
179	LOAD_FACTOR_AVG_ HISTORY_4	218	7	r	-	-
180	Reserved	-	-	-	-	-
181	SET_LOAD_FACTOR_REF	131	1	w	0x00=No action 0x01=Set load factor reference	-

Legend

Access: r Read: Parameter readable

w Write: Parameter writeable

3.6 Parameter Description

All the parameters listed above are described in the following table in alphabetic order.

Name	Description
ACT_STROKE_TIME_DEC	Minimum of time for moving the system positioner, actuator and valve into direction of 0%- in seconds as time constant T63. This time will be measured during autostart.
ACT_STROKE_TIME_INC	Minimum of time for moving the system positioner, actuator and valve into direction of 100%- in seconds as time constant T63. This time will be measured during autostart.
ACTUATOR_SPRING	Defines, if the actuator has a spring and if true in which direction it is working.
ACTUATOR_SER_NUM	Serial number of the actuator.
ACTUATOR_TYPE	Type of the actuator respectively the positioner. For the positioner SRD991 or SRD960 it is „electro-pneumatic“.
AIR_SUPPLY_PRESSURE	Float parameter defining the air supply pressure in units SENSOR1_VALUE for the calculation of the LOAD_FACTOR for positioners where no SENSOR1 is available.
ALARM_HYSTERESIS	Float parameter which contains the hysteresis in percent for the positioning alarms POS_VALVE_HI_ALARM, POS_VALVE_HIHI_ALARM, POS_VALVE_LO_ALARM and POS_VALVE_LOLO_ALARM. This hysteresis will be applied, when the valve position is around one these alarm values to avoid possible oscillations at the according status bits.
ANALOG_OUTPUT	For positioners with the option board „External Feedback Transmission“, the current value in unit mA will be supplied as a float parameter.
ANALOG_SETPOINT	
BININ_CONFIG	For positioners with option board “Binary Input“ the behavior of the positioner refer to switched binary inputs can be configured. Per default by triggering switch 1 the system will go to valve position 0% and by triggering switch 2 the system will go to valve position 100%. In addition, triggering of one or both switched will be indicated within the parameter DIAGNOSE_EXT.
BININ_STAT	Status-byte which indicates, which of the binary inputs of the according option board has been triggered and if this had influenced the setpoint.

BINOUT1_ CONFIG	For positioners with option board “Binary Output“ the behavior of the binary output 1 can be configured. On one side the assignment of the output to the alarms POS_VALVE_HI_ ALARM, POS_VALVE_HIHI_ALARM, POS_VALVE_LO_ALARM and/or POS_VALVE_LOLO_ALARM can be done as well as an inversion of the binary output itself can be configured. Per default the binary output 1 is assigned to POS_VALVE_LOLO_ALARM and the output is not inverted.
BINOUT2_ CONFIG	For positioners with option board “Binary Output“ the behavior of the binary output 2 can be configured. On one side the assignment of the output to the alarms POS_VALVE_HI_ ALARM, POS_VALVE_HIHI_ALARM, POS_VALVE_LO_ALARM and/or POS_VALVE_LOLO_ALARM can be done as well as an inversion of the binary output itself can be configured. Per default the binary output 2 is assigned to POS_VALVE_HIHI_ALARM and the output is not inverted.
CHECKSUM_ ERRORS	Number of communication checksum errors.
CONTROL_ ALGORITHM	Control algorithm. For SRD991 and SRD960 it is always PID.
CONTROL_ DIFFERENCE	Float value which shows the difference between setpoint and the actual valve position in percent.
CONTROL_ DIFF_LIMIT	Float parameter, which contains the limit for the control difference in percent. If the control difference exceed this limit for a time greater than the time specified by CONTROL_DIFF_ TIME, it will be indicated within the device diagnosis.
CONTROL_ DIFF_TIME	Float parameter which contains the time limit in seconds. If the control difference exceed the limit defined by CONTROL_DIFF_LIMIT for this time, it will be indicated within the device diagnosis.
CONTROL_ GAP	Defines the deadband of the controller. This is the range (of control difference) within no re-control of the valve position will be done.
CONTROL_P_ INC	Proportional-action coefficient in the moving direction of opening the valve.
CONTROL_P_ DEC	Proportional-action coefficient in the moving direction of closing the valve.
CONTROL_D_ INC	Derivative-action coefficient in seconds in the moving direction of opening the valve.
CONTROL_D_ DEC	Derivative-action coefficient in seconds in the moving direction of closing the valve.
CONTROL_I_ INC	Integral-action coefficient in seconds in the moving direction of opening the valve.
CONTROL_I_ DEC	Integral-action coefficient in seconds in the moving direction of closing the valve.
CUTOFF_0%	When the setpoint goes below this defined value (in percent), the valve will be moved with maximum force in direction of the endpoint 0%. This will be done by totally ventilate/filling of the actuator depending on the safety position.
CUTOFF_ 100%	When the setpoint goes above this defined value (in percent), the valve will be moved with maximum force in direction of the endpoint 100%. This will be done by totally ventilate/ filling of the actuator depending on the safety position.

CUTOFF_ HYSTERESIS	Float parameter, which contains the hysteresis in percent for the cutoffs SETP_ CUTOFF_DEC and SETP_CUTOFF_INC. This hysteresis will be applied, when a cutoff should be left and is intended to avoid possible oscillations when the setpoint is around the starting point of a cutoff range.
CYCLE_ COUNT	Summary of cycle counts represented as a LONG parameter. This counter counts changes in movements (up/down or right/left).
CYCLE_ COUNT_ LIMIT	Limit for the CYCLE_COUNT. Exceeds the CYCLE_COUNT this value it will be indicated within the parameter CHECKBACK as well as within the device diagnosis.
DESCRIPTOR	User defined text which allows a description of the measuring point
DEVICE_ CALIB_DATE	Last calibration date of the device. Format: yyyy-mm-dd.
DEVICE_ OPTIONS	Shows the additional built-in options of the positioner. This information is bit-coded and there can be more than one option existing at one time (but only one option board): 0x01: External Position Transmission 4-20mA (Option board) 0x02: Internal Pressure cells 0x04: External Binary Inputs (Option board) 0x08: External Binary Outputs (Option board) 0x20: External Position Sensor 0x80: External Binary Inputs/Outputs (Option Board)
ELECTRONIC S_TEMP	Shows the temperature of the electronics as a float value in units of ELECTRONICS_ TEMP_UNITS.
ELECTRONIC S_TEMP_LL	Float value for the lower limit for the electronics temperature ELECTRONICS_TEMP in units of ELECTRONICS_TEMP_UNITS. If the electronics temperature is falling below this value, it will be indicated within the device diagnosis.
ELECTRONIC S_TEMP_UL	Float value for the upper limit for the electronics temperature ELECTRONICS_TEMP in units of ELECTRONICS_TEMP_UNITS. If the electronics temperature exceeds this value it will be indicated within the device diagnosis (see Chapter 3.7).
ELECTRONIC S_TEMP_ UNITS	Unit code for the ELECTRONICS_TEMP. Valid units are Grad Celsius and Fahrenheit.
FACTORY_ CODE	Shows the part “year-code” of the fabrication-number.
FACTORY_ SETTING	Reset of the device. 1: Resetting the SRD991/SRD960 to factory default values.
FRAMES	Number of received communication frames.
FSAFE_ CONFIG	Defines the reaction of the positioner for failure in communication after exceeding the FAILSAFE_TIME. Note: Failsafe Handling is only possible, if SETPOINT_SOUCE is set to DIGITAL. Following 3 possibilities can be specified: Safety position: De-aeration of the actuator. For single acting actuator the spring defines the moving direction. Hold last value: The last received valid setpoint will be used and consequently the actual valve position will be kept. Target Value: The position defined by FSAFE_VALUE will be reached.
FSAFE_TIME	Float parameter for the time in seconds how long the positioner tolerates no receive of a valid setpoint until the behavior defined in FSAFE_TYPE will be performed.

FSAFE_ VALUE	Float Parameter, which defines the target position in percent, when FSAFE_TYPE is configured to “Target value“ and Failsafe will be performed after the FSAFE_TIME.
GAP_ERRORS	Number of communication GAP errors.
HARDWARE_ REVISION	Hardware-Revision of the positioner SRD991 or SRD960.
INSTRUMENT _MODE	Instrument mode of the SRD991/SRD960
LIFETIME	Actual Time in operation of the positioner. It shows the full time in 0.1h the positioner was in operation. The counter starts as soon as the power is connected to the unit. The value cannot be reset.
LCD_CONFIG	Configuration of the LCDisplay.
LINE_ FREQUENCY	LINE_FREQUENCY of the Standard power supply (50/60 Hz).
LOAD_ FACTOR	Float parameter showing the actual measured value for the load factor.
LOAD_FACTO R_AVERAGE	Float value showing the average for the LOAD_FACTOR over the last 24h.
LOAD_FACTO R_AVG_ HISTORY3	Histogram displaying the duration of the average friction measurement compared with the LOAD_FACTOR_REF_AVG for the time range TIMESCALE_HISTORY_3.
LOAD_FACTOR_ AVG_ HISTORY4	Histogram displaying the duration of the average friction measurement compared with the LOAD_FACTOR_REF_AVG for the time range TIMESCALE_HISTORY_4.
LOAD_ FACTOR_ LL	Float parameter defining the lower limit in percent of a degradation for LOAD_ FACTOR_AVERAGE compared to the LOAD_FACTOR_REF_AVG.
LOAD_ FACTOR_ UL	Float parameter defining the upper limit in percent of a incensement for LOAD_ FACTOR_AVERAGE compared to the LOAD_FACTOR_REF_AVG.
LOAD_ FACTOR_ MAX	Drag pointer showing the maximal Load Factor ever measured since the last reset of the valve diagnosis.
LOAD_ FACTOR_ MIN	Drag pointer showing the minimal Load Factor ever measured since the last reset of the valve diagnosis.
LOCAL_OP_ ENA	Enables or disables operation of the positioner via local push buttons. Per default local operation is enabled, meaning that local operation is allowed.
LOAD_FACTO R_REF_AVG	Float value showing the reference for the average for the LOAD_FACTOR. This value is the base for the Load Factor Average Histories and the Load Factor Limits.
LOAD_FACTO R_REF_TIME	Long parameter showing the time stamp (LIFETIME) where the LOAD_FACTOR_ REFERENCE has been created.
LOW_ PRESSU RE_ LIMIT	Float Parameter representing the lower limit for the air supply pressure in units of SENSOR1_UNITS. If internal pressure cells are available and the air supply pressure is falling below the specified lower limit it will be indicated within the device diagnosis.
MAX_TEMP	Drag pointer showing the maximal temperature ever measured since the last reset of the valve diagnosis.

MESSAGE... MESSAGE_5	Free usable text area allowing storage of any textual information.
MIN_TEMP	Drag pointer showing the minimal temperature ever measured since the last reset of the valve diagnosis.
MODELCODE	Modelcode of the device.
MOTOR_PAR	Foxboro Eckardt internal parameter for accessing the I/P-Module. Will be detected during autostart.
NOISE_ ERRORS	Number of communication noise errors.
PARITY_ ERRORS	Number of communication parity errors.
POS_VALVE_ HI_ALARM	Float parameter, which defines the HI-Alarm. If the valve position exceeds the defined alarm limit, it will be indicated within the device diagnosis.
POS_VALVE_ HIHI_ALARM	Float parameter, which defines the HIHI-Alarm. If the valve position exceeds the defined alarm limit, it will be indicated within the device diagnosis.
POSITION_ HISTORY_1	Histogram that shows the percentage of the actuator/valve duration in a specific valve position for the last time range of 15min.
POSITION_ HISTORY_2	Histogram that shows the percentage of the actuator/valve duration in a specific valve position for the time range TIMESCALE_HISTORY_2
POSITION_ HISTORY_3	Histogram that shows the percentage of the actuator/valve duration in a specific valve position for the time range TIMESCALE_HISTORY_3
POSITION_ HISTORY_4	Histogram that shows the percentage of the actuator/valve duration in a specific valve position for the time range TIMESCALE_HISTORY_4
POSITION_ LINEARIZATIO N	Defines the mounting of the positioner at the actuator respective the mounting side. Possible options are: 2 = Linear/Left mounted or direct mounting on valves from Invensys Flow Control 3 = Rotary, counter clockwise 6 = Linear/Right mounted 7 = Rotary, clockwise
POSITIONER_ ACTION	Defines the amplifier type installed within the positioner. Values are: 1 = Single acting amplifier 2 = Double acting amplifier 3 = Spool valve
POWER_UP_ ACTION	Defines the reaction of the positioner after power up of the bus power until the positioner receives the first valid setpoint via communication. Alternatives are „In Service“ and „Failsafe“. At „In Service“ the setpoint will be initialized in the way, that the valve doesn’t move (Safety position). At “Failsafe” the action defined at FSAVE_ TYPE will be done.
POS_VALVE_ LO_ALARM	Float parameter, which defines the LO-Alarm. If the valve position falls below the defined alarm limit, it will be indicated within device diagnosis.
POS_VALVE_ LOLO_ALARM	Float Parameter which defines the LOLO-Alarm. If the valve position falls below the defined alarm limit, it will be indicated within the device diagnosis.

PST_ COMMAND	Writing the value 1 invokes the Partial Stroke Test immediately.
PST_CONFIG	Defines if the Partial Stroke Test will be performed automatically by a software time or manually by a software command or via the input signal of an option board.
PST_DURATIO N_TIME	Float Value defining the maximal wait time in seconds for a position change during the Partial Stroke Test.
PST_SETPOIN T_CHANGE	Float Value defining the setpoint change in percent which will be applied to the setpoint during the Partial Stroke Test.
PST_STATUS	Shows the Status of the performed Partial Stroke Test.
PST_TIME_ INTERVAL	Long Value defining the time interval in 0.1h after which the Partial Stroke Test will be repeated if PST_CONFIG is set to automatic.
RESPONSE_ HISTORY_1	Histogram that shows the control behavior of the actuator/valve in percentage over the last time range of 15min.
RESPONSE_ HISTORY_2	Histogram that shows the control behavior of the actuator/valve in percentage for the time range TIMESCALE_HISTORY_2
RESPONSE_ HISTORY_3	Histogram that shows the control behavior of the actuator/valve in percentage for the time range TIMESCALE_HISTORY_3
RESPONSE_ HISTORY_4	Histogram that shows the control behavior of the actuator/valve in percentage for the time range TIMESCALE_HISTORY_4
RESPONSE_ STATUS	Shows the actual value of the response status (used for the response history): 0x00: Offline. Indicates that the positioner is powered up, but the Autostart has not been performed, or the positioner has manually been put into the device status Offline 0x01: Steady. Indicates that the positioner is in control, but not moving. The setpoint and the valve position are constant at a certain value. 0x02: Transient. Indicates that the positioner is online and constantly moving. 0x04: Offset. Indicates that the positioner identifies a deviation between the setpoint and the valve position, greater than the configured CONTROL_DIFF_LIMIT. 0x08: Unstable. Indicates that the positioner is continuously oscillating around a constant setpoint.
RESPONSE_ TIMEOUTS	Number of communication Response Timeouts.
SENSOR1_ UNITS	Unit for the variable SENSOR1_VALUE (Air supply pressure). Valid units are Bar, PSI und kPa.
SENSOR2_ UNITS	Unit for the variable SENSOR2_VALUE (Output pressure Y1). Valid units are Bar, PSI and kPa.
SENSOR3_ UNITS	Unit for the variable SENSOR3_VALUE (Differential pressure Y1-Y2). Valid units are Bar, PSI and kPa.
SENSOR1_ VALUE	If the positioner contains internal pressure cells, the actual air supply pressure will be shown with status in engineering unit of SENSOR1_UNITS.
SENSOR2_ VALUE	If the positioner contains internal pressure cells, the output pressure Y1 will be shown with status in engineering unit of SENSOR2_UNITS.
SENSOR3_ VALUE	If the universal positioner SRD960 contains internal pressure cells, the difference of the output pressures Y1 – Y2 will be shown with status in engineering unit of SENSOR3_UNITS. For the intelligent positioner SRD991 the value is always identical with SENSOR2_VALUE.

SERVICETIME	Time since last service of the positioner. It shows the time in 0.1h the positioner was in operation since the last time the SERVICETIME has been reset.
SERVICETIME _LIMIT	This parameter is used in combination with SERVICETIME. If the SERVICETIME exceeds the defined SERVICETIME_LIMIT, a status bit is set, informing that the device needs to be serviced.
SETPOINT_ CHARACTER-IZATION	Selection of the characterization curves provided by the positioner: Linear Equal percentage 1:50 Invers equal percentage 1:50 Custom specific curve The custom specific curve can be read and write via the commands #197 and #198.
SET_LOAD_ FACTOR_REF	Writing the value 1 invokes the setting of the load factor reference.
SIMULATION_ ENABLE	If SIMULATION_ENABLED is activated the value defined in SIMULATION_VALUE will be delivered within VALVE_POSITION instead of the actual valve position.
SIMULATE_ VALUE	If SIMULATION_ENABLED is activated, this value will be delivered within VALVE_ POSITION instead of the actual valve position.
SPRING_END	Float Value defining the end of the spring range of a single acting actuator in units SPRING_UNIT.
SPRING_ START	Float Value defining the beginning of the spring range of a single acting actuator in units SPRING_UNIT.
SPRING_UNIT	Unit for the variables SPRING_START and SPRING_END. Valid units are Bar, PSI und kPa.
STATUS_ AUTOINIT	This parameter shows the actual status of the autostart during its performing.
TAG	TAG-Number of the device.
TIMESCALE_ HISTORY_2	Timescale (1-24h) used for Position- and Response History 2
TIMESCALE_ HISTORY_3	Timescale (1-30 days) used for Position-, Response and Friction History 3
TIMESCALE_ HISTORY_4	Timescale (1-60 months) used for Position-, Response and Friction History 4
TOTAL_VALVE _TRAVEL	Accumulated valve travel represented by a float parameter. It is the summarized valve travel in nominal duty cycles.
TOTAL_VALVE _TRAV_LIM	Limit for the TOTAL_VALVE_TRAVEL. If TOTAL_VALVE_TRAVEL exceeds this defined value it will be indicated within the parameter CHECKBACK as well as within the device diagnosis.
TRAVEL_ LIMIT_LOW	Lower Limit of the valve position in percent of travel span.
TRAVEL_ LIMIT_UP	Upper Limit of the valve position in percent of travel span.
TRAVEL_ RATE_DEC	Configurable travel time in seconds in moving direction 0% position as time constant T63.
TRAVEL_ RATE_INC	Configurable travel time in seconds in moving direction 100% position as time constant T63.

TRAVEL_SUM _DEADBAND	Defines the hysteresis respectively deadband for the counters CYCLE_COUNT and TOTAL_VALVE_TRAVEL in percent as a float parameter. Movements of the actuator/valve within this deadband will not be added to these counters. The default value of this deadband is 1%.
VALVE_ POSITION	Actual position of the actuator in units of TRAVEL_POSITION_UNITS.
TRAVEL_ POSITION_ UNITS	Unit code for the TRAVEL_POSITION. Valid units are mm, inch and Degree.
TRAVEL_ SPAN	Nominal stroke for the actuator/valve-combination in units of OUT_SCALE. If the positioner is mounted to a rotary actuator and the unit of OUT_SCALE is in consequence Grad, the value of this parameter will be detected during autostart and can't be written in this case.
UART_ ERRORS	Number of communication UART errors.
VALVE_ ACTION	Defines the valve action of the actuator. The positioner SRD991/SRD960 supports single- and double-acting actuators.
VALVE_ SETPOINT	Final setpoint used for controlling the valve. This is the sepoint after applying limits, characterization, etc.
VALVE_TYPE	Valve type (Globe, Rotary, Butterfly, etc.)
ZERO_ CONTROL_ SIGNAL	Working direction of the positioner: 0: Increasing setpoint opens the valve 1: Increasing setpoint closes the valve

3.7 Device Specific Status

The Device Specific Status consists of 6 Byte Diagnosis information. It is bit-coded as described below. The first 3 bytes contain actual information. Here a bit is set as long as the specified condition is true. When the condition no longer exists, the bit will be reset immediately. Bytes 4-6 contain historical diagnosis data. Here a bit will be set, when the specified condition is true. Such bits are set until they will be reset by issuing command #38 (Reset Configuration Changed Flag).

Byte 1 contains System Errors:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
OPTION Error	Poti Defect	IP LOOP Error	ACTUAT. OOL	ADC Defect	EPROM Defect	EEPROM Defect	RAM Defect

Bit 7 OPTION Error: Missing or faulty Optionboard.
Bit 6 Poti Defect: Potentiometer failed.
Bit 5 IP LOOP Error: Current Loop to I/P-Module broken.
Bit 4 ACTUAT. OOL: Actuator out of range 0...100%.
Bit 3 ADC Defect: Faulty AD-Converter.
Bit 2 ERPOM Defect: Checksum-error at ROM (EPROM).
Bit 1 EEPROM Defect: Checksum-error at EEPROM.
Bit 0 RAM Defect: RAM-Test failure.

Byte 2 contains additional System Errors:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
BinIn high	Feedback Calibration	Loop Calibration	Cycle Count	Travel Sum	Config invalid	Temp low	Temp high

Bit 7 BinIn high: Binary Input Channel set.
Bit 6 Feedback Calibration: Faulty Calibration of Position Feedback (Potentiometer).
Bit 5 Loop Calibration: Faulty Calibration of Input Loop Current Measuring.
Bit 4 Cycle Count: CYCLE_COUNT has reached CYCLE_COUNT_LIMIT.
Bit 3 Travel Sum: TOTAL_VALVE_TRAVEL has reached TOTAL_VALVE_TRAVEL_LIM.
Bit 2 Configuration invalid: Invalid Configuration data.
Bit 1 Temp low: ELECTRONICS_TEMP is falling below ELECTRONICS_TEMP_LL.
Bit 0 Temp high: ELECTRONICS_TEMP is exceeding ELECTRONICS_TEMP_UL.

Byte 3 contains Process Errors:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Output P. Alarm	Air supply Alarm	Autostart failed	Control Diff Lim	LoLo Alarm	HiHi Alarm	Lo Alarm	Hi Alarm

Bit 7 Output P. Alarm: Output pressure Y1 (SENSOR2_VALUE) not plausible.
Bit 6 Air supply Alarm: Air supply pressure (SENSOR1_VALUE) is falling below LOW_PRESSURE_LIMIT.
Bit 5 Autostart failed: Autostart not or performed with error.
Bit 4 Control Diff Lim: Limit for Control difference (CONTROL_DIFF_LIMIT, CONTROL_DIFF_TIME) reached.
Bit 3 LoLo Alarm: LoLo Alarm reached (POS_VALVE_LOLO_ALARM)
Bit 2 HiHi Alarm: HiHi Alarm reached (POS_VALVE_HIHI_ALARM)
Bit 1 Lo Alarm: Lo Alarm reached (POS_VALVE_LO_ALARM)
Bit 0 Hi Alarm: Hi Alarm reached (POS_VALVE_HI_ALARM)

Byte 4 contains historical System Errors:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
OPTION Error	Poti Defect	IP LOOP Error	ACTUAT. OOL	ADC Defect	EPROM Defect	EEPROM Defect	RAM Defect

Bit 7 OPTION Error: Optionboard was missing or faulty.
Bit 6 Poti Defect: Potentiometer had been failed.
Bit 5 IP LOOP Error: Current Loop to I/P-Module had been broken.
Bit 4 ACTUAT. OOL: Actuator was out of range 0...100%.
Bit 3 ADC Defect: AD-Converter was faulty.
Bit 2 ERPOM Defect: ROM (EPROM) had Checksum-error.
Bit 1 EEPROM Defect: EEPROM had Checksum-error.
Bit 0 RAM Defect: RAM-Test was faulty.

Byte 5 contains historical additional System Errors.

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
BinIn high	Feedback Calibration	Loop Calibration	Cycle Count	Travel Sum	Config invalid	Temp low	Temp high

Bit 7 BinIn high: Binary Input Channel had been set.
Bit 6 Feedback Calibration: Calibration of Position Feedback (Potentiometer) was faulty.
Bit 5 Loop Calibration: Calibration of Input Loop Current Measuring was faulty.
Bit 4 Cycle Count: CYCLE_COUNT had been reached CYCLE_COUNT_LIMIT.
Bit 3 Travel Sum: TOTAL_VALVE_TRAVEL had been reached TOTAL_VALVE_TRAVEL_LIM.
Bit 2 Configuration invalid: Configuration data was invalid.
Bit 1 Temp low: ELECTRONICS_TEMP had been falling below ELECTRONICS_TEMP_LL.
Bit 0 Temp high: ELECTRONICS_TEMP had exceeded ELECTRONICS_TEMP_UL.

Byte 6 contains historical Process Errors:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Output P. Alarm	Air supply Alarm	Autostart failed	Control Diff Lim	LoLo Alarm	HiHi Alarm	Lo Alarm	Hi Alarm

Bit 7 Output P. Alarm: Output pressure Y1 (SENSOR2_VALUE) was not plausible.
Bit 6 Air supply Alarm: Air supply pressure (SENSOR1_VALUE) had been falling below LOW_PRESSURE_LIMIT.
Bit 5 Autostart failed: Autostart was not or had been performed with error.
Bit 4 Control Diff Lim: Limit for Control difference (CONTROL_DIFF_LIMIT, CONTROL_DIFF_TIME) had been reached.
Bit 3 LoLo Alarm: LoLo Alarm had been reached (POS_VALVE_LOLO_ALARM)
Bit 2 HiHi Alarm: HiHi Alarm had been reached (POS_VALVE_HIHI_ALARM)
Bit 1 Lo Alarm: Lo Alarm had been reached (POS_VALVE_LO_ALARM)
Bit 0 Hi Alarm: Hi Alarm had been reached (POS_VALVE_HI_ALARM)

3.8 Valve Diagnosis Status

The Device Specific Status consists of 6 Byte Valve Diagnosis information. It is bit-coded as described below. The first 3 bytes contain actual information. Here a bit is set as long as the specified condition is true. When the condition no longer exists, the bit will be reset immediately. Bytes 4-6 contain historical valve diagnosis data. Here a bit will be set, when the specified condition is true. Such bits are set until they will be reset by issuing command #211 (Write Reset Valve Diagnosis).

Byte 1 contains actual valve diagnosis alarm 1:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Reserved	PST Alarm	Backlash Alarm	Reserved	LOAD FACTOR HIGH	LOAD FACTOR LOW	Reserved	Service Interval

Bit 7 Reserved
Bit 6 PST Alarm: Partial Stroke Test failed.
Bit 5 Backlash Alarm: Backlash Limit reached.
Bit 4 Reserved
Bit 3 Load Factor High: Load Factor High Limit reached.
Bit 2 Load Factor Low: Load Factor Low Limit reached.
Bit 1 Reserved
Bit 0 Service Interval: Service Interval Time reached.

Byte 2 is reserved for future use.

Byte 3 contains actual miscellaneous alarms:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Power High Supply	Power Low Supply

Bit 7 Reserved
Bit 6 Reserved
Bit 5 Reserved
Bit 4 Reserved
Bit 3 Reserved
Bit 2 Reserved
Bit 1 Power High Supply: Power Supply too high
Bit 0 Power Low Supply: Power Supply too low

Byte 4 contains historical valve diagnosis alarm 1:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Reserved	PST Alarm	Backlash Alarm	Reserved	LOAD FACTOR HIGH	LOAD FACTOR LOW	Reserved	Service Interval

Bit 7 Reserved
Bit 6 PST Alarm: Partial Stroke Test had failed.
Bit 5 Backlash Alarm: Backlash Limit had been reached.
Bit 4 Reserved
Bit 3 Load Factor High: Load Factor High Limit had been reached.
Bit 2 Load Factor Low: Load Factor Low Limit had been reached.
Bit 1 Reserved
Bit 0 Service Interval: Service Interval Time had been reached.

Byte 5 is reserved for future use.

Byte 6 contains historical miscellaneous alarms:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Power High Supply	Power Low Supply

Bit 7 Reserved
Bit 6 Reserved
Bit 5 Reserved
Bit 4 Reserved
Bit 3 Reserved
Bit 2 Reserved
Bit 1 Power High Supply: Power Supply was too high
Bit 0 Power Low Supply: Power Supply was too low

4 REFERENCE DOCUMENTS

[Ref. 1] HART Protocol Reference Library Rev. 5.0, July 1997

HCF, Order-Nr. HCF_KIT-120

[Ref. 2] SRD991 Intelligent Positioner

Master Instruction

Foxboro Eckardt GmbH, MI EVE0105 E

[Ref. 3] SRD960 Universal Positioner

Master Instruction

Foxboro Eckardt GmbH, MI EVE0109 E

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