HART® Field Device Specification:

Siemens SITRANS Probe LU240 revision 1

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1 Introduction

1.1 Scope

The SIEMENS SITRANS Probe LU240 revision 1 device complies with HART Protocol Revision 7.6. This document specifies the common device specific features and documents HART protocol implementation details e.g. the engineering unit codes supported.

1.2 Purpose

This specification complements other documentation (e.g. Operating Instructions) by providing a complete, unambiguous description of this field device from a HART communication perspective.

1.3 Who should use the document?

This specification is designed to be a technical reference for HART capable host developers, system integrators, and knowledgeable end users. It also provides functional specifications (e.g. commands, enumerations, and performance requirements) used during Field Device development, maintenance, and testing. This document assumes the reader is familiar with HART protocol requirements and terminology.

1.4 Abbreviations and Definitions

Abbreviation	Description
DAC	Digital to Analog Converter
DSS	Display Subsystem
EUP	End User Privilege
FTP	File Transfer protocol. For HART: Block Data Transfer
FW	Firmware
GCF	FieldCommGroup is owner of the HART protocol
HCF	HART Communication Foundation. Former owner of the HART protocol
HMI	Human Machine Interface
HW	Hardware
NAMUR	Normen-Arbeitsgemeinschaft für Mess- und Regeltechnik. NAMUR is an international user association of automation technology in process industries.
NaN	Not a Number NaN = 0x7FA00000 used e.g. in Trends or process values when no value is available
PIN	Personal Identification Number
PC	Personal Computer
PV	Primary Variable
QV	Quaternary Variable
SI Unit	International System of units
SSS	Sensor Subsystem
Subsystem	similar to system, typically a smaller entity e.g. only mechanical, electronic or

	software subsystem
SV	Secondary Variable
TASS	Transmitter Application Subsystem
TV	Tertiary Variable

Table 1: Abbreviations and Definitions

1.5 References

#	Document	Document name / A5E-Number
1	HART Spec Rev 7.6	HART Specification available from the GCF
2	SITRANS Probe LU240 Operating Instructions	A5E42673511

2 Device Identification

This information can be found in the product specific HART Data Specification.

Manufacturer Name:	SIEMENS	**Model Name:**	SITRANS Probe LU240
Manufacturer ID Code:	42 (2A Hex)	**Device Type Code:**	45 (2D Hex)
HART Protocol Revision:	7.6	**Device Revision:**	1
Physical Layers Supported:	1 (FSK)		
Physical Device Category			

Table 2: Device Identification

SITRANS Probe LU240

3 Product Overview

The SITRANS Probe LU240 ultrasonic level transmitter with HART, 4 to 20 mA is ideal for level, volume, and volume flow measurements. It works with liquids, slurries, and bulk materials up to 12 meters (40 feet).

The transducer is available as ETFE (ethylene-tetrafluoroethylene) or PVDF (polyvinylidene fluoride) to suit the chemical conditions of your application. For applications with varying temperatures, the SITRANS Probe LU240 incorporates an internal temperature sensor to compensate for temperature changes.
The self-cleaning face of SITRANS Probe LU240 is resistant to build-up and condensation and has field-proven Process Intelligence signal processing. Together, they provide long term, low maintenance level, volume, and volume flow measurement in difficult applications.

The SITRANS Probe LU240 is available with approvals for General purpose and Intrinsic safety for hazardous area installations.

See the SITRANS Probe LU240 Operating Instructions (A5E42673511) for detailed installation instructions.

4 Product Interfaces

4.1 Process Interface

4.1.1 Sensor Input Channels

The SITRANS Probe LU240 is a one-piece ultrasonic level-measuring device. The ultrasonic sensor and temperature sensor are integrated in the nose cone of the device. No additional sensors need to be connected.

There are two measured inputs to the device:
- Distance
- Sensor Temperature

The distance is used to derive:
- Level
- Space

The Level can then be used to derive one of 3 other values:
- Volume
- Volume Flow
- Custom Linearization

These measurement values result in Device Variable 0 to 6.
All the values are represented in respective engineering units.

4.2 Host Interface

The SITRANS Probe LU240 transmitter can be used in a number of system configurations. As a standalone version, supplied with the necessary power and as part of a complex system environment e.g. SIMATIC S7.

All basic settings can be made directly on the device with four input keys. The full scope of communication is available via HART (online parameterization). Communication via the HART interface can take place optionally with:

- HART modem with following PC/laptop on which suitable software such as
    - SIMATIC PDM is available or other host systems
- a HART-capable control system (e.g. SIMATIC S7 with ET 200M)

4.2.1 Analog output

The value of the upper and lower fault current and the upper and lower limit of the linear modulation range are freely selectable within the given limits of the current modulation range. The specified accuracy of the current output signal only applies within the current limits 4 to 20 mA.

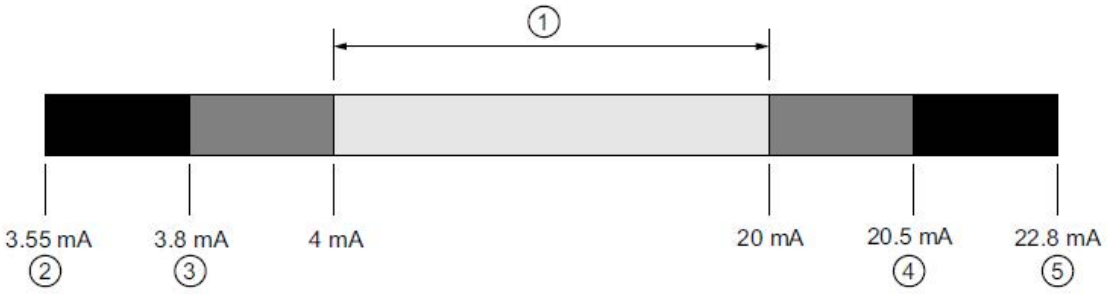

Figure 1: Failure and Saturation Limits

① Normal Measurement range
② Lower Failure Current (factory setting)
③ Lower Saturation limit (factory setting)
④ Upper Failure Current (factory setting)
⑤ Upper Saturation Current (factory setting)

The device supports a saturation function, which limits the current output. Calculated current values higher than the upper saturation values are limited to the upper saturation values. Values lower than the lower saturation value are limited to the lower saturation value. This relation is shown in the following table.

Output Scaling	0% range	100% range	Lower saturation value	Upper saturation value	Lower fault current	Upper fault current
4-20 mA NAMUR	4 mA	20 mA	3.8 mA	20.5 mA	3.5 mA	22.6 mA

By writing the appropriate parameter (Failure Current Select), the user can select whether the failure indication low or high is used.

The value of the Multi-Drop mode can be configured between 3.6 and 22.8 mA, regardless of the setting of the output scaling. (Parameter: PID_CURRENT_MULTIDROP_VALUE)

Maximum current	22,8 mA
Multi-Drop Current	3,55-22,8 mA
Minimum terminal voltage	10.5 V
Nominal terminal voltage	24V
Maximum terminal voltage	45V

4.3 Local Interfaces, Jumpers and Switches

4.3.1 Local Controls and Displays

You can parameterize the transmitter directly at the measuring point with the four input keys and view measuring results and error messages on the digital display.

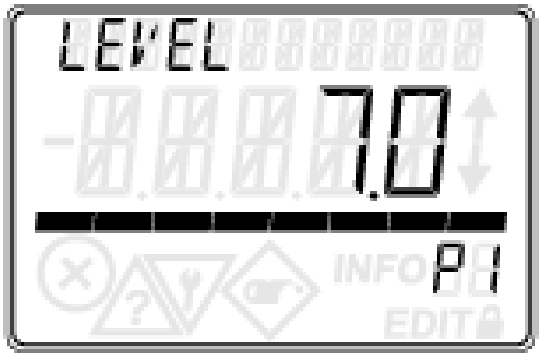

Figure 2: Local Display

A plug-in display is used for local display of the measured value with unit, sign and diagnostic NAMUR information.

4.3.2 Device Malfunction

The direction of indication of a detected malfunction by the analog current output is user-selectable to user the upper/lower fault current. This can be parameterized via the display or over the parameter PID_FAILURE_CURRENT_SELECT. On the display menu the FAULT CUR[10] is used.

4.3.3 Polling Address

The parameter PID_HART_POLLING_ADDRESS is used for the polling address of the device.
It can be changed via the Universal Command 6.

Multi-Drop mode is selected independently from the polling address by setting the loop current mode (also see Universal Command 6).

5 Device Variables

These are the defined device variable codes from the HART Spec

Parameter name	Device Variable Code
Percent Range (FAE_PERCENT_OF_RANGE)	244
Loop Current (FAE_LOOP_CURRENT)	245
Primary Variable	246
Secondary Variable	247
Tertiary Variable	248
Quaternary Variable	249

Table 3: Standard Device Variables

SITRANS Probe LU240 Device Variables

Device Variable	Description	Classification	Engineering Units
0	Level	Level	Length (See Section 11.3)
1	Space	Level	Length (See Section 11.3)
2	Distance	Level	Length (See Section 11.3)
3	Sensor Temperature	Temperature	Temperature (See Section 11.4)
4	Volume	Volume	Volume (See Section 11.5)
5	Volume Flow	Volumetric Flow	Volumetric Flow (See Section 11.6)
6	Custom	None	Custom (See Section 11.7)

Table 4: Level Device Variables

If the user wants to select Volume, Volume flow or Custom the parameter PID_TRANSFER_SELECT must be configured so that the derived value is calculated.

5.1 Device Variable 0 Level

Level is the difference between the distance and the lower level point. It is a value derived from distance and is used to derive the volume, volume flow and custom device variables.

5.2 Device Variable 1 Space

Space is the difference between the distance and the upper level point. It is a value derived from distance.

5.3 Device Variable 2 Distance

Distance is the distance measured with the ultrasonic transducer and corrected using the sensor temperature. This is used to calculate level and space.

5.4 Device Variable 3 Sensor Temperature

Sensor temperature is the temperature measured at the ultrasonic transducer. This is used as the process temperature for correcting the speed of sound when calculating the distance.

5.5 Device Variable 4 Volume

Volume is a value derived from level. To enable volume the parameter PID_TRANSFER_SELECT must be set to volume. Also the vessel shape and if applicable dimensions must be set using the following parameters:
PID_VESSEL_SHAPE
PID_VESSEL_DIMENSION_A
PID_VESSEL_DIMENSION_B
FAE_VOLUME_PV_UPPER_RANGE_LIMIT

See the Operating Instructions for more details.

5.6 Device Variable 5 Volume Flow

Volume Flow is a value derived from level. To enable volume flow the parameter PID_TRANSFER_SELECT must be set to volume flow. Also the PMD shape and if applicable dimensions must be set using the following parameters:
PID_OCM_PRIMARY_ELEMENT
PID_OCM_EXPONENT
PID_OCM_K_FACTOR
PID_OCM_V_NOTCH
PID_OCM_SLOPE
PID_OCM_ROUGHNESS_COEF
PID_OCM_METHOD
FAE_OCM_DIMENSION_1
FAE_OCM_DIMENSION_2
FAE_OCM_DIMENSION_3
FAE_OCM_DIMENSION_4
FAE_FLOW_PV_UPPER_RANGE_LIMIT

See the Operating Instructions for more details.

5.7 Device Variable 6 Custom

Custom is a value derived from level. It uses a linearization table to define the relationship to level. To enable custom the parameter PID_TRANSFER_SELECT must be set to custom. Also the units and linearization table must be set using the following parameters:
PID_CUSTOM_PVUNIT_STRING
PID_LIN_TABLE_X_1..PID_LIN_TABLE_X_32
PID_LIN_TABLE_Y_1..PID_LIN_TABLE_Y_32
FAE_CUSTOM_PV_UPPER_RANGE_LIMIT

See the Operating Instructions for more details.

6 Dynamic Variables

All 4 dynamic variables con be configured to any of the 7 device variables. The PV, SV, TV and QV can be read and written via HART Commands 50 and 51.

Note: The HMI and EDD's only show PV and SV and excludes temperature from PV but the device supports all 4 with full mapping via HART commands.

7 Status Information

7.1 Device Status (Command #48)

Command 48 returns 25 bytes of data, with the following device specific status information:

Byte	Bit	Meaning	Class
Device Specific Status byte 0			
0	0	Configuration Changed	
	1	Process Value Tolerance	
	2	Maintenance Required	Maintenance required
	3	Maintenance Demanded	Maintenance required
	4	Process Value Warning	Out of Specification
	5	Process Value Alarm	Out of Specification
	6	Manual Operation	Function Check
	7	Configuration warning	Function Check
Device Specific Status byte 1			
1	0	Simulation or Substitute Value	Function Check
	1	Configuration Error	Failure
	2	Maintenance Alarm	Failure
	3	Out of Service	Failure
	4	Not used, fixed to 0	
	5	Not used, fixed to 0	
	6	Not used, fixed to 0	
	7	Not used, fixed to 0	
Device Specific Status byte 2			
2	0	not used	
	1	not used	
	2	not used	
	3	not used	
	4	not used	
	5	not used	
	6	not used	
	7	not used	
Device Specific Status byte 3			
3	0	not used	
	1	not used	
	2	not used	
	3	not used	

Byte	Bit	Meaning	Class
	4	not used	
	5	not used	
	6	not used	
	7	not used	
Device Specific Status byte 4			
4	0	not used	
	1	not used	
	2	not used	
	3	not used	
	4	not used	
	5	not used	
	6	not used	
	7	not used	
Device Specific Status byte 5			
5	0	not used	
	1	not used	
	2	not used	
	3	not used	
	4	not used	
	5	not used	
	6	not used	
	7	not used	
Extended Field Device Status			
6	0	Maintenance Required	N/A
	1	Device Variable Alert	Set if the status of one of the device variables is set to bad.
	2	Critical Power Failure	Not used set to 0
	3	Failure	N/A
	4	Out of Specification	N/A
	5	Function Check	N/A
	6	Not used	
	7	Not used	
Device Operation Mode			
7	0	Reserved (0x00)	
	1	Reserved (0x00)	
	2	Reserved (0x00)	
	3	Reserved (0x00)	
	4	Reserved (0x00)	

Byte	Bit	Meaning	Class
	5	Reserved (0x00)	
	6	Reserved (0x00)	
	7	Reserved (0x00)	
Standardized Status 0			
8	0	Device Variable Simulation Active	Function check
	1	Non-Volatile Memory Defect.	Failure
	2	Volatile Memory Defect	Failure
	3	Watchdog Reset Executed	Failure
	4	Power Supply Conditions Out of Range	Out of Specification
	5	Environmental Conditions Out of Range	Out of Specification
	6	Electronic Defect	Failure
	7	Device Configuration Locked	No effect
Standardized Status 1			
9	0	Status Simulation Active	No effect
	1	Discrete Variable Simulation Active	Function check
	2	Event Notification Overflow	No effect
	3	Battery or Power Supply needs Maintenance	Maintenance Required
	4	n/a	
	5	n/a	
	6	n/a	
	7	n/a	
Analog Channel Saturated			
10	0	Analog Channel 1 saturated - Not used	
	1	Analog Channel 2 saturated - Not Used	
	2	Analog Channel 3 saturated - Not used	
	3	Analog Channel 4 saturated - Not used	
	4	n/a	
	5	n/a	
	6	n/a	
	7	n/a	
Standardized Status 2			
11	0	Sub-Device List Changed	No effect
	1	Duplicate Master Detected	Maintenance Required
	2	Sub-Device Mismatch	Maintenance Required
	3	Sub-Devices with Duplicate IDs Found	No effect
	4	Stale Data Notice	Out of Specification
	5		

Byte	Bit	Meaning	Class
	6		
	7		
Standardized Status 3			
12	0	Capacity Denied Not used	Maintenance Required
	1	Reserved	No effect
	2	Bandwidth allocation pending Not used	No effect
	3	Block Transfer Pending	No effect
	4	Radio Failure Not used	Failure
	5		
	6		
	7		
Analog Channel Fixed			
13	0	Analog Channel 1 - Not used	Function Check
	1	Analog Channel 2 - Not used	Function Check
	2	Analog Channel 3 - Not used	Function Check
	3	Analog Channel 4 - Not used	Function Check
Device Specific Status - byte 14			
14	0	Process Value Simulation Active	Function Check
	1	Nonvolatile Memory Defect	Failure
	2	Volatile Memory Defect	Failure
	3	Not used	n/a
	4	Power Supply Conditions OOR	Out of Specification
	5	Environmental Conditions OOR	Out of Specification
	6	Electronics Defect	Failure
	7	Not used	n/a
Device Specific Status - byte 15			
15	0	Status Simulation Active	Function Check
	1	Not used	n/a
	2	Sensor Break	Failure
	3	Out of Service	Failure
	4	Configuration Failure	Failure
	5	Failsafe Timer Expired	Out of Specification
	6	Not used	n/a
	7	Not used	n/a
Device Specific Status - byte 16			

Byte	Bit	Meaning	Class
16	0	Not used	n/a
	1	Sensor Limit Exceeded	Out of Specification
	2	Not used	n/a
	3	Not used	n/a
	4	Limiter1OverRunsEventCountOOSpec	Out of Specification
	5	Limiter1UnderRunsEventCountOOSpec	Out of Specification
	6	Limiter2OverRunsEventCountOOSpec	Out of Specification
	7	Limiter2UnderRunsEventCountOOSpec	Out of Specification
Device Specific Status - byte 17			
17	0	Limiter3OverRunsEventCountOOSpec	Out of Specification
	1	Limiter3UnderRunsEventCountOOSpec	Out of Specification
	2	Limiter1OverRunsEventCountMaintReq	Maintenance Required
	3	Limiter1UnderRunsEventCountMaintReq	Maintenance Required
	4	Limiter2OverRunsEventCountMaintReq	Maintenance Required
	5	Limiter2UnderRunsEventCountMaintReq	Maintenance Required
	6	Limiter3OverRunsEventCountMaintReq	Maintenance Required
	7	Limiter3UnderRunsEventCountMaintReq	Maintenance Required
Device Specific Status - byte 18			
18	0	Limiter1OverRunsEventCountFailure	Failure
	1	Limiter1UnderRunsEventCountFailure	Failure
	2	Limiter2OverRunsEventCountFailure	Failure
	3	Limiter2UnderRunsEventCountFailure	Failure
	4	Limiter3OverRunsEventCountFailure	Failure
	5	Limiter3UnderRunsEventCountFailure	Failure
	6	Fixed Current	Function Check
	7	Saturated Current	Out of Specification
Device Specific Status - byte 19			
19	0	Not used	n/a
	1	Not used	n/a
	2	Watchdog reset	Failure
	3	Power cycle	Maintenance Required
	4	PvStatus Uncertain	Out of Specification
	5	PvStatus Bad	Failure
	6	Operating Time Maintenance Demanded	Maintenance Required
	7	Operating Time Maintenance Required	Maintenance Required
Device Specific Status - byte 20			

Byte	Bit	Meaning	Class
20	0	Operating TimeSSS Maintenance Demanded	Maintenance Required
	1	OperatingTimeSSS Maintenance Required	Maintenance Required
	2	Service Maintenance Demanded	Maintenance Required
	3	Service Maintenance Required	Maintenance Required
	4	Calibration Maintenance Demanded	Maintenance Required
	5	Calibration Maintenance Required	Maintenance Required
	6	Loop Voltage Below Limit	n/a
	7	Loop Voltage Above Limit	Failure
Device Specific Status - byte 21			
21	0	Limiter1AboveLimit	Out of Specification
	1	Limiter1BelowLimit	Out of Specification
	2	Limiter2AboveLimit	Out of Specification
	3	Limiter2BelowLimit	Out of Specification
	4	Limiter3AboveLimit	Out of Specification
	5	Limiter3BelowLimit	Out of Specification
	6	Connection Loss to SSS	Failure
	7	Safety Error	Failure
Device Specific Status - byte 22			
22	0	Not used	n/a
	1	Not used	
	2	Not used	
	3	Not used	
	4	Not used	
	5	Not used	
	6	Not used	
	7	Not used	
Device Specific Status - byte 23			
23	0	Not used	n/a
	1	Not used	
	2	Not used	
	3	Not used	
	4	Not used	
	5	Not used	
	6	Not used	
	7	Not used	
Device Specific Status - byte 24			
24	0	Not used	n/a

Byte	Bit	Meaning	Class
	1	Not used	
	2	Not used	
	3	Not used	
	4	Not used	
	5	Not used	
	6	Not used	
	7	Not used	

Table 5: Device Status

"Not used" bits are always set to 0.

8 Universal Commands

All universal commands are implemented according HART Rev. 7.6

#	Description
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
7	Read Loop Configuration
8	Read Dynamic Variable Classification
9	Read Device Variable With Status
11	Read Unique Identifier Associated With Tag
12	Read Message
13	Read Tag, Descriptor, Date
14	Read Primary Variable Transducer Information
15	Read Device Information
16	Read Final Assembly Number
17	Write Message
18	Write Tag, Descriptor, Date
19	Write Final Assembly Number
20	Read Long Tag
21	Read Unique Identifier Associated With Long Tag
22	Write Long Tag
38	Reset Configuration Changed Flag
48	Read Additional Device Status

Table 6: Universal Commands

8.1 Command #3

Command #3 returns the following preconfigured values:

- PV: Distance (configurable)
- SV: Sensor Temperature (configurable)
- TV: Level (configurable)
- QV: Space (configurable)

8.2 Command #15: Read Device Information / Write Protect Code

The command returns the FW Write protection of the device that can be set using command 130.

9 Common Practice Commands

9.1 Supported Commands

The device supports the following Common Practice commands according to HART Rev. 7.6:

Number	Description
33	Read Device Variables
34	Write PV Damping Value
35	Write PV Range Values
36	Set Primary Variable Upper Range Value
37	Set Primary Variable Lower Range Value
40	Enter Exit Fixed PV Current Mode
41	Perform Self-Test
42	Perform Device Reset
44	Write PV Units
45	Trim PV Current DAC Zero
46	Trim PV Current DAC Gain
47	Write Primary Variable Transfer Function
50	Read Device Variable Assignments
51	Write Device Variable Assignments
53	Write Device Variable Units
54	Read Device Variable Information
55	Write Device Variable Damping Value
59	Write Number of Response Preambles
72	Squawk
73	Find Device
95	Read Device Communication Statistics
111	Transfer Service Control (Block Data Transfer)
112	Transfer Service (lock Data Transfer)
523	Read Condensed Status Mapping Array
526	Write Status Simulation Mode

527	Simulate Status Bit

Table 7: Common practice commands

9.2 Burst Mode

This device does not support the Burst-Mode.

9.3 Catch Device Variable

This device does not support Catch Device Variable.

9.4 Command #34 Write Primary Damping Value

The Primary Variable Damping Value represents one time constant. (The output response to a step input is 63% of final steady-state value after this time has elapsed.) Both the analog and digital outputs of the Primary Variable utilize this value. The damping applied to these outputs may be also affected by other commands. Possible Values are 0.0s to 100.0s..

9.5 Command #36: Set Primary Variable Upper Range Value

The device allows the Upper Range Value of the Primary Variable to be lower than its Lower Range Value, enabling the device to be operated with a reversed output.

9.6 Command #37: Set Primary Variable Lower Range Value

The device allows the Upper Range Value of the Primary Variable to be lower than its Lower Range Value, enabling the device to be operated with a reversed output.

9.7 Command #40: Enter / Exit Fixed Primary Variable Current Mode

Values between 3.55 mA and 23.0 mA can be selected if the current is active (no multidrop).

9.8 Command #42: Perform Master Reset

The device will save some data to non-volatile memory and then perform the reset. After the reset the device will need some time (about 20s) to resume normal operation.

9.9 Command #45: Trim Primary Variable Current DAC Zero

The output must be set to 4mA with command 40.

9.10 Command #46: Trim Primary Variable Current DAC Gain

The output must be set to 20mA with command 40.

9.11 Command #47: Write Primary Variable Transfer Function

The transfer function is supported but only has 1 valid value.

Code	Transfer Function Description	Used for
0	Linear	Level

Table 8: Level Transfer functions

9.12 Command #53: Write Device Variable Units

The HART master is able to modify the device variable units for those device variables assigned to one of the following unit classification:

Unit Classification	Base Unit
Length	M
Temperature	°C
Volume	m^3
Volumetric Flow	m^3/s
None	none

Table 9: Level Device VariableUnits

For details see chapter: supported engineering units.

9.13 Command #72: Squawk

This command is intended to identify which device is configured. The device that receives this command will signal that it was addressed. This is indicated by starting the Display Self-Test. If no display is present the Response Code 9 “Unable to Squawk” will be returned.

9.14 Command #111: Transfer Service Control

This command opens virtual connection to the field device. The service to be provided is defined by the Port assignment:

File description	HART port number	Required access level	Size
Read Configuration Log	133	Read-only	
Read TRENDLOG	146	Standard	
Read Diagnostic Log	147	Standard	
Read Generic Internal File (internal file id specified in HART_BLOCKXFER_FILE_ID)	238	file specific	
Write Generic Internal File (internal file id specified in HART_BLOCKXFER_FILE_ID)	239	file specific	

Table 10: Port assignment

9.15 Command #112: Block Transfer

This command passes data between a field device and a master via port previously opened using command 111. For Port definition see command 111.

10 Device Specific Commands

This chapter specifies the device specific commands that are implemented.
The HART specification specifies that device specific commands are in the range of 128...253 (126 commands), as well as the additional device specific commands 64768...65021 (254 commands).
The additional area is not used by the current version of the device.

#	Description
130	Write Standard User PIN (EUP)
131	Read Current Access Level of the device
149	Read Parameter(s) from Identifier range
150	Write Parameter(s) to Identifier range
211	Transfer Service Control
212	Block Transfer

Table 11: Device Specific commands

10.1 Command #130: Write Standard User PIN

Operation: WRITE

By writing the correct PIN the Access-Level of the device is raised to EUP (Standard). Now the user can change most of the parameters. If the PIN security is activated, writing a wrong PIN or a timeout (10 min) will cause the Access-Level to switch back to Read only mode.
Every Write-Access to a parameter/command restarts the timeout.

The device has only one access level independent of the interface.

Request Data Bytes

Byte	Format	Description
0…1	Unsigned-16	Standard User PIN

Response Data Bytes

Byte	Format	Description
0…1	Unsigned-16	Written Standard User PIN (PID_WP_INPUT_PIN)
2	Enum	Resulting Access-Level 0 - (Read only) 1 (EUP) - Standard

Command-Specific Response Codes

Code	Class	Description	Explanation
0	Success	No Command-Specific Errors	
5	Error	Too Few Data Bytes Received	Not enough data for standard PIN
6	Error	Device Specific Command Error	

10.2 Command #131: Read Current Access Level

Operation: READ

This command reads the currently set Access Level of the device.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0	Enum	Current Access Level 0 (Read only) 1 (EUP - Standard)

Command-Specific Response Codes

Code	Class	Description	Explanation
0	Success	No Command-Specific Errors	
6	Error	Device Specific Command Error	

10.3 Command #149: Read Parameter from Identifier range

This command is a general read access command, used to read one or more parameters in a consecutive identifier range from the device. Parameters are returned in device units as specified by the assigned unit parameter.

Request Data Bytes

Byte	Format	Description
0..1	Unsigned-16	Transaction Identifier
2	Unsigned-8	Number of Parameters (n)
3..4	Unsigned-16	Identifier of Parameter 1
5..6	Unsigned-16	Identifier of Parameter 2
		…
*2*n+1..2*n+2*	Unsigned-16	Identifier of Parameter **n**

Response Data Bytes

Byte	Format	Description
0..1	Unsigned-16	Transaction Identifier
2	Unsigned-8	Number of Parameters (n)
3..4	Unsigned-16	Identifier of Parameter 1
5..x	<parameter-specific>	Value of Parameter 1
…	Unsigned-16	Identifier of Parameter 2
…	<parameter-specific>	Value of Parameter 2
		…
…	Unsigned-16	Identifier of Parameter n
…	<parameter-specific>	Value of Parameter n

Command-Specific Response Codes

Code	Class	Description	Explanation
0	Success	No Command-Specific Errors	
2	Error	Invalid Selection	Register does not exist
5	Error	Too Few Data Bytes Received	Not enough data for these Identifiers
6	Error	Device Specific Command Error	
16	Error	Access Restricted	Identifier is not readable
30	Error	Command Response Truncated	Response would be too large

10.4 Command #150: Write Parameter(s) to Identifier range

This command is a general write access command, used to write one or more parameters within a consecutive Identifier range into the device. Parameters must be written in device units as specified by the assigned unit parameter (similar to command 146).

Request Data Bytes

Byte	Format	Description
0..1	Unsigned-16	Transaction Identifier
2	Unsigned-8	Number of Parameters (n)
3..4	Unsigned-16	Identifier of Parameter 1
5..x	<parameter-specific>	Value of Parameter 1
…	Unsigned-16	Identifier of Parameter 2
…	<parameter-specific>	Value of Parameter 2
		…
…	Unsigned-16	Identifier of Parameter n
…	<parameter-specific>	Value of Parameter n

Response Data Bytes

Byte	Format	Description
0..1	Unsigned-16	Transaction Identifier
2	Unsigned-8	Number of Parameters (n)
3..4	Unsigned-16	Identifier of Parameter 1
5..x	<parameter-specific>	Value of Parameter 1
…	Unsigned-16	Identifier of Parameter 2
…	<parameter-specific>	Value of Parameter 2
		…
…	Unsigned-16	Identifier of Parameter n
…	<parameter-specific>	Value of Parameter n

Command-Specific Response Codes

Code	Class	Description	Explanation
0	Success	No Command-Specific Errors	
2	Error	Invalid Selection	Register does not exist or number of registers does not match.
3	Error	Parameter too large	Provided value is too large
4	Error	Parameter too small	Provided value is too small
5	Error	Too Few Data Bytes Received	Not enough data for a Identifier range
6	Error	Device Specific Command Error	
7	Error	Write Protected	Device is in write-protect-mode
8	Warning	Set to Nearest Possible Value	Value was adapted
16	Error	Access Restricted	Identifier range is not writeable

10.5 Command # 211: Transfer Service Control (same as cmd#111)

Command 211 is identical to command 111. This is necessary because some host systems do not support the build-ins for block transfer. This is an alternative command used to get the data.

For details and the supported ports, see the specification for command 111.

10.6 Command #212: Block Transfer (same as cmd#112)

Command 212 is identical to command 112. This is necessary because some host systems do not support the build-ins for block transfer. This is an alternative command used to get the data.

For details and the supported ports, see the specification for command 111 and command 112.

11 Family Specific Commands

There are no device family specific HART commands.

12 Supported Engineering Units

The following tables list the engineering units supported by this device.

12.1 Percent of Range

HART Code	Symbol	Description
57	%	Percent

Table 12: Unit - Percent of Range

12.2 Current

HART Code	Symbol	Description
39	mA	Milliamp

Table 13: Unit - Current

12.3 Length (Device Variable Classification 69)

Based on Table 2.69 of HART Communication Foundation Document HCF_SPEC-183

HART Code	Symbol	Description
44	ft	Feet
45	m	Meters
47	in	Inches
48	cm	Centimeters
49	mm	Millimeters

Table 14: Unit -Length

12.4 Temperature (Device Variable Classification 64)

Based on Table 2.64 of HART Communication Foundation Document HCF_SPEC-183

HART Code	Symbol	Description
32	°C	Degrees Celsius
33	°F	Degrees Fahrenheit
34	°R	Degrees Rankine
35	K	Kelvin

Table 15: Unit - Temperature

12.5 Volume (Device Variable Classification 68)

Based on Table 2.68 of HART Communication Foundation Document HCF_SPEC-183

HART Code	Symbol	Description
40	gal	US gallons
41	l	Liters
42	gal (UK)	Imperial gallons
43	m^3	Cubic meters
46	bbl	Barrels 1 barrel (oil) equals 42 U.S. gallons
110	bu	Bushels
111	yd^3	Cubic yards
112	ft^3	Cubic feet
113	in^3	Cubic inches
124	bbl (US)	bbl liq 1 liquid barrel equals 31.5 U.S. gallons
166	Nm^3	Normal cubic meters at 0 ºC, 1 Atmosphere
167	Nl	Normal liters at 0 ºC, 1 Atmosphere
236	hl	Hectoliters

Table 16: Unit -Volume

12.6 Volumetric Flow (Device Variable Classification 66)

Based on Table 2.66 of HART Communication Foundation Document HCF_SPEC-183

HART Code	Symbol	Description
15	Ft^3/min	Cubic feet per minute
16	gal/min	Gallons per minute
17	l/min	Liters per minute
18	gal (UK)/min	Imperial gallons per minute
19	M^3/h	Cubic meter per hour
22	gal/s	Gallons per second
23	Mgal/d	Million gallons per day
24	l/s	Liters per second
25	Ml/d	Million liters per day
26	ft^3/s	Cubic feet per second
27	ft^3/d	Cubic feet per day
28	m^3/s	Cubic meters per second
29	m^3/d	Cubic meters per day
30	gal (UK)/ h	Imperial gallons per hour
31	gal (UK)/d	Imperial gallons per day
121	Nm^3/s	Normal cubic meters per hour at 0 ºC, 1 Atmosphere
122	Nl/h	Normal liters per hour at 0 ºC, 1 Atmosphere
123	SCF/min	Standard cubic feet per minute at 20 ºC, 1 Atmosphere
130	ft^3/h	Cubic feet per hour
131	m^3/min	Cubic meters per minute
132	bbl/s	barrels per second 1 barrel (oil) equals 42 U.S. gallons
133	bbl/min	Barrels per minute 1 barrel (oil) equals 42 U.S. gallons)
134	bbl/h	Barrels per hour 1 barrel (oil) equals 42 U.S. gallons)
135	bbl/d	Barrels per day 1 barrel (oil) equals 42 U.S. gallons)
136	gal/h	Gallons per hour
137	gal (UK)/s	Imperial gallons per second
138	l/h	Liters per hour

185	SCF/h	Standard cubic feet per hour at 20 ºC, 1 Atmosphere
235	gal/d	Gallons per day

Table 17: Unit –Volume Flow

12.7 Custom

HART Code	Symbol	Description
253	<string>	User defined string

Table 18: Unit - Custom

12.8 Scheduled Maintenance Times

Based on Table 2.70 of HART Communication Foundation Document HCF_SPEC-183

HART Code	Symbol	Description
52	hours	Hours
53	days	Days
253	years	Years

Table 19: Unit - Time

13 Parameters and Enumerations

13.1 Parameters

ID	Type	Name	Handling	Description
0x03CA	float32	FAE_LEVEL_PV_LOWER_SENSOR_LIMIT	r/w	Lower scaling point
0x03CC	float32	FAE_SPACE_PV_LOWER_SENSOR_LIMIT	r/w	Lower scaling point
0x03CE	float32	FAE_DISTANCE_PV_LOWER_SENSOR_LIMIT	r/w	Lower scaling point
0x03D0	float32	FAE_TEMPERATURE1_PV_LOWER_SENSOR_LIMIT	r/w	Lower scaling point
0x03D2	float32	FAE_LEVEL_PV_UPPER_SENSOR_LIMIT	r/w	Upper scaling point
0x03D4	float32	FAE_SPACE_PV_UPPER_SENSOR_LIMIT	r/w	Upper scaling point
0x03D6	float32	FAE_DISTANCE_PV_UPPER_SENSOR_LIMIT	r/w	Upper scaling point
0x03D8	float32	FAE_TEMPERATURE1_PV_UPPER_SENSOR_LIMIT	r/w	Upper scaling point
0x0496	uinteger16	PID_SSS_SERIAL_NUMBER	r	Sensor serial number
0x0499	uinteger16	PID_SSS_OPERATING_HOURS	r	Operating time sensor
0x04B0	uinteger8	PID_SSS_SIMULATION_MODE	r/w	Simulation mode See Table: Simulation Mode Options
0x04B1	float32	PID_SSS_SIMULATED_PV	r/w	Simulation value
0x04B3	uinteger8	PID_SSS_SIMULATED_PVSTATUS	r/w	PV status Quality code to simulate. See Table: PV Status Options
0x04B5	float32	PID_SSS_SIMULATION_RAMP_END	r/w	Ramp end
0x04B7	uinteger16	PID_SSS_SIMULATION_RAMP_STEPS	r/w	Ramp steps
0x04B8	uinteger16	PID_SSS_SIM_RAMP_STEP_TIME	r/w	Ramp duration
0x07D0	uinteger8	PAR_TB_LOE_FLAG	r	Fail-safe loss of echo
0x07E2	integer16	PAR_TB_CONF_LONG	r	Confidence
0x07E3	integer16	PAR_TB_CONF_SHORT	r	Short shot confidence
0x07E5	integer16	PAR_TB_NOISE_PEAK	r	Noise peak
0x07E6	integer16	PAR_TB_NOISE_AVERAGE	r	Noise average
0x07F3	integer16	PAR_TB_ECHO_STRENGTH_SHORT	r	Short shot echo signal strength
0x07F4	integer16	PAR_TB_ECHO_STRENGTH_LONG	r	Echo signal strength
0x0825	float32	PID_SSS_L_SENSOR_VALUE	r	Distance
0x0837	float32	PAR_TB_VELOCITY	r/w	Sound velocity
0x0C52	string16	PAR_PB_DATE_OF_BIRTH	r/w	Manufacture date
0x0C61	uinteger16	PAR_TB_FAIL_SAFE_TIMER	r/w	Fail-safe LOE timer
0x0C62	float32	PAR_TB_LOWER_LEVEL_LIMIT	r/w	Low-level cutoff
0x0C6A	float32	PID_SSS_L_SENSOR_OFFSET	r/w	Sensor offset
0x0C6C	uinteger8	PAR_TB_NUMBER_LONG_SHOTS	r/w	Number of long shots
0x0C79	float32	PAR_TB_ECHO_LOCK_WINDOW	r/w	Echo lock window
0x0C84	uinteger16	PAR_TB_WINDOW_SILL_SET	r/w	Echo marker setting
0x0C85	uinteger16	PAR_TB_ECHO_LOCK	r/w	Echo lock See Table: Echo Lock Options
0x0C86	uinteger8	PAR_TB_ALGORITHM	r/w	Algorithm See Table: Algorithm Options

ID	Type	Name	Handling	Description
0x0C87	uinteger16	PAR_TB_NARROW_ECHO_FILTER	r/w	Narrow echo filter
0x0C8C	uinteger8	PAR_TB_TVT_HOVER	r/w	Hover level
0x0C90	float32	PAR_TB_FAR_RANGE	r/w	Far range
0x0C92	float32	PAR_TB_NEAR_RANGE	r/w	Near range
0x0C94	float32	PAR_TB_SENSOR_HI_LIMIT	r	Upper limit
0x0C96	float32	PAR_TB_SENSOR_LO_LIMIT	r	Lower limit
0x0C98	float32	PAR_TB_PV_MINIMUM_SPAN_0	r	Minimum measuring span
0x0C9A	float32	PAR_TB_PV_MINIMUM_SPAN_1	r	Minimum measuring span
0x0C9C	float32	PAR_TB_PV_MINIMUM_SPAN_2	r	Minimum measuring span
0x0CAF	uinteger8	PAR_TB_ECHO_KALMAN_MODE	r/w	Kalman-filter See Table: Disabled Enabled Options
0x0CB1	float32	PAR_TB_EMPTY_RATE_LIMIT	r/w	Empty rate
0x0CB3	float32	PAR_TB_FILL_RATE_LIMIT	r/w	Fill rate
0x0CBD	uinteger8	PAR_TB_TVT_SHAPER_MODE	r/w	Custom TVT shaper mode See Table: Disabled Enabled Options
0x0CBE	integer16	PAR_TB_TVT_SHAPER_1	r/w	Breakpoint 1
0x0CBF	integer16	PAR_TB_TVT_SHAPER_2	r/w	Breakpoint 2
0x0CC0	integer16	PAR_TB_TVT_SHAPER_3	r/w	Breakpoint 3
0x0CC1	integer16	PAR_TB_TVT_SHAPER_4	r/w	Breakpoint 4
0x0CC2	integer16	PAR_TB_TVT_SHAPER_5	r/w	Breakpoint 5
0x0CC3	integer16	PAR_TB_TVT_SHAPER_6	r/w	Breakpoint 6
0x0CC4	integer16	PAR_TB_TVT_SHAPER_7	r/w	Breakpoint 7
0x0CC5	integer16	PAR_TB_TVT_SHAPER_8	r/w	Breakpoint 8
0x0CC6	integer16	PAR_TB_TVT_SHAPER_9	r/w	Breakpoint 9
0x0CC7	integer16	PAR_TB_TVT_SHAPER_10	r/w	Breakpoint 10
0x0CC8	integer16	PAR_TB_TVT_SHAPER_11	r/w	Breakpoint 11
0x0CC9	integer16	PAR_TB_TVT_SHAPER_12	r/w	Breakpoint 12
0x0CCA	integer16	PAR_TB_TVT_SHAPER_13	r/w	Breakpoint 13
0x0CCB	integer16	PAR_TB_TVT_SHAPER_14	r/w	Breakpoint 14
0x0CCC	integer16	PAR_TB_TVT_SHAPER_15	r/w	Breakpoint 15
0x0CCD	integer16	PAR_TB_TVT_SHAPER_16	r/w	Breakpoint 16
0x0CCE	integer16	PAR_TB_TVT_SHAPER_17	r/w	Breakpoint 17
0x0CCF	integer16	PAR_TB_TVT_SHAPER_18	r/w	Breakpoint 18
0x0CD0	integer16	PAR_TB_TVT_SHAPER_19	r/w	Breakpoint 19
0x0CD1	integer16	PAR_TB_TVT_SHAPER_20	r/w	Breakpoint 20
0x0CD2	integer16	PAR_TB_TVT_SHAPER_21	r/w	Breakpoint 21
0x0CD3	integer16	PAR_TB_TVT_SHAPER_22	r/w	Breakpoint 22
0x0CD4	integer16	PAR_TB_TVT_SHAPER_23	r/w	Breakpoint 23
0x0CD5	integer16	PAR_TB_TVT_SHAPER_24	r/w	Breakpoint 24
0x0CD6	integer16	PAR_TB_TVT_SHAPER_25	r/w	Breakpoint 25
0x0CD7	integer16	PAR_TB_TVT_SHAPER_26	r/w	Breakpoint 26
0x0CD8	integer16	PAR_TB_TVT_SHAPER_27	r/w	Breakpoint 27
0x0CD9	integer16	PAR_TB_TVT_SHAPER_28	r/w	Breakpoint 28
0x0CDA	integer16	PAR_TB_TVT_SHAPER_29	r/w	Breakpoint 29
0x0CDB	integer16	PAR_TB_TVT_SHAPER_30	r/w	Breakpoint 30
0x0CDC	integer16	PAR_TB_TVT_SHAPER_31	r/w	Breakpoint 31
0x0CDD	integer16	PAR_TB_TVT_SHAPER_32	r/w	Breakpoint 32
0x0CDE	integer16	PAR_TB_TVT_SHAPER_33	r/w	Breakpoint 33
0x0CDF	integer16	PAR_TB_TVT_SHAPER_34	r/w	Breakpoint 34
0x0CE0	integer16	PAR_TB_TVT_SHAPER_35	r/w	Breakpoint 35

ID	Type	Name	Handling	Description
0x0CE1	integer16	PAR_TB_TVT_SHAPER_36	r/w	Breakpoint 36
0x0CE2	integer16	PAR_TB_TVT_SHAPER_37	r/w	Breakpoint 37
0x0CE3	integer16	PAR_TB_TVT_SHAPER_38	r/w	Breakpoint 38
0x0CE4	integer16	PAR_TB_TVT_SHAPER_39	r/w	Breakpoint 39
0x0CE5	integer16	PAR_TB_TVT_SHAPER_40	r/w	Breakpoint 40
0x0CE6	integer16	PAR_TB_CONF_THRESH_LONG	r/w	Echo threshold
0x0CE7	uinteger8	PAR_TB_REFORM_ECHO	r/w	Reform echo
0x0CEA	float32	PAR_TB_ECHO_TIME_LEF_SCOPE	r/w	CLEF range
0x0CF2	uinteger8	PAR_TB_AUTO_NEAR_TVT_MODE	r/w	Auto false echo suppression See Table: Auto False Echo Suppression Options
0x0CF3	float32	PAR_TB_AUTO_NEAR_TVT_RANGE	r/w	Auto false echo suppression range
0x0CF9	uinteger8	PAR_TB_ECHO_POSITION	r/w	Position detect
0x0D02	float32	PAR_TB_FOLF_TIME_CONSTANT	r/w	Sensor damping value
0x0D13	float32	PAR_TB_FAR_RANGE_DEFAULT	r	Far range
0x0D15	float32	PAR_TB_FAR_RANGE_MAX	r	Upper limit
0x0D1F	float32	PID_SSS_L_CAL_LO	r/w	Lower calibration point
0x0D21	float32	PID_SSS_L_CAL_HI	r/w	Upper calibration point
0x0D23	float32	PID_SSS_L_LEVEL_LO	r/w	Lower level point
0x0D25	float32	PID_SSS_L_LEVEL_HI	r/w	Upper level point
0x0D2A	uinteger8	PAR_TB_SCHEDULER_FTP_LOOP_SPEED	r/w	FTP loop speed
0x0DEE	uinteger8	PAR_TB_FAIL_SAFE_LOE	r/w	Fail-safe loss of echo See Table: Fail-safe Loss of Echo Options
0x0E50	uinteger16	PAR_TB_CONFIG_DIRTY_FLAG	r/w	Config dirty flag
0x0E6C	float32	PAR_TB_LONG_SHOT_FREQ	r/w	Long shot frequency
0x0E6E	float32	PAR_TB_LONG_TX_WIDTH	r/w	Long shot duration
0x0E74	float32	PAR_TB_VELOCITY_AT_20C	r/w	Sound velocity (20°C)
0x0E7C	uinteger8	PAR_TB_NUMBER_SHORT_SHOTS	r/w	Number of short shots
0x0E7D	float32	PAR_TB_SHORT_SHOT_FREQ	r/w	Short shot frequency
0x0E7F	float32	PAR_TB_SHORT_TX_WIDTH	r/w	Short shot duration
0x0E85	integer16	PAR_TB_CONF_THRESH_SHORT	r/w	Short shot echo threshold
0x0EA0	uinteger8	PAR_TB_ATTN_CONTROL	r/w	Gain control See Table: Gain Control Options
0x0EA1	integer16	PAR_TB_ATTN_SATURATION_HI	r/w	Gain upper threshold
0x0EA2	integer16	PAR_TB_ATTN_SATURATION_LO	r/w	Gain lower threshold
0x0ED8	uinteger8	PID_EX_CERTIFICATE	r	Device certificates See Table: Device certificates Bits
0x1770	string32	PID_PRODUCT_NAME	r	Product name
0x178A	string16	PID_PRODUCT_HWREVISION	r	HW version
0x1792	string16	PID_PRODUCT_FWVERSION	r	FW version
0x179A	string32	PID_DEVICE_SERIAL_NUMBER	r	Serial number
0x17AA	string32	PID_ORDER_NUMBER	r	Article number
0x17BA	string32	PID_ORDER_OPTIONS1	r	Order option 1
0x17CA	string32	PID_ORDER_OPTIONS2	r	Order option 2
0x1822	uinteger16	PID_TASS_SERIAL_NUMBER	r	Serial number
0x1834	uinteger16	PID_HARDWARE_EXCHANGE_COUNTER	r	HW exchange counter

ID	Type	Name	Handling	Description
0x1857	uinteger16	PID_WP_STORED_PIN	r/w	Read - Current access level See Table: Current Access Level Options Write - User PIN
0x1859	uinteger16	PID_WP_SUPER_PIN	w	Enter PUK
0x186B	uinteger16	PID_WP_RECOVERY_NUMBER	r	Recovery ID
0x1889	uinteger8	PID_KEYPAD_LOCK	r/w	Button lock See Table: Disabled Enabled Options
0x1901	uinteger8	PID_LANGUAGE	r	Language See Table: Language Options
0x1906	uinteger8	PID_DEFAULT_PROCESS_VALUE	r/w	PV to display on start view See Table: PV to Display On Start View Options
0x190A	uinteger8	PID_DSS_LOCATION_DISPLAY	r/w	Service view See Table: Disabled Enabled Options
0x1914	uinteger8	PID_SET_TO_DEFAULT	w	Reset See Table: Reset Options
0x193C	uinteger16	PID_TASS_PRECALCULATED_VALIDATIONKEY	r	PreValidation key
0x193D	string6	PID_TASS_CALCULATED_VALIDATION KEY	r	Validation key
0x1940	uinteger16	PID_TASS_VALIDATIONKEY	r/w	Enter validation key
0x1942	uinteger16	PID_TRANSITION_BLOCK_INFO	r	Reason(s) See Table: Transition Block Info Bits
0x19E1	uinteger8	PID_SIMULATION_MODE_DIAGNOSTICS	r	Simulation
0x1A2C	uinteger16	PID_OPERATING_TIME_UNIT	r/w	Time See Table: Scheduled Maintenance Time Units
0x1A2D	float32	PID_EXPECTED_OPERATING_TIME	r/w	Operating time
0x1A2F	float32	PID_ELAPSED_OPERATING_TIME	r	Elapsed time
0x1A31	float32	PID_REMAINING_OPERATING_TIME	r	Remaining time
0x1A33	uinteger8	PID_RESET_ELAPSED_OPERATING_TIME	w	Reset elapsed time
0x1A34	uinteger8	PID_OPERATING_TIME_MONITORING	r/w	Monitoring See Table: Monitoring Options
0x1A35	float32	PID_OPERATING_TIME_LIMIT_MAINTENANCE_REQUIRED	r/w	Maintenance required
0x1A37	float32	PID_OPERATING_TIME_LIMIT_MAINTENANCE_DEMANDED	r/w	Maintenance demanded
0x1A3B	uinteger16	PID_OPERATING_TIME_UNIT_SSS	r/w	Time See Table: Scheduled Maintenance Time Units
0x1A3C	float32	PID_EXPECTED_OPERATING_TIME_SSS	r/w	Operating time
0x1A3E	float32	PID_ELAPSED_OPERATING_TIME_SSS	r	Elapsed time
0x1A40	float32	PID_REMAINING_OPERATING_TIME_SSS	r	Remaining time
0x1A42	uinteger8	PID_RESET_ELAPSED_OPERATING_TIME_SSS	w	Reset elapsed time
0x1A43	uinteger8	PID_OPERATING_TIME_MONITORING_SSS	r/w	Monitoring See Table: Monitoring Options
0x1A44	float32	PID_OPERATING_TIME_LIMIT_MAINTENANCE_REQUIRED_SSS	r/w	Maintenance required
0x1A46	float32	PID_OPERATING_TIME_LIMIT_MAINTENANCE_DEMANDED_SSS	r/w	Maintenance demanded
0x1AA8	uinteger16	PID_CONFIGURATION_LOG_ENTRIES	r	Number of entries

ID	Type	Name	Handling	Description
0x1AC2	uinteger8	PID_TRENDLOG_NB_INPUTS	r/w	Number of logging values See Table: Number of Logging Values Options
0x1AC3	uinteger16	PID_TRENDLOG_NB_SAMPLES	r/w	Number of logged points
0x1AC5	uinteger8	FAE_TRENDLOG_INPUT_SELECT_0	r/w	Logged value 1 See Table: PV Selection Options
0x1AC6	uinteger8	FAE_TRENDLOG_INPUT_SELECT_1	r/w	Logged value 2 See Table: PV Selection Options
0x1AC7	uinteger8	FAE_TRENDLOG_INPUT_SELECT_2	r/w	Logged value 3 See Table: PV Selection Options
0x1ACD	uinteger16	PID_TRENDLOG_INTERVAL	r/w	Logging interval
0x1ACE	uinteger8	PID_TRENDLOG_BUFFER_BEHAVIOR	r/w	Logging behavior See Table: Logging Behavior Options
0x1ACF	uinteger8	PID_TRENDLOG_RESET	w	Reset
0x1AD0	uinteger16	PID_TRENDLOG_AVAILABLE_SAMPLES	r	Number of available points
0x1AE5	uinteger16	PID_TRENDLOG_STARTTIME	r	Start time
0x1AE7	uinteger8	PID_TRENDLOG_FTP_NB_INPUTS	r/w	Number of process values
0x1AE8	uinteger16	PID_TRENDLOG_FTP_NB_SAMPLES	r/w	Number of points to read
0x1AEA	uinteger8	PID_TRENDLOG_FTP_INPUT_SELECT_1	r/w	Input select 1 See Table: PV Selection Options
0x1AEB	uinteger8	PID_TRENDLOG_FTP_INPUT_SELECT_2	r/w	Input select 2 See Table: PV Selection Options
0x1AEC	uinteger8	PID_TRENDLOG_FTP_INPUT_SELECT_3	r/w	Input select 3 See Table: PV Selection Options
0x1AED	uinteger16	PID_TRENDLOG_FTP_SAMPLE_DENSITY	r/w	Point density
0x1AEE	uinteger16	PID_TRENDLOG_FTP_STARTTIME	r/w	Start time to read
0x1AF4	uinteger16	PID_TASS_OPERATING_HOURS	r	Operating time
0x1B24	float32	FAE_TASS_POINTER_0_MIN_VALUE	r	Minimum
0x1B26	float32	FAE_TASS_POINTER_1_MIN_VALUE	r	Minimum
0x1B28	float32	FAE_TASS_POINTER_2_MIN_VALUE	r	Minimum
0x1B60	float32	FAE_TASS_POINTER_0_MAX_VALUE	r	Maximum
0x1B62	float32	FAE_TASS_POINTER_1_MAX_VALUE	r	Maximum
0x1B64	float32	FAE_TASS_POINTER_2_MAX_VALUE	r	Maximum
0x1B9C	uinteger8	PID_RESET_MIN_MAX_POINTERS	w	Reset peak values
0x1B9E	uinteger16	PID_SERVICE_TIME_UNIT	r/w	Time See Table: Scheduled Maintenance Time Units
0x1B9F	float32	PID_SERVICE_INTERVAL	r/w	Service interval
0x1BA1	float32	PID_SERVICE_ELAPSED_TIME	r	Elapsed time
0x1BA3	float32	PID_SERVICE_REMAINING_TIME	r	Remaining time
0x1BA5	uinteger8	PID_RESET_SERVICE_ELAPSED_TIME	w	Reset elapsed time
0x1BA6	uinteger8	PID_SERVICE_MONITORING	r/w	Monitoring See Table: Monitoring Options
0x1BA7	float32	PID_SERVICE_LIMIT_MAINTENANCE_REQUIRED	r/w	Maintenance required
0x1BA9	float32	PID_SERVICE_LIMIT_MAINTENANCE_DEMANDED	r/w	Maintenance demanded
0x1BAD	uinteger16	PID_CALIBRATION_TIME_UNIT	r/w	Time See Table: Scheduled Maintenance Time Units
0x1BAE	float32	PID_CALIBRATION_INTERVAL	r/w	Calibration interval

ID	Type	Name	Handling	Description
0x1BB0	float32	PID_CALIBRATION_ELAPSED_TIME	r	Elapsed time
0x1BB2	float32	PID_CALIBRATION_REMAINING_TIME	r	Remaining time
0x1BB4	uinteger8	PID_RESET_CALIBRATION_ELAPSED_TIME	w	Reset elapsed time
0x1BB5	uinteger8	PID_CALIBRATION_MONITORING	r/w	Monitoring See Table: Monitoring Options
0x1BB6	float32	PID_CALIBRATION_LIMIT_MAINTENANCE_REQUIRED	r/w	Maintenance required
0x1BB8	float32	PID_CALIBRATION_LIMIT_MAINTENANCE_DEMANDED	r/w	Maintenance demanded
0x1BC2	float32	FAE_TEMPERATURE1_PV	r	Temperature
0x1BFB	uinteger8	FAE_TEMPERATURE1_PVUNIT	r	Temperature units See Table: Temperature Units
0x1BFC	uinteger8	FAE_VOLUME_PVUNIT	r/w	Volume units See Table: Volume Units
0x1BFD	uinteger8	FAE_CUSTOM_PVUNIT	r/w	Custom units See Table: Custom Units
0x1C00	uinteger8	FAE_DAMPED_PVUNIT	r/w	Units See Tables: Length Units, Temperature Units, Volume Units, Volume Flow Units, Custom Units
0x1C04	uinteger8	FAE_FLOW_PVUNIT	r/w	Volume flow units See Table: Volume Flow Units
0x1C0C	float32	PID_SELECTED_LOWER_RANGE_LIMIT	r	Lower scaling point
0x1C0E	float32	PID_SELECTED_UPPER_RANGE_LIMIT	r	Upper scaling point
0x1C10	float32	FAE_LEVEL_PV_LOWER_RANGE_LIMIT	r/w	Minimum
0x1C12	float32	FAE_SPACE_PV_LOWER_RANGE_LIMIT	r/w	Lower scaling point
0x1C14	float32	FAE_DISTANCE_PV_LOWER_RANGE_LIMIT	r/w	Lower scaling point
0x1C16	float32	FAE_TEMPERATURE1_PV_LOWER_RANGE_LIMIT	r/w	Lower scaling point
0x1C18	float32	FAE_VOLUME_PV_LOWER_RANGE_LIMIT	r/w	Lower scaling point
0x1C1A	float32	FAE_CUSTOM_PV_LOWER_RANGE_LIMIT	r/w	Lower scaling point
0x1C20	float32	FAE_DAMPED_PV_LOWER_RANGE_LIMIT	r/w	Minimum
0x1C28	float32	FAE_FLOW_PV_LOWER_RANGE_LIMIT	r/w	Lower scaling point
0x1C38	float32	FAE_LEVEL_PV_UPPER_RANGE_LIMIT	r/w	Maximum
0x1C3A	float32	FAE_SPACE_PV_UPPER_RANGE_LIMIT	r/w	Upper scaling point
0x1C3C	float32	FAE_DISTANCE_PV_UPPER_RANGE_LIMIT	r/w	Upper scaling point
0x1C3E	float32	FAE_TEMPERATURE1_PV_UPPER_RANGE_LIMIT	r/w	Upper scaling point
0x1C40	float32	FAE_VOLUME_PV_UPPER_RANGE_LIMIT	r/w	Upper scaling point
0x1C42	float32	FAE_CUSTOM_PV_UPPER_RANGE_LIMIT	r/w	Upper scaling point
0x1C48	float32	FAE_DAMPED_PV_UPPER_RANGE_LIMIT	r/w	Maximum
0x1C50	float32	FAE_FLOW_PV_UPPER_RANGE_LIMIT	r/w	Upper scaling point
0x1C60	float32	FAE_LEVEL_PV_MINSPAN	r	Minimum measuring span
0x1C62	float32	FAE_SPACE_PV_MINSPAN	r	Minimum measuring span

ID	Type	Name	Handling	Description
0x1C64	float32	FAE_DISTANCE_PV_MINSPAN	r	Minimum measuring span
0x1C66	float32	FAE_TEMPERATURE1_PV_MINSPAN	r	Minimum measuring span
0x1C68	float32	FAE_VOLUME_PV_MINSPAN	r	Minimum measuring span
0x1C6A	float32	FAE_CUSTOM_PV_MINSPAN	r	Minimum measuring span
0x1C70	float32	FAE_DAMPED_PV_MINSPAN	r	Minimum measuring span
0x1C78	float32	FAE_FLOW_PV_MINSPAN	r	Minimum measuring span
0x1C88	uinteger8	PID_PV_SELECTOR	r/w	PV selection See Table: PV Selection Options
0x1C9F	float32	PID_UPPER_RANGE	r/w	Upper range value
0x1CA1	float32	PID_LOWER_RANGE	r/w	Lower range value
0x1CAD	float32	PID_DAMPING_TIME	r/w	Damping value
0x1CAF	string12	PID_CUSTOM_PVUNIT_STRING	r/w	Custom units
0x1D88	string2	PID_HART_COUNTRY_CODE	r	Country code
0x1D94	uinteger8	FAE_LEVEL_PV_FAMILY_CODE	r	Device family
0x1D95	uinteger8	FAE_SPACE_PV_FAMILY_CODE	r	Device family
0x1D96	uinteger8	FAE_DISTANCE_PV_FAMILY_CODE	r	Device family
0x1D97	uinteger8	FAE_TEMPERATURE1_PV_FAMILY_CODE	r	Device family
0x1D98	uinteger8	FAE_VOLUME_PV_FAMILY_CODE	r	Device family
0x1D99	uinteger8	FAE_CUSTOM_PV_FAMILY_CODE	r	Device family
0x1DA0	uinteger8	FAE_FLOW_PV_FAMILY_CODE	r	Device family
0x1DA8	uinteger16	FAE_LEVEL_PV_ACQUISITION_PERIOD	r	Acquisition Period
0x1DAA	uinteger16	FAE_SPACE_PV_ACQUISITION_PERIOD	r	Acquisition Period
0x1DAC	uinteger16	FAE_DISTANCE_PV_ACQUISITION_PERIOD	r	Acquisition Period
0x1DAE	uinteger16	FAE_TEMPERATURE1_PV_ACQUISITION_PERIOD	r	Acquisition Period
0x1DB0	uinteger16	FAE_VOLUME_PV_ACQUISITION_PERIOD	r	Acquisition Period
0x1DB2	uinteger16	FAE_CUSTOM_PV_ACQUISITION_PERIOD	r	Acquisition Period
0x1DB8	uinteger16	FAE_DAMPED_PV_ACQUISITION_PERIOD	r	Acquisition Period
0x1DC0	uinteger16	FAE_FLOW_PV_ACQUISITION_PERIOD	r	Acquisition Period
0x1E01	uinteger16	PID_HART_BLOCKDT_FILE_SPECIFIC_DATA	r/w	Block file ID
0x1E02	uinteger16	PID_HART_BLOCKDT_FILEID_TO_OPEN	r/w	Block file specific data
0x1E39	uinteger8	PID_HART_BLOCK_TRANSFER_MODE	r/w	HART block transfer mode See Table: HART Bock Transfer Mode Options
0x1E78	uinteger8	FAE_LIMITER_INPUT_0	r/w	Monitored value See Table: PV Selection Options
0x1E79	uinteger8	FAE_LIMITER_INPUT_1	r/w	Monitored value See Table: PV Selection Options
0x1E7A	uinteger8	FAE_LIMITER_INPUT_2	r/w	Monitored value See Table: PV Selection Options
0x1E7B	float32	FAE_LIMITER_HIGH_LIMIT_0	r/w	Upper limit
0x1E7D	float32	FAE_LIMITER_HIGH_LIMIT_1	r/w	Upper limit
0x1E7F	float32	FAE_LIMITER_HIGH_LIMIT_2	r/w	Upper limit

ID	Type	Name	Handling	Description
0x1E81	float32	FAE_LIMITER_LOW_LIMIT_0	r/w	Lower limit
0x1E83	float32	FAE_LIMITER_LOW_LIMIT_1	r/w	Lower limit
0x1E85	float32	FAE_LIMITER_LOW_LIMIT_2	r/w	Lower limit
0x1E87	uinteger8	FAE_LIMITER_PVUNIT_0	r	Limit monitoring 1 Units See Tables: Length Units, Temperature Units, Volume Units, Volume Flow Units, Custom Units
0x1E88	uinteger8	FAE_LIMITER_PVUNIT_1	r	Limit monitoring 2 Units See Tables: Length Units, Temperature Units, Volume Units, Volume Flow Units, Custom Units
0x1E89	uinteger8	FAE_LIMITER_PVUNIT_2	r	Limit monitoring 3 Units See Tables: Length Units, Temperature Units, Volume Units, Volume Flow Units, Custom Units
0x1E8A	uinteger8	FAE_LIMITER_ENABLE_0	r/w	Limit monitoring See Table: Disabled Enabled Options
0x1E8B	uinteger8	FAE_LIMITER_ENABLE_1	r/w	Limit monitoring See Table: Disabled Enabled Options
0x1E8C	uinteger8	FAE_LIMITER_ENABLE_2	r/w	Limit monitoring See Table: Disabled Enabled Options
0x1E90	float32	FAE_LIMITER_HYSTERESIS_0	r/w	Hysteresis
0x1E92	float32	FAE_LIMITER_HYSTERESIS_1	r/w	Hysteresis
0x1E94	float32	FAE_LIMITER_HYSTERESIS_2	r/w	Hysteresis
0x1E96	uinteger16	FAE_LIMITER_EVENTCOUNTER_NUMBER_OF_OVERFLOWS_0	r	Events
0x1E97	uinteger16	FAE_LIMITER_EVENTCOUNTER_NUMBER_OF_OVERFLOWS_1	r	Events
0x1E98	uinteger16	FAE_LIMITER_EVENTCOUNTER_NUMBER_OF_OVERFLOWS_2	r	Events
0x1E99	uinteger16	FAE_LIMITER_EVENTCOUNTER_NUMBER_OF_UNDERFLOWS_0	r	Events
0x1E9A	uinteger16	FAE_LIMITER_EVENTCOUNTER_NUMBER_OF_UNDERFLOWS_1	r	Events
0x1E9B	uinteger16	FAE_LIMITER_EVENTCOUNTER_NUMBER_OF_UNDERFLOWS_2	r	Events
0x1E9C	uinteger8	FAE_LIMITER_EVENTCOUNTER_RESET_0	w	Limiter and event counter reset
0x1E9D	uinteger8	FAE_LIMITER_EVENTCOUNTER_RESET_1	w	Limiter and event counter reset
0x1E9E	uinteger8	FAE_LIMITER_EVENTCOUNTER_RESET_2	w	Limiter and event counter reset
0x1E9F	uinteger16	FAE_LIMITER_EVENTCOUNTER_OVERFLOW_LIMIT_0	r/w	Threshold
0x1EA0	uinteger16	FAE_LIMITER_EVENTCOUNTER_OVERFLOW_LIMIT_1	r/w	Threshold
0x1EA1	uinteger16	FAE_LIMITER_EVENTCOUNTER_OVERFLOW_LIMIT_2	r/w	Threshold
0x1EA2	uinteger8	FAE_LIMITER_EVENTCOUNTER_OVERFLOW_ACTION_0	r/w	Action See Table: Limiter Action Options
0x1EA3	uinteger8	FAE_LIMITER_EVENTCOUNTER_OVERFLOW_ACTION_1	r/w	Action See Table: Limiter Action Options
0x1EA4	uinteger8	FAE_LIMITER_EVENTCOUNTER_OVERFLOW_ACTION_2	r/w	Action See Table: Limiter Action Options
0x1EA5	uinteger16	FAE_LIMITER_EVENTCOUNTER_UNDERFLOW_LIMIT_0	r/w	Threshold
0x1EA6	uinteger16	FAE_LIMITER_EVENTCOUNTER_UNDERFLOW_LIMIT_1	r/w	Threshold

ID	Type	Name	Handling	Description
0x1EA7	uinteger16	FAE_LIMITER_EVENTCOUNTER_UNDERFLOW_LIMIT_2	r/w	Threshold
0x1EA8	uinteger8	FAE_LIMITER_EVENTCOUNTER_UNDERFLOW_ACTION_0	r/w	Action See Table: Limiter Action Options
0x1EA9	uinteger8	FAE_LIMITER_EVENTCOUNTER_UNDERFLOW_ACTION_1	r/w	Action See Table: Limiter Action Options
0x1EAA	uinteger8	FAE_LIMITER_EVENTCOUNTER_UNDERFLOW_ACTION_2	r/w	Action See Table: Limiter Action Options
0x1F47	float32	PID_LOWER_SATURATION_LIMIT	r/w	Lower saturation limit
0x1F49	float32	PID_UPPER_SATURATION_LIMIT	r/w	Upper saturation limit
0x1F4B	float32	PID_LOWER_FAILURE_CURRENT	r/w	Lower fault current
0x1F4D	float32	PID_UPPER_FAILURE_CURRENT	r/w	Upper fault current
0x1F4F	uinteger8	PID_FAILURE_CURRENT_SELECT	r/w	Fault current See Table: Fault Current Options
0x1F53	float32	PID_CURRENT_MULTIDROP_VALUE	r/w	Loop current value in multidrop mode
0x1F6F	float32	PID_CURRENT_TRIM_OFFSET	r/w	Loop current offset
0x1F71	float32	PID_CURRENT_TRIM_GAIN	r/w	Loop current gain
0x1FC6	float32	PID_LIN_TABLE_X_1	r/w	X-value 1
0x1FC8	float32	PID_LIN_TABLE_X_2	r/w	X-value 2
0x1FCA	float32	PID_LIN_TABLE_X_3	r/w	X-value 3
0x1FCC	float32	PID_LIN_TABLE_X_4	r/w	X-value 4
0x1FCE	float32	PID_LIN_TABLE_X_5	r/w	X-value 5
0x1FD0	float32	PID_LIN_TABLE_X_6	r/w	X-value 6
0x1FD2	float32	PID_LIN_TABLE_X_7	r/w	X-value 7
0x1FD4	float32	PID_LIN_TABLE_X_8	r/w	X-value 8
0x1FD6	float32	PID_LIN_TABLE_X_9	r/w	X-value 9
0x1FD8	float32	PID_LIN_TABLE_X_10	r/w	X-value 10
0x1FDA	float32	PID_LIN_TABLE_X_11	r/w	X-value 11
0x1FDC	float32	PID_LIN_TABLE_X_12	r/w	X-value 12
0x1FDE	float32	PID_LIN_TABLE_X_13	r/w	X-value 13
0x1FE0	float32	PID_LIN_TABLE_X_14	r/w	X-value 14
0x1FE2	float32	PID_LIN_TABLE_X_15	r/w	X-value 15
0x1FE4	float32	PID_LIN_TABLE_X_16	r/w	X-value 16
0x1FE6	float32	PID_LIN_TABLE_X_17	r/w	X-value 17
0x1FE8	float32	PID_LIN_TABLE_X_18	r/w	X-value 18
0x1FEA	float32	PID_LIN_TABLE_X_19	r/w	X-value 19
0x1FEC	float32	PID_LIN_TABLE_X_20	r/w	X-value 20
0x1FEE	float32	PID_LIN_TABLE_X_21	r/w	X-value 21
0x1FF0	float32	PID_LIN_TABLE_X_22	r/w	X-value 22
0x1FF2	float32	PID_LIN_TABLE_X_23	r/w	X-value 23
0x1FF4	float32	PID_LIN_TABLE_X_24	r/w	X-value 24
0x1FF6	float32	PID_LIN_TABLE_X_25	r/w	X-value 25
0x1FF8	float32	PID_LIN_TABLE_X_26	r/w	X-value 26
0x1FFA	float32	PID_LIN_TABLE_X_27	r/w	X-value 27
0x1FFC	float32	PID_LIN_TABLE_X_28	r/w	X-value 28
0x1FFE	float32	PID_LIN_TABLE_X_29	r/w	X-value 29
0x2000	float32	PID_LIN_TABLE_X_30	r/w	X-value 30
0x2002	float32	PID_LIN_TABLE_X_31	r/w	X-value 31
0x2004	float32	PID_LIN_TABLE_X_32	r/w	X-value 32
0x2006	float32	PID_LIN_TABLE_Y_1	r/w	Y-value 1

ID	Type	Name	Handling	Description
0x2008	float32	PID_LIN_TABLE_Y_2	r/w	Y-value 2
0x200A	float32	PID_LIN_TABLE_Y_3	r/w	Y-value 3
0x200C	float32	PID_LIN_TABLE_Y_4	r/w	Y-value 4
0x200E	float32	PID_LIN_TABLE_Y_5	r/w	Y-value 5
0x2010	float32	PID_LIN_TABLE_Y_6	r/w	Y-value 6
0x2012	float32	PID_LIN_TABLE_Y_7	r/w	Y-value 7
0x2014	float32	PID_LIN_TABLE_Y_8	r/w	Y-value 8
0x2016	float32	PID_LIN_TABLE_Y_9	r/w	Y-value 9
0x2018	float32	PID_LIN_TABLE_Y_10	r/w	Y-value 10
0x201A	float32	PID_LIN_TABLE_Y_11	r/w	Y-value 11
0x201C	float32	PID_LIN_TABLE_Y_12	r/w	Y-value 12
0x201E	float32	PID_LIN_TABLE_Y_13	r/w	Y-value 13
0x2020	float32	PID_LIN_TABLE_Y_14	r/w	Y-value 14
0x2022	float32	PID_LIN_TABLE_Y_15	r/w	Y-value 15
0x2024	float32	PID_LIN_TABLE_Y_16	r/w	Y-value 16
0x2026	float32	PID_LIN_TABLE_Y_17	r/w	Y-value 17
0x2028	float32	PID_LIN_TABLE_Y_18	r/w	Y-value 18
0x202A	float32	PID_LIN_TABLE_Y_19	r/w	Y-value 19
0x202C	float32	PID_LIN_TABLE_Y_20	r/w	Y-value 20
0x202E	float32	PID_LIN_TABLE_Y_21	r/w	Y-value 21
0x2030	float32	PID_LIN_TABLE_Y_22	r/w	Y-value 22
0x2032	float32	PID_LIN_TABLE_Y_23	r/w	Y-value 23
0x2034	float32	PID_LIN_TABLE_Y_24	r/w	Y-value 24
0x2036	float32	PID_LIN_TABLE_Y_25	r/w	Y-value 25
0x2038	float32	PID_LIN_TABLE_Y_26	r/w	Y-value 26
0x203A	float32	PID_LIN_TABLE_Y_27	r/w	Y-value 27
0x203C	float32	PID_LIN_TABLE_Y_28	r/w	Y-value 28
0x203E	float32	PID_LIN_TABLE_Y_29	r/w	Y-value 29
0x2040	float32	PID_LIN_TABLE_Y_30	r/w	Y-value 30
0x2042	float32	PID_LIN_TABLE_Y_31	r/w	Y-value 31
0x2044	float32	PID_LIN_TABLE_Y_32	r/w	Y-value 32
0x2046	float32	PID_VESSEL_DIMENSION_A	r/w	Vessel dimension A
0x2048	float32	PID_VESSEL_DIMENSION_B	r/w	Vessel dimension L
0x204D	uinteger8	PID_TRANSFER_SELECT	r/w	Linearization type See Table: Linearization Type Options
0x204E	uinteger8	PID_VESSEL_SHAPE	r/w	Vessel shape See Table: Vessel Shape Options
0x204F	uinteger16	PID_OCM_PRIMARY_ELEMENT	r/w	Primary measuring device See Table: Primary Measuring Device Options
0x2050	float32	PID_OCM_EXPONENT	r/w	Flow exponent
0x2052	float32	PID_OCM_K_FACTOR	r/w	K-factor
0x2054	float32	PID_OCM_V_NOTCH	r/w	V-notch angle
0x2056	float32	PID_OCM_SLOPE	r/w	Slope
0x2058	float32	PID_OCM_ROUGHNESS_COEF	r/w	Roughness coefficient
0x205A	uinteger8	PID_OCM_METHOD	r/w	Method of flow calculation See Table: Method of Flow Calculation Options
0x205B	float32	FAE_OCM_DIMENSION_1	r/w	OCM dimension 1
0x205D	float32	FAE_OCM_DIMENSION_2	r/w	OCM dimension 2
0x205F	float32	FAE_OCM_DIMENSION_3	r/w	OCM dimension 3

ID	Type	Name	Handling	Description
0x2061	float32	FAE_OCM_DIMENSION_4	r/w	OCM dimension 4
0x2080	uinteger16	PID_QS_ENTRY_MATERIAL_TYPE	r/w	Material type for Quickstart See Table: Material Type Options
0x2081	uinteger8	PID_QS_ENTRY_APPLICATION	r/w	Operation for Quickstart See Table: Operation Options
0x2082	uinteger8	PID_QS_ENTRY_UNITS	r/w	Units for Quickstart See Table: Length Units
0x2083	uinteger16	PID_QS_ENTRY_RESPONSE_RATE	r/w	Response rate for Quickstart See Table: Response Rate Options
0x2084	float32	PID_QS_ENTRY_CAL_LO	r/w	Lower calibration point for Quickstart
0x2086	float32	PID_QS_ENTRY_CAL_HI	r/w	Upper calibration point for Quickstart
0x20B2	float32	PID_UC_ENTRY_AFES_RANGE	r/w	Auto false echo suppression range for Wizard
0x20B4	float32	PID_UC_ENTRY_OFFSET_DISTANCE	r/w	Actual distance for Wizard
0x20B6	float32	PID_UC_ENTRY_VELOCITY_DISTANCE	r/w	Actual distance for Wizard
0x20B8	uinteger16	PID_UC_ENTRY_AFES_RANGE_APPLY	w	Apply for Wizard
0x20B9	uinteger16	PID_UC_ENTRY_OFFSET_DISTANCE_ APPLY	w	Apply for Wizard
0x20BA	uinteger16	PID_UC_ENTRY_VELOCITY_DISTANCE _APPLY	w	Apply for Wizard
0x20BE	uinteger8	PID_MENU_ENTRY_LENGTH_UNIT	r/w	Units See Table: Length Units
0x20D0	uinteger8	PID_QS_ENTRY_VOL_VESSEL_SHAPE	r/w	Vessel shape for Quickstart See Table: Vessel Shape Options
0x20D1	float32	PID_QS_ENTRY_VOL_DIMENSION_A	r/w	Vessel dimension A for Quickstart
0x20D3	float32	PID_QS_ENTRY_VOL_DIMENSION_B	r/w	Vessel dimension L for Quickstart
0x20D5	float32	PID_QS_ENTRY_VOL_MAX_VOLUME	r/w	Upper range value for Quickstart
0x20D7	uinteger8	PID_QS_ENTRY_VOL_UNITS	r/w	Volume units for Quickstart See Table: Volume Units
0x20E4	uinteger8	PID_QS_ENTRY_OCM_PMD	r/w	Primary measuring device for Quickstart See Table: Primary Measuring Device Options
0x20E5	float32	PID_QS_ENTRY_OCM_EXPONENT	r/w	Flow exponent for Quickstart
0x20E7	float32	PID_QS_ENTRY_OCM_K_FACTOR	r/w	K-factor for Quickstart
0x20E9	float32	PID_QS_ENTRY_OCM_V_NOTCH	r/w	V-notch angle for Quickstart
0x20EB	float32	PID_QS_ENTRY_OCM_SLOPE	r/w	Slope for Quickstart
0x20ED	float32	PID_QS_ENTRY_OCM_ROUGHNESS_C OEF	r/w	Roughness coefficient for Quickstart
0x20EF	float32	PID_QS_ENTRY_OCM_MAX_HEAD	r/w	Upper scaling point for Quickstart
0x20F1	uinteger8	PID_QS_ENTRY_OCM_METHOD	r/w	Method of flow calculation for Quickstart See Table: Method of Flow Calculation Options
0x20F2	float32	PID_QS_ENTRY_OCM_MAX_AT_20MA	r/w	Upper range value for Quickstart
0x20F4	uinteger8	PID_QS_ENTRY_OCM_UNITS	r/w	Volume flow units for Quickstart See Table: Volume Flow Units
0x20F5	uinteger8	PID_QS_ENTRY_OCM_DECIMALS	r/w	Decimal places for Quickstart
0x20F6	float32	PID_QS_ENTRY_OCM_DIMENSION_1	r/w	OCM dimension 1 for Quickstart
0x20F8	float32	PID_QS_ENTRY_OCM_DIMENSION_2	r/w	OCM dimension 2 for Quickstart
0x20FA	float32	PID_QS_ENTRY_OCM_DIMENSION_3	r/w	OCM dimension 3 for Quickstart
0x20FC	float32	PID_QS_ENTRY_OCM_DIMENSION_4	r/w	OCM dimension 4 for Quickstart
0x210C	float32	PID_QS_ENTRY_CUSTOM_MAX_AT_20 MA	r/w	Upper range value for Quickstart
0x210E	string12	PID_QS_ENTRY_CUSTOM_PVUNIT_ST	r/w	Custom units for Quickstart

ID	Type	Name	Handling	Description
		RING		
0x2167	uinteger16	PID_QS_TASK_TIMEOUT_SEC	r	Timeout
0x2168	uinteger16	PID_QS_ENTRY_APPLY	r/w	Apply for Quickstart See Table: Apply for Quickstart Options
0x2169	uinteger8	PID_QS_WRITE_STATUS	r	Status
0x2280	uinteger8	PID_NV_DIAGLOG_NB_RECORDS	r	Number of entries

Table 20: Parameters

13.2 Simulation Mode

Simulation mode	Value
Disable	0
Enable fixed	1
Enable ramp	2

Table 21: Simulation Mode Options

13.3 PV Status

PV status	Value
Bad	00
Uncertain	01
Good	10

Table 22: PV Status Options

13.4 Echo Lock

Echo lock	Value
Off	0
On	1
Material agitator	2

Table 23: Echo Lock Options

13.5 Algorithm

Algorithm	Value
Area largest first	1
Largest echo	3
Echo area largest	5
Best of first and largest echo	8
True first echo	12

Table 24: Algorithm Options

13.6 Disable Enable

Disable Enable	Value
Disabled	0
Enabled	1

Table 25: Disable Enable Options

13.7 Auto False Echo Suppression

Auto false echo suppression	Value
Disabled	0
Enabled	1
Learn	2

Table 26: Auto false echo suppression Options

13.8 Fail-safe loss of echo

Fail-safe loss of echo	Value

Hold	0
Fault current	1

Table 27: Fail-safe loss of echo Options

13.9 Gain Control

Gain control	Value
Off	0
On	1
Auto	2

Table 28: Gain Control Options

13.10 Device Certificates

Device certificates	Value
Intrinsic safety	0x01
Flame proof explosion proof	0x02
Nonsparking nonincendive	0x04
Protection by enclosure dust ignition proof	0x08
Increased safety	0x10
Protection by encapsulation	0x20

Table 29: Device Certificate Bits

13.11 Default User Access Level

Default user access level	Value
Read only	0
Standard	1

Table 30: Default User Access Level Options

13.12 Current Access Level

Current access level	Value
Read only	0
Standard	1

Table 31: Current Access Level Options

13.13 Language

Language	Value
English	0
German	1
French	2
Italian	3
Spanish	4
Chinese	5

Table 32: Language Options

13.14 PV to display on start view

PV to display on start view	Value
Distance	2
Level	0
Space	1
Volume	4
Volume flow	12
Custom	5
Loop current	10
Primary variable	8
Percent of range	9
Sensor temperature	3

Table 33: PV to Display on Start View Options

13.15 Reset Options

Reset	Value
Factory reset	1
Reset sensor calibration	2
Restore DAC calibration	3
Restore ordered configuration	4

Table 34: Reset Options

13.16 Number of Logging Values

Number of logging values	Value
Disabled	0
One	1
Two	2
Three	3

Table 35: Number of logging values Options

13.17 Logging Behavior

Logging behavior	Value
Overwrite oldest	0
Fill and stop	1

Table 36: Logging behavior Options

13.18 Monitoring

Monitoring	Value
Off	0
Only timer on	1
Maintenance required	2
Maintenance required demanded	3

Table 37: Monitoring Options

13.19 PV Selection

PV selection	Value
Level	0
Space	1
Distance	2
Sensor temperature	3
Volume	4
Volume flow	12
Custom	5

Table 38: PV Selection Options

13.20 HART Block Transfer Mode

HART block transfer mode	Value
Auto	0
Manual	1

Table 39: HART Block Transfer Mode Options

13.21 Limiter Action

Limiter Action	Value
Disabled	0
Process alarms	1
Maintenance required	2
Maintenance alarm	3

Table 40: Limiter Action Options

13.22 Fault Current

Fault current	Value
Upper fault current	0
Lower fault current	1

Table 41: Fault Current Options

13.23 Linearization Type

Linearization type	Value
None	0
Volume	1
Volume flow	2
Custom	3

Table 42: Linearization Type Options

13.24 Vessel Shape

Vessel shape	Value
Vessel linear	100
Vessel cylinder	105
Vessel sphere	107
Vessel conical bottom	101
Vessel parabolic bottom	102
Vessel half sphere bottom	103
Vessel flat sloped bottom	104
Vessel parabolic ends	106

Table 43: Vessel Shape Options

13.25 Primary Measuring Device

Primary measuring device	Value
Exponential devices	1
Rectangular flume bs3680	2
Round nose horizontal crest weir	3
Trapezoidal flume bs3680	4
U flume bs3680	5
Finite crest weir bs3680	6
Thin plate rectangular weir bs3680	7
Thin plate v notch weir bs3680	8
Rectangular weir contracted	9
Round pipe	10
Palmer-Bowlus flume	11
H flume	12

Table 44: Primary Measuring Device Options

13.26 Method of Flow Calculation

Method of flow calculation	Value
Absolute	0
Ratiometric	1

Table 45: Method of Flow Calculation Options

13.27 Material Type

Material type	Value
Liquid	0
Solid	1

Table 46: Material Type Options

13.28 Operation

Operation	Value
Level	0
Space	1
Distance	2
Volume	4
Volume flow	12

Custom	5

Table 47: Operation Options

13.29 Response Rate

Response rate	Value
Slow	0
Medium	1
Fast	2

Table 48: Response Rate Options

13.30 Apply for Quickstart

Apply for Quickstart	Value
Do nothing	0
Apply	1

Table 49: Apply for Quickstart Options

14 Performance

14.1 Sampling Rates

Typical sampling rates are shown in the following table:

Value	Samples /Time
Sensor temperature	100ms (1 times of CyclicTime)
Level	100ms (1 times of CyclicTime)
Distance	100ms (1 times of CyclicTime)
Space	100ms (1 times of CyclicTime)
Volume	100ms (1 times of CyclicTime)
Loop Current	100ms (1 times of CyclicTime)
Percent of Range	100ms (1 times of CyclicTime)
Analog output update	100ms (1 times of CyclicTime)

Table 50: Level Sampling rate

CyclicTime = 100ms

14.2 Power-Up

Upon power up, the transmitter goes through an internal initialization procedure. During this period, the device will not respond to HART commands, and the analog output is set to smaller than 3,6 mA.
All the device variables will show NaN (Not-A-Number) until reliable values are available and the device completed his startup.

14.3 Device Reset

A HART master can perform a device reset by using HART Command 42 or by cycling the power. After about 4 seconds the device will be working again..

14.4 Self-Test

Command 41 (Perform Self-Test) is supported. Continuous self-testing is part of the normal device operation. Errors are reported in command#48.

14.5 Delayed Response

None

14.6 Command Response time

The response time for command response of a device is 256ms or better.

14.7 Long Message

The device supports messages with a payload of up to 255 bytes.

14.8 Non-Volatile Memory

This device contains non-volatile memory to store parameters. It cannot be assumed that the device has finished storing the parameters in non-volatile memory when a command returns. It can take up to one second until changed parameters are stored in non-volatile memory.

14.9 Modes

The product supports the fixed current mode by Command #40. A power loss or device reset clears this mode.

14.10 Damping

Damping is standard, affecting only the PV and the loop current signal.

14.11 Sensor Trim

Using sensor trim it is possible to set the characteristic of the transmitter at two adjustment points. This has the effect of improving the measurement accuracy by setting the sensor's upper and lower values close to the range of process values. The adjustment points are freely selectable within the sensor's nominal range.

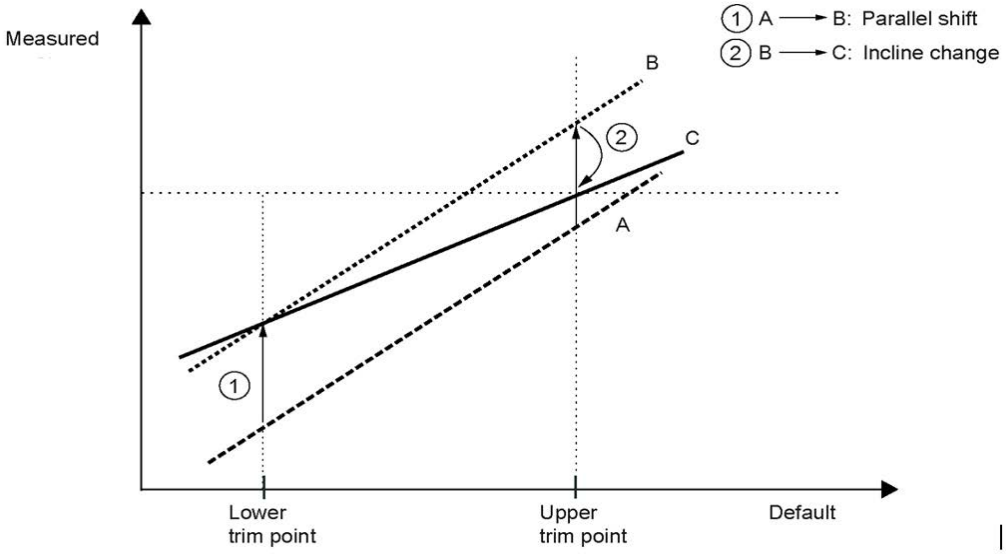

Figure 3: Sensor Trim

14.11.1 Lower Sensor Adjustment point

In this procedure, the reference value representing the lower sensor adjustment point is applied and the transmitter is instructed to accept this value. This represents an offset shift of the characteristic.

14.11.2 Upper Sensor Adjustment point

A value representing the upper sensor value is applied and the transmitter is instructed to accept this value. This corrects the characteristic slope. Adjusting the upper sensor adjusting point

will not affect the lower sensor adjusting point. The upper point must be greater than the lower point.

14.12 Access Control

Access control manages whether the HART master is allowed to modify device parameters. The general access control rules are:

- The HART interface has an access level that can be changed by providing PIN information via the HART commands 130 and 131.
- Each parameter has a protection level assigned that specifies the required access level to modify the parameter . This access level is independent of the interface (HMI, Sevice Interface and HART)
- If the access level of the HART interface is smaller than the protection level of the parameter that is desired to be modified, then the attempt to modify the parameter is rejected by the device.

Access level	Description
Restricted User Privilege (Read Only)	Having this access level, the HART master is able to modify only the device parameters without change restrictions.
End User Privilege (EUP)	Having this access level, the HART master is able to modify a subset of the device configuration. The HART master has to provide the correct end user password with HART command 130 to reach this access level..

Table 51: Access level definitions

ANNEX A. CAPABILITY CHECKLIST

Manufacturer, model and revision	42 (0x2A) Siemens SITRANS Probe LU240 Revision 1
Device type	45(0x2D)
HART revision	7.6
Device Description available	Yes
Number and type of sensors	Ultrasonic level sensor
Number and type of actuators	0
Number and type of host side signals	4 - 20mA analog
Number of Device Variables	7
Number of Dynamic Variables	4
Mappable Dynamic Variables?	Yes
Number of common-practice commands	17
Number of device-specific commands	12
Bits of additional device status	51
Alternative operating modes?	None
Burst mode?	No
Capture Device Variables?	No
Write-protection?	Yes

Table 52: Annex A – Capacity checklist

ANNEX B. REVISION HISTORY

Revision	Date	Changes
1.0	November 27, 2018	• Initial release