

## Stratos Evo A402 PH Stratos Pro A201 PH

# Transmitter Specific HART Command Specification

Device Type 0xD5 (A402 PH) Device Revision: 5  
Device Type 0xE7 (A201 PH) Device Revision: 5

Document Revision 4.0

**Knick Elektronische Messgeräte GmbH & Co. KG**

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### 1 Reference Documents

Document Title	Revision	Document Number
HART® - FSK Physical Layer Specification	8.1	HCF_SPEC-54
HART® - Data Link Layer Specification	8.0	HCF_SPEC-81
HART® - Command Summary Specification	8.1	HCF_SPEC-99
HART® - Universal Command Specification	6.0	HCF_SPEC-127
HART® - Common Practice Command Specification	8.0	HCF_SPEC-151
HART® - Common Tables	16.0	HCF_SPEC-183
Appendix 1 - Command Specific Response Code Definitions	5.0	HCF_SPEC-307
Application Layer Guideline on HART Status Information	1.0	HCF_LIT-5

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## 2 Common Tables Related to A201 PH and A402 PH

### 2.1 Device Variable Code Tables

Device Variable Code	Measurement Value	Units Code	Lower Limit	Upper Limit	Minimum Span	Damping
0	pH	59 – pH	-2	16	0	0
1	ORP	36 – mV	-1999	1999	0	0
2	Temperature	32 – °C	-20	200	0	0
		33 – °F	-4	392	0	0
3	rH	248 – rH	0	42,5	0	0

Device Variable Code	Device Variable	Device Variable Class	Device Variable Family
0	pH	81 – Analytical	8 – pH
1	ORP	81 – Analytical	250– Not Used
2	Temperature	64 – Temperature	4 – Temperature
3	rH	81 – Analytical	250– Not Used

### 2.2 Analog Channel Code Table

Analog Channel Code	Current Loop of Device
0	Primary Current Loop (OUT1)
1	Secondary Current Loop (OUT2)

### 3 Universal Commands

#### 3.1 Command 0 Read Unique Identifier

##### Request Data Bytes

Byte	Format	Description
None		

##### Response Data Bytes

Byte	Format	Description
0	Unsigned-8	(=254)
1	Enum	Manufacturer Identification Code (=97, Knick)
2	Enum	Device Type (=0xD5 for A402 PH)
3	Unsigned-8	Minimum Number of Preambles (=5)
4	Unsigned-8	Universal Command Major Revision Number (=6)
5	Unsigned-8	Device Revision Level (=4)
6	Unsigned-8	Software Revision Level (=1)
7	Enum	Hardware Revision Level (=1)
8	Bits	Flags (=0)
9-11	Unsigned-24	Device Identification Number
12	Unsigned-8	Number of Preambles
13	Unsigned-8	Maximum Number of Device Variables (=2, Index of last device variable)
14-15	Unsigned-16	Configuration Change Counter
16	Bits	Extended Field Device Status

##### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

#### 3.2 Command 1 Read Primary Variable

##### Request Data Bytes

Byte	Format	Description
None		

##### Response Data Bytes

Byte	Format	Description
0	Unsigned-8	Primary Variable Units Code (Coding see 2.1)
1-4	Float	Primary Variable

##### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

### 3.3 Command 2 Read Loop Current and Percent of Range

#### Request Data Bytes

Byte	Format	Description
None		

#### Response Data Bytes

Byte	Format	Description
0-3	Float	Primary Variable Loop Current [mA]
4-7	Float	Primary Variable Percent of Range [%]

#### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

### 3.4 Command 3 Read Dynamic Variables and Loop Current

#### Request Data Bytes

Byte	Format	Description
None		

#### Response Data Bytes

Byte	Format	Description
0-3	Float	Primary Variable Loop Current [mA]
4	Enum	Primary Variable Units Code (Coding see 2.1)
5-8	Float	Primary Variable
9	Enum	Secondary Variable Units Code (Coding see 2.1)
10-13	Float	Secondary Variable
14	Enum	Tertiary Variable Units Code (Coding see 2.1)
15-18	Float	Tertiary Variable
19	Enum	Quaternary Variable Units Code (Coding see 2.1)
20-23	Float	Quaternary Variable

#### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

### 3.5 Command 6 Write Polling Address

#### Request Data Bytes

Byte	Format	Description
0	Unsigned-8	Polling Address of Device
1	Enum	Loop Current Mode 0 – Disabled (= Multidrop Mode) 1 – Enabled (= Current Signaling Mode)

#### Response Data Bytes

Byte	Format	Description
0	Unsigned-8	Polling Address of Device
1	Enum	Loop Current Mode

#### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Polling Address Selection (>63)
5	Error	Too Few Data Bytes Received
16	Error	Access Restricted

### 3.6 Command 7 Read Loop Configuration

#### Request Data Bytes

Byte	Format	Description
None		

#### Response Data Bytes

Byte	Format	Description
0	Unsigned-8	Polling Address of Device
1	Enum	Loop Current Mode (Coding see Command 6)

#### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

### 3.7 Command 8 Read Dynamic Variable Classifications

#### Request Data Bytes

Byte	Format	Description
None		

#### Response Data Bytes

Byte	Format	Description
0	Enum	Primary Variable Classification (Coding see 2.1)
1	Enum	Secondary Variable Classification (Coding see 2.1)
2	Enum	Tertiary Variable Classification (Coding see 2.1)
3	Enum	Quaternary Variable Classification (Coding see 2.1)

#### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors



### 3.8 Command 9 Read Device Variables with Status

#### Request Data Bytes

Byte	Format	Description
0	Unsigned-8	Slot 0: Device Variable Code (Coding see 2.1)
1	Unsigned-8	Slot 1: Device Variable Code (Coding see 2.1)
2	Unsigned-8	Slot 2: Device Variable Code (Coding see 2.1)
3	Unsigned-8	Slot 3: Device Variable Code (Coding see 2.1)

#### Response Data Bytes

Byte	Format	Description
0	Enum	Extended Field Device Status
1	Unsigned-8	Slot 0: Device Variable Code (Coding see 2.1)
2	Enum	Slot 0: Device Variable Classification
3	Enum	Slot 0: Units Code
4-7	Float	Slot 0: Device Variable Value
8	Bits	Slot 0: Device Variable Status 0x80 – 0x40: 00 – Bad 01 – Poor 11 – Good 0x20 – 0x10: 00 - ok 01 - Low Limited 10 - High Limited 11 - Constant
9	Unsigned-8	Slot 1: Device Variable Code
10	Enum	Slot 1: Device Variable Classification
11	Enum	Slot 1: Units Code
12-15	Float	Slot 1: Device Variable Value
16	Bits	Slot 1: Device Variable Status (Coding see Byte 8)
17	Unsigned-8	Slot 2: Device Variable Code
18	Enum	Slot 2: Device Variable Classification
19	Enum	Slot 2: Units Code
20-23	Float	Slot 2: Device Variable Value
24	Bits	Slot 2: Device Variable Status (Coding see Byte 8)
25	Unsigned-8	Slot 3: Device Variable Code
26	Enum	Slot 3: Device Variable Classification
27	Enum	Slot 3: Units Code
28-31	Float	Slot 3: Device Variable Value
32	Bits	Slot 3: Device Variable Status (Coding see Byte 8)

#### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
5	Error	Too Few Data Bytes Received
8	Warning	Update Failure

### 3.9 Command 11 Read Unique Identifier Associated with Tag

**Request Data Bytes**

Byte	Format	Description
0-5	Packed	Tag

**Response Data Bytes**

Byte	Format	Description
0-16		Same as Command 0 (Read Unique Identifier) No response is made unless the Tag matches that of the device.

**Command-Specific Response Codes**

Code	Class	Description
0	Success	No Command-Specific Errors

### 3.10 Command 12 Read Message

**Request Data Bytes**

Byte	Format	Description
None		

**Response Data Bytes**

Byte	Format	Description
0-23	Packed	Message

**Command-Specific Response Codes**

Code	Class	Description
0	Success	No Command-Specific Errors

### 3.11 Command 13 Read Tag, Descriptor, Date

**Request Data Bytes**

Byte	Format	Description
None		

**Response Data Bytes**

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

**Command-Specific Response Codes**

Code	Class	Description
0	Success	No Command-Specific Errors

### 3.12 Command 14 Read Primary Variable Transducer Information

#### Request Data Bytes

Byte	Format	Description
None		

#### Response Data Bytes

Byte	Format	Description
0-2	Unsigned-24	Numerical Sensor Serialnumber - ISM sensors only (reads 0 if there is no ISM sensor)
3	Enum	Transducer Limits and Minimum Span Units Code (Coding see 2.1)
4-7	Float	Upper Transducer Limit
8-11	Float	Lower Transducer Limit
12-15	Float	=0.0

#### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

### 3.13 Command 15 Read Device Information

#### Request Data Bytes

Byte	Format	Description
None		

#### Response Data Bytes

Byte	Format	Description
0	Enum	PV Alarm Selection Code 0 – High 239– Last Val 250– not used
1	Enum	PV Transfer Function Code (=0, linear)
2	Enum	PV Upper and Lower Range Values Units Code (Coding see 2.1)
3-6	Float	PV Upper Range Value
7-10	Float	PV Lower Range Value
11-14	Float	PV Damping Value [s]
15	Enum	Write Protect Code (=251, None)
16	Enum	Private Label Distributor Code (=97, Knick)
17	Bits	PV Analog Channel Flags (=0)

#### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

### 3.14 Command 16 Read Final Assembly Number

#### Request Data Bytes

Byte	Format	Description
None		

#### Response Data Bytes

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

#### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

### 3.15 Command 17 Write Message

#### Request Data Bytes

Byte	Format	Description
0-23	Packed	Message String Used by the Master for Record Keeping

#### Response Data Bytes

Byte	Format	Description
0-23	Packed	Message String

#### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
5	Error	Too Few Data Bytes Received
16	Error	Access Restricted

### 3.16 Command 18 Write Tag, Descriptor, Date

#### Request Data Bytes

Byte	Format	Description
0-5	Packed	Tag
6-17	Packed	Descriptor Used by the Master for Record Keeping
18-20	Unsigned-24	A Date Code Used by the Master for Record Keeping (e.g. Last Or Next Calibration Date)

#### Response Data Bytes

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

#### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
5	Error	Too Few Data Bytes Received
9	Error	Invalid Date Code Detected
16	Error	Access Restricted

### 3.17 Command 19 Write Final Assembly Number

#### 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

#### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
5	Error	Too Few Data Bytes Received
16	Error	Access Restricted

### 3.18 Command 20 Read Long Tag

**Request Data Bytes**

Byte	Format	Description
None		

**Response Data Bytes**

Byte	Format	Description
0-31	Latin-1	Long Tag

**Command-Specific Response Codes**

Code	Class	Description
0	Success	No Command-Specific Errors

### 3.19 Command 21 Read Unique Identifier Associated With Long Tag

**Request Data Bytes**

Byte	Format	Description
0-31	Latin-1	Long Tag

**Response Data Bytes**

Byte	Format	Description
0-16		Same as Command 0 (Read Unique Identifier) No response is made unless the Long Tag matches that of the device.

**Command-Specific Response Codes**

Code	Class	Description
0	Success	No Command-Specific Errors

### 3.20 Command 22 Write Long Tag

**Request Data Bytes**

Byte	Format	Description
0-31	Latin-1	Long Tag

**Response Data Bytes**

Byte	Format	Description
0-31	Latin-1	Long Tag

**Command-Specific Response Codes**

Code	Class	Description
0	Success	No Command-Specific Errors
5	Error	Too Few Data Bytes Received
16	Error	Access Restricted

## 4 Common Practice Commands

### 4.1 Command 33 Read Device Variables

#### Request Data Bytes

Byte	Format	Description
0	Unsigned-8	Slot 0: Device Variable Code (Coding see 2.1)
1	Unsigned-8	Slot 1: Device Variable Code (Coding see 2.1)
2	Unsigned-8	Slot 2: Device Variable Code (Coding see 2.1)
3	Unsigned-8	Slot 3: Device Variable Code (Coding see 2.1)

#### Response Data Bytes

Byte	Format	Description
0	Unsigned-8	Slot 0: Device Variable Code
1	Enum	Slot 0: Units Code (Coding see 2.1)
2-5	Float	Slot 0: Device Variable Value
6	Unsigned-8	Slot 1: Device Variable Code
7	Enum	Slot 1: Units Code (Coding see 2.1)
8-11	Float	Slot 1: Device Variable Value
12	Unsigned-8	Slot 2: Device Variable Code
13	Enum	Slot 2: Units Code (Coding see 2.1)
14-17	Float	Slot 2: Device Variable Value
18	Unsigned-8	Slot 3: Device Variable Code
19	Enum	Slot 3: Units Code (Coding see 2.1)
20-23	Float	Slot 3: Device Variable Value

#### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
5	Error	Too Few Data Bytes Received
8	Warning	Update Failure

## 4.2 Command 35 Write Primary Variable Range Values

### Request Data Bytes

Byte	Format	Description
0	Unsigned-8	Upper and Lower Range Values Units Code (must be the same as the actually used unit) (Coding see 2.1)
1-4	Float	Upper Range Value
5-8	Float	Lower Range Value

### Response Data Bytes

Byte	Format	Description
0	Unsigned-8	Upper and Lower Range Values Units Code
1-4	Float	Upper Range Value
5-8	Float	Lower Range Value

### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
5	Error	Too Few Data Bytes Received
6	Error	Device-Specific Command Error
9	Error	Lower Range Value Too High
10	Error	Lower Range Value Too Low
11	Error	Upper Range Value Too High
12	Error	Upper Range Value Too Low
16	Error	Access Restricted

## 4.3 Command 36 Set Primary Variable Upper Range Value

This Command sets the actual value of the Primary Variable as the Upper Range Value.

### Request Data Bytes

Byte	Format	Description
None		

### Response Data Bytes

Byte	Format	Description
None		

### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
9	Error	Applied Process Too High
10	Error	Applied Process Too Low
16	Error	Access Restricted



#### 4.4 Command 37 Set Primary Variable Lower Range Value

This Command sets the actual value of the Primary Variable as the Lower Range Value.

##### Request Data Bytes

Byte	Format	Description
None		

##### Response Data Bytes

Byte	Format	Description
None		

##### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
9	Error	Applied Process Too High
10	Error	Applied Process Too Low
14	Warning	New Lower Range Value Pushed
16	Error	Access Restricted
29	Error	Invalid Span

#### 4.5 Command 38 Reset Configuration Changed Flag

##### Request Data Bytes

Byte	Format	Description
None		

##### Response Data Bytes

Byte	Format	Description
None		

##### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
16	Error	Access Restricted

#### 4.6 Command 41 Perform Self Test

##### Request Data Bytes

Byte	Format	Description
None		

##### Response Data Bytes

Byte	Format	Description
None		

##### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
16	Error	Access Restricted

#### 4.7 Command 42 Perform Device Reset

##### Request Data Bytes

Byte	Format	Description
None		

##### Response Data Bytes

Byte	Format	Description
None		

##### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
16	Error	Access Restricted

#### 4.8 Command 44 Write Primary Variable Units

##### Request Data Bytes

Byte	Format	Description
0	Enum	Primary Variable Units Code (switching between °C and °F is allowed; pH and mV must not be changed) (Coding see 2.1)

##### Response Data Bytes

Byte	Format	Description
0	Enum	Primary Variable Units Code

##### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
5	Error	Too Few Data Bytes Received
16	Error	Access Restricted

#### 4.9 Command 47 Write Primary Variable Transfer Function

##### Request Data Bytes

Byte	Format	Description
0	Enum	Transfer Function Code (=0, linear)

##### Response Data Bytes

Byte	Format	Description
0	Enum	Transfer Function Code

##### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
5	Error	Too Few Data Bytes Received
16	Error	Access Restricted

#### 4.10 Command 48 Read Additional Device Status

##### Request Data Bytes

Byte	Format	Description
None		

##### Response Data Bytes

Byte	Format	Description
0	Unsigned-8	Error number
1	Unsigned-8	Reserved
2	Enum	Device Specific Status: 0 – MEAS 1 – DIAG 2 – CAL 3 – CONF 4 – SERVICE
3	Enum	Sensoface: 0 – Good 1 – Poor 2 – Bad 3 – Unknown
4	Enum	Active Parameter Set: 0 – PARSET A 1 – PARSET B
5	Bits	State: 0x10 – Alarm 0x08 – Sensor Connected 0x02 – Product Calibration Step 2 Pending 0x01 – Hold
6	Bits	Extended Device Status: 0x01 – Maintenance required
7-9	Bits	Reserved
10	Bits	Analog Channel Saturation: 0x02 – Channel 2 saturated 0x01 – Channel 1 saturated
11-12	Bits	Reserved
13	Bits	Analog Channel Fixed: 0x02 – Channel 2 fixed 0x01 – Channel 1 fixed
14-21	Bits	Device specific status

##### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

#### 4.11 Command 50 Read Dynamic Variable Assignment

##### Request Data Bytes

Byte	Format	Description
None		

##### Response Data Bytes

Byte	Format	Description
0	Unsigned-8	Device Variable assigned to the Primary Variable (Coding see 2.1)
1	Unsigned-8	Device Variable assigned to the Secondary Variable (Coding see 2.1)
2	Unsigned-8	Device Variable assigned to the Tertiary Variable (Coding see 2.1)
3	Unsigned-8	Device Variable assigned to the Quaternary Variable (Coding see 2.1)

##### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

#### 4.12 Command 53 Write Device Variable Units

##### Request Data Bytes

Byte	Format	Description
0	Unsigned-8	Device Variable Code (Coding see 2.1)
1	Enum	Device Variable Units Code (switching between °C and °F is allowed; pH and mV must remain the same) (Coding see 2.1)

##### Response Data Bytes

Byte	Format	Description
0	Unsigned-8	Device Variable Code
1	Enum	Device Variable Units Code

##### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
5	Error	Too Few Data Bytes Received
11	Error	Invalid Device Variable Code
12	Error	Invalid Units Code
16	Error	Access Restricted

#### 4.13 Command 54 Read Device Variable Information

##### Request Data Bytes

Byte	Format	Description
0	Unsigned-8	Device Variable Code (Coding see 2.1)

##### Response Data Bytes

Byte	Format	Description
0	Unsigned-8	Device Variable Code
1-3	Unsigned-24	Device Variable Transducer Serialnumber (ISM sensors only)
4	Enum	Device Variable Limits/Minimum Span Units Code (Coding see 2.1)
5-8	Float	Device Variable Upper Transducer Limit
9-12	Float	Device Variable Lower Transducer Limit
13-16	Float	Device Variable Damping Value (=0)
17-20	Float	Device Variable Minimum Span (=0.0)
21	Enum	Device Variable Classification (Coding see 2.1)
22	Enum	Device Variable Family (Coding see 2.1)

##### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
5	Error	Too Few Data Bytes Received

#### 4.14 Command 59 Write Number of Response Preambles

##### Request Data Bytes

Byte	Format	Description
0	Unsigned-8	Number of preambles to be sent with the response message from Slave to the Master

##### Response Data Bytes

Byte	Format	Description
0	Unsigned-8	Number of preambles to be sent with the response message from Slave to the Master

##### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
5	Error	Too Few Data Bytes Received
8	Warning	Set to Nearest Possible Value
16	Error	Access Restricted

#### 4.15 Command 60 Read Analog Channel and Percent of Range

##### Request Data Bytes

Byte	Format	Description
0	Unsigned-8	Analog Channel Number Code (Coding see 2.2)

##### Response Data Bytes

Byte	Format	Description
0	Unsigned-8	Analog Channel Number Code
1	Enum	Analog Channel Units Code (=39, mA)
2-5	Float	Analog Channel Level
6-9	Float	Analog Channel Percent of Range

##### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
5	Error	Too Few Data Bytes Received

#### 4.16 Command 62 Read Analog Channels

##### Request Data Bytes

Byte	Format	Description
0	Unsigned-8	Analog Channel Number Code assigned to Slot 0 (Coding see 2.2)
1	Unsigned-8	Analog Channel Number Code assigned to Slot 1 (Coding see 2.2)
2	Unsigned-8	Analog Channel Number Code assigned to Slot 2 (Coding see 2.2)
3	Unsigned-8	Analog Channel Number Code assigned to Slot 3 (Coding see 2.2)

##### Response Data Bytes

Byte	Format	Description
0	Unsigned-8	Analog Channel Number Code in Slot 0
1	Enum	Slot 0 Units Code (=39, mA)
2-5	Float	Slot 0 Level of selected Analog Channel
6	Unsigned-8	Analog Channel Number Code in Slot 1
7	Enum	Slot 1 Units Code (=39, mA)
8-11	Float	Slot 1 Level of selected Analog Channel
12	Unsigned-8	Analog Channel Number Code in Slot 2
13	Enum	Slot 2 Units Code (=39, mA)
14-17	Float	Slot 2 Level of selected Analog Channel
18	Unsigned-8	Analog Channel Number Code in Slot 3
19	Enum	Slot 3 Units Code (=39, mA)
20-23	Float	Slot 3 Level of selected Analog Channel

##### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
5	Error	Too Few Data Bytes Received

#### 4.17 Command 63 Read Analog Channel Information

##### Request Data Bytes

Byte	Format	Description
0	Unsigned-8	Analog Channel Number Code (Coding see 2.2)

##### Response Data Bytes

Byte	Format	Description
0	Unsigned-8	Analog Channel Number Code
1	Enum	Analog Channel Alarm Selection Code 0 = Alarm Selection High 239 = Alarm Selection Last Value 250 = not used
2	Enum	Analog Channel Transfer Function Code (=0, linear)
3	Enum	Analog Channel Upper and Lower Range Values Units Code (Coding see 2.1)
4-7	Float	Analog Channel Upper Range Value
8-11	Float	Analog Channel Lower Range Value
12-15	Float	Analog Channel Damping Value [s]
16	Bits	Analog Channel Flags (=0)

##### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
5	Error	Too Few Data Bytes Received

#### 4.18 Command 64 Write Analog Channel Additional Damping Value

##### Request Data Bytes

Byte	Format	Description
0	Unsigned-8	Analog Channel Number Code (Coding see 2.2)
1-4	Float	Analog Channel Additional Damping Value [s]

##### Response Data Bytes

Byte	Format	Description
0	Unsigned-8	Analog Channel Number Code
6-9	Float	Analog Channel Additional Damping Value [s]

##### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
3	Error	Passed Parameter Too Large
4	Error	Passed Parameter Too Small
5	Error	Too Few Data Bytes Received
16	Error	Access Restricted



#### 4.19 Command 65 Write Analog Channel Range Values

##### Request Data Bytes

Byte	Format	Description
0	Unsigned-8	Analog Channel Number Code (Coding see 2.2)
1	Enum	Analog Channel Upper and Lower Range Values Units Codes (the actually used unit must not be changed) (Coding see 2.1)
2-5	Float	Analog Channel Upper Range Value
6-9	Float	Analog Channel Lower Range Value

##### Response Data Bytes

Byte	Format	Description
0	Unsigned-8	Analog Channel Number Code
1	Enum	Analog Channel Upper and Lower Range Values Units Codes
2-5	Float	Analog Channel Upper Range Value
6-9	Float	Analog Channel Lower Range Value

##### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
5	Error	Too Few Data Bytes Received
6	Error	Device-Specific Error Code
9	Error	Lower Range Value Too High
10	Error	Lower Range Value Too Low
11	Error	Upper Range Value Too High
12	Error	Upper Range Value Too Low
15	Error	Invalid Analog Channel Code Number
16	Error	Access Restricted

#### 4.20 Command 69 Write Analog Channel Transfer Function

##### Request Data Bytes

Byte	Format	Description
0	Unsigned-8	Analog Channel Number Code (Coding see 2.2)
1	Enum	Analog Channel Transfer Function Code (=0, linear)

##### Response Data Bytes

Byte	Format	Description
0	Unsigned-8	Analog Channel Number Code
1	Enum	Analog Channel Transfer Function Code

##### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
5	Error	Too Few Data Bytes Received
13	Error	Invalid Transfer Function Code
15	Error	Invalid Analog Channel Code Number
16	Error	Access Restricted

#### 4.21 Command 71 Lock Device

##### Request Data Bytes

Byte	Format	Description
0	Enum	Lock Code: 0 – Unlocked 1 – Lock – Temporary 2 – Lock – Permanent

##### Response Data Bytes

Byte	Format	Description
0	Enum	Lock Code

##### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
5	Error	Too Few Data Bytes Received
10	Error	Invalid Lock Code
16	Error	Access Restricted

#### 4.22 Command 72 Squawk

##### Request Data Bytes

Byte	Format	Description
None		

##### Response Data Bytes

Byte	Format	Description
None		

##### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

#### 4.23 Command 73 Find Device

The A402 PH must be set to Diag mode manually before using this command. In all other modes the device will not answer this command.

##### Request Data Bytes

Byte	Format	Description
None		

##### Response Data Bytes

Byte	Format	Description
0-16	Bits	Same as Command 0 (Read Unique Identifier)

##### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

#### 4.24 Command 76 Read Lock Device State

##### Request Data Bytes

Byte	Format	Description
None		

##### Response Data Bytes

Byte	Format	Description
0	Bits	Lock Status: 0x01 – Device Locked 0x02 – Lock is Permanent 0x04 – Locked by Primary Master

##### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

## 5 Device Specific Commands

### 5.1 Command 128 Read Device Configuration

#### Request Data Bytes

Byte	Format	Description
None		

#### Response Data Bytes

Byte	Format	Description
0	Bits	Device type and options 1: 0x01 – 0= A201, 1= A402 0x02 – reserved 0x04 – 0 = non Ex, 1=Ex 0x08 – 1= option Secondary Loop Current activated 0x20 – 1= option Logbook activated 0x40 – 1= option Current Input activated 0x80 – reserved
1	Bits	Device type and options 2: 0x01 – 1 = option Audit Trail activated 0x02 – 1 = option ISM activated 0x04 – 1 = option Pfadler activated
2	Unsigned-8	Reserved
3	Unsigned-8	Reserved

#### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

## 5.2 Command 129 Read Sensor Information

### Request Data Bytes

Byte	Format	Description
0	Enum	(=0)

### Response Data Bytes

Byte	Format	Description	Parameter Name on Display
0	Enum	(=0)	
1	Enum	Sensortype: 0 – STANDARD 1 – ISFET 2 – INDUCON 3 – ISM 4 – MEMOSENS	SNS:
2	Enum	RTD Type: 0 – PT100 1 – PT1000 2 – NTC8,55K 5 – NTC30K 8 – BALCO 3K	SNS: RTD TYPE
3	Enum	Temperature Units Code: 32 – °C 33 – °F	SNS: TEMP UNIT
4	Enum	Temperature Meas-Mode: 0 – AUTO 1 – MAN 2 – EXT	SNS: TEMP MEAS
5-8	Float	Manual Temperature Value for Measuring	SNS: MAN
9	Enum	Temperature CAL-Mode: 0 – AUTO 1 – MAN 2 – EXT	SNS: TEMP CAL
10-13	Float	Manual Temperature Value for Calibration	SNS: MAN
14	Enum	Calibration Mode: 0 – AUTO 1 – MAN 2 – DAT	SNS: CAL MODE
15	Enum	Buffer Set: 1 – METTLER 2 – KNICK CALIMAT 3 – CIBA 4 – NIST TECH 5 – NIST STD 6 – HACH 7 – WTW 8 – HAMILTON 9 – REAGECON 10 – DIN 11 – USER SPECIFIC	SNS: BUFFER SET
16	Enum	CAL Timer: 0 – OFF 1 – FIX 2 – ADAPT	SNS: CAL TIMER
17-20	Float	CAL Cycle [h]	SNS: CAL CYCLE
21	Enum	CIP Count: 0 – OFF 1 – ON	SNS: CIP COUNT
22-23	Unsigned-16	CIP Cycles	SNS: CIP CYCLES
24	Enum	SIP Count: 0 – OFF 1 – ON	SNS: SIP COUNT
25-26	Unsigned-16	SIP Cycles	SNS: SIP CYCLES
27	Unsigned-8	Adaptive Calibration Timer (ACT) Mode 0 – OFF 1 – AUTO	SNS: ACT MODE

		2 – MAN	
28-31	Float	ACT Cycle [h]	SNS: ACT CYCLE
32	Unsigned-8	Time To Maintenance (TTM) Mode 0 – OFF 1 – AUTO 2 – MAN	SNS: TTM MODE
33-36	Float	TTM Cycle [h]	SNS: TTM CYCLE
37	Enum	Autoclave Count: 0 – OFF 1 – ON	SNS: AUTOCLAVE
38-39	Unsigned-16	Autoclave Cycles	SNS: AC CYCLES

**Command-Specific Response Codes**

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
5	Error	Too Few Data Bytes Received

**5.3 Command 130 Write Sensor Information**

**Request Data Bytes**

Byte	Format	Description
0-39		Same as Response of Command 129

**Response Data Bytes**

Byte	Format	Description
0-39		Same as Response of Command 129

**Command-Specific Response Codes**

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
3	Error	Passed Parameter Too Large
4	Error	Passed Parameter Too Small
5	Error	Too Few Data Bytes Received
6	Error	Device-Specific Command Error
16	Error	Access Restricted

**5.4 Command 131 Read Nominal Zero And Slope**

**Request Data Bytes**

Byte	Format	Description
None		

**Response Data Bytes**

Byte	Format	Description	Parameter Name on Display
0-3	Float	Nominal Zero Value [pH]	SNS: NOM ZERO
4-7	Float	Nominal Slope Value [mV/pH]	SNS: NOM SLOPE
8-11	Float	PH Iso Value [pH]	SNS: PH_ISO

**Command-Specific Response Codes**

Code	Class	Description
0	Success	No Command-Specific Errors
5	Error	Too Few Data Bytes Received

**5.5 Command 132 Write Nominal Zero And Slope**

**Request Data Bytes**

Byte	Format	Description
------	--------	-------------

0-11	Same as Response of Command 131
------	---------------------------------

**Response Data Bytes**

Byte	Format	Description
0-11		Same as Response of Command 131

**Command-Specific Response Codes**

Code	Class	Description
0	Success	No Command-Specific Errors
3	Error	Passed Parameter Too Large
4	Error	Passed Parameter Too Small
5	Error	Too Few Data Bytes Received
6	Error	Device-Specific Command Error
16	Error	Access Restricted

**5.6 Command 139 Read Dynamic Variable Assignments**

**Request Data Bytes**

Byte	Format	Description
0	Enum	Parset selection: 0 – Parset A 1 – Parset B

**Response Data Bytes**

Byte	Format	Description
0	Enum	Parset selection (Coding see Request)
1	Unsigned-8	Device Variable assigned to the primary variable (Coding see 2.1)
2	Unsigned-8	Device Variable assigned to the secondary variable (Coding see 2.1)
3	Unsigned-8	Device Variable assigned to the tertiary variable (Coding see 2.1)
4	Unsigned-8	Device variable assigned to the quaternary variable (Coding see 2.1)

**Command-Specific Response Codes**

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
5	Error	Too Few Data Bytes Received



## 5.7 Command 141 Read OUT1/OUT2

### Request Data Bytes

Byte	Format	Description
0	Enum	Parset and analog channel selection: 0 – OUT1, Parset A 1 – OUT1, Parset B 2 – OUT2, Parset A 3 – OUT2, Parset B

### Response Data Bytes

Byte	Format	Description	Parameter Name on Display
0	Enum	Parset and analog channel selection (Coding see Request)	
1	Enum	Channel: 0 – PH 1 – ORP 2 – Temperature	OT1/2: CHANNEL
2	Enum	Output Range: 0 – 0-20mA 1 – 4-20mA	OT1/2: RANGE
3-6	Float	BEGIN Value	OT1/2: BEGIN
7-10	Float	END Value	OT1/2: END
11-14	Float	Filtertime [s]	OT1/2: FILTERTIME
15	Enum	22mA-Fail: 0 – OFF 1 – ON	OT1/2: FAIL 22mA
16	Enum	Hold Mode: 1 – FIX 3 – LAST	OT1/2: HOLD MODE
17-20	Float	Hold Fix Value	OT1/2: HOLD FIX
21	Enum	22mA on Sensoface Message: 0 – OFF 1 – ON	OT1/2: FACE 22mA

### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
5	Error	Too Few Data Bytes Received

## 5.8 Command 142 Write OUT1/OUT2

### Request Data Bytes

Byte	Format	Description
0-21		Same as Response of Command 141

### Response Data Bytes

Byte	Format	Description
0-21		Same as Response of Command 141

### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
3	Error	Passed Parameter Too Large
4	Error	Passed Parameter Too Small
5	Error	Too Few Data Bytes Received
6	Error	Device-Specific Command Error
16	Error	Access Restricted

## 5.9 Command 151 Read Correction

### Request Data Bytes

Byte	Format	Description
0	Enum	Parset selection: 0 – Parset A 1 – Parset B

### Response Data Bytes

Byte	Format	Description	Parameter Name on Display
0	Enum	Parset selection (Coding see Request)	
1-4	Float	TC Liquid [%/K]	COR: TC LIQUID
5	Enum	Input Type: 0 – 0-20mA 1 – 4-20mA	COR: I-INPUT
6-9	Float	Input Begin Temperature Value (in the active temperature unit)	COR: BEGIN
10-13	Float	Input End Temperature Value (in the active temperature unit)	COR: END
14	Enum	TC Select: 0 – Off 1 – Linear 2 – User Table 3 – Pure Water	COR: TC SELECT

### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
5	Error	Too Few Data Bytes Received

## 5.10 Command 152 Write Correction

### Request Data Bytes

Byte	Format	Description
0-14		Same as Response of Command 151

### Response Data Bytes

Byte	Format	Description
0-14		Same as Response of Command 151

### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
3	Error	Passed Parameter Too Large
4	Error	Passed Parameter Too Small
5	Error	Too Few Data Bytes Received
6	Error	Device-Specific Command Error
16	Error	Access Restricted

### 5.11 Command 159 Read Control Input

#### Request Data Bytes

Byte	Format	Description
None		

#### Response Data Bytes

Byte	Format	Description	Parameter Name on Display
0	Enum	Control Mode 0 – PARSET 1 – FLOW	IN: CONTROL
1-4	Float	Flow Adjust for Control Mode = Flow [Pulses/Litre]	IN: ADJUST FLOW

#### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
5	Error	Too Few Data Bytes Received

### 5.12 Command 160 Write Control Input

#### Request Data Bytes

Byte	Format	Description
0-4		Same as Response of Command 159

#### Response Data Bytes

Byte	Format	Description
0-4		Same as Response of Command 159

#### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
3	Error	Passed Parameter Too Large
4	Error	Passed Parameter Too Small
5	Error	Too Few Data Bytes Received
6	Error	Device-Specific Command Error
16	Error	Access Restricted

### 5.13 Command 161 Read Alarm

#### Request Data Bytes

Byte	Format	Description
0	Enum	Parset selection: 0 – Parset A 1 – Parset B

#### Response Data Bytes

Byte	Format	Description	Parameter Name on Display
0	Enum	Parset selection (Coding see Request)	
1-4	Float	Delay Time [s]	ALA: DELAYTIME
5	Enum	Sensocheck: 0 – OFF 1 – ON	ALA: SENSOCHECK
6	Enum	Flow Control: 0 – OFF 1 – ON	ALA: FLOW CONTR
7-10	Float	Flow Min [l/h]	ALA: FLOW MIN
11-14	Float	Flow Max [l/h]	ALA: FLOW MAX

#### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
5	Error	Too Few Data Bytes Received

### 5.14 Command 162 Write Alarm

#### Request Data Bytes

Byte	Format	Description
0-14		Same as Response of Command 161

#### Response Data Bytes

Byte	Format	Description
0-14		Same as Response of Command 161

#### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
3	Error	Passed Parameter Too Large
4	Error	Passed Parameter Too Small
5	Error	Too Few Data Bytes Received
6	Error	Device-Specific Command Error
16	Error	Access Restricted

### 5.15 Command 163 Read Relais

#### Request Data Bytes

Byte	Format	Description
0	Enum	Parset selection: 0 – Parset A 1 – Parset B

#### Response Data Bytes

Byte	Format	Description	Parameter Name on Display
0	Enum	Parset selection (Coding see Request)	
1	Enum	Relais Mode: 0 – Limits 1 – Controller	REL:

#### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
5	Error	Too Few Data Bytes Received

### 5.16 Command 164 Write Relais

#### Request Data Bytes

Byte	Format	Description
0-1		Same as Response of Command 163

#### Response Data Bytes

Byte	Format	Description
0-1		Same as Response of Command 163

#### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
5	Error	Too Few Data Bytes Received
6	Error	Device-Specific Command Error
16	Error	Access Restricted

### 5.17 Command 165 Read Limits

#### Request Data Bytes

Byte	Format	Description
0	Enum	Relais and parset selection: 0 – Rel1, Parset A 1 – Rel1, Parset B 2 – Rel2, Parset A 3 – Rel2, Parset B

#### Response Data Bytes

Byte	Format	Description	Parameter Name on Display
0	Enum	Relais and parset selection (Coding see Request)	
1	Enum	Channel: 0 – PH 1 – ORP 2 – TMP (Temperature) 3 – FLOW	RL1/2: CHANNEL
2	Enum	Function: 0 – Low Level 1 – High Level	RL1/2: FUNCTION
3	Enum	Contact Type: 0 – N/O 1 – N/C	RL1/2: CONTACT
4-7	Float	Level	RL1/2: LEVEL
8-11	Float	Hysteresis	RL1/2: HYSTERESIS
12-15	Float	Delay Time [s]	RL1/2: DELAYTIME

#### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
5	Error	Too Few Data Bytes Received

### 5.18 Command 166 Write Limits

#### Request Data Bytes

Byte	Format	Description
0-15		Same as Response of Command 165

#### Response Data Bytes

Byte	Format	Description
0-15		Same as Response of Command 165

#### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
3	Error	Passed Parameter Too Large
4	Error	Passed Parameter Too Small
5	Error	Too Few Data Bytes Received
6	Error	Device-Specific Command Error
16	Error	Access Restricted

### 5.19 Command 167 Read Controller

#### Request Data Bytes

Byte	Format	Description
0	Enum	Parset selection: 0 – Parset A 1 – Parset B

#### Response Data Bytes

Byte	Format	Description	Parameter Name on Display
0	Enum	Parset selection (Coding see Request)	
1	Enum	Channel: 0 – PH 1 – ORP 2 – TMP (Temperature) 3 – FLOW 4 – RH (rH value)	CTR: CHANNEL
2	Enum	Controller Type: 0 – Pulse Length (PLC) 1 – Pulse Frequency (PFC)	CTR: TYPE
3-6	Float	Pulse Length [s] (PLC only)	CTR: PULSE LEN
7-10	Float	Pulse Frequency [1/min] (PFC only)	CTR: PULSE FREQ
11-14	Float	Set Point	CTR: SETPOINT
15-18	Float	Dead Band	CTR: DEAD BAND
19-22	Float	P Gain [%]	CTR: P-GAIN
23-26	Float	I Time [s]	CTR: I-TIME
27-30	Float	D Time [s]	CTR: D-TIME
31	Enum	Hold Mode: 0 – Y OFF 3 – Y LAST	CTR: HOLD MODE

#### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
5	Error	Too Few Data Bytes Received



## 5.20 Command 168 Write Controller

### Request Data Bytes

Byte	Format	Description
0-31		Same as Response of Command 167

### Response Data Bytes

Byte	Format	Description
0-31		Same as Response of Command 167

### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
3	Error	Passed Parameter Too Large
4	Error	Passed Parameter Too Small
5	Error	Too Few Data Bytes Received
6	Error	Device-Specific Command Error
16	Error	Access Restricted

### 5.21 Command 171 Read Wash

#### Request Data Bytes

Byte	Format	Description
		None

#### Response Data Bytes

Byte	Format	Description	Parameter Name on Display
0	Enum	Mode: 0 – Wash 2 – Parset A/B	WSH:
1-4	Float	Wash Cycle [h]	WSH: WASH CYCLE
5-8	Float	Wash Time [s]	WSH: WASH TIME
9	Enum	Contact Type: 0 – N/O 1 – N/C	WSH: CONTACT
10-13	Float	Relax Time [s]	WSH: RELAX TIME

#### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

### 5.22 Command 172 Write Wash

#### Request Data Bytes

Byte	Format	Description
0-13		Same as Response of Command 171

#### Response Data Bytes

Byte	Format	Description
0-13		Same as Response of Command 171

#### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
3	Error	Passed Parameter Too Large
4	Error	Passed Parameter Too Small
5	Error	Too Few Data Bytes Received
6	Error	Device-Specific Command Error
16	Error	Access Restricted

### 5.23 Command 173 Read Clock

#### Request Data Bytes

Byte	Format	Description
		None

#### Response Data Bytes

Byte	Format	Description
0-1	Unsigned-16	Milliseconds
2	Unsigned-8	Minute
3	Unsigned-8	Hour
4	Unsigned-8	Day
5	Unsigned-8	Month
6	Unsigned-8	Year

#### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

### 5.24 Command 174 Write Clock

#### Request Data Bytes

Byte	Format	Description
0-1	Unsigned-16	Milliseconds (0-59999)
2	Unsigned-8	Minute (0-59)
3	Unsigned-8	Hour (0-23)
4	Unsigned-8	Day (1-31)
5	Unsigned-8	Month (1-12)
6	Unsigned-8	Year (1-255)

#### Response Data Bytes

Byte	Format	Description
0-6		Same as Response of Command 173

#### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
5	Error	Too Few Data Bytes Received
9	Error	Invalid Date Code Detected
16	Error	Access Restricted

## 5.25 Command 175 Read Logbook Entry

### Request Data Bytes

Byte	Format	Description
0	Unsigned-8	Group index: Value range depends on setting of Logbook options No Logbook option activated: 0 Logbook activated: 0-49 Logbook + Audit Trail activated: 0-99

### Response Data Bytes

Byte	Format	Description
0	Unsigned-8	Group Index
1	Unsigned-8	Index of latest entry
2	Unsigned-8	Index of the first entry of the requested group index
3-27		Logbook entry
28	Unsigned-8	Index of the second entry of the requested group index
29-53		Logbook entry

### Logbook Entry

Byte	Format	Description
0	Unsigned-8	Message ID
1	Unsigned-8	Day
2	Unsigned-8	Month
3	Unsigned-8	Year
4-9	Packed	Time (Format: "hh:mm:ss")
10	Bits	Info Flags: 0x01 - 0x02: Sensoface 0 - Good 1 - Medium 2 - Bad 3 - Unknown 0x04: Parset 0 - ParsetA 1 - ParsetB 0x08 - 0x10: Reserved 0x20 - 0x80: Kind of Message 0 - Static 1 - Begin of event 2 - End of event 3 - Float (Bytes 11-14 are valid, 15-18 are reserved) 4 - Unsigned-32 (Bytes 15-18 are valid, 11-14 and 19-24 are reserved) 5 - Packed (Bytes 19-24 are valid, 11-18 are reserved)
11-14	Float	Float Value
15-18	Unsigned-32	Integer Value
19-24	Packed	String Value

### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
5	Error	Too Few Data Bytes Received

### 5.26 Command 176 Store Actual Process Value

Command 176 takes a sample of the actual process value and stores it for later correction. This is step 1 of the product calibration.

#### Request Data Bytes

Byte	Format	Description
0	Enum	(=0)

#### Response Data Bytes

Byte	Format	Description
0	Enum	(=0)

#### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
5	Error	Too Few Data Bytes Received
16	Error	Access Restricted

### 5.27 Command 177 Read Stored Process Value

Reads the process value stored with Command 176. It returns NaN (not a number) if no value has been stored.

#### Request Data Bytes

Byte	Format	Description
0	Enum	(=0)

#### Response Data Bytes

Byte	Format	Description
0	Enum	(=0)
1-4	Float	Stored value or NaN

#### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
5	Error	Too Few Data Bytes Received

## 5.28 Command 178 Write Calibration Reference Value

### Request Data Bytes

Byte	Format	Description
0	Enum	(=0)
1	Enum	(=0)
2-5	Float	Reference value

### Response Data Bytes

Byte	Format	Description
0	Enum	(=0)
1	Enum	(=0)
2-5	Float	Reference value

### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
3	Error	Passed Parameter Too Large
4	Error	Passed Parameter Too Small
5	Error	Too Few Data Bytes Received
6	Error	Device-Specific Command Error
16	Error	Access Restricted

## 5.29 Command 179 Read Slope and Zero Values

### Request Data Bytes

Byte	Format	Description
0	Enum	(=0)

### Response Data Bytes

Byte	Format	Description
0	Enum	(=0)
1	Unsigned-8	Result of the last calibration (manual or via HART), Sensoface: 0 – Good 1 – Medium 2 – Bad 3 – Unknown
2	Unsigned-8	Slope Value Units Code (=57, %)
3-6	Float	Slope Value
7	Unsigned-8	Zero Value Units Code (=36, mV)
8-11	Float	Zero Value

### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
5	Error	Too Few Data Bytes Received

### 5.30 Command 180 Write Active Parset

The parameter set can only be switched in Parset Mode MAN (see Command 181).

#### Request Data Bytes

Byte	Format	Description
0	Enum	Parset selection: 0 – Parset A 1 – Parset B

#### Response Data Bytes

Byte	Format	Description
0	Enum	Parset selection (Coding see Request)

#### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
5	Error	Too Few Data Bytes Received
16	Error	Access Restricted

### 5.31 Command 181 Read Parset Mode

#### Request Data Bytes

Byte	Format	Description
		none

#### Response Data Bytes

Byte	Format	Description	Parameter Name on Display
0	Enum	Parset Mode: 0 – CNTR Input 1 – MAN 2 – FIX A	PAR:

#### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

### 5.32 Command 182 Write Parset Mode

#### Request Data Bytes

Byte	Format	Description
0		Same as Response of Command 181

#### Response Data Bytes

Byte	Format	Description
0		Same as Response of Command 181

#### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
5	Error	Too Few Data Bytes Received
6	Error	Device-Specific Command Error
16	Error	Access Restricted



### 5.33 Command 183 Read Device Tag

#### Request Data Bytes

Byte	Format	Description
		None

#### Response Data Bytes

Byte	Format	Description	Parameter Name on Display
0-31	Latin-1	Device Tag	TAG:

#### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

### 5.34 Command 184 Write Device Tag

#### Request Data Bytes

Byte	Format	Description
0-31		Same as Response of Command 183

#### Response Data Bytes

Byte	Format	Description
0-31		Same as Response of Command 183

#### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
5	Error	Too Few Data Bytes Received
6	Error	Device-Specific Command Error
16	Error	Access Restricted

### 5.35 Command 185 Read Sensor Identification

#### Request Data Bytes

Byte	Format	Description
0	Enum	Info Request Selector: 0 – Sensortype 1 – Manufacturer 2 – Sensorname 3 – Serialnumber 4 – Date of lastest calibration

#### Response Data Bytes

Byte	Format	Description
0	Enum	Info Request Selector (Coding see Request)
1	Enum	Sensor Connection State: 0 – disconnected 1 – connected
2-19	Latin-1	Requested Information

#### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
5	Error	Too Few Data Bytes Received

### 5.36 Command 186 Read Unit Code

#### Request Data Bytes

Byte	Format	Description
0	Enum	Parset and analog channel selection: 0 – OUT1, Parset A 1 – OUT1, Parset B 2 – OUT2, Parset A 3 – OUT2, Parset B

#### Response Data Bytes

Byte	Format	Description
0	Enum	Parset and analog channel selection (Coding see Request)
1	Unsigned-8	Units Code (Coding see 2.1)

#### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
5	Error	Too Few Data Bytes Received

### 5.37 Command 187 Read Version Info

#### Request Data Bytes

Byte	Format	Description
0	Enum	Info Request Selector: 0 – Device: Software Version 1 – Device: Hardware Version 2 – Device: Serialnumber 4 – HART IF: Software Version 7 – Meas Unit: Software Version 8 – Meas Unit: Hardware Version 9 – Meas Unit: Serialnumber 15 – Device: Type 16 – Device: Bootloader Version 17 – Meas Unit: Bootloader Version

#### Response Data Bytes

Byte	Format	Description
0	Unsigned-8	Info Request Selector (Coding see Request)
1-16	Latin-1	Requested Information

#### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
5	Error	Too Few Data Bytes Received

### 5.38 Command 188 Read Calibration Values

#### Request Data Bytes

Byte	Format	Description
0	Unsigned-8	Info Request Selector: 0 – Zero [mV] 1 – Slope [%] 2 – ISFET Offset [mV] 3 – Time of next calibration [h] 4 – Delta ORP [mV]

#### Response Data Bytes

Byte	Format	Description
0	Unsigned-8	Info Request Selector (Coding see Request)
1	Enum	Unit Codes: 0x24 – mV 0x39 – % 0x34 – h
2-5	Float	Calibration Value

#### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
5	Error	Too Few Data Bytes Received

### 5.39 Command 189 Read Process Values

#### Request Data Bytes

Byte	Format	Description
0	Unsigned-8	Info Request Selector: 0 – Resistance of Temperature Sensor [Ohm] 1 – Temperature 2 – Impedance of Glass electrode [kOhm] 3 – Impedance of Reference electrode [kOhm] 4 – pH value [pH] 5 – ORP value [mV] 6 – Glass mV value (pH) [mV] 7 – Glass-mV value (ORP) [mV] 8 – Current input value [mA] 9 – Flow [l/h]

#### Response Data Bytes

Byte	Format	Description
0	Unsigned-8	Info Request Selector (Coding see Request)
1	Enum	Unit Codes: 0x20 – °C 0x21 – °F 0x24 – mV 0x25 – Ohm 0x27 – mA 0x3B – pH 0x8A – l/h 0xA3 – kOhm
2-5	Float	Process Value

#### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
5	Error	Too Few Data Bytes Received

### 5.40 Command 190 Read Digital Sensor Information

#### Request Data Bytes

Byte	Format	Description
0	Unsigned-8	Value Request Selector: 0 – Operation time 1 – Sensor wear 2 – Lifetime 3 – CIP counter 4 – SIP counter 5 – AUTOCLAVE counter 6 – Dynamic Lifetime Indicator (DLI) [d] or [h] 7 – Adaptive Calibration Timer (ACT) [d] or [h] 8 – Time To Maintenance (TTM) [d] or [h]

#### Response Data Bytes

Byte	Format	Description
0	Unsigned-8	Value Request Selector (Coding see Request)
1	Enum	Unit Codes: 0x35 – d 0x34 – h 0x39 – % 0xFB – none
2-5	Float	Requested value

#### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
5	Error	Too Few Data Bytes Received

### 5.41 Command 191 Read Last Calibration Date

#### Request Data Bytes

Byte	Format	Description
None		

#### Response Data Bytes

Byte	Format	Description
0-7	Latin-1	Date of latest calibration (Format „dd.mm.yy“)

#### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

### 5.42 Command 192 Read User Specific Buffer Values

#### Request Data Bytes

Byte	Format	Description
0	Unsigned-8	Groupindex: 0 – Buffer 1 at 0°C to 45°C [pH] (at 25°C = nominal value of buffer 1) 1 – Buffer 1 at 50°C to 95°C [pH] 2 – Buffer 2 at 0°C to 45°C [pH] (at 25°C = nominal value of buffer 2) 3 – Buffer 2 at 50°C to 95°C [pH]

#### Response Data Bytes

Byte	Format	Description
0	Unsigned-8	Groupindex (Coding see Request)
1-40	Float array	10 buffer values of the group requested by groupindex. The one for the lowest temperature value of the group is transmitted first.

#### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
5	Error	Too Few Data Bytes Received

### 5.43 Command 193 Write User Specific Buffer Values

#### Request Data Bytes

Byte	Format	Description
0-40		Same as Response of Command 192

#### Response Data Bytes

Byte	Format	Description
0-40		Same as Response of Command 192

#### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
5	Error	Too Few Data Bytes Received

#### 5.44 Command 194 Read User Specific Buffer Set Consistency Check Result

##### Request Data Bytes

Byte	Format	Description

##### Response Data Bytes

Byte	Format	Description
0	Enum	Result of user buffer set consistency check: 0 – ok 1 – not ok (data is inconsistent)

##### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

### 5.45 Command 195 Read User Specific TC Values

#### Request Data Bytes

Byte	Format	Description
0	Unsigned-8	Groupindex: 0 – Parset A at 0°C to 45°C [%] 1 – Parset A at 50°C to 95°C [%] 2 – Parset B at 0°C to 45°C [%] 3 – Parset B at 50°C to 95°C [%]

#### Response Data Bytes

Byte	Format	Description
0	Unsigned-8	Groupindex (Coding see Request)
1-40	Float array	10 TC values of the group requested by groupindex. The one for the lowest temperature value of the group is transmitted first.

#### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
5	Error	Too Few Data Bytes Received

### 5.46 Command 196 Write User Specific TC Values

#### Request Data Bytes

Byte	Format	Description
0-40		Same as Response of Command 195

#### Response Data Bytes

Byte	Format	Description
0-40		Same as Response of Command 195

#### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
5	Error	Too Few Data Bytes Received

### 5.47 Command 197 Read User Specific TC Consistency Check Result

#### Request Data Bytes

Byte	Format	Description

#### Response Data Bytes

Byte	Format	Description
0	Enum	Result of user buffer set consistency check: 0 – ok 1 – not ok (data is inconsistent)

#### Command-Specific Response Codes

Code	Class	Description
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0	Success	No Command-Specific Errors
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### 5.48 Command 198 Service Sensor

#### Request Data Bytes

Byte	Format	Description
0	Enum	0 – Reset TTM 1 – Increment AUTOCLAVE Counter by 1

#### Response Data Bytes

Byte	Format	Description
0		Same as Request Data Byte

#### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
5	Error	Too Few Data Bytes Received
16	Error	Access Restricted

### 5.49 Command 199 Read Product Calibration Success

#### Request Data Bytes

Byte	Format	Description
0	Enum	(=0)

#### Response Data Bytes

Byte	Format	Description
0	Enum	(=0)
1	Unsigned-8	Result of Latest Product Calibration done via HART 0 – Success 1 – Fail 2 – Busy (result not yet available)

#### Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
5	Error	Too Few Data Bytes Received

### 5.50 Command 200 Write TV and QV Assignment

#### Request Data Bytes

Byte	Format	Description
0	Unsigned-8	Device Variable assigned to the Tertiary Variable
1	Unsigned-8	Device Variable assigned to the Quaternary Variable

#### Response Data Bytes

Byte	Format	Description
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0	Unsigned-8	Device Variable assigned to the Tertiary Variable
1	Unsigned-8	Device Variable assigned to the Quaternary Variable

**Command-Specific Response Codes**

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
5	Error	Too Few Data Bytes Received
16	Error	Access Restricted

**5.1 Command 202 Read Device Group**

**Request Data Bytes**

Byte	Format	Description
		None

**Response Data Bytes**

Byte	Format	Description	Parameter Name on Display
0-1	Unsigned-16	Group number (0..9999)	TAG: GROUP

**Command-Specific Response Codes**

Code	Class	Description
0	Success	No Command-Specific Errors

**5.2 Command 203 Write Device Group**

**Request Data Bytes**

Byte	Format	Description
0-1		Same as Response of Command 202

**Response Data Bytes**

Byte	Format	Description
0-1		Same as Response of Command 202

**Command-Specific Response Codes**

Code	Class	Description
0	Success	No Command-Specific Errors
3	Error	Passed Parameter Too Large
4	Error	Passed Parameter Too Small
5	Error	Too Few Data Bytes Received
6	Error	Device-Specific Command Error
16	Error	Access Restricted

**5.1 Command 204 Read Sensor Verification**

**Request Data Bytes**

Byte	Format	Description
0	Enum	(=0)

**Response Data Bytes**

Byte	Format	Description	Parameter Name on Display
0	Enum	(=0)	
1	Enum	Sensor verification TAG-Mode: 0 – on 1 – off	SNS: CHECK TAG
2	Enum	Sensor verification Group-Mode: 0 – on 1 – off	SNS: CHECK GROUP

**Command-Specific Response Codes**

Code	Class	Description
0	Success	No Command-Specific Errors

**5.2 Command 205 Write Sensor Verification**

**Request Data Bytes**

Byte	Format	Description
0-2		Same as Response of Command 204

**Response Data Bytes**

Byte	Format	Description
0-2		Same as Response of Command 204

**Command-Specific Response Codes**

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
5	Error	Too Few Data Bytes Received
6	Error	Device-Specific Command Error
16	Error	Access Restricted