Honeywell

HART® 7.x Field Device Specification for STT 750 Smartline Temperature Transmitters

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1. Introduction

1.1 Scope

The Honeywell SmartLine Temperature Transmitter, STT 750, device complies with HART Protocol Revision 7.x. This document specifies all the device specific features and gives HART Protocol implementation details. The functionality of this Field Device is described sufficiently to allow its proper application in a process and its complete support in HART capable Host Applications.

1.2 Purpose

This specification is designed to complement other documentation by providing a complete, unambiguous description of this Field Device from a HART Communication perspective.

1.3 Who should use this document?

The specification is designed to be a technical reference for HART capable Host Application 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

ADC	Analog to Digital Converter
DAC	Digital to Analog Converter
EEPROM	Electrically-Erasable Programmable Read-Only Memory
ROM	Read-Only Memory
PV	Primary Variable
SV	Secondary Variable
TV	Tertiary Variable
MSG	Model Selection Guide
Float	An IEEE 754 single precision floating point value (4 bytes)

Packed	A string consisting of 6-bit alpha-numeric characters that are a subset of the ASCII character set. This allows four characters to be packed into three bytes.
Unsigned-nn	An unsigned integer where nn indicates the number of bits in this integer. Multi-byte integers are transmitted MSB-LSB.
Enum	It can be assigned any of the enumerators as a value

Table 1 Abbreviations and Definitions

1.5 References

HART Field Communications Protocol Specification. HCF_SPEC-12, Revision 7.4, dated 29 June 2012.

2. Device Identification

Manufacturer Name:	Honeywell	**Model Name(s):**	STT 750
Manufacture ID Code:	23 (17 Hex)	**Device Type Code:**	41 (2A Hex)
HART Protocol Revision	7.x	**Device Revision**:	1
Number of Device Variables	3		
Physical Layers Supported	FSK		
Physical Device Category	Transmitter, Non-DC-isolated Bus Device		

Table 2 Device Identification

The Honeywell STT 750 is designed to meet hazardous area approvals. Refer to the STT 750 Transmitter User's manual (34-TT-25-13) on the available methods of protections for use in hazardous locations.

3. Product Overview

3.1 Transmitter

The STT 750 Temperature Transmitter measures the process temperature and transmits an output signal proportional to the measured variable over a 4 to 20 mA, two-wire loop. A diagrammatic representation of STT 750 is shown in Figure 1.

Supported mode of loop operation (referred as Loop control mode).

1. Sensor – Loop PV controlled by sensor input.

The STT 750 can transmit its output in either an analog 4 to 20 mA format for direct digital communications with our TPS system, Allen-Bradley PLCs and other control systems. Besides the process variable (PV) output, the transmitter also provides the Cold junction temperature as a secondary variable, Sensor inputs as tertiary variables, which are available as read-only parameters through the MC Toolkit when the transmitter is in its analog mode.

It supports multiple various TC, RTD; mV & Ohms sensor types Refer Annex.

A configuration tool (Honeywell MCToolkit) is connected to the loop wiring of the STT 750 transmitter for direct communication with the transmitter. The handheld device communicates with the transmitter via the HART interface.

Note: The multiple mounting configurations are possible and are fully described in the STT 750 Installation and User Manuals.

Figure 1 Typical Communication Interface

3.2 Communicator Purpose

The communicator allows the user to adjust transmitter values, or diagnose potential problems from a remote location such as the control room. The communicator can be used to:

- Configure: Define and enter the transmitter's operating parameters.
- Monitor: Read the input temperature to the transmitter in engineering units and the transmitter's output in mA or percent.
- Display: Retrieve and display data from the transmitter or the communicator's memory.
- Change Mode of Operation: Select configuration for multi-drop mode (digital) or loop current enabled (analog) operation.
- Check current output: Use the transmitter to supply the output current desired for verifying analog loop operation, troubleshooting, or calibrating other components in the analog loop.
- Troubleshoot: Check status of transmitter operation and display diagnostic messages to identify transmitter, communication, or operator error problems.
- Product Interfaces
- Process Interface

4. Product Interfaces

4.1 Process Interface

Sensor Input Channel

The primary variable is the temperature derived based on the sensor inputs and the loop control mode configured. Temperature sensors are wired externally to the transmitter.

STT 750 supports 2, 3 & 4 wire RTD sensor inputs (Pt25, Pt100, Pt200, Pt500 and Pt1000),
2- Wire thermocouple input (Types B, E, J, K, N, R, S, T and W5W26).
Mill volt (-20 to 120mV), -100 to 1200mV range and Ohm (0 to 500, 0 to 2000, 0 to 3000 range sensor inputs are supported.
Open circuit sensor analysis is carried out in every measurement cycle.
Lead wire compensation is provided for RTDs and internal digital cold junction compensation is provided for thermocouples.
Refer to the Operator Manual (see references) for connection details.

The transmitter is designed to operate in a two-wire power/current loop with loop resistance and power supply voltage within the operating range.

4.2 Host Interface

Analog Output 1: Process Temperature

The transmitter is powered via the 2 wire, 4-20 mA signal connected to the + and - terminals on the output side of the module.

This is the only output from this transmitter, representing the process temperature measurement. The data is linearized and ranged to lower and upper range values held in the non-volatile memory.

HART Communication is supported on this loop. A guaranteed linear over-range is provided. Downscale or upscale current can indicate device malfunction. The direction is selectable by the user; see Section 4.3 below.

Current values are shown in the table below.

	Direction		Values (% of range)	Values (mA or V)
Linear over-range*	Classic	Down	-1.25 % ± 0.1 %	3.8 to 4.0 mA 0.95 to 1.0 V
		Up	105.0 % ± 0.1 %	20.0 to 20.8 mA 5.0 to 5.2 V
	NAMUR	Down	-1.25 % to ± 0.1 %	3.8 to 4.0 mA 0.95 to 1.0 V
		Up	103.125 % ± 0.1 %	20.0 to 20.5 mA 5.0 to 5.125 V
Device malfunction indication	Down: less than		- 1.25 %	3.6 mA
	Up: greater than		+ 105 %	21 mA
Maximum current			+111.25%	21.8 mA
Multi-Drop current draw				4.0 mA
Lift-off voltage **				10.8 V

Table 3 Analog Output Values

* Honeywell will offer the STT 750 HART transmitter with NAMUR compliant analog outputs, in addition to the "Classic" levels traditionally featured in the product.

****** For the Lightning protection option, add 1 Volt (internal added 50 Ohm impedance).

4.3 Local Interfaces, Jumpers and Switches

The STT 750 three-button option provides a user interface and operation without the use of the MC Toolkit. Figure 2 shows the location of the three-button option and the labels for each button.

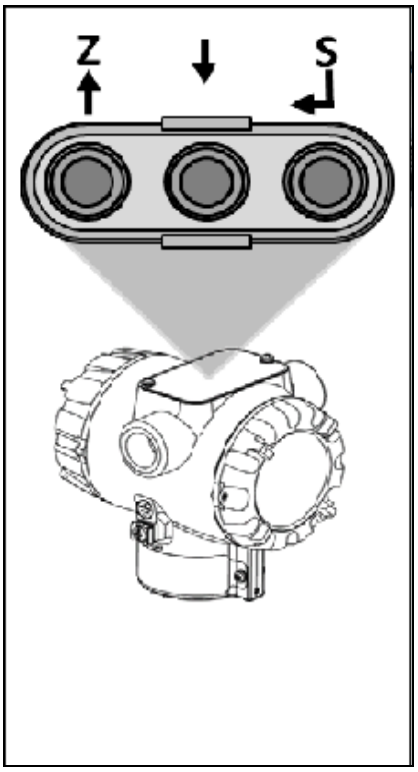

Figure 2 Three-Button Option

The functions of the three buttons are:

- **Enter** (S↵)
  - Enter the top level main menu from the normal PV display mode
  - Select a target to go down to the next menu level, up to the previous level or exit back to the PV display mode
  - Accept the current value of an entered parameter
- **Down** (↓)
  - Advance to the next configured screen when in the normal PV display mode
  - Scroll down to the next item in a menu
  - Advance through a list of parameters for configuration
  - Advance through numerical values or alpha characters for data entry
- **Up** (Z↑**)**
  - Go back to the previous configured screen when in the normal PV display mode
  - Scroll up to the previous item in a menu
  - Go back through a list of parameters for configuration
  - Go back through numerical values or alpha characters for data entry

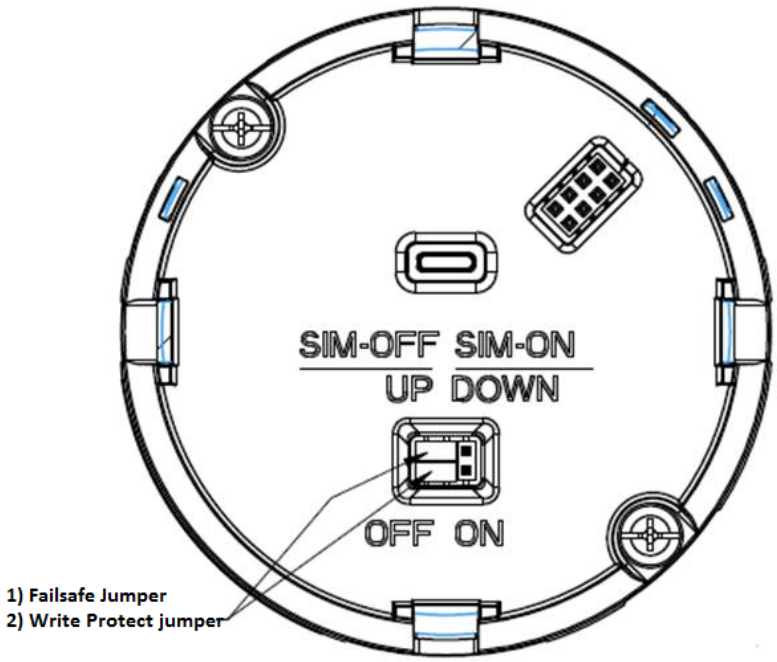

Figure 3 Locating the Failsafe Jumper

Device Malfunction

The direction of indication of a detected malfunction by the analog current output is user-selectable to up or down, by means of a two-position jumper inside the instrument. STT 750 transmitters are shipped with a default failsafe direction of upscale. This means that the transmitter's output will be driven upscale (maximum output) when the transmitter detects a critical status.

Write Protection

The STT 750 transmitters have a transmitter security option, also known as a "write protect option," which is jumper-selectable. The jumper, located on the transmitter's printed wiring assembly (PWA), can be positioned to allow read and write access or read only access to the transmitter's configuration database. When the jumper is in the read only position, the transmitter's configuration and calibration data can only be read / viewed. The factory-default jumper positions are for read and write access. The figure above shows the location of the write protect jumper on the PWA. The Write Protect hardware Jumper is placed behind the Display PWA. For accessing the hardware write protect jumper, the Display PWA needs to be removed. Also software write protect is available. Refer Common Practice command 175 &command 176. When the Device is in Hardware write protect (Jumper) then the software write protect functionality is inoperative.

4.4 Meter Display Options

The STT 750 Temperature Transmitter offers a Basic display; see Table 4.

Basic Display	• Suitable for basic process needs • 360° rotation in 90° Increments • 2 lines, 16 characters • Standard units-of-measurement: degC, degF, Rankine, Kelvin, Milli volt, Ohm • Diagnostic messaging • Out-of-range indication • Supports optional 3-Button configuration

Table 4 Available Display Characteristics

5. Device Variables

The Device variables are the same as dynamic variables however the units applicable for PV will apply to TV as well.

6. Dynamic Variables

Three Dynamic Variables are implemented.

Process Variable	Meaning	Units
PV	Temperature output	degC, degF, Rankine, Kelvin, Milli volt, Ohm
SV	Cold Junction temperature	degC, degF, Rankine, Kelvin
TV	Sensor Input temperature	degC, degF, Rankine, Kelvin, Milli volt, Ohm The unit selected for PV will be applied to TV as well

Table 5 List of Dynamic Variables

7. Status Information

7.1 Field Device Status

Many of the flags in the device status are further described by critical, non-critical, and informative flags in the additional status bytes described in section 7.3.

Bit	Name	Use
7	Device Malfunction	This flag is set to "1" when any critical failure is detected. When a "Device Malfunction" is indicated, the "More Status Available" status flag is always asserted and further information is available in the manufacturer specific status bytes. The designation for critical status, and Honeywell's unique status bytes are described in section 7.3.
6	Configuration Changed	Set when any parameter in the device configuration is changed. The flag will be reset when command 38 is received.
5	Cold Start	Set when power is first applied. The flag will also be set when the device is reset.
4	More Status Available	Set whenever any failure is detected. Command #48 gives further detail. (See section 7.3).
3	Loop Current Fixed	Set when the device is placed in fixed current mode (command 40).
2	Loop Current Saturated	Set if the primary variable is out of range. The measurement limits differ between the "classic" and "NAMUR" output options. This event does *not* set bit 7 ("Field Device Malfunction").
1	Non-Primary Variable Out Of Limits	Set if the temperature calculated from the temperature sensor is too high (greater than 125 degC for most transmitters). When this status is asserted, the "More Status Available" flag is also set, and the specific failure is indicated as "Sensor Over Temp" in the manufacturer specific status (see section 7.3).
0	Primary Variable Out of Limits	Set if the temperature is greater than the Upper Range Limit (URL) or Lower Range Limit (LRL) of the device. When this status is asserted, the "More Status Available" flag is also set, and the specific failure is indicated as Input1 Out of Range in the sensors section of manufacturer specific status (see section 7.3).

Table 6 Field Device Status

7.2 Extended Device Status

The Extended Device Status byte has the following flags:

Bit	Description	Use in Device
0	Maintenance Required	Not Used
1	Device Variable Alert	Set when a critical or non-critical error (except “In Fixed Output Current Mode”) associated with the PV has been detected (see section 7.3).
2-7	Undefined	

Table 7 Extended Device Status

7.3 Command #48 – Additional Field Device Status

Command #48 returns 8 bytes of data. The first 3 bytes contain device specific status as shown below. The Extended Device Status byte (byte 6) will be returned as defined above in section 7.2. All other bytes are unused, and will be returned as 0. The three detailed status bytes are divided by category of status: critical error and non-critical error.

Status Type	Bit	Command 48 Status
Critical status (Byte 1)	7	Comm VCC Fault
	5	Sensor Communication Timeout
	4	Sensor Critical Failure
	3	Comm Module Diag Failure
	2	Comm module Config Data Corrupt
	1	Sensor NVM Corrupted
	0	Electronic Module DAC Failure
Non critical status (Byte 2)	7	No DAC Compensation
	6	No Factory Calibration
	5	PV Out of Range
	4	Fixed Current Mode
	3	Cold junction temperature out of range
	2	Sensing Section non critical failure
	1	Comm Module Non critical Failure
	0	Display Failure

Non critical status 2 (Byte 3)	7	Low Supply Voltage (not applicable for the STT 750)
	6	No DAC Calibration
	5	Tamper Alarm
	4	Unreliable sensor communication
	3	Loop current noise
	2	AO Out of Range
	1	URV Set Error - Span Config Button
	0	LRV Set Error - Zero Config Button
Non critical status 3 (Byte 4)	6	Sensor input out of range
	5	Sensor in low power mode
	3	Sensor input open
	2	Sensor over temperature
	1	Sensor health warning

Table 8 Additional Field Device Status

All critical faults will be indicated to the user with bits 4 and 7 set in the Field Device Status byte of the response.

Some faults are cleared when the error condition is resolved, while all Critical Status faults require the device be power cycled.

8. Universal Commands

The transmitter supports version 7.x of the HART protocol, thus each universal command is as specified in that standard. The following universal commands are provided by the device:

Number	Name	Notes
0	Read Unique Identifier	Returns unique identification for the device
1	Read Primary Variable	Returns PV value and its unit
2	Read Loop Current and Percent of Range	Returns AO value and % range
3	Read Dynamic Variables and Loop Current	Returns PV and SV, TV values and corresponding unit values along with AO value
6	Write Polling Address	Changes device's polling address and loop current mode.
7	Read Loop Configuration	Returns polling address and loop current mode status.
8	Read Dynamic Variable Classifications	Returns dynamic variable classification.
9	Read Device Variables with Status	Returns dynamic variables PV, SV & TV with status.
11	Read Unique Identifier Associated With Tag	Same response as command 0
12	Read Message	Returns 24 bytes of packed ASCII data
13	Read Tag, Descriptor, Date	Returns tag, descriptor (packed ASCII format) and date from the device
14	Read Primary Variable Transducer Information	Returns transducer limits and span
15	Read Device Information	Returns burnout settings, PV unit value, LRV, URV, damping value and write protect code
16	Read Final Assembly Number	Returns final assembly number
17	Write Message	Write 24 bytes of packed ASCII data.
18	Write Tag, Descriptor, Date	Writes tag, descriptor (packed ASCII format) and date to the device
19	Write Final Assembly Number	Writes final assembly number to the device
20	Read Long Tag	Returns 32-byte Long Tag.
21	Read Unique Identifier	Returns unique identifier associated with Long Tag.

Number	Name	Notes
22	Write Long Tag	Writes Long Tag
38	Reset Configuration Changed Flag	Resets the configuration change flag
48	Read Additional Device Status	See section 11.2 for details.

Table 9 Universal Commands

9. Common-Practice Commands

9.1 Supported Common Practice Commands

The following common-practice commands are implemented:

Number	Name	Notes
33	Read Device Variables	Will return Device Variable 0 = PV (Temperature), Device Variable 1 = SV (Cold Junction Temperature), Device Variable 2 = TV (Sensor input temperature) when requested.
34	Write PV Damping Value	Accepts damping values between 0 and 102 seconds.
35	Write PV Range Values	Write PV LRV/URV values
36	Set PV Upper Range Value	Set current PV as URV. Adjusts the span accordingly.
37	Set PV Lower Range Value	Set current PV as LRV. Adjusts the span accordingly.
40	Enter/Exit Fixed Current Mode	Sets loop current to a fixed value.
42	Perform Device Reset	Resets the device
44	Write Primary Variable Units	Write PV units value If Sensor types are TC or RTD, deg C, deg F, deg R and Kelvin are applicable and if sensor type is mV then Mill volt unit is applicable and if sensor type is RTD then Ohms will be applicable
45	Trim Loop Current Zero	Trims loop current to 4mA
46	Trim Loop Current Gain	Trims loop current to 20mA
53	Write Device Variable Units	Writes Device Variable Units for PV and SV only. For TV, unit selected for PV is only applied, as the PV is computed based on TV
71	Lock Device	This command locks a device preventing any changes being made from a local panel or from another master.
76	Read Lock Device status	This command reads the current state of lock device.

Table 10 Common Practice Commands

9.2 Burst Mode

This Field Device does not support burst mode.

9.3 Catch Device Variable

This Field Device does not support Catch Device Variable.

10. Device-Specific Commands

The following device-specific commands are implemented:

Number	Name	Notes
130	Correct Sensor Input to URV	It trims the Sensor input to URV.
131	Correct Sensor Input to LRV	It trims the Sensor input to LRV.
133	Reset Corrects Sensor	It resets all the user correct operations performed for sensor.
134	Read transmitter specifics	Information about display
135	Read sensor extra configuration	Reads the sensor configuration common to both sensors.
136	Read sensor configuration	Reads the configuration specific to sensor.
138	Read URL, LRL	Reads the range limits from sensor
139	Read model number – Key Number and Table I	Reads 7 byte Key number, and Table I information. For factory use.
140	Read model number – Table II	Reads Table II information. For factory use.
141	Read model number – Table III	Reads Table III information. For factory use.
142	Read time in service, service life remaining, percent time in stress	It reads Time in Service, Service life and % life in stress.
144	Read last time and date for correct URV, correct LRV sensor	Reads Calibration records sensor.
148	Read power fail counter and its timestamp	The power fail count and Time stamp are read.
149	Read Electronics Temperature and upper tracking parameters value	Electronics Temperature maximum tracking parameters.
150	Read Electronics Temperature lower tracking parameters value	Electronics Temperature minimum tracking parameters.
155	Read current and min operating voltage and its timestamp	Reads operating voltage and minimum Time stamp.
156	Reset min terminal voltage and its time stamp	It resets the Operating Voltage records.

157	Read internal processor core temperature up tracking parameters	Reads internal processor core temperature up tracking.
158	Read internal processor core temperature down tracking parameters	Reads internal processor core temperature down tracking.
159	Read AVDD max and time stamp	Read AVDD records and Time stamp.
160	Read AVDD min and time stamp	Read AVDD records and Time stamp.
161	Read sensors and transmitter install dates	Reads sensor and transmitter installed date.
162	Read sensor board stress monitor and sensor board service life	Reads sensor board Stress and service life.
163	Write install date to sensor	Writes transmitter install date to sensor. **One time writable**.
164	Read Model Number –Table IV	Reads Table IV information. For factory use.
165	Read Previous time and date for correct URV, correct LRV sensor	Reads Calibration records Sensor.
166	Read current time and date for correct URV, correct LRV sensor	Reads Calibration records sensor.
167	Read current, last and previous reset correct Time & Date sensor	Reads Calibration records for sensor Reset corrects.
173	Sensor Bias value	Configures the senor bias value
175	Read/Lock Write Protect Configuration	Soft Write protection
176	Write/Change Write Protect Password	Changes the write Protect Password.
177	Read Database ID	Reads Database ID for the requested config history code
178	Read last 5 Configuration history	Enables to view the last 5 configuration history.
179	Read UTL, LTL	Reads the respective values
185	Read CJ-UTL, CJ-LTL	Reads the respective values
186	Read all sensor times in service	Reads Sensor, transmitter time in Service.
187	Read HART board f/w revision	It reads Communication board firmware rev. number.
188	Read the loop controlling sensor	Reads the respective values
191	Write Sensor type & Id	Configures the types and Id's of sensor
192	Write PV high and low alarm limits	Configures PV high and low alarm limits needed for PV tracking

193	Write RTD type	Configures the sensor RTD type
197	Write CJ compensation type	Configures the cold junction compensation state
198	Write Break detect	Configures the break detect status
200	Write Latching	Configures latching status
202	Write fixed CJ compensation	Configures the Cold Junction compensation value
203	Write RTD lead wire resistance	This command configures the sensor lead wire resistance.
210	Write Display Common Configuration	Writes Displays common features like Rotation time and Contrast.
211	Read Display Common Setup	Reads the display set-up.
212	Read Display Firmware Version	Reads Display Firmware Version.
213	Read Error log Part 1	Reads the latest 5 errors
214	Read Error log Part 2	Reads the oldest 5 errors
215	Reset Error Log	Resets the errors logged
216	Read Error Logging Status	Reads the error logging status
217	Write Error Logging Status	Configures the error logging status
218	Read Highest Value, Lowest Value, Time stamp, High alarm limit, Low alarm limit, Counters for PV	Reads the PV tracking values
219	Read SV up racking values	Reads SV up racking values
220	Read additional status	It reads the Device status in Detail.
221	Set Date/Time for calibration	Before Calibration it is compulsory to enter the Time and Date.
222	Sensor f/w read	Reads Sensor Firmware version
228	Read the state of “Available for maintenance” flag	Reads the status of “Available for Maintenance” Flag
229	Write “Available for maintenance” message	Enables the flag.
230	Read the Tamper configuration	Reads the tamper configuration
231	Write tamper configuration	Writes the tamper configuration.
232	Reset recorded tamper attempts	It resets the Tamper attempts recorded.

240	Reset PV Tracking values	Resets the PV tracking values.
247	Read SV down racking values	Reads SV down racking values
64768	Write View configuration I	Writes display screen configuration part 1
64769	Write View configuration II	Writes display screen configuration part 2
64770	Write View configuration III	Writes display screen configuration part 3
64771	Read View configuration I	Reads display screen configuration part 1
64772	Read View configuration II	Reads display screen configuration part 2
64773	Read View configuration III	Reads display screen configuration part 3
64790	Write upper calibration point sensor	Sensor upper calibration point write
64791	Write lower calibration point sensor	Sensor lower calibration point write
64794	Read calibration points sensor	Read sensor calibration points
64807	Read sensor ET up tracking values	Read sensor electronics temperature up tracking values
64808	Read sensor ET down tracking values	Read sensor electronics temperature down tracking values
64809	Read SHM ohms, internal processor core temperature	Read SHM ohms, internal processor core temperature
64811	Write Sensor install date	
64813	Reset CJ Tracking values	Reset Cold Junction temperature tracking values
64814	Acknowledge Latching	Acknowledge the sensor errors
64815	Write 32 byte sensor scratch pad	
64816	Read Sensor scratch pad data	Reads the sensor scratch pad data
64817	Write command for NAMUR enable and disable	
64818	Read NAMUR status	Reads whether NAMUR is enabled or disabled

Table 11 Device Specific Commands

Each device specific command is detailed below. Only the supported response codes are listed for a command.

10.1 Command #130: Correct Sensor Input to URV

This command performs a calibration trim for the sensor. The calibration temperature applied to the transmitter is received with this command and the transmitter trims the sensor calibration so that its output equals the applied value.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
None		

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
3	Error	Passed parameter too large
4	Error	Passed parameter too small
6	Error	Transmitter specific command error
7	Error	In Write Protect Mode
9	Error	Applied Process too High
10	Error	Applied process too low
16	Error	Access restricted
20	Error	Excess span corrects
32	Error	Busy

10.2 Command #131: Correct Sensor Input to LRV

This command performs a calibration trim for the sensor. The calibration temperature applied to the transmitter is received with this command and the PV is calibrated to the applied LRV input.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
None		

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
3	Error	Passed parameter too large
4	Error	Passed parameter too small
6	Error	Transmitter specific command error
7	Error	In Write Protect Mode
9	Error	Applied Process too High
10	Error	Applied process too low
16	Error	Access restricted
32	Error	Busy

10.3 Command #133: Reset Corrects sensor

This command removes the calibration of sensorand returns the performance to factory calibration. This function is useful as a diagnostic tool to get an indication of characterization performance.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
None		

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
6	Error	Transmitter specific command error
7	Error	In Write Protect Mode
16	Error	Access restricted
32	Error	Busy

10.4 Command #134: Read Transmitter Specifics

The command reads the display information.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0	Enum	Device type
1	Enum	meter connected flag 00: Not Connected 01: Connected
2	Enum	meter type 02: Basic display

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

10.5 Command #135: Read sensors extra configuration

The command is used to read configurable sensor parameters common to both sensors.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0-3	Float	Mid Range Value (MRV) - reserved
4	Enum	Break detect status
5	Enum	Cold Junction compensation type
7	Enum	Latching status
8-11	Float	Fixed cold junction compensation value

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

10.6 Command #136: Read sensor configuration

This command reads the sensor configuration parameters.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0	Enum	Sensor type (0 = MV, 1 = TC, 2 = RTD, 3 = OHMS)
1	Enum	Sensor Id (0 = mV125, 1 = mV1200, 2 = TC Type E, 3 = TC Type J, 4 = TC Type K, 5 = TC Type N, 6 = TC Type T, 7 = TC Type S, 8 = TC Type R, 9 = TC Type B, 10 = TC Type C (W5W26), 11 =RTD Pt 25, 12 = RTD Pt 100, 13 = RTD Pt 200, 14 = RTD Pt 500, 15 = RTD Pt 1000, 16 = OHM 500, 17 = OHM 2K, 18 = OHM 3K)
2	Enum	RTD type (0 = 2wire, 1 = 3wire, 2 = 4wire)
3-6	Float	RTD lead wire resistance
7-11	Float	Sensor Bias value

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

10.7 Command #138: Read URL, LRL

The command reads range limits of sensor.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0-3	Float	Upper Range Limit sensor
4-8	Float	Lower Range Limit Sensor

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
6	Error	Transmitter specific command error

10.8 Command #139: Read Model Number – Key Number, Table I

This command reads the 7 byte key number and 20 byte Table 1 information.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0-6	Enum	key number
7-26	Enum	Table 1 information

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

10.9 Command #140: Read Model Number – Table II

This command reads Model number Table II information.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0-19	Enum	Table II information

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

10.10 Command #141: Read Model Number –Table III

This command reads Model number Table III information.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0-19	Enum	Table III information

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

10.11 Command #142: Read time in service, percent time in stress, service life remaining

This command reads time in service, percent time in stress, service life remaining for the transmitter.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0-3	Enum	Time in Service
4-7	Float	Percent Time in stress
8-11	Enum	Service Life remaining

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

10.12 Command #144: Read last Time & Date for correct URV, correct LRV for Sensor

This command reads Last Time and Dates for correct URV, correct LRV of sensor

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0-4	Enum	last correct URV time (DD 1 MM 1 YY 1 HR 1 MIN 1)
5-9	Enum	last correct LRV time (DD 1 MM 1 YY 1 HR 1 MIN 1)
10-14	Enum	last zero trim time (DD 1 MM 1 YY 1 HR 1 MIN 1)

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
6	Error	Transmitter specific command error

10.13 Command #148: Read power fail counter and its timestamp

This command reads the power fail counter and its time stamp.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0-1	Enum	Power fail count
2-5	Enum	Time stamp

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

10.14 Command #149: Read ET and electronics temperature tracking values.

This command reads electronics temperature and electronics temperature tracking values.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0-3	Float	ET value
4-7	Float	ET max limit
8-11	Float	max value
12-15	Float	max time counter
16-19	Float	max time stamp

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

10.15 Command #150: Read ET lower tracking parameters

This command reads ET lower tracking parameters.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0-3	Float	ET min limit
4-7	Float	min value
8-11	Float	min time counter
12-15	Float	min time stamp

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

10.16 Command #155: Read current, minimum operating voltage and its timestamp

This command reads current, minimum operating voltage and its timestamp.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0-3	Float	Vloop current value(4),
4-7	Float	Vloop min value(4),
8-11	Float	Vloop min time stamp(4)

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

10.17 Command #156: Reset min terminal voltage and its time stamp

This command Resets min terminal voltage and its time stamp.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
None		

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
32	Error	Busy

10.18 Command #157: Read internal processor core temperature up tracking parameters

This command reads the internal processor core temperature up tracking parameters.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0-3	Float	internal processor core temperature max
4-7	Unsigned-32	max accumulator
8-11	Unsigned-32	max time stamp

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
6	Error	Transmitter specific command error

10.19 Command #158: Read internal processor core temperature down tracking parameters

This command reads the internal processor core temperature down tracking parameters.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0-3	Float	internal processor core temperature min
4-7	unsigned-32	min accumulator
8-11	Unsigned-32	min time stamp

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
6	Error	Transmitter specific command error

10.20 Command #159: Read AVDD max and time stamp

This command reads the AVDD max and time stamp.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0-3	Float	AVDD max
4-7	Unsigned-32	max time stamp

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
6	Error	Transmitter specific command error

10.21 Command #160: Read AVDD min and time stamp

This command reads the AVDD min and time stamp.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0-3	Float	AVDD min
4-7	Float	min time stamp

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
6	Error	Transmitter specific command error

10.22 Command #161: Read sensors and transmitter install dates

This command reads the senor install dates.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0	Enum	Date, sensor
1	Enum	Month, sensor
2	Enum	Year, sensor
3	Enum	Hour, sensor
4	Enum	Minute, sensor
10	Enum	Date, Transmitter
11	Enum	Month, Transmitter
12	Enum	Year, Transmitter
13	Enum	Hour, Transmitter
14	Enum	Minute, Transmitter

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
6	Error	Transmitter specific command error

10.23 Command #162: Read sensor board stress monitor and sensor board service life

This command reads the sensor stress monitor and sensor service life.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0-3	Float	sensor stress monitor
4-7	Float	Sensor service life

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
6	Error	Transmitter specific command error

10.24 Command #163: Write transmitter install date to sensor

This command writes transmitter install date to sensor.

Request Data Bytes

Byte	Format	Description
0	Enum	Date, Transmitter
1	Enum	Month, Transmitter
2	Enum	Year, Transmitter

Response Data Bytes

Byte	Format	Description
0	Enum	Date, Transmitter
1	Enum	Month, Transmitter
2	Enum	Year, Transmitter

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
5	Error	Too few data bytes received
6	Error	Transmitter specific command error
7	Error	In write protect mode
16	Error	Access Restricted

10.25 Command #164: Read Model Number –Table IV

This command reads the 20 byte Model Number –Table IV

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0-19	Enum	Model Number –Table IV Information

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

10.26 Command #165: Read Previous Time & Date for correct URV, correct LRV sensor

This command reads Previous Time and Dates for correct URV, correct LRV for sensor

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0-4	Enum	Previous correct URV time (DD 1 MM 1 YY 1 HR 1 MIN 1)
5-9	Enum	Previous correct LRV time (DD 1 MM 1 YY 1 HR 1 MIN 1)
10-14	Enum	Previous zero trim time (DD 1 MM 1 YY 1 HR 1 MIN 1)

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
6	Error	Transmitter specific command error

10.27 Command #166: Read current Time & Date for correct URV, correct LRV sensor

This command reads Current Time and Dates for correct URV, correct LRV For sensor.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0-4	Enum	Current correct URV time (DD 1 MM 1 YY 1 HR 1 MIN 1)
5-9	Enum	Current correct LRV time (DD 1 MM 1 YY 1 HR 1 MIN 1)
10-14	Enum	Current zero trim time (DD 1 MM 1 YY 1 HR 1 MIN 1)

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
6	Error	Transmitter specific command error

10.28 Command #167: Read current, last and previous reset correct Time & Date sensor

This command reads the current, last and previous reset correct T&D for sensor

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0-4	Enum	Read current reset correct T&D(DD 1 MM 1 YY 1 HR 1 MIN 1)
5-9	Enum	Read last reset correct T&D(DD 1 MM 1 YY 1 HR 1 MIN 1)
10-14	Enum	Read previous reset correct T&D(DD 1 MM 1 YY 1 HR 1 MIN 1)

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
6	Error	Transmitter specific command error

10.29 Command #173: Write sensor bias value

This command configures the sensor bias value

Request Data Bytes

Byte	Format	Description
0-3	Float	Sensor bias value

Response Data Bytes

Byte	Format	Description
0-3	Float	Sensor bias value

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid selection
5	Error	Too few data bytes
6	Error	Transmitter specific command error
7	Error	In Write Protect Mode
16	Error	Access restricted
32	Error	Busy

10.30 Command #175: Read/Lock Write Protect Configuration

This command reads or Locks Write Protect Configuration based on selection.

Request Data Bytes

Byte	Format	Description
0	Enum	0x01 – Enable WP 0x02 – Read WP status

Response Data Bytes

Byte	Format	Description
0	Enum	0x00 – Disabled 0x01 – Enabled

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
5	Error	Too Few Data Bytes Received
7	Error	Transmitter In Write Protect Mode
16	Error	Access Denied
32	Error	Busy

10.31 Command #176: Write/Change Write Protect Password

This command is used to Write/Change Write Protect Password.

Request Data Bytes

Byte	Format	Description
0	Enum	Disable WP(0x00) / Change(0x03)
1-4	ASCII	“Current Password” for Disable WP command (Or) “New Password” for Change command
5-8	ASCII	Current password (field valid only for password change command)

Response Data Bytes

Byte	Format	Description
0	Enum	Unlock(0x00) / Change(0x03)

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
5	Error	Too Few Data Bytes Received
6	Error	Transmitter specific command error
7	Error	Transmitter In Write Protect Mode
16	Error	Access Denied
32	Error	Busy

10.32 Command #177: Read Database ID

This command provides a Database ID for the requested configuration history code.

Request Data Bytes

Byte	Format	Description
0	Enum	01 This is request byte to read latest parameter) 02:- (This is request byte to read second last parameter written) 03:- (This is request byte to read third last parameter written) 04:- (This is request byte to read forth last parameter written) 05:- (This is request byte to read fifth last parameter written)

Response Data Bytes

Byte	Format	Description
0	Enum	Database ID of the parameter for which we have made request When no record is present, database ID returned will be 0xFF.

Command-Specific Response Codes

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

Database Id's:

1. NVM database version - 0
2. HART selection -1
3. Crc of common data block - 2
4. Conformity - 3
5. Loop current 4mA - 4
6. Loop current 20mA - 5
7. Damping - 6
8. Polling address & Loop Current Mode - 7
9. Namur - 8
10. Pv Units - 9
11. Sv Units - 10
12. Device number identifier - 11
13. User break point -12
14. Cutoff method - 13
15. Lock device configuration - 14
16. Final assembly number - 15
17. Software write protect - 16
18. User password -17
19. Master password -18
20. Tag, descriptor & date -19
21. Tag -20
22. Message -21
23. Message1 -22

24. Message2 - 23
25. Message3 - 24
26. Message4 - 25
27. Long tag - 26
28. Basic database MX - 27
29. Extended database UT - 28
30. Digital database byte1 -29
31. Broadcast selection - 30
32. Tamper mode configuration - 31
33. Hysteresis band -32
34. Damping for bump less transfer -33
35. Loop control mode, Excess delta detect status, URV, LRV, MRV, Delta Limit-34
36. Error logging status -37
37. URV, LRV -38
38. Loop current mode - 40
39. Polling address - 41
40. Date - 42
41. High and Low Alarm Limits – 43

10.33 Command #178: Read Configuration history

This command provides a history of the last 5 Configuration changes.

Request Data Bytes

Byte	Format	Description
0	Enum	01:-(This is request byte to read latest parameter) 02:- (This is request byte to read second last parameter written) 03:- (This is request byte to read third last parameter written) 04:- (This is request byte to read forth last parameter written) 05:- (This is request byte to read fifth last parameter written)

Response Data Bytes

Byte	Format	Description
0	Enum	Database ID of the parameter for which we have made request When no record is present, database ID returned will be 0xFF.
1-33	Enum	Value of the parameter for which we have made request We will get number of byte= size of parameter Eg, If PV unit is of size 2 byte so we will get 2 byte rest 3-33 bytes will be garbage. Rest bytes will be garbage data When no record is present, it will return 32 garbage bytes.

Command-Specific Response Codes

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

10.34 Command #179: Read UTL & LTL

The command reads the transducer limits UTL, LTL

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0-3	Float	Upper Transducer Limit sensor
4-7	Float	Lower Transducer Limit Sensor
8-11	Float	Reserved

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
6	Error	Transmitter specific command error

10.35 Command #185: Read CJ-UTL, CJ-LL

The command reads the cold junction upper and lower limits.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0-3	Float	Reserved
8-11	Float	Cold Junction upper Limit
12-15	Float	Cold Junction lower Limit

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
6	Error	Transmitter specific command error

10.36 Command #186: Read all sensor times in service

This command reads the Sensor Times in Service.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0-3	Unsigned-32	Sensor Time in Service
4-7	Float	Reservered
8-11	Unsigned-32	Transmitter Time in Service

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
6	Error	Transmitter specific command error

10.37 Command #187: Read HART board firmware revision

This command reads the HART-DE board firmware revision.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0-7	ASCII	Firmware version

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

10.38 Command #188: Read the loop controlling sensor

Reads the HART communication board parameters loop controlling sensor.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0	Enum	(0x02: Sensor
1	Enum	Loop controlling PV
2-5	Float	Reserved
6-9	Float	Reserved

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

10.39 Command #191: Write sensor type

This command configures the types and Id's of sensor.

Request Data Bytes

Byte	Format	Description
0	Enum	Sensor type (0 = MV, 1 = TC, 2 = RTD, 3 = OHMS)

1	Enum	Sensor Id
		(if sensor type is MV then
		0 = MV,
		1 = MV1,
		if sensor type is TC then
		0 = TC Type E,
		1 = TC Type J,
		2 = TC Type K,
		3 = TC Type N,
		4 = TC Type T,
		5 = TC Type S,
		6 = TC Type R,
		7 = TC Type B,
		8 = TC Type C (W5W26),
		if sensor type is RTD then
		0 = RTD Pt 25,
		1 = RTD Pt 100,
		2 = RTD Pt 200,
		3 = RTD Pt 500,
		4 = RTD Pt 1000,
		if sensor type is OHMS then
		0 = OHM 500,
		1 = OHM 2K,
		2 = OHM 3K)

Response Data Bytes

Byte	Format	Description
0	Enum	Sensor type
1	Enum	Sensor Id
2	Enum	Reserved
3	Enum	Reserved

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid selection
5	Error	Too few data bytes
6	Error	Transmitter specific command error
7	Error	In Write Protect Mode
16	Error	Access restricted
32	Error	Busy

10.40 Command #192: Write PV high and low alarm limits

This command configures the PV high and low alarm limits.

Request Data Bytes

Byte	Format	Description
0-3	Float	PV high alarm limit
4-7	Float	PV low alarm limit

Response Data Bytes

Byte	Format	Description
0-3	Float	PV high alarm limit
4-7	Float	PV low alarm limit

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid selection
5	Error	Too few data bytes
7	Error	In Write Protect Mode
16	Error	Access restricted
32	Error	Busy

10.41 Command #193: Write RTD type

This command configures the sensor RTD type.

Request Data Bytes

Byte	Format	Description
0	Enum	RTD type (0 = 2wire, 1 = 3wire, 2 = 4wire)

Response Data Bytes

Byte	Format	Description
0	Enum	RTD type (0 = 2wire, 1 = 3wire, 2 = 4wire)

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid selection
5	Error	Too few data bytes
6	Error	Transmitter specific command error
7	Error	In Write Protect Mode
16	Error	Access restricted
32	Error	Busy

10.42 Command #197: Write CJ compensation type

This command configures the Cold Junction compensation type.

Request Data Bytes

Byte	Format	Description
0	Enum	CJ compensation type (0x00 = Internal, 0x02 = Fixed)

Response Data Bytes

Byte	Format	Description
0	Enum	CJ compensation type (0x00 = Internal, 0x02 = Fixed)

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid selection
5	Error	Too few data bytes
6	Error	Transmitter specific command error
7	Error	In Write Protect Mode
16	Error	Access restricted
32	Error	Busy

10.43 Command #198: Write break detect status

This command configures the break detection status.

Request Data Bytes

Byte	Format	Description
0	Enum	Break detect status (0x00 = OFF, 0x01 = ON)

Response Data Bytes

Byte	Format	Description
0	Enum	Break detect status (0x00 = OFF, 0x01 = ON)

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid selection
5	Error	Too few data bytes
6	Error	Transmitter specific command error
7	Error	In Write Protect Mode
16	Error	Access restricted
32	Error	Busy

10.44 Command #200: Write latching status

This command configures the sensor information bits latching status.

Request Data Bytes

Byte	Format	Description
0	Enum	Latching status (0x00 = OFF, 0x01 = ON)

Response Data Bytes

Byte	Format	Description
0	Enum	Latching status (0x00 = OFF, 0x01 = ON)

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid selection
5	Error	Too few data bytes
6	Error	Transmitter specific command error
7	Error	In Write Protect Mode
16	Error	Access restricted
32	Error	Busy

10.45 Command #202: Write fixed CJ compensation

This command configures the fixed cold junction compensation.

Request Data Bytes

Byte	Format	Description
0-3	Float	Fixed CJ compensation

Response Data Bytes

Byte	Format	Description
0-3	Float	Fixed CJ compensation

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid selection
5	Error	Too few data bytes
6	Error	Transmitter specific command error
7	Error	In Write Protect Mode
16	Error	Access restricted
32	Error	Busy

10.46 Command #203: Write RTD lead wire resistance

This command configures the sensor lead wire resistance.

Request Data Bytes

Byte	Format	Description
0-3	Float	RTD lead wire resistance

Response Data Bytes

Byte	Format	Description
0-3	Float	RTD lead wire resistance

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid selection
5	Error	Too few data bytes
6	Error	Transmitter specific command error
7	Error	In Write Protect Mode
16	Error	Access restricted
32	Error	Busy

10.47 Command #210: Write Display General configuration

This command writes the General Display Configuration

Request Data Bytes

Byte	Format	Description
1	Enum	Rotation Time(3 to 30 Seconds.)
2-5	ASCII	Password
6	Enum	Display Contrast(0-9)

Response Data Bytes

Byte	Format	Description
1	Enum	Rotation Time (3 to 30 Seconds.)
2-5	ASCII	Password
6	Enum	Display Contrast(0-9)

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
5	Error	Too Few Data Bytes Received
6	Error	Transmitter specific command error
7	Error	Transmitter In Write Protect Mode
16	Error	Access Denied
32	Error	Busy
2	Error	Invalid Selection

10.48 Command #211: Read Display General configuration

This command reads the Display General Configuration.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
1	Enum	Rotation Time (3 to 30 Seconds.)
2-5	ASCII	Password
6	Enum	Display Contrast(0-9)

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
6	Error	Transmitter specific command error

10.49 Command #212: Read Display Firmware Version

This command reads the Display Firmware Version.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0-7	Enum	Display Firmware revision

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
6	Error	Transmitter specific command error

10.50 Command #213: Read error log part1

This command reads the 5 latest errors information.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0	Enum	Error code1
1	Enum	Error code2
2	Enum	Error code3
3	Enum	Error code4
4	Enum	Error code5
5-8	Unsigned -32	Error 1 time stamp
9-12	Unsigned -32	Error 2 time stamp
13-16	Unsigned -32	Error 3 time stamp
17-20	Unsigned -32	Error 4 time stamp
21-24	Unsigned -32	Error 5 time stamp
25-28	Unsigned -32	Transmitter time in service

Error Log codes:

a) No error = 0
b) DAC failure = 1
c) Calibration corrupt = 2
d) Configuration corrupt = 3
e) Comm section failure = 4
f) Sensing section failure =5
g) Sensor communication timeout = 6
h) Display failure = 9
i) Watch dog reset =10
j) Cold start = 11
k) Comm section non-critical failure= 12
l) Sensing section non-critical failure = 13
m) Input open = 14

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

10.51 Command #214: Read error log part2

This command reads the 5 oldest errors information.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0	Enum	Error code6
1	Enum	Error code7
2	Enum	Error code8
3	Enum	Error code9
4	Enum	Error code10
5-8	Unsigned -32	Error 6 time stamp
9-12	Unsigned -32	Error 7 time stamp
13-16	Unsigned -32	Error 8 time stamp
17-20	Unsigned -32	Error 9 time stamp
21-24	Unsigned -32	Error 10 time stamp

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

10.52 Command #215: Reset error log

This command initializes the error log data to zeros.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0	Enum	Command execution status (always 0x00 indicating success)

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

10.53 Command #216: Read error logging status

This command reads the error logging status.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0	Enum	Error logging status (0x00: Disabled 0x01: Enabled)

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

10.54 Command #217: Write error logging status

This command configures the error logging status.

Request Data Bytes

Byte	Format	Description
0	Enum	Error logging status (0x00: Disable 0x01: Enable)

Response Data Bytes

Byte	Format	Description
0	Enum	Error logging status (0x00: Disabled 0x01: Enabled)

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid selection
5	Error	Too few data bytes
7	Error	In Write Protect Mode
16	Error	Access restricted
32	Error	Busy

10.55 Command #218: Read PV tracking values

This command reads Primary Variable tracking values.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0-3	Float	Highest PV recorded
4-7	Unsigned-32	Highest PV Timestamp
8-11	Float	Lowest PV recorded
12-15	Unsigned-32	Lowest PV Timestamp
16-19	Float	High alarm limit
20-23	Float	Low alarm limit
24-25	Unsigned-16	No of times PV recorded above High alarm limit
26-27	Unsigned-16	No of times PV recorded below low alarm limit

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

10.56 Command #219: Read SV up tracking values

This command reads Secondary variable up tracking values.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0-3	Float	Highest SV recorded
4-7	Unsigned-32	Highest SV Timestamp
8-11	Unsigned-32	No of times SV recorded above High alarm limit

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
6	Error	Transmitter specific command error

10.57 Command #220: Read additional status

This command reads the additional Status.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0-8	Enum	Refer table 11.3

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

10.58 Command #221: Set Date/Time for calibration

This command is used to Set Date/Time for calibration.

Request Data Bytes

Byte	Format	Description
0-4	Enum	DD 1 MM 1 YY 1 HR 1 MIN 1

Response Data Bytes

Byte	Format	Description
0-4	Enum	DD 1 MM 1 YY 1 HR 1 MIN 1

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
5	Error	Too Few Data Bytes Received
7	Error	Transmitter In Write Protect Mode
32	Error	Busy
16	Error	Access Restricted

10.59 Command #222: Read sensor firmware version number

This command reads the sensor Firmware revision number.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0-7	Enum	Sensor Firmware revision

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

10.60 Command #228: Read maintenance flag

This command reads the maintenance flag.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0	Enum	0x00 – “Check with operator” 0x01 – “Available for maintenance”

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

10.61 Command #229: Write maintenance flag

This command writes Maintenance Flag.

Request Data Bytes

Byte	Format	Description
0	Enum	0x00 – “Check with operator” 0x01 – “Available for maintenance”

Response Data Bytes

Byte	Format	Description
0	Enum	0x00 – “Check with operator” 0x01 – “Available for maintenance”

Command-Specific Response Codes

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

10.62 Command #230: Read tamper alarm settings

This command reads tamper alarm settings.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0	Enum	Tamper mode(0x00 – Disable/ 0x01 – Enable),
1	Enum	Tamper latency in seconds(range 0 - 60 seconds),
2	Enum	Maximum allowable Tamper Attempts (Min 1 / Max 10),
3	Enum	Tamper attempts recorded so far

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

10.63 Command #231: Write Tamper alarm settings

This command writes Tamper alarm settings.

Request Data Bytes

Byte	Format	Description
0	Enum	Tamper mode(0x00 – Disable/ 0x01 – Enable),
1	Enum	Tamper latency in seconds(range 0 - 60 seconds),
2	Enum	Maximum allowable Tamper Attempts (Min 1 / Max 10),

Response Data Bytes

Byte	Format	Description
0	Enum	Tamper mode(0x00 – Disable/ 0x01 – Enable),
1	Enum	Tamper latency in seconds(range 0 - 60 seconds),
2	Enum	Maximum allowable Tamper Attempts (Min 1 / Max 10),
3	Enum	Tamper attempts recorded so far

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
5	Error	Too Few Data Bytes Received
7	Error	Transmitter In Write Protect Mode
16	Error	Access Denied
32	Error	Busy

10.64 Command #232: Reset executed attempts counter

This command resets the tamper attempt count.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
None		

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
7	Error	Transmitter In Write Protect Mode
16	Error	Access Denied

10.65 Command #240: Reset PV tracking values

This command initializes the PV tracking values.

Request Data Bytes

Byte	Format	Description
0	Enum	Device variable code
1	Enum	Reset data type (0x01: Reset all 0x02: Reset Highest value 0x03: Reset Lowest value 0x04: Reset high alarm count 0x05: Reset low alarm count)

Response Data Bytes

Byte	Format	Description
0	Enum	Device variable code
1	Enum	Reset data type

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid selection
5	Error	Too few data bytes
7	Error	In Write Protect Mode
16	Error	Access restricted

10.66 Command #247: Read SV down tracking values

This command reads Secondary variable down tracking values.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0-3	Float	lowest SV recorded
4-7	Unsigned-32	lowest SV Timestamp
8-11	Unsigned-32	No of times SV recorded below low alarm limit

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
6	Error	Transmitter specific command error

10.67 Command #64768: Write Display Screen configuration I

This command writes part 1 of screen configuration.

Request Data Bytes

Byte	Format	Description
0-1	Unsigned-16	Extended command number (0xFD00)
2	Enum	Screen Selection screen 1:-Hex 3E screen 2:-Hex 3F screen 3:-Hex 40 screen 4:-Hex 41 screen 5:-Hex 42 screen 6:-Hex 43 screen 7:-Hex 44 screen 8:-Hex 45
3	Enum	Screen Format None- 00 PV - 01
4	Enum	Identifies which of the process variables in the publish message is displayed in the view – parameter index
5-6	Enum	Unit Code (Refer Table 11.1)
7	Enum	Number of digits to display after the decimal point.
8-9	Enum	Trend duration, Duration of a trend screen in hours. Valid range 1 – 999

Response Data Bytes

Byte	Format	Description
0-1	Unsigned-16	Extended command number (0xFD00)
2	Enum	Screen Selection screen 1:-Hex 3E screen 2:-Hex 3F screen 3:-Hex 40 screen 4:-Hex 41 screen 5:-Hex 42 screen 6:-Hex 43 screen 7:-Hex 44 screen 8:-Hex 45
3	Enum	Screen Format None- 00 PV - 01
4	Enum	Identifies which of the process variables in the publish message is displayed in the view – parameter index

5-6	Enum	Unit Code (Refer Table 11.1)
7	Enum	Number of digits to display after the decimal point.
8-9	Enum	Trend duration, Duration of a trend screen in hours. Valid range 1 – 999

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
5	Error	Too Few Data Bytes Received
6	Error	Transmitter specific command error
7	Error	Transmitter In Write Protect Mode
16	Error	Access Denied
32	Error	Busy

10.68 Command #64769: Write Display View configuration II

This command writes part 2 of screen configuration.

Request Data Bytes

Byte	Format	Description
0-1	Unsigned-16	Extended command number (0xFD01)
2	Enum	Screen selection
3-6	Float	LowLimit
7-10	Float	HighLimit

Response Data Bytes

Byte	Format	Description
0-1	Unsigned-16	Extended command number (0xFD01)
2	Enum	Screen selection
3-6	Float	LowLimit
7-10	Float	HighLimit

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
5	Error	Too Few Data Bytes Received
6	Error	Transmitter specific command error
7	Error	Transmitter In Write Protect Mode
16	Error	Access Denied
32	Error	Busy

10.69 Command #64770: Write View configuration III

This command writes part 3 of screen configuration.

Request Data Bytes

Byte	Format	Description
0-1	Unsigned-16	Extended command number (0xFD02)
2	Enum	Screen selection
3-32	ASCII	CustomTag

Response Data Bytes

Byte	Format	Description
0-1	Unsigned-16	Extended command number (0xFD02)
2	Enum	Screen selection
3-32	ASCII	CustomTag

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid Selection
5	Error	Too Few Data Bytes Received
6	Error	Transmitter specific command error
7	Error	Transmitter In Write Protect Mode
16	Error	Access Denied
32	Error	Busy

10.70 Command #64771: Read Display View configuration I

This command reads view configuration I.

Request Data Bytes

Byte	Format	Description
0-1	Unsigned-16	Extended command number (0xFD03)
2	Enum	Screen Selection screen 1:-Hex 3E screen 2:-Hex 3F screen 3:-Hex 40 screen 4:-Hex 41 screen 5:-Hex 42 screen 6:-Hex 43 screen 7:-Hex 44 screen 8:-Hex 45

Response Data Bytes

Byte	Format	Description
0-1	Unsigned-16	Extended command number (0xFD03)
2	Enum	Screen Selection screen 1:-Hex 3E screen 2:-Hex 3F screen 3:-Hex 40 screen 4:-Hex 41 screen 5:-Hex 42 screen 6:-Hex 43 screen 7:-Hex 44 screen 8:-Hex 45
3	Enum	Screen Format None- 00 PV - 01
4	Enum	Identifies which of the process variables in the publish message is displayed in the view – parameter index
5-6	Enum	Unit Code (Refer Table 11.1)
7	Enum	Number of digits to display after the decimal point.
8-9	enum	Trend duration, Duration of a trend screen in hours. Valid range 1 – 999

Command-Specific Response Codes

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

10.71 Command #64772: Read Display View configuration II

This command reads the View configuration II

Request Data Bytes

Byte	Format	Description
0-1	Unsigned-16	Extended command number (0xFD04)
2	Enum	Screen selection

Response Data Bytes

Byte	Format	Description
0-1	Unsigned-16	Extended command number (0xFD04)
0	Enum	Screen selection
10-13	Float	Low Limit
14-17	Float	High Limit

Command-Specific Response Codes

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

10.72 Command #64773: Read Display View configuration III

This command reads the View configuration III.

Request Data Bytes

Byte	Format	Description
0-1	Unsigned-16	Extended command number (0xFD05)
2	Enum	Screen selection

Response Data Bytes

Byte	Format	Description
0-1	Unsigned-16	Extended command number (0xFD05)
2	Enum	Screen selection
3-32	Enum	Custom Tag

Command-Specific Response Codes

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

10.73 Command #64790: Write upper calibration point sensor

This command configures the sensor lower calibration value.

Request Data Bytes

Byte	Format	Description
0-1	Unsigned-16	Extended command number (0xFD16)
2-5	Float	Upper calibration value

Response Data Bytes

Byte	Format	Description
0-1	Unsigned-16	Extended command number (0xFD16)
2-5	Float	Upper calibration value

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
5	Error	Too few data bytes
6	Error	Transmitter specific command error
7	Error	In Write Protect Mode
16	Error	Access restricted
32	Error	Busy

10.74 Command #64791: Write lower calibration point sensor

This command configures the sensor lower calibration value.

Request Data Bytes

Byte	Format	Description
0-1	Unsigned-16	Extended command number (0xFD17)
2-5	Float	Lower calibration value

Response Data Bytes

Byte	Format	Description
0-1	Unsigned-16	Extended command number (0xFD17)
2-5	Float	lower calibration value

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
5	Error	Too few data bytes
6	Error	Transmitter specific command error
7	Error	In Write Protect Mode
16	Error	Access restricted
32	Error	Busy

10.75 Command #64794: Read calibration points sensor

This command reads the sensor calibration values.

Request Data Bytes

Byte	Format	Description
0-1	Unsigned-16	Extended command number (0xFD1A)

Response Data Bytes

Byte	Format	Description
0-1	Unsigned-16	Extended command number (0xFD1A)
2-5	Float	upper calibration value
6-9	Float	Lower calibration value

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
6	Error	Transmitter specific command error

10.76 Command #64807: Read sensor ET up tracking values

This command reads the sensor ET up tracking values.

Request Data Bytes

Byte	Format	Description
0-1	Unsigned-16	Extended command number (0xFD27)

Response Data Bytes

Byte	Format	Description
0-1	Unsigned-16	Extended command number (0xFD27)
2-5	Float	ET highest value
6-9	enum	ET highest value timestamp
10-13	Float	ET high alarm counter

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
6	Error	Transmitter specific command error

10.77 Command #64808: Read sensor ET down tracking values

This command reads the sensor ET down tracking values.

Request Data Bytes

Byte	Format	Description
0-1	Unsigned-16	Extended command number (0xFD28)

Response Data Bytes

Byte	Format	Description
0-1	Unsigned-16	Extended command number (0xFD28)
2-5	Float	ET lowest value
6-9	enum	ET lowest value timestamp
10-13	Float	ET low alarm counter

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
6	Error	Transmitter specific command error

10.78 Command #64809: Read SHM ohms, M360 Core Temp Delta

This command reads the sensor advanced diagnostic parameters shm ohms and M360 core temperature delta value

Request Data Bytes

Byte	Format	Description
0-1	Unsigned-16	Extended command number (0xFD29)

Response Data Bytes

Byte	Format	Description
0-1	Unsigned-16	Extended command number (0xFD29)
2-5	Float	SHM ohms
6-9	Float	Reserved
10-13	Float	Internal processor core temperature delta value

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
6	Error	Transmitter specific command error

10.79 Command #64811: Write Sensor install date

This command is used to write the sensor install date.

Request Data Bytes

Byte	Format	Description
0-1	Unsigned-16	Extended command number (0xFD2B)
2	Enum	Day
3	Enum	Month
4	Enum	Year

Response Data Bytes

Byte	Format	Description
0-1	Unsigned-16	Extended command number (0xFD2B)
2	Enum	Day
3	Enum	Month
4	Enum	Year
5	Enum	Hour
6	Enum	Minute

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid selection
5	Error	Too few data bytes received
6	Error	Transmitter specific command error
7	Error	In Write Protect Mode
16	Error	Access restricted

10.80 Command #64813: Reset CJ tracking parameters

This command is used to reset the cold junction (SV) tracking parameters.

Request Data Bytes

Byte	Format	Description
0-1	Unsigned-16	Extended command number (0xFD2D)

Response Data Bytes

Byte	Format	Description
0-1	Unsigned-16	Extended command number (0xFD2D)

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
6	Error	Transmitter specific command error
7	Error	In Write Protect Mode
16	Error	Access restricted
32	Error	Busy

10.81 Command #64814: Acknowledge latching

This command is used to acknowledge sensor errors.

Request Data Bytes

Byte	Format	Description
0-1	Unsigned-16	Extended command number (0xFD2E)

Response Data Bytes

Byte	Format	Description
0-1	Unsigned-16	Extended command number (0xFD2E)

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
6	Error	Transmitter specific command error
7	Error	In Write Protect Mode
16	Error	Access restricted
32	Error	Busy

10.82 Command #64815: Write Sensor Scratch pad

This command is used to write sensor scratch data.

Request Data Bytes

Byte	Format	Description
0-1	Unsigned-16	Extended command number (0xFD2F)
2-33	ASCII	Scratch pad data for user

Response Data Bytes

Byte	Format	Description
0-1	Unsigned-16	Extended command number (0xFD2F)
2-34	ASCII	Data entered

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
3	Error	Too many data bytes received
5	Error	Too few data bytes received
6	Error	Transmitter specific command error
7	Error	In Write Protect Mode
16	Error	Access restricted
32	Error	Busy

10.83 Command #64816: Read Sensor Scratch pad

This command is used to read sensor scratch data

Request Data Bytes

Byte	Format	Description
0-1	Unsigned-16	Extended command number (0xFD30)

Response Data Bytes

Byte	Format	Description
0-1	Unsigned-16	Extended command number (0xFD30)
2-33	ASCII	Data entered

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
6	Error	Transmitter specific command error

10.84 Command #64817: Write NAMUR Selection

This command is used to write NAMUR enable or disable.

Request Data Bytes

Byte	Format	Description
0-1	Unsigned-16	Extended command number (0xFD31)
2	Enum	0x00 to disable 0x01 to enable

Response Data Bytes

Byte	Format	Description
0-1	Unsigned-16	Extended command number (0xFD31)
2	Enum	Accepted value

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
3	Error	Too many data bytes received
5	Error	Too few data bytes received
6	Error	Transmitter specific command error
7	Error	In Write Protect Mode
16	Error	Access restricted
32	Error	Busy

10.85 Command #64818: Read NAMUR Selection

This command is used to read NAMUR selection.

Request Data Bytes

Byte	Format	Description
0-1	Unsigned-16	Extended command number (0xFD32)

Response Data Bytes

Byte	Format	Description
0-1	Unsigned-16	Extended command number (0xFD32)
2	Enum	NAMUR selection 0x00 – Disabled 0x01 – Enabled

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
6	Error	Transmitter specific command error

11. Tables

11.1 Unit Codes

	Unit	HART Code
0	Custom	0
1	Degrees Celsius	32
2	Degrees Fahrenheit	33
3	Degrees Rankin	34
4	Kelvin	35
5	Milli Volt	36
6	Ohms	37
7	Percent	57
8	Unknown Enumerator	250

Table 12 Unit Codes supported

11.2 Unit Conversion

Temperature Units

Internally, the transmitter uses degrees Celsius for the temperature variable. Conversions to the other supported units are made using the following equations:

"To" unit	Formula
Farenheit	$T_F = (T_C*1.8) + 32$
Rankine	$T_R = (T_C + 273.15)*1.8$
Kelvin	$T_K = T_C + 273.15$

Table 13 Temperature Units

11.3 Command 220 details

Type	Bit	Command 220 bit status
DAC Failure (HART) (BYTE1)	7	SPI Failure
	6	Packet Error
	5	Over Current Status
	4	Under Current Status
	3	Temp Above 140C
	2	Temp Above 100C
	1	Unused
	0	Unused
Communication (HART) (BYTE2)	7	Unused
	6	Unused
	5	Unused
	4	Unused
	3	Brownout Status
	2	Program Flow Failure
	1	ROM Failure
	0	RAM Failure
Display (HART) (BYTE3)	7	Unused
	6	Unused
	5	Unused
	4	Unused
	3	Unused
	2	Display Configuration Data Corrupt
	1	Display Communication Timeout
	0	Unused
Other Info (HART) (BYTE4)	7	Unused
	6	Unused
	5	Sensor ADC Reference fault
	4	Sensor ADC1 Range fault
	3	Sensor ADC0 Range fault
	2	Sensor CJ_CT Delta warning
	1	Low Transmitter supply
	0	Control Word Write Fault (write to DAC failed)

Sensor (BYTE5)	7	Program Flow Failure in Sensor
	6	Flash CRC Failure in Sensor
	5	RAM Failure in Sensor
	4	Suspect Input
	3	TV/SV Bad
	2	Sensor characterization CRC fault
	1	Sensor section NVM corrupt
	0	Low sensor supply
Sensor (BYTE6)	6	Sensor input fault
	5	SV Bad
	3	TV Bad
	2	User corrects activated
	0	Sensor Excess cal Correction
Database Integrity (BYTE7)	7	Unused
	6	Display Common Config DB corrupt
	5	Display View Config DB corrupt
	4	Adv Diag DB corrupt
	3	Config Change DB corrupt
	2	General Config DB corrupt
	1	Vital Config DB corrupt
	0	Common DB corrupt
Display Integrity (BYTE8)	7	Display View8 corrupt
	6	Display View7 corrupt
	5	Display View6 corrupt
	4	Display View5 corrupt
	3	Display View4 corrupt
	2	Display View3 corrupt
	1	Display View2 corrupt
	0	Display View1 corrupt

Table 14 Command 220 details

11.4 Sensor Type Codes

0	MV125
1	MV1200
2	Thermocouple Type E
3	Thermocouple Type J
4	Thermocouple Type K
5	Thermocouple Type N
6	Thermocouple Type T
7	Thermocouple Type S
8	Thermocouple Type R
9	Thermocouple Type B
10	Thermocouple Type C (W5W26)
11	RTD Pt 25
12	RTD Pt 100
13	RTD Pt 200
14	RTD Pt 500
15	RTD Pt 1000
16	OHM 500
17	OHM 2K
18	OHM 3K

Table 15 Sensor type codes

12. Performance

12.1 Sampling Rates

Typical sampling rates are shown in the following table.

Primary Temperature sensor sample	10 per second
Internal sensor sample	50 per second
PV digital value calculation	10 per second
SV digital value calculation	10 per second
TV digital value calculation	10 per second
Analog output update	10 per second

Table 16 Sampling Rates

12.2 Power-Up

On power up, the transmitter initializes the data in RAM and the HART communication links and starts the task scheduler to sample the input.

The device will not respond to HART commands during the Power Up sequence.

Fixed-current mode is cancelled by power loss or software reset (command 42, for instance).

Typical Startup Time = 2-4 sec

HART communication start time = 15 sec

In very short succession after power is applied to the transmitter, the device will set its output to the user-selected burnout level, then briefly transition to 50% (12 mA nominal), and then begin publishing the primary variable.

12.3 Device Reset

Command 42 ("Perform Device Reset") causes the device to reset its microprocessor. The resulting restart is similar to the normal power up sequence. (See section 12.2). The only difference is if the primary variable is valid at the start of the reset sequence. If so, it will be maintained until initialization is performed, and then a new calculation will be placed on the analog output channel.

12.4 Self Test

The transmitter keeps performing continuous self tests in the background. The device does support Command 237 “Self Test”.

12.5 Command Response Times

Minimum	18.236ms
Typical	64ms
Maximum	208.643ms

Table 17 Response Times

12.6 Busy and Delayed-Response

1) BUSY (32) response code implementation:

   BUSY Response code is implemented for the commands, where NVM writing is involved. Each time when the NVM write command comes, first it is checked if the device is busy in writing NVM in background, when some configuration is done from display OR long string parameters like tag/date/descriptor, Long tag, Message from previous HART command, in the background task.

   a. If device is busy in writing long string parameters then the device issues RC-32 to the HART command and completes the NVM write activity in hand in the command itself using its response time of 250ms. As device sends RC-32 to the HART command, the host is expected to send the same command again until it gets a success response code or till the limited number of retries as decided by host in case of BUSY RC.

   b. If the NVM write background task is in progress for the parameters configured from display, the device sends BUSY RC to the host, and keeps on sending BUSY RC's to the next coming HART commands until it finishes this background task of NVM write.

   For any IPC command if the Comm PWA is unable to respond in 240mSec as it may have not received response from sensor/display, for the first time it sends BUSY response so that host can retry, then if again the Comm PWA is unable to respond in 240mSec then it sends a Device specific error (RC=0x06) to HART host.

2) Delayed-response is not used.

12.7 Long Messages

The largest data field used is in the response to Commands 20 and 22: 32 bytes of long tag and Command 17: 24 bytes containing the packed ASCII message data.

12.8 Non-Volatile Memory

EEPROM is used to hold the device's configuration parameters. New data is written to this memory 20 seconds after the execution of a write command. When data is downloaded to the device, power to the transmitter should not be interrupted until the data is copied to the non volatile memory.

12.9 Modes

Fixed current mode is implemented, using Command 40. This mode is cleared by power loss or reset. When the device is in fixed current mode, the analog output will not track the input.

12.10 Write Protection

Write-protection is provided, selected by an external jumper as well as a software write protect (command 175 and 176) .When the jumper is present, all commands are available.

12.11 Damping

The damping is available from 0 to 102 seconds in HART.

Annex A. Capability Checklist

Manufacturer, model and revision	Honeywell Intl (23)., STT 750, rev.1
Device type	1 (Transmitter)
HART revision	7.x
Device Description available?	Yes
Number and type of sensors	1
Number and type of actuators	0
Number and type of host side signals	1: 4 – 20mA analog
Number of Device Variables	4
Number of Dynamic Variables	4
Map able Dynamic Variables?	No
Number of common-practice commands	13
Number of device-specific commands	135
Bits of additional device status	45 (8 bytes are used)
Alternative operating modes?	No
Burst mode?	No
Capture Device Variables?	No
Write-protection?	Yes

Table 18 Capability checklist

Annex B. Default Configuration

Parameter	Default value
Sensor type	MV
Sensor	Averaging
Lower Range Value	-20
Upper Range Value	120
Mid Range Value	70
PV Units	Degrees Celsius
SV Units	Degrees Celsius
TV Units	Degrees Celsius
Damping time constant	0.5 seconds
Fault-indication jumper	Up-scale
Write-protect jumper	Installed (write disabled)
Number of response preambles	7
Polling Address	0
Loop Current	Enable
Output mode	Analog

Table 19 Default Configuration

Annex C. Revision History

Document Revision	Date	Description
1.0	August 2015	Preliminary version - for HART 7.x device.

Sales and Service

For application assistance, current specifications, pricing, or name of the nearest Authorized Distributor, contact one of the offices below.

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