PH Transmitter 2100 e /2(X)H
Transmitter-Specific Command Specification

using the HART® Communications Protocol
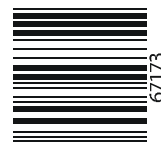
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pH Transmitter 2100 e/2(X)H

67173

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1. REFERENCE DOCUMENTS:

Document Title	Revision	Document Number
HART® - FSK Physical Layer Specification	8.0	HCF_SPEC-54
HART® - Data Link Layer Specification	7.1	HCF_SPEC-81
HART® - Command Summary Specification	7.1	HCF_SPEC-99
HART® - Universal Command Specification	5.2	HCF_SPEC-127
HART® - Common Practice Command Specification	7.1	HCF_SPEC-151
HART® - Common Tables	9.0	HCF_SPEC-183
Appendix 1 - Command Specific Response Code Definitions	4.1	HCF_SPEC-307
Application Layer Guideline on HART Status Information	1.0	HCF_LIT-5

2. EXPANDED DEVICE TYPE CODE:

Manufacturer Identification Code: Mettler   142
Manufacturer's Device Type Code: pH Transmitter 2100e/2(X)H   123

3. PHYSICAL LAYER INFORMATION:

Field Device Category   Transmitter Type A   (Sink direct current and receive operating power from the Network)
Capacitance Number (CN)   2   (approx. 2 x 5000 pF)

4. CONFORMANCE AND COMMAND CLASS SUMMARY

CONFORMANCE CLASS #1
    - UNIVERSAL
0   Read Unique Identifier
1   Read Primary Variable

CONFORMANCE CLASS #1A
    - UNIVERSAL
0   Read Unique Identifier
2   Read P. V. Current and Percent of Range

CONFORMANCE CLASS #2
    - UNIVERSAL
11   Read Unique Identifier Associated with Tag
12   Read Message
13   Read Tag, Descriptor, Date
14   Read Primary Variable Sensor Information
15   Read Primary Variable Output Information
16   Read Final Assembly Number

CONFORMANCE CLASS #3
    - UNIVERSAL
3   Read Dynamic Variables and P. V. Current
    - COMMON-PRACTICE
48   Read Additional Transmitter Status
54   Read Transmitter Variable Information

CONFORMANCE CLASS #4
- COMMON-PRACTICE
35   Write Primary Variable Range Values
36   Set Primary Variable Upper Range Value
37   Set Primary Variable Lower Range Value
38   Reset Configuration Changed Flag
40   Enter/Exit Fixed Primary Variable Current Mode
41   Perform Transmitter Self Test
42   Perform Master Reset

CONFORMANCE CLASS #5
- UNIVERSAL
6   Write Polling Address
17   Write Message
18   Write Tag, Descriptor, Date
19   Write Final Assembly Number
- COMMON-PRACTICE
59   Write Number of Response Preambles
- TRANSMITTER-SPECIFIC
128   Read One Transmitter-Specific Variable
129   Write One Transmitter-Specific Variable

5.   ADDITIONAL RESPONSE CODE INFORMATION

FIRST BYTE

5.1   **BUSY**
Response Code #32

The Busy Response Code is implemented for Commands #6, #18, #35, #36, #37, #42, #59 and #129. A confirming response is made before execution begins. The Busy Response Code is returned when a command is received during the execution.

SECOND BYTE

5.2   **FIELD DEVICE MALFUNCTION**
Bit #7

Malfunctions detected by the transmitter:
- CRC-Error in internal Configuration Data of the transmitter.
- On SensoCheck® Errors (from Device Software Revision 1.1)
- After Reset or Power up
  (See HCF_LIT-5: Application Layer Guideline on HART Status Information)

5.3   **CONFIGURATION CHANGED**
Bit #6

When the Parameter Setting Data changed, this Bit will be set. The Command #38 resets the Flag.

5.4   **MORE STATUS AVAILABLE**
Bit #4

This Bit is set if more status information can be read with Command #48.

5.5 PRIMARY VARIABLE ANALOG OUTPUT FIXED
Bit #3

This bit is set if output current 1 has been frozen by corresponding operation at the transmitter or if the output has been fixed via HART with the Command #40 or in the case of reset or power failure during start-up.

5.6 PRIMARY VARIABLE ANALOG OUTPUT SATURATED
Bit #2

This flag is set whenever the Primary Variable Analog Output saturates below 3.8 milliamperes and above 20.5 milliamperes.

5.7 NON-PRIMARY VARIABLE OUT OF LIMITS
Bit #1

This flag is set whenever the Non-Primary Variable exceeds the transmitter operating limits. Command #48, Read Additional Transmitter Status, provides additional information.

5.8 PRIMARY VARIABLE OUT OF LIMITS
Bit #0

This flag is set whenever the Primary Variable exceeds the Sensor Limits returned with Command #14, Read Primary Variable Sensor Information.

6. GENERAL TRANSMITTER INFORMATION

6.1 DAMPING IMPLEMENTATION

The pH Transmitter 2100 e/2(X)H has a fixed damping value.

6.2 NONVOLATILE MEMORY DATA STORAGE

The Flags Byte of Command #0 referenced in the Universal Command Specification document, will have Bit #1 (Command #39, EEPROM Control, Required) set to 0, indicating that all data sent to the transmitter will be saved automatically in the nonvolatile memory upon receipt of the Write or Set Command. Command #39, EEPROM Control, is not implemented.

6.3 MULTIDROP OPERATION

This revision of the pH Transmitter 2100 e/2(X)H supports Multidrop Operation.

6.4 BURST MODE

This revision of the pH Transmitter 2100 e/2(X)H does **not** support Burst Mode.

6.5 UNIT CONVERSIONS

All temperatures are based of degrees Celsius or degrees Fahrenheit. The temperature unit is selected with transmitter-specific variable 10, Byte 1. Command #129, Write One Transmitter-Specific Variable, can write this Byte.

7. ADDITIONAL COMMON-PRACTICE COMMAND SPECIFICATION

The Stratos e 2211(X)pH implements a subset of the Common-Practice Commands specified in the Common-Practice Command Specification document. This section contains information pertaining to those commands that require clarification.

7.1 COMMAND #35   WRITE PRIMARY VARIABLE RANGE VALUES

The Primary Variable Range Unit Code accepted by this transmitter is only the current Unit Code for the Primary Variable.

7.2 COMMAND #41   PERFORM TRANSMITTER SELF TEST

The Transmitter Self Test (Device Diagnostics) starts immediately after execution of this command. The transmitter display shows the test progress. No measurement at the execution of Selftest. A Display test, RAM test, EPROM test (internal program) and EEPROM test (parameter memory, transmitter calibration data) are performed. The test takes about 20 seconds.

The result can then be retrieved with Command #48, Read Additional Transmitter Status.

7.3 COMMAND #48   READ ADDITIONAL TRANSMITTER STATUS

This Command returns the Global Device Status, the Function Mode, Alarms and Errors, the results of a Transmitter Self Test and other transmitter information.

Byte **#0**   Error Status
  Bit 0.0 - pH value   Err 01
  Bit 0.1 - mV value   Err 02
  Bit 0.2 - Temperature value   Err 03
  Bit 0.3 - Current output < 3.8 mA   Err 11
  Bit 0.4 - Current output > 20.5 mA   Err 12
  Bit 0.5 - Current output span   Err 13
  Bit 0.6 - Configuration data   Err 98
  Bit 0.7 - Transmitter calibration data   Err 99

Byte **#1**   Smiley ☺ Status
  Bit 1.0 - Electrode response time
  Bit 1.1 - Cal timer ≥ 80 %
  Bit 1.2 - *Undefined*
  Bit 1.3 - *Undefined*
  Bit 1.4 - Electrode parameters for next calibration
  Bit 1.5 - *Undefined*
  Bit 1.6 - *Undefined*
  Bit 1.7 - *Undefined*

Byte **#2**   Smiley ☹ Status
  Bit 2.0 - Electrode response time
  Bit 2.1 - Cal timer ≥ 100 %
  Bit 2.2 - SensoCheck® glass-electrode   Err 33
  Bit 2.3 - SensoCheck® reference-electrode   Err 34
  Bit 2.4 - Electrode parameters for next calibration
  Bit 2.5 - Zero point of electrode
  Bit 2.6 - Slope of electrode
  Bit 2.7 - *Undefined*

Byte **#3 to 5**   *Undefined*

Byte **#6**   Operating Mode #1   (Refer to Common Table XIV)
Byte **#7**   Operating Mode #2   (Refer to Common Table XIV)

Byte **#8**   Analog Output Saturated
          Bit 8.0 -   Analog Output saturated
          Bit 8.1 to 7 - *Undefined*
Byte **#9**   Bit 9.0 to 7 - *Undefined*
Byte **#10**   Bit 10.0 to 7 - *Undefined*

Byte **#11**   Analog Output Fixed
          Bit 11.0 -   Analog Output fixed
          Bit 11.1 to 7 - *Undefined*
Byte **#12**   Bit 12.0 to 7 - *Undefined*
Byte **#13**   Bit 13.0 to 7 - *Undefined*

Byte **#14 to 23**   *Undefined*

Byte #**24**   Transmitter Mode
          Bit 24.0   - *Configuration*
          Bit 24.1   - *Calibration*
          Bit 24.3   - *Sample was taken*

8. TRANSMITTER-SPECIFIC COMMANDS

8.1 COMMAND #128 READ ONE TRANSMITTER-SPECIFIC VARIABLE

REQUEST DATA BYTES

DATA BYTES   #0
         XMTR
         VAR
         CODE

Data Byte #0:   Transmitter Variable, 8-bit unsigned integer,
                   Refer to Transmitter Variable Code Table 9.2.

RESPONSE DATA BYTES

DATA BYTES   #0   #1
         XMTR   UNITS
         VAR
         CODE

                #2   #3   #4   #5
                DATA   DATA
                MSB   LSB

Data Byte #0:   Transmitter Variable, 8-bit unsigned integer,
                   Refer to Transmitter Variable Code Table 9.2.

Data Byte #1:   Units Code, 8-bit unsigned integer, Refer to Table II; Unit Codes

Data Byte #2-#5:   Data for selected Transmitter Variable, IEEE 754 or selection data in 4 single bytes,
                      Refer to Transmitter Variable Code Table 9.2.

COMMAND-SPECIFIC RESPONSE CODES

0	No Command-Specific Errors
1	Undefined
2	Invalid Selection
3 - 4	Undefined
5	Too Few Data Bytes Received
6 - 15	Undefined
16	Access Restricted
17 - 127	Undefined

8.2   COMMAND #129   WRITE ONE TRANSMITTER-SPECIFIC VARIABLE

REQUEST DATA BYTES

DATA BYTES	#0 XMTR VAR CODE		#1 UNITS	

	#2 DATA MSB	#3	#4 DATA LSB	#5

Data Byte #0:   Transmitter Variable, 8-bit unsigned integer,
                     Refer to Transmitter Variable Code Table 9.2.

Data Byte #1   : Units Code, 8-bit unsigned integer, Refer to Table II; Unit Codes

Data Byte #2 - #5 : Data for selected Transmitter Variable, IEEE 754 or selection data in 4 single bytes,
                     Refer to Transmitter Variable Code Table 9.2.

RESPONSE DATA BYTES

DATA BYTES	#0 XMTR VAR CODE	UNITS	#1	

	#2 DATA MSB	#3	#4	#5 DATA LSB

Data Byte #0:   Transmitter Variable, 8-bit unsigned integer,
                     Refer to Transmitter Variable Code Table 9.2.

Data Byte #1:   Units Code, 8-bit unsigned integer, Refer to Table II; Unit Codes

Data Byte #2 - #5 : Data for selected Transmitter Variable, IEEE 754 or selection data in 4 single bytes,
                     Refer to Transmitter Variable Code Table 9.2.

COMMAND-SPECIFIC RESPONSE CODES

0	No Command-Specific Errors
1	Undefined
2	Invalid Selection
3	Passed Parameter too Large
4	Passed Parameter too Small
5	Too Few Data Bytes Received
6	Undefined
7	In Write Protect Mode
8 - 11	Undefined
12	Invalid Units Code
13 - 15	Undefined
16	Access Restricted
17 - 127	Undefined

9. TRANSMITTER SPECIFIC TABLES

Refer to the Common Tables Document for all references in this section to 'Subset of Table'.

9.1 USED COMMON UNIT CODES

Subset of Table II, Unit Codes

32	-	°C
33	-	°F
36	-	mV
39	-	mA
51	-	s
52	-	h
57	-	%
59	-	pH
243	-	%/K
251	-	none

9.2 TRANSMITTER VARIABLE CODES

Var.No.	Description	Unit	Access	Lower Limit	Upper Limit	Note
0	pH value	pH	Read	-2.00	16.00	
1	mV value	mV	Read	-1999	+1999	
2	Temperature value	°C °F	Read	-20.0 °C -4 °F	150.0 °C 302 °F	For Pt100/1000 and manual
					150.0 °C 302 °F	For NTC 30k Ohm
				-10,0 °C 14 °F	130 °C 266 °F	For NTC 8,55k Ohm
3 to 7	*Undefined*					
8	mA output current	mA	Read	3.8	22.0	
9	Percent value of output current	%	Read	-	-	
10	Inputs　10.0　Primary variable 　　　　10.1　Temperature 　　　　10.2　Temp.-Sensor 　　　　10.3　*Undefined*		R/W			Selections bytewise, see table 9.3
11	Manual meas Temperature	°C °F	R/W	-20.0 °C -4 °F	150.0 °C 302 °F	
12	Output current, lower range value (4 mA)	pH mV	R/W	-2.00 -1999	16.00 +1999	Same unit as primary variable
13	Output current, upper range value (20 mA)	pH mV	R/W	-2.00 -1999	16.00 +1999	Same unit as primary variable
14	Calibration　14.0　Bufferset, Manual 　　　　　　Cal or Data Entry 　　　　14.1　Sensocheck 　　　　14.2　*Undefined*r 　　　　14.3　*Undefined*		R/W			Selections bytewise, see table 9.4
15	Electrode symmetrie potential	mV	R/W	-60	60	Resets the cal timer
16	Electrode slope	%	R/W	85	103	
17	Cal timer	h	R/W	0	9999	
18	Manual buffer value 1	pH	R/W	-2.00	16.00	Manual cal only
19	Manual buffer value 2	pH	R/W	-2.00	16.00	Manual cal only
20	Output　20.0　22mA on Error 　　　　20.1　HOLD / Last Fix 　　　　20.2　*Undefined* 　　　　20.3　*Undefined*		R/W			Selections bytewise, see table 9.5
21	HOLD-fix value	mA	R/W	3.8	22.0	
22	Manual Cal Temperature	°C °F	R/W	-20.0 °C -4 °F	200.0 °C 392 °F	
23 – 29	*Undefined*					
30	Sample calibration (Step 2)		R/W	-1999	1999	Laborvalue

Var.No.	Description	Unit	Access	Lower Limit	Upper Limit	Note
31	Time constant of output filter	sec	R/W	0.0	120.0	Filtertime
32	Alarm delay	sec	R/W	0.0	600.0	
33	33.0 Alarm LED mode	/	R/W	-	-	Selections bytewise, see table 9.6
	33.1 Electrode type	/	R/W	-	-	Selections bytewise, see table 9.6
34	TC process medium	%/K	R/W	-19.99	19.99	Only at pH
35-249	*Undefined*					
250	Not Used					
251-255	*Reserved*					

9.3   INPUT SELECTION CODE

Usage of bytes for input selections in Transmitter-Specific Variable 10

Byte	Description	Selections	Note
10.0	Primary variable	0 - pH 1 - mV 2-255 - *Undefined*	Valid also for output current upper and lower range values
10.1	Temperature	0 - Auto °C 1 - Auto °F 2 - Manual °C 3 - Manual °F 4 - Auto °C / Cal manual 5 - Auto °F / Cal manual 6 - Man °C / Cal auto 7 - Man °F / Cal auto 6-255 - *Undefined*	Unit is valid for all read and write commands
10.2	Temperature sensor type	0 - Pt 100 1 - Pt 1000 2 - NTC 30kΩ 3 - NTC 8.55kΩ 4-255 - *Undefined*	
10.3	*Undefined*		

9.4   CALIBRATION SELECTION CODE

Usage of bytes for calibration selections in Transmitter-Specific Variable 14

Byte	Description	Selections	Note
14.0	Bufferset, Manual or Data Entry	0 - Bufferset -00- Knick 1 - Bufferset -01- Mettler Toledo 2 - Bufferset -02- Merck/Riedel 3 - Bufferset -03- Ciba 1994 4 - Bufferset -04- Mettler (USA) 5 - Bufferset -05- NIST 6 - Bufferset -06- HACH 7 - Bufferset -07- WTW 8-9 - *Reserved* 10 - Manual Calibration 11 - Data Entry 12-255 - *Undefined*	
14.1	Sensocheck	0 - Off 1 - On 2-255 - *Undefined*	
14.2	*Undefined*		
14.3	*Undefined*		

9.5 OUTPUT SELECTION CODE
Usage of bytes for output selections in Transmitter-Specific Variable 20

Byte	Description	Selections	Note
20.0	22 mA on Error	0 - Off 1 - On 2-255 - *Undefined*	
20.1	HOLD Last / Fix	0 - Last value 1 - Fixed current 2-255 - *Undefined*	
20.2	*Undefined*		
20.3	*Undefined*		

9.6 EXTENDED SELECTION CODE
Usage of bytes for extended selections in Transmitter-Specific Variable 33

Byte	Description	Selections	Note
33.0	Alarm LED Mode	0 - Off 1 - On 2-255 - *Undefined*	
33.1	HOLD Last / Fix	0 - Glas EL 1 - Fet EL 2-255 - *Undefined*	Only at pH
20.2	*Undefined*		
20.3	*Undefined*		

10. RELEASE NOTES

10.1   Preliminary Release

10.2   Revision 1.1
!   Sensocheck® Errors set Bit #7 in the second Response Code Byte, see Section 5.2
!   Error Numbers *Err 33* and *Err 34.* For Sensocheck® Errors, see Section 7.3

10.3   Revision 1.2
!   Additional selections in Variable #10.1, see Section 9.3
!   Additional bufferset -07- in Variable #14.0, see Section 9.4
!   new Transmitter Variable #22: manual Cal Temperature, see Section 9.2

10.4   Revision 1.3
!   new Byte (#24) in Command #48
!   Additional selections in Variable #2 (NTC 8,55 kOhm added)
!   new Transmitter Variable #30 see Table 9.2
!   new Transmitter Variable #31 see Table 9.2
!   new Transmitter Variable #32 see Table 9.2
!   new Transmitter Variable #33: see Section 9.6
!   Additional selections in Variable #10.1, see Section 9.3
!   new Transmitter Variable #22: manual Cal Temperature, see Section 9.2
!   new Transmitter Specific Command #131

UNIVERSAL COMMANDS:

Command #0 - Read Unique Identifier

Request Data Bytes	None		
Response Data Bytes	#0	-	254
	#1	-	Manufacturer Id = 142 *(Mettler)*
	#2	-	Manufacturer Device Type = 123 *(pH Transmitter 2100 e/2(X)H)*
	#3	-	Number of Preambles
	#4	-	Univ Cmd Rev
	#5	-	Trans Spec Rev
	#6	-	Soft Rev *(40 for Version 4.0)*
	#7	-	Hard Rev (See Universal Command Spec. Cmd #0)
	#8	-	Flags
	#9 to #11	-	Device Id Number (24-bit unsigned int)
Response Codes	#0	-	No Command-Specific Errors

Command #1 - Read Primary Variable

Request Data Bytes	None		
Response Data Bytes	#0	-	PV Units Code (See Common Table II) *(Spec.Var. 10.0)*
	#1 to #4	-	Primary Variable *(Spec.Var. 0 or 1)*
Response Codes	#0	-	No Command-Specific Errors

Command #2 - Read P.V. Current and Percent of Range

Request Data Bytes	None		
Response Data Bytes	#0 to #3	-	P.V. Current [mA] *(Spec.Var. 8)*
	#4 to #7	-	P.V. Percent of Range [%] *(Spec.Var. 9)*
Response Codes	#0	-	No Command-Specific Errors

Command #3 - Read Dynamic Variables and P.V. Current

Request Data Bytes	None		
Response Data Bytes	#0 to #3	-	P.V. Current [mA]
	#4	-	P.V. Units Code (See Common Table II) *(Spec.Var. 10.0)*
	#5 to #8	-	Primary Variable *(Spec.Var. 0 or 1)*
	#9	-	S.V. Units Code
	#10 to #13	-	Secondary Variable *(Spec.Var. 2)*
Response Codes	#0	-	No Command-Specific Errors
Note		-	Data String trancates after last variable supported

Command #6 - Write Polling Address

Request Data Bytes	#0	-	Polling Address of Device
Response Data Bytes	#0	-	Polling Address of Device
Response Codes	#0	-	No Command-Specific Errors
	#2	-	Invalid Selection *(Address > 15)*
	#5	-	Too Few Data Bytes Received
	#32	-	Busy

Command #11 - Read Unique Identifier associated with Tag

Request Data Bytes	#0 to #5	-	Tag (6 Byte Packed-ASCII = 8 Char.)
Response Data Bytes	#0	-	254
	#1	-	Manufacturer Id = 142 *(Mettler)*
	#2	-	Manufacturer Device Type = 123 *(pH Transmitter 2100 e/2(X)H)*
	#3	-	Number of Preambles
	#4	-	Univ Cmd Rev
	#5	-	Trans Spec Rev
	#6	-	Soft Rev *(40 for Version 4.0)*
	#7	-	Hard Rev (See Universal Command Spec. Cmd #0)
	#8	-	Flags
	#9 to #11	-	Device Id Number (24-bit unsigned int)
Response Codes	#0	-	No Command-Specific Errors
Note		-	Response only if Tag corresponds
		-	Only valid for Broadcast Frames

Command #12 - Read Message

Request Data Bytes	None		
Response Data Bytes	#0 to #23	-	Message (24 Byte Packed-ASCII = 32 Character)
Response Codes	#0	-	No Command-Specific Errors

Command #13 - Read Tag, Descriptor, Date

Request Data Bytes	None		
Response Data Bytes	#0 to #5 #6 to #17 #18 to #20	- - -	Tag (Packed-ASCII = 8 Char.) Descriptor (Packed-ASCII = 16 Char.) Date [dd.mm.yy]
Response Codes	#0	-	No Command-Specific Errors

Command #14 - Read Primary Variable Sensor Information

Request Data Bytes	None			
Response Data Bytes	#0 to #2 #3 #4 to #7 #8 to #11 #12 to #15	- - - - -	P.V. Sensor Serial Number P.V. Sensor Units Code P.V. Upper Sensor Limit P.V. Lower Sensor Limit P.V. Minimum Span	*(000000)* *(16.00 pH bzw. +1999 mV)* *(-2.00 pH bzw. −1999 mV)* *(2.00 pH bzw. 200 mV)*
Response Codes	#0	-	No Command-Specific Errors	

Command #15 - Read Primary Variable Output Information

Request Data Bytes	None			
Response Data Bytes	#0 #1 #2 #3 to #6 #7 to #10 #11 to #14 #15 #16	- - - - - - - -	Alarm Select Code (See Common Table VI) P.V. Transfer Function Code (See Common Table III) P.V. Range Units Code P.V. Upper Range Value P.V. Lower Range Value P.V. Damping Value [s] Write Protect Code (See Common Table VII) Private Label Distributor Code (See Common Table VIII) **Parameters not used:** Units Code = FA$_{HEX}$ (not used), Value = 7FA00000$_{HEX}$ (NaN)	 *(Spec.Var. 10.0)* *(Spec.Var. 13)* *(Spec.Var. 12)* *(NaN)*
Response Codes	#0	-	No Command-Specific Errors	

Command #16 - Read Final Assembly Number

Request Data Bytes	None		
Response Data Bytes	#0 to #2	-	Final Assembly Number (24-bit unsigned int)
Response Codes	#0	-	No Command-Specific Errors

Command #17 - Write Message

Request Data Bytes	#0 to #23	-	Message (24 Byte Packed-ASCII = 32 Character)
Response Data Bytes	#0 to #23	-	Message
Response Codes	#0 #5	- -	No Command-Specific Errors Too Few Data Bytes Received

Command #18 - Write Tag, Descriptor, Date

Request Data Bytes	#0 to #5 #6 to #17 #18 to #20	- - -	Tag (Packed-ASCII = 8 Character) Descriptor (Packed-ASCII = 16 Character) Date [dd.mm.yy]
Response Data Bytes	#0 to #5 #6 to #17 #18 to #20	- - -	Tag Descriptor Date
Response Codes	#0 #5	- -	No Command-Specific Errors Too Few Data Bytes Received

Command #19 - Write Final Assembly Number

Request Data Bytes	#0 to #2	-	Final Assembly Number (24-bit unsigned int)
Response Data Bytes	#0 to #2	-	Final Assembly Number
Response Codes	#0 #5	- -	No Command-Specific Errors Too Few Data Bytes Received

COMMON PRACTICE COMMANDS:

Command #35 - Write Primary Variable Range Values

Request Data Bytes	#0	-	P.V. Range Units Code	(Changes P.V. in Spec.Var. 10.0)
	#1 to #4	-	P.V. upper range value	(Spec.Var. 13)
	#5 to #8	-	P.V. lower range value	(Spec.Var. 12)
Response Data Bytes	#0	-	P.V. Range Units Code	(Spec.Var. 10.0)
	#1 to #4	-	P.V. upper range value	(Spec.Var. 13)
	#5 to #8	-	P.V. lower range value	(Spec.Var. 12)
Response Codes	#0	-	No Command-Specific Errors	
	#2	-	Invalid Selection	(wrong Units Code)
	#5	-	Too Few Data Bytes	
	#9	-	Lower Range Value too High	
	#10	-	Lower Range Value too Low	
	#11	-	Upper Range Value too High	
	#12	-	Upper Range Value too Low	
	#13	-	Upper and Lower Range Values Out of Limits	
	#14	-	Span too Small	
	#32	-	Busy	

Command #36 - Set Primary Variable Upper Range Value   *(actual value => Upper Range Value)*

Request Data Bytes	None		
Response Data Bytes	None		
Response Codes	#0	-	No Command-Specific Errors
	#32	-	Busy

Command #37 - Set Primary Variable Lower Range Value   *(actual value => Lower Range Value)*

Request Data Bytes	None		
Response Data Bytes	None		
Response Codes	#0	-	No Command-Specific Errors
	#32	-	Busy

Command #38 - Reset Configuration Changed Flag

Request Data Bytes	None		
Response Data Bytes	None		
Response Codes	#0	-	No Command-Specific Errors

Command #40 - Enter/Exit Fixed Primary Variable Current Mode

Request Data Bytes	#0 to #3	-	Fixed P.V. Current Level [mA]	
			0.0 = Exits the Fixed P.V. Current Mode	
Response Data Bytes	#0 to #3	-	Actual Fixed P.V. Current Level [mA]	
Response Codes	#0	-	No Command-Specific Errors	
	#3	-	Passed Parameter too Large	(Current > 22mA)
	#4	-	Passed Parameter too Small	(Current < 3.8mA)
	#5	-	Too Few Data Bytes Received	

Command #41 - Perform Transmitter Self Test

Request Data Bytes	None		
Response Data Bytes	None		
Response Codes	#0	-	No Command-Specific Errors

Command #42 - Perform Master Reset

Request Data Bytes	None		
Response Data Bytes	None		
Response Codes	#0	-	No Command-Specific Errors
	#32	-	Busy

Command #48 - Read Additional Transmitter Status

Response Data Bytes (See 7.3)	#0 to #5	-	Transmitter-Specific Status	
Request Data Bytes	None			
	#6	-	Operating Mode #1	(0 = normal)
	#7	-	Operating Mode #2	(0 = normal)
	#8 to #10	-	Analog Output Saturated	
	#11 to #13	-	Analog Output Fixed	
	#14 to #24	-	Transmitter-Specific Status	
Response Codes	#0	-	No Command-Specific Errors	

Command #54 - Read Transmitter Variable Information

Request Data Bytes	#0	-	Transmitter Variable (See Chap. 9.2)	
Response Data Bytes	#0	-	Transmitter Variable	
	#1 to #3	-	Transmitter Variable Sensor Serial Number	*(000000)*
	#4	-	Units Code for Limits and Minimum Span	
	#5 to #8	-	Upper Limit	
	#9 to #12	-	Lower Limit	
	#13 to #16	-	Damping Value	
	#17 to #20	-	Minimum Span	
Response Codes	#0	-	No Command-Specific Errors	
	#2	-	Invalid Selection	
	#5	-	Too Few Data Bytes Received	

Command #59 - Write Number of Response Preambles

Request Data Bytes	#0	-	Number of Preambles to be sent with the Response message from Slave to the Master	
Response Data Bytes	#0	-	Number of Preambles	
Response Codes	#0	-	No Command-Specific Errors	
	#3	-	Passed Parameter too Large	*(Preambles > 20)*
	#4	-	Passed Parameter too Small	*(Preambles < 2)*
	#5	-	Too Few Data Bytes Received	

TRANSMITTER-SPECIFIC COMMANDS:

Command #128 - Read One Transmitter-Specific Variable

Request Data Bytes	#0	-	Transmitter Variable, 8-bit unsigned integer. Refer to Transmitter Variable Code Table 9.2 in this document
Response Data Bytes	#0	-	Transmitter Variable
	#1	-	Units Code for Transmitter Variable
	#2 to #5	-	Data for selected Transmitter Variable, IEEE 754 format or bytewise selections
Response Codes	#0	-	No Command-Specific Errors
	#2	-	Invalid Selection
	#5	-	Too Few Data Bytes Received

Command #129 - Write One Transmitter-Specific Variable

Request Data Bytes	#0	-	Transmitter variable, 8-bit unsigned integer. Refer to transmitter Variable code table 9.2 in this document
	#1	-	Units code for transmitter variable
	#2 to #5	-	Data for selected transmitter variable, IEEE 754 format or bytewise selections
Response Data Bytes	#0	-	Transmitter variable
	#1	-	Units code for transmitter variable
	#2 to #5	-	Data for selected transmitter variable, IEEE 754 format or bytewise selections
Response Codes	#0	-	No Command-Specific Errors
	#2	-	Invalid Selection
	#3	-	Passed parameter too large
	#4	-	Passed parameter too small
	#5	-	Too few data bytes Received
	#7	-	In Write Protect Mode
	#12	-	Invalid Units Code
	#32	-	Busy

Command #131 – start product calibration (Calibration by sampling)

Request Data Bytes	none		
Response Data Bytes	none		
Response Codes	#0		No Command Specific Errors
	#5	-	Too Few Data Bytes Received (< 0)
	#16	-	Access Restricted