Honeywell

HART® 7.x Field Device Specification for STT700 SmartLine Temperature Transmitters

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1. Introduction

1.1 Scope

The Honeywell SmartLine Temperature Transmitter, STT700, 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):**	STT700
Manufacture ID Code:	23 (17 Hex)	**Device Type Code:**	43 (2B Hex)
HART Protocol Revision	7.x	**Device Revision**:	2
Number of Device Variables	4		
Physical Layers Supported	FSK		
Physical Device Category	Transmitter, Non-DC-isolated Bus Device		

Table 2 Device Identification

The Honeywell STT700 is designed to meet hazardous area approvals. Refer to the STT700 Transmitter User's manual (34-TT-25-17) on the available methods of protections for use in hazardous locations.

3. Product Overview

3.1 Transmitter

The STT700 Temperature Transmitter measures the process temperature and transmits an output signal proportional to the measured variable over a 4 to 20 milli-ampere, two-wire loop. A diagrammatic representation of STT700 is shown in

Figure 1.

The STT 700 SmartLine Temperature Transmitter can transmit its output in an analog 4 to 20 milli-ampere format. The process variable (PV) output, the transmitter also provides the Cold junction temperature as a secondary variable, Sensor1 as tertiary variable and Sensor2 as quaternary variable, which are available as read-only parameters through the MC Toolkit when the transmitter is in its analog mode.

Please note the device modules shown in Figure 1 must be removed from support bracket to access the power connections for HART or DE connections.

Refer to the User's manual 34-TT-25-17 for instructions on removing the display module, mounting configurations and sensor type (TC, RTD; mV & Ohms). Documentation is available from: https://www.honeywellprocess.com/en-US/explore/products/instrumentation/temperature-transmitters-and-sensors/smartline-temperature/Pages/smartLine-stt700-temperature-transmitter.aspx

A configuration tool (Honeywell MC Toolkit) is connected to the loop wiring of the STT700 transmitter for direct communication with the transmiter. The handheld device communicates with the transmitter via the HART interface.

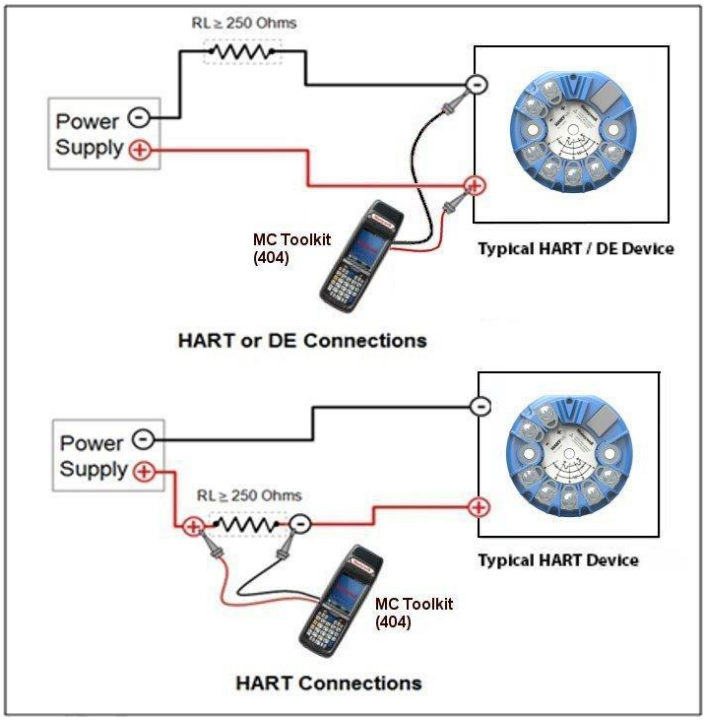

Figure 1 Typical Communication Interface

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.

STT700 supports 2, 3 & 4 wire RTD sensor inputs

- RTD Pt 100, ,a=385
- RTD Pt 200, ,a=385
- RTD Pt50, a=391
- RTD Pt100, a=391
- RTD Ni 120,
- RTD Cu50, a=426
- RTD Cu50, a=428
- RTD Cu100, a=426
- RTD Cu100, a=428

2- Wire thermocouple input (Types B, E, J, K, N, R, S, T, C and GOST L).
Mill volt (mV 22 and mV 125) and Ohm (OHM 500 and OHM 2K) sensor inputs are also accepted.
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.

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 STT700 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).

Device Malfunction

The direction of indication of a detected malfunction by the analog current output is user-selectable by means of hart command 134, 135. STT700 transmitters are shipped with a default failsafe 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 STT700 transmitters have a transmitter security option, also known as a "write protect option," which is selectable by HART command 175/176. When the device is in write protect mode, the transmitter's configuration and calibration data can only be read / viewed.

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.

Table 4 List of Dynamic Variables

Process Variable	Meaning	Units
PV	Temperature output	degC, degF, Rankine, Kelvin, Milli volt, Ohm
SV	Cold Junction temperature	degC, degF, Rankine, Kelvin
TV	Sensor1 Input temperature	degC, degF, Rankine, Kelvin, Milli volt, Ohm The unit selected for PV will be applied to TV and QV as well
QV	Sensor2 Input temperature	degC, degF, Rankine, Kelvin, Milli volt, Ohm

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 85 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 or Input2 Out of Range in the sensors section of manufacturer specific status (see section 7.3).

Table 5 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 6 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	Unused
	6	Unused
	5	Unused
	4	Configuration corrupt (NVM Data corruption)
	3	Char/Cal table CRC failure
	2	Sensor Input Failure (Input1/2- open/short, suspect)
	1	DAC failure
	0	Diagnostics failure (SIL) (For HART it is run time as well)
Non critical status (Byte 2)	7	User Correct Active
	6	Fixed Current Mode
	5	sensor1 excess urv correct
	4	sensor1 excess lrv correct
	3	Cold junction temperature out of range and SV Bad
	2	PV Out of Range
	1	No Factory Calibration
	0	CT (core temperature) Out of Range
Non critical status 2 (Byte 3)	7	Unused

	6	Analog Output Saturated
	5	Input2 Fault
	4	Input1 Fault
	3	Unused
	2	Unused
	1	No DAC Compensation
	0	Input suspect
Non critical status 3 (Byte 4)	7	Supply Voltage Fault
	6	Watchdog reset
	5	Input2 Out Of Range
	4	Input1 Out Of Range
	3	sensor2 excess urv correct
	2	sensor2 excess lrv correct
	1	ADC Fault
	0	Excess Delta Detect
Non critical status 4 (Byte 5)	7	Unused
	6	Unused
	5	Unused
	4	Unused
	3	Unused
	2	Unused
	1	Unused
	0	SIL Diagnostics

Table 7 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, QV 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 & QV 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.
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 8 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 (Sensor1 input temperature) and device Variable 3 = QV (Sensor2 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 and QV, unit selected for PV is only applied, as the PV is computed based on TV and QV
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 9 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
128	Correct Sensor 1 / Sensor 2 Input to URV	It trims the Sensor 1 /Sensor 2 input to URV.
129	Correct Sensor 1 / Sensor 2 Input to LRV	It trims the Sensor 1 / Sensor 2 input to LRV.
130	Reset Corrects Sensor 1 / Sensor 2	It resets all the user correct operations performed for sensor 1 / sensor 2.
131	Write upper calibration point sensor1/sensor2	Sensor1/Sensor2 upper calibration point write.
132	Write lower calibration point sensor1/sensor2	Sensor1/Sensor2 lower calibration point write.
133	Read calibration points sensor 1 and sensor2	Read sensor1 and sensor2 calibration points.
134	Write Burnout Selection	This command writes burn out selection (High/Low) in device.
135	Read Burnout Selection	This command reads burn out selection.
136	Read URL1, LRL1, URL2, LRL2	Reads the range limits from sensor1 and sensor2
137	Read UTL1, LTL1, UTL2, LTL2, CJ-UTL, CJ-LTL	Reads the respective values
138	Read sensor1 configuration	Reads the configuration specific to sensor1.
139	Read sensor2 configuration	Reads the configuration specific to sensor2.
140	Write Sensor1/Sensor2 Bias value	Configures the sensor1/sensor2 bias value.
141	Write Sensor 1/ Sensor 2 RTD type	Configures the sensor 1 RTD / sensor2 RTD type.
142	Write sensor1 /sensor 2 RTD lead wire resistance	Configures the sensor 1 / sensor 2 RTD resistance.
143	Write excess delta detection	Configures the excess delta detection status.
144	Read delta limit, delta, excess delta detection	Read the delta limit value, delta value and excess delta detection status
145	Write CJ compensation type	Configures the cold junction compensation state
146	Read sensor extra configuration	Reads the sensor configuration common to both sensors.
147	Read transmitter specifics	Information about display

148	Read Sensor 1 and Sensor 2 resistance	Read Sensor 1 and Sensor 2 resistance
149	Read Sensor 1 and Sensor 2 voltages	Read Sensor 1 and Sensor 2 voltages
150	Write fixed CJ compensation	Configures the Cold Junction compensation value
151	Read Device Serial Number	Read Device Serial Number
152	Write delta limit	Configures the delta limit value
153	Read power fail counter and its timestamp	The power fail count and Time stamp are read.
154	Read time in service and service life remaining.	It reads Time in Service and Service life.
155	Write command for NAMUR enable and disable	This command writes namur enable/disable status.
156	Read NAMUR status	Reads whether NAMUR is enabled or disabled
157	Read CT Tracking	
158	Read last time and date for correct URV, correct LRV sensor 1/ sensor2	Reads Calibration records sensor 1 / sensor2.
159	Read previous time and date for correct URV, correct LRV sensor 1/ sensor2.	Reads Calibration records sensor 1 / sensor2.
160	Read current time and date for correct URV, correct LRV sensor 1/ sensor2.	Reads Calibration records sensor 1 / sensor2.
161	Read current, last and previous reset correct Time & Date sensor 1 / sensor2.	Reads Calibration records for sensor 1 / sensor 2 Reset corrects.
162	Write Sensor1 / sensor2 install date	This command write sensor1 / sensor2 install date
163	Read sensors and transmitter install dates	Reads sensor1, sensor2 and transmitter installed date.
164	Write transmitter install date.	Writes transmitter install date to sensor. **One time writable**.
165	Read model number – Key Number and Table I	Reads 7 byte Key number, and Table I information. For factory use.
166	Read model number – Table II	Reads Table II information. For factory use.
167	Read model number – Table III	Reads Table III information. For factory use.
168	Read Model Number –Table IV	Reads Table IV information. For factory use.
169	Write CVD1/CVD2 4 Coefficients.	Write R0, α, δ, β
170	Read CVD1/CVD2 4 Coefficients.	Read R0, α, δ, β
171	Write CVD1 /CVD2 Activation.	Write CVD1/CVD2 Activation value.
172	Read CVD1/CVD2 Coefficient activation.	Read CVD1/CVD2 Coefficient activation.

173	Read CVD1 and CVD2 User Cal values.	Read CVD1 and CVD2 User Cal values.
175	Read/Lock Write Protect Configuration	Soft Write protection
176	Write/Change/Reset Write Protect Password	Changes the write Protect Password.
177	Read Error log Part 1 / part 2	Reads the latest 5 errors for part1/part2
178	Reset Error Log	Resets the errors logged
179	Read Error Logging Status	Reads the error logging status
180	Write Error Logging Status	Configures the error logging status
181	Write Break detect	Configures the break detect status
182	Write MRV	Configures the Mid-range value used in split range mode
183	Write Latching	Configures latching status
184	Write match PV's	Configures PV matching status
185	Write hysteresis value	Configures the hysteresis value
186	Write Damping for bump-less transfer	Configures the bump less damping value
187	Read f/w revision	It reads firmware rev. number.
188	Read the loop control mode, loop controlling sensor, hysteresis value, Damping for bump-less transfer	Reads the respective values
189	Write the loop control Mode	Configures the loop operation mode
191	Write Sensor 1 & 2 type & Id	Configures the types and Id's of sensor 1 and sensor 2
195	Read SV up tracking values	Reads SV up tracking values
198	Write PV/SV high and low alarm limits	Configures PV/SV high and low alarm limits needed for PV tracking
199	Read PV Tracking values	Reads the PV tracking values
200	Reset PV/SV (CJ) tracking values.	Reset PV/SV (CJ) tracking values.
201	Reset operating voltage and its time stamp	It resets the Operating Voltage records.
202	Read current, minimum operating voltage and its timestamp	Reads operating voltage and minimum timestamp.
221	Set Date/Time for calibration	Before Calibration it is compulsory to enter the Time and Date.
222	Acknowledge Latching	Acknowledge the sensor errors

225	Write Display Configuration Parameters	Configures display parameters PV selected, units, contrast and extended menu selection through
226	Read Display Configuration Parameters	Read display configured parameters PV selected, units, contrast and extended menu selection
228	Read the state of “Available for maintenance” flag	Reads the status of “Available for Maintenance” Flag
229	Read last time and date for correct URV, correct LRV sensor 1 / sensor2	Reads Calibration records sensor 1 / sensor2.
230	Read previous time and date for correct URV, correct LRV sensor 1 / sensor2.	Reads Calibration records sensor 1 / sensor2.
231	Read current time and date for correct URV, correct LRV sensor 1 / sensor2.	Reads Calibration records sensor 1 / sensor2.
232	Read current, last and previous reset correct Time & Date sensor 1 / sensor2.	Reads Calibration records for sensor 1 / sensor 2 Reset corrects.
233	Read model number – Key Number and Table I	Reads 7 byte Key number, and Table I information. For factory use.
234	Read model number – Table II	Reads Table II information. For factory use.
235	Read CVD1/CVD2 4 Coefficients.	Read R0, α, δ, β
236	Read CVD1/CVD2 Coefficient activation.	Read CVD1/CVD2 Coefficient activation.
237	Read Error log Part 1 / part 2	Reads the latest 5 errors for part1/part2

Table 10 Device Specific Commands

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

10.1 Command #128: Correct sensor 1 / sensor 2 Input to URV

This command performs a calibration trim for the sensor1/sensor2. The calibration temperature applied to the transmitter is received with this command and the transmitter trims the sensor1/ sensor2 calibration so that its output equals the applied URV value.

Request Data Bytes

Byte	Format	Description
0	Unsigned – 8	Request data from user 0: Sensor 1 1: Sensor 2

Response Data Bytes

Byte	Format	Description
0	Unsigned-8	0: Sensor 1 1: Sensor 2

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 #129: Correct sensor 1 / sensor 2 Input to LRV

This command performs a calibration trim for the sensor1/sensor2. The calibration temperature applied to the transmitter is received with this command and the transmitter trims the sensor1/ sensor2 calibration so that its output equals the applied LRV value.

Request Data Bytes

Byte	Format	Description
0	Unsigned – 8	Request data from user 0: Sensor 1 1: Sensor 2

Response Data Bytes

Byte	Format	Description
0	Unsigned-8	0: Sensor 1 1: Sensor 2

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

10.3 Command #130: Reset Corrects sensor 1 / sensor 2

This command removes the calibration of sensor 1 /sensor 2 and 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
0	Unsigned – 8	Request data from user 0: Sensor 1 1: Sensor 2

Response Data Bytes

Byte	Format	Description
0	Unsigned-8	0: Sensor 1 1: Sensor 2

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 #131: Write upper calibration point sensor1/ sensor2

This command configures the sensor1/ sensor2 upper calibration value.

Request Data Bytes

Byte	Format	Description
0	Unsigned – 8	Request data from user 0: Sensor 1 1: Sensor 2
1-4	Float	Upper calibration value

Response Data Bytes

Byte	Format	Description
0	Unsigned-8	0: Sensor 1 1: Sensor 2
1-4	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

10.5 Command #132: Write lower calibration point sensor1/ sensor2

This command configures the sensor1/ sensor2 lower calibration value.

Request Data Bytes

Byte	Format	Description
0	Unsigned – 8	Request data from user 0: Sensor 1 1: Sensor 2
1-4	Float	Lower calibration value

Response Data Bytes

Byte	Format	Description
0	Unsigned-8	0: Sensor 1 1: Sensor 2
1-4	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

10.6 Command #133: Read calibration points sensor1/ sensor2

This command reads the sensor1/sensor2 calibration values.

Request Data Bytes

Byte	Format	Description

Response Data Bytes

Byte	Format	Description
0-3	Float	Upper calibration value for Sensor2
4-7	Float	Lower calibration value for Sensor2
8-11	Float	Upper calibration value for Sensor1
12-15	Float	Lower calibration value for Sensor1

Command-Specific Response Codes

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

10.7 Command #134: Write high and low Burnout Selection

This command writes the high and low burnout selection.

Request Data Bytes

Byte	Format	Description
0-1	Unsigned – 16	0x0000 = Low Burnout Selection 0x0001 = High Burnout Selection

Response Data Bytes

Byte	Format	Description
0-1	Unsigned – 16	0x0000 = Low Burnout Selection 0x0001 = High Burnout Selection

Command-Specific Response Codes:

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

10.8 Command #135: Read Burnout Selection

This command reads burnout selection.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0-1	Unsigned – 16	0x0000 = Low Burnout Selection 0x0001 = High Burnout Selection

Command-Specific Response Codes

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

10.9 Command #136: Read URL1, LRL1, URL2, LRL2

The command reads range limits of sensor 1 and sensor 2.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0-3	Float	Upper Range Limit sensor 1
4-7	Float	Lower Range Limit Sensor 1
8-11	Float	Upper Range Limit sensor 2
12-15	Float	Lower Range Limit Sensor 2

Command-Specific Response Codes

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

10.10 Command #137: Read UTL1, LTL1, UTL2, LTL2, CJ upper limit, CJ lower Limit

The command reads the upper and lower transducer limits for sensor1/sensor2. This command also reads CJ upper limit, CJ Lower Limit.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0-3	Float	Upper Transducer Limit sensor 1
4-7	Float	Lower Transducer Limit Sensor 1
8-11	Float	Upper Transducer Limit sensor 2
12-15	Float	Lower Transducer Limit Sensor 2
16-19	Float	Cold Junction Upper Limit
20-23	Float	Cold Junction Lower Limit

Command-Specific Response Codes

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

10.11 Command #138: Read sensor1 configuration

This command reads Sensor1 Type, Sensor1 Id, RTD1 Type, RTD1 lead wire resistance, Sensor1 bias value.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0	Enum	Sensor 1 type (0 = MV, 1 = TC, 2 = RTD, 3 = OHMS)
1-2	Enum	Sensor 1 Id 0x0000 = mV22, 0x0001 = mV125, 0x0100 = TC Type E, 0x0101 = TC Type J, 0x0102 = TC Type K, 0x0103 = TC Type N, 0x0104 = TC Type T, 0x0105 = TC Type S, 0x0106 = TC Type R, 0x0107 = TC Type B, 0x0108 = TC Type C, 0x0109 = TC Type L GOST 0x0200 = Reserved, 0x0201 = RTD Pt 100, a=385 0x0202 = RTD Pt 200,a=385 0x0203 = Reserved 0x0204 = Reserved, 0x0205 = RTD Pt50, a=391, 0x0206 = RTD Pt100, a=391, 0x0207 = RTD Ni 120, a=672 0x0208 = Reserved 0x0209 = RTD Cu50, a=426, 0x020A = RTD Cu50, a=428, 0x020B = RTD Cu100, a=426, 0x020C = RTD Cu100, a=428, 0x0300 = Ohms 500, 0x0301 = Ohms 2K

3	Enum	RTD1 type (0 = 2wire, 1 = 3wire, 2 = 4wire)
4-7	Float	RTD1 lead wire resistance is 0 by default
8-11	Float	Sensor 1 Bias value is 0 by default

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

10.12 Command #139: Read sensor2 configuration

This command reads Sensor2 Type, Sensor2 Id, RTD2 Type, RTD2 lead wire resistance, Sensor2 bias value.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0	Enum	Sensor 2 type (0 = MV, 1 = TC, 2 = RTD, 3 = OHMS)
1-2	Enum	Sensor 2 Id 0x0000 = mV22, 0x0001 = mV125, 0x0100 = TC Type E, 0x0101 = TC Type J, 0x0102 = TC Type K, 0x0103 = TC Type N, 0x0104 = TC Type T, 0x0105 = TC Type S, 0x0106 = TC Type R, 0x0107 = TC Type B, 0x0108 = TC Type C, 0x0109 = TC Type L GOST 0x0200 = Reserved, 0x0201 = RTD Pt 100, a=385 0x0202 = RTD Pt 200,a=385 0x0203 = Reserved 0x0204 = Reserved, 0x0205 = RTD Pt50, a=391, 0x0206 = RTD Pt100, a=391, 0x0207 = RTD Ni 120, a=672 0x0208 = Reserved 0x0209 = RTD Cu50, a=426, 0x020A = RTD Cu50, a=428, 0x020B = RTD Cu100, a=426, 0x020C = RTD Cu100, a=428, 0x0300 = Ohms 500, 0x0301 = Ohms 2K

3	Enum	RTD2 type (0 = 2wire, 1 = 3wire, 2 = 4wire)
4-7	Float	RTD2 lead wire resistance
8-11	Float	Sensor 2 Bias value

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

10.13 Command #140: Write sensor1/ sensor2 bias value

This command configures the sensor1 /sensor2 bias value.

Request Data Bytes

Byte	Format	Description
0	Unsigned-8	0: Sensor 1 1: Sensor 2
1-4	Float	Sensor bias value

Response Data Bytes

Byte	Format	Description
0	Unsigned-8	0: Sensor 1 1: Sensor 2
1-4	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

10.14 Command #141: Write RTD1/RTD2 type

This command configures the sensor1 RTD and sensor2 RTD type and by default it will be 3wire.

Request Data Bytes

Byte	Format	Description
0	Unsigned-8	0: Sensor 1 1: Sensor 2
1	Enum	RTD type (0 = 2wire, 1 = 3wire, 2 = 4wire)

Response Data Bytes

Byte	Format	Description
0	Unsigned-8	0: Sensor 1 1: Sensor 2
1	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

10.15 Command #142: Write RTD1 / RTD2 lead wire resistance

This command configures the sensor1 and sensor2 lead wire resistance.

Request Data Bytes

Byte	Format	Description
0	Unsigned-8	0: Sensor 1 1: Sensor 2
1-4	Float	RTD lead wire resistance

Response Data Bytes

Byte	Format	Description
0	Unsigned-8	0: Sensor 1 1: Sensor 2
1-4	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

10.16 Command #143: Write excess delta detection

This command configures excess delta detection status

Request Data Bytes

Byte	Format	Description
0	Enum	Excess delta detection status (0x00: Disable 0x01: Enable)

Response Data Bytes

Byte	Format	Description
0	Enum	Excess delta detection 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

10.17 Command #144: Read delta limit, delta, excess delta detection

This command reads delta limit, delta, and excess delta detection.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0-3	Float	Delta limit
4-7	Float	delta
8	Enum	Excess delta detection status (0x00: Disabled 0x01: Enabled)

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

10.18 Command #145: Write CJ compensation type

This command configures the Cold Junction compensation type and by default it will be internal.

Request Data Bytes

Byte	Format	Description
0	Enum	CJ compensation type 0x00 = Internal, 0x01 = External, 0x02 = Fixed

Response Data Bytes

Byte	Format	Description
0	Enum	CJ compensation type 0x00 = Internal, 0x01 = External, 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

10.19 Command #146: Read sensors extra configuration

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

By default sensors will be in mV and the UTL is 120mV and LTL is -20mV and MRV is 70mV.

Break Detect status is Enable by default.

Enable: 01

Disable: 00

Cold Junction Compensation Type:

Internal: 00

External: 01

Fixed: 02

Match PV Status:

ON: 01

OFF: 00

Latching Status:

ON: 01

OFF: 00

Fixed Cold Junction Compensation value is 0 by default

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0-3	Float	Mid-range Value (MRV)
4	Enum	Break detect status
5	Enum	Cold Junction compensation type
6	Enum	Latching status
7-10	Float	Fixed cold junction compensation value

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

10.20 Command #147: Read Transmitter Specifics

The command reads the device type code and display module information.

The Device type code for STT700 SmartLine Temperature Transmitter is 0x2B.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0	Unsigned 8	Transmitter Device type code (STT700 = 0x2B)
1	Enum	Meter/Display connected flag 00: Not Connected 01: Connected
2	Enum	Meter/Display type 01: Advanced display 02: Basic display 03:Standard display

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

10.21 Command #148: Read Sensor 1 and Sensor 2 resistance

This command is used to Read Sensor 1 and Sensor 2 resistance

Request Data Bytes

Byte	Format	Description

Response Data Bytes

Byte	Format	Description
0-3	Float	Sensor 1 Resistance
4-7	Float	Sensor 2 Resistance

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

10.22 Command #149: Read Sensor 1 and Sensor 2 voltages

This command is used to Read Sensor 1 and Sensor 2 voltages

Request Data Bytes

Byte	Format	Description

Response Data Bytes

Byte	Format	Description
0-3	Float	Sensor 1 voltage
4-7	Float	Sensor 2 voltage

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

10.23 Command #150: 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

10.24 Command #151: Read Device Serial Number

This command reads device Serial Number.

Request Data Bytes:

Byte	Format	Description

Response Data Bytes

Byte	Format	Description
0-13	Unsigned 8	Device Serial Number

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

10.25 Command #152: Write delta limit

This command configures the delta limit.

Range for delta limit is 0.0 to (URV-LRV).

Request Data Bytes

Byte	Format	Description
0-3	Float	Delta limit

Response Data Bytes

Byte	Format	Description
0-3	Float	Delta limit

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
5	Error	Too few data bytes
7	Error	In Write Protect Mode
16	Error	Access restricted
32	Error	Busy
3	Error	Passed Parameter Value is too large
4	Error	Passed Parameter Value is too Small

10.26 Command #153: Read power fail counter and its timestamp

This command reads Power fail count & it's time stamp. Timestamp is in minutes.

Note: Power Fail Count value is in minutes and provides the time for which device is on before power cycle or reset.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0-1	Unsigned 16	Power fail count
2-5	Unsigned 32	Power Fail Stamp (in minutes)

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

10.27 Command #154: Read time in service, service life remaining

This command reads time in service, service life remaining for the transmitter. Unit for Time In service is minutes and Service Life Remaining is %.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0-3	Unsigned 32	Time in Service(In minutes)
4-7	Float	Service Life remaining (In %)

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

10.28 Command #155: Write NAMUR Selection

This command is used to write NAMUR enable or disable.

Request Data Bytes

Byte	Format	Description
0	Enum	0x00 to disable 0x01 to enable

Response Data Bytes

Byte	Format	Description
0	Enum	0x00 to disable 0x01 to enable

Command-Specific Response Codes

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

10.29 Command #156: Read NAMUR Selection

This command is used to read NAMUR selection.

Request Data Bytes

Byte	Format	Description

Response Data Bytes

Byte	Format	Description
0	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

10.30 Command #157: Read CT Tracking value

This command reads CT values and its tracking.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0-3	Float	CT Value
4-7	Float	Highest CT recorded
8-11	Float	Highest CT Timestamp
12-15	Float	Lowest CT recorded
16-19	Float	Lowest CT Timestamp

Command-Specific Response Codes

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

10.31 Command #158: Read last Time & Date for correct URV, correct LRV and reset corrects for Sensor 1 / Sensor 2

This command reads Last Time and Dates for correct URV, correct LRV and reset corrects of sensor 1 / sensor 2

Request Data Bytes

Byte	Format	Description
0	Unsigned – 8	Request data from user 0: Sensor 1 1: Sensor 2

Response Data Bytes

Byte	Format	Description
0	Unsigned – 8	0: Sensor 1 1: Sensor 2
1	Unsigned 8	Last URV Correct Date
2	Unsigned 8	Last URV Correct Month
3	Unsigned 8	Last URV Correct Year
4	Unsigned 8	Last URV Correct Hours
5	Unsigned 8	Last URV Correct Minutes
6	Unsigned 8	Last LRV Correct Date
7	Unsigned 8	Last LRV Correct Month
8	Unsigned 8	Last LRV Correct Year
9	Unsigned 8	Last LRV Correct Hours
10	Unsigned 8	Last LRV Correct Minutes
11	Unsigned 8	Last Reset Correct Date
12	Unsigned 8	Last Reset Correct Month
13	Unsigned 8	Last Reset Correct Year
14	Unsigned 8	Last Reset Correct Hours
15	Unsigned 8	Last Reset Correct Minutes

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
6	Error	Transmitter specific command error
5	Error	Too few data bytes received
2	Error	Invalid Selection

10.32 Command #159: Read Previous Time & Date for correct URV, correct LRV and reset corrects for Sensor 1/ Sensor 2

This command reads Previous Time and Dates for correct URV, correct LRV and reset corrects of sensor 1/ sensor2.

Request Data Bytes

Byte	Format	Description
0	Unsigned – 8	Request data from user 0: Sensor 1 1: Sensor 2

Response Data Bytes

Byte	Format	Description
0	Unsigned – 8	0: Sensor 1 1: Sensor 2
1	Unsigned 8	Previous URV Correct Date
2	Unsigned 8	Previous URV Correct Month
3	Unsigned 8	Previous URV Correct Year
4	Unsigned 8	Previous URV Correct Hours
5	Unsigned 8	Previous URV Correct Minutes
6	Unsigned 8	Previous LRV Correct Date
7	Unsigned 8	Previous LRV Correct Month
8	Unsigned 8	Previous LRV Correct Year
9	Unsigned 8	Previous LRV Correct Hours
10	Unsigned 8	Previous LRV Correct Minutes
11	Unsigned 8	Previous Reset Correct Date
12	Unsigned 8	Previous Reset Correct Month
13	Unsigned 8	Previous Reset Correct Year
14	Unsigned 8	Previous Reset Correct Hours
15	Unsigned 8	Previous Reset Correct Minutes

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
6	Error	Transmitter specific command error
5	Error	Too few data bytes received
2	Error	Invalid Selection

10.33 Command #160: Read Current Time & Date for correct URV, correct LRV for Sensor 1 sensor 2

This command reads Current Time and Dates for correct URV, correct LRV of sensor 1 and sensor 2

Request Data Bytes

Byte	Format	Description
0	Unsigned – 8	Request data from user 0: Sensor 1 1: Sensor 2

Response Data Bytes

Byte	Format	Description
0	Unsigned 8	0: Sensor 1 1: Sensor 2
1	Unsigned 8	Current URV Correct Date
2	Unsigned 8	Current URV Correct Month
3	Unsigned 8	Current URV Correct Year
4	Unsigned 8	Current URV Correct Hours
5	Unsigned 8	Current URV Correct Minutes
6	Unsigned 8	Current LRV Correct Date
7	Unsigned 8	Current LRV Correct Month
8	Unsigned 8	Current LRV Correct Year
9	Unsigned 8	Current LRV Correct Hours
10	Unsigned 8	Current LRV Correct Minutes
11	Unsigned 8	Current Reset Correct Date
12	Unsigned 8	Current Reset Correct Month
13	Unsigned 8	Current Reset Correct Year
14	Unsigned 8	Current Reset Correct Hours
15	Unsigned 8	Current Reset Correct Minutes

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
6	Error	Transmitter specific command error
5	Error	Too few data bytes received
2	Error	Invalid Selection

10.34 Command #161: Read Current, Last, Previous Time & Date for reset corrects for Sensor 1 / Sensor 2

This command reads Current Time and Dates for correct URV, correct LRV of sensor 1 / sensor 2

Request Data Bytes

Byte	Format	Description
0	Unsigned – 8	Request data from user 0: Sensor 1 1: Sensor 2

Response Data Bytes

Byte	Format	Description
0	Unsigned – 8	0: Sensor 1 1: Sensor 2
1	Unsigned 8	Current Reset Correct Date
2	Unsigned 8	Current Reset Correct Month
3	Unsigned 8	Current Reset Correct Year
4	Unsigned 8	Current Reset Correct Hours
5	Unsigned 8	Current Reset Correct Minutes
6	Unsigned 8	Last Reset Correct Date
7	Unsigned 8	Last Reset Correct Month
8	Unsigned 8	Last Reset Correct Year
9	Unsigned 8	Last Reset Correct Hours
10	Unsigned 8	Last Reset Correct Minutes
11	Unsigned 8	Previous Reset Correct Date
12	Unsigned 8	Previous Reset Correct Month
13	Unsigned 8	Previous Reset Correct Year
14	Unsigned 8	Previous Reset Correct Hours
15	Unsigned 8	Previous Reset Correct Minutes

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
6	Error	Transmitter specific command error
5	Error	Too few data bytes received
2	Error	Invalid Selection

10.35 Command #162: Write Sensor1 /Sensor2 install date

This command is used to write the sensor1 / sensor2 install date.

Request Data Bytes

Byte	Format	Description
0	Unsigned – 8	0: Sensor 1 1: Sensor 2
1	Unsigned-8	Day
2	Unsigned-8	Month
3	Unsigned-8	Year

Response Data Bytes

Byte	Format	Description
0	Unsigned – 8	0: Sensor 1 1: Sensor 2
1	Unsigned-8	Day
2	Unsigned-8	Month
3	Unsigned-8	Year
4	Unsigned-8	Hour
5	Unsigned-8	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

10.36 Command #163: Read sensors and transmitter install dates

This command reads the sensor1, sensor2, and transmitter install dates.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0	Unsigned 8	Date, sensor 1
1	Unsigned 8	Month, sensor 1
2	Unsigned 8	Year, sensor 1
3	Unsigned 8	Hour, sensor 1
4	Unsigned 8	Minute, sensor 1
5	Unsigned 8	Date, sensor 2
6	Unsigned 8	Month, sensor 2
7	Unsigned 8	Year, sensor 2
8	Unsigned 8	Hour, sensor 2
9	Unsigned 8	Minute, sensor 2
10	Unsigned 8	Date, Transmitter
11	Unsigned 8	Month, Transmitter
12	Unsigned 8	Year, Transmitter
13	Unsigned 8	Hour, Transmitter
14	Unsigned 8	Minute, Transmitter

Command-Specific Response Codes

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

10.37 Command #164: Write transmitter install date to sensor

This command writes transmitter install date to sensor.

Request Data Bytes

Byte	Format	Description
0	Unsigned 8	Date, Transmitter
1	Unsigned 8	Month, Transmitter
2	Unsigned 8	Year, Transmitter

Response Data Bytes

Byte	Format	Description
0	Unsigned 8	Date, Transmitter
1	Unsigned 8	Month, Transmitter
2	Unsigned 8	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

10.38 Command #165: 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

10.39 Command #166: 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

10.40 Command #167: 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

10.41 Command #168: 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	ASCII	Model Number –Table IV Information

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

10.42 Command #169: Write CVD1/CVD2 4 Coefficients

This command writes the Sensor CVD1/CVD2 coefficients 1 to 4 (R0, α, δ, β).

Request Data Bytes

Byte	Format	Description
0	Unsigned-8	0: Sensor 1 1: Sensor 2
1-4	Float	CVD R0 value
5-8	Float	CVD α value
9-12	Float	CVD δ value
13-16	Float	CVD β value

Response Data Bytes

Byte	Format	Description
0	Unsigned-8	0: Sensor 1 1: Sensor 2
1-4	Float	CVD R0 value
5-8	Float	CVD α value
9-12	Float	CVD δ value
13-16	Float	CVD β 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

10.43 Command #170: Read CVD1/CVD2 co-efficient Values:

This command Reads CVD1/CVD2 co-efficient values.

Request Data Bytes

Byte	Format	Description
0	Unsigned-8	0 = CVD1 1 = CVD2

Response Data Bytes

Byte	Format	Description
0	Unsigned-8	0 = CVD1 1 = CVD2
1-4	Float	CVD R0 value
5-8	Float	CVD α value
9-12	Float	CVD δ value
13-16	Float	CVD β value

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
5	Error	Too few data bytes received
2	Error	Invalid Selection

10.44 Command #171: Write CVD1/CVD2 Coefficient activation

This command writes the Sensor CVD Activation of CVD1/CVD2.

Below are the possible values for CVD1/CVD2 Activation.

0x00 = CVD OFF
0x01 = CVD ON

Request Data Bytes

Byte	Format	Description
0	Unsigned-8	0 = CVD1 1 = CVD2
1	Unsigned-8	CVD Activation

Response Data Bytes

Byte	Format	Description
0	Unsigned-8	0 = CVD1 1 = CVD2
1	Unsigned-8	CVD Activation

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid selection
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

10.45 Command #172: Read CVD1/CVD2 Coefficient activation:

This command Reads CVD1/CVD2 Coefficient activation.

Request Data Bytes

Byte	Format	Description
0	Unsigned-8	0 = CVD1 1 = CVD2

Response Data Bytes

Byte	Format	Description
0	Unsigned-8	CVD Activation

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid selection
5	Error	Too few data bytes received

10.46 Command #173: Read CVD1 and CVD2 User Cal values

This command reads CVD1 and CVD2 user calibration values.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0-3	Float	CVD1 Low Cal Value
4-7	Float	CVD1 High Cal Value
8-11	Float	CVD2 Low Cal Value
12-15	Float	CVD2 High Cal Value

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

10.47 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

10.48 Command #176: Write/Change Write Protect Password

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

Request Data Bytes

Byte	Format	Description
0	Enum	Disable WP code(0x00) / Change Password Code(0x03) / Reset Password Code (0x04)
1-4	ASCII	“Current Password” for Disable WP command / “New Password” for Change command/ “Reset Password Code” for Resetting the Password
5-8	ASCII	“default Password (0000)” for Disable WP command / “Current Password” for Change command / “New Password” for Resetting the Password

Response Data Bytes

Byte	Format	Description
0	Enum	Disable WP code(0x00) / Change password code (0x03) / Reset Password code(0x04)
1-4	ASCII	“Current Password” for Disable WP command / “New Password” for Change command/ “Reset Password Code” for Resetting the Password
5-8	ASCII	“default Password (0000)” for Disable WP command / “Current Password” for Change command / “New Password” for Resetting the Password

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

10.49 Command #177: Read error log part1/part2

This command reads the error log part 1-> 5 latest errors information and error log part 2-> 5 oldest error information.

Request Data Bytes

Byte	Format	Description
0	Unsigned-8	0x01 – Error Log Part1 0x02 –Error Log Part2

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) SIL Diagnostic Failure = 4
f) Excess Delta Detected = 5
g) Watch dog reset = 7
h) Cold start = 8
i) Non-Critical failure = 9
j) Input 1 Open = 10
k) Input 2 open = 11

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid selection
5	Error	Too few data bytes received

10.50 Command #178: 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
7	Error	In Write Protect Mode
16	Error	Access restricted

10.51 Command #179: 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

10.52 Command #180: 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

10.53 Command #181: Write break detect status

This command configures the break detection status and by default it is enabled.

Request Data Bytes

Byte	Format	Description
0	Enum	Break detect status (0x00 = Disable, 0x01 = Enable)

Response Data Bytes

Byte	Format	Description
0	Enum	Break detect status 0x00 = Disable, 0x01 = Enable)

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

10.54 Command #182: Write Mid-Range Value((MRV)

This command configures the Mid-range value, this value is used for split range loop control mode.

Request Data Bytes

Byte	Format	Description
0-3	Float	MRV

Response Data Bytes

Byte	Format	Description
0-3	Float	MRV

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

10.55 Command #183: Write latching status

This command configures the sensor information bits latching status and by default it is ON.

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

10.56 Command #184: Write match PV status

This command configures the PV matching status.

Request Data Bytes

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

Response Data Bytes

Byte	Format	Description
0	Enum	Match PV 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

10.57 Command #185: Write hysteresis value

This command configures the hysteresis value.

Request Data Bytes

Byte	Format	Description
0-3	Float	hysteresis

Response Data Bytes

Byte	Format	Description
0-3	Float	hysteresis

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

10.58 Command #186: Write damping for bump less transfer

This command configures the damping for bump less transfer value.

Limit/Range for damping for bump less transfer is 0.00 to 99.9 sec

Request Data Bytes

Byte	Format	Description
0-3	Float	Damping for bump less transfer

Response Data Bytes

Byte	Format	Description
0-3	Float	Damping for bump less transfer

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
3	Error	Passed Parameter value is too large
4	Error	Passed Parameter value is too Small

10.59 Command #187: Read HART-DE 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

10.60 Command #188: Read the loop control mode, loop controlling sensor, hysteresis value, Damping for bump-less transfer

This command reads the HART communication board parameters, loop control mode, loop controlling sensor, hysteresis value, Damping for bump-less transfer and device variant.

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0	Enum	Loop control mode (0x00: Averaging, 0x01: Difference, 0x02: Sensor1, 0x03: Sensor2, 0x04: Redundant, 0x05: Split-Ranging)
1	Enum	Loop controlling PV: (0x00: Both Sensor 0x01: Primary Sensor 0x02: Secondary Sensor 0x04: Single Input)
2-5	Float	Hysteresis value
6-9	Float	Damping for bump less transfer
10	Enum	Device variant (0x01 = Single input 0x02 = Dual input)

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

10.61 Command #189: Write Loop control mode

This command configures the loop control mode.

Request Data Bytes

Byte	Format	Description
0	Enum	Loop control mode (0x00: Average, 0x01: Difference, 0x02: Sensor1, 0x03: Sensor2, 0x04: Redundant, 0x05: Split-Ranging)

Response Data Bytes

Byte	Format	Description
0	Enum	Loop control mode (0x00: Average, 0x01: Difference, 0x02: Sensor1, 0x03: Sensor2, 0x04: Redundant, 0x05: Split-Ranging)

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

10.62 Command #191: Write sensor type/Id

This command configures the types and Id's of sensor1 and sensor2.

Request Data Bytes

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

1	Enum	Sensor 1 Id
		(if sensor1 type is MV then
		0 = mV-22,
		1 = mV-125,
		if sensor1 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),
		9 = TC Type L(GOST)
		if sensor1 type is RTD then
		0 = Reserved,
		1 = RTD Pt 100, ,a=385
		2 = RTD Pt 200, ,a=385
		3 = Reserved,
		4 = Reserved,
		5 = RTD Pt50, a=391
		6 = RTD Pt100, a=391
		7 = RTD Ni 120,
		8 = Reserved,
		9 = RTD Cu50, a=426
		10 = RTD Cu50, a=428
		11 = RTD Cu100, a=426
		12 = RTD Cu100, a=428
		if sensor1 type is OHMS then
		0 = OHM 500,
		1 = OHM 2K)

2	Enum	Sensor 2 type (0 = MV, 1 = TC, 2 = RTD, 3 = OHMS, 4 = None)

3	Enum	Sensor 2 Id
		(if sensor2 type is MV then
		0 = mV-22,
		1 = mV-125,
		if sensor2 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),
		9 = TC Type L(GOST)
		if sensor2 type is RTD then
		0 = Reserved,
		1 = RTD Pt 100, ,a=385
		2 = RTD Pt 200, ,a=385
		3 = Reserved,
		4 = Reserved,
		5 = RTD Pt50, a=391
		6 = RTD Pt100, a=391
		7 = RTD Ni 120,
		8 = Reserved,
		9 = RTD Cu50, a=426
		10 = RTD Cu50, a=428
		11 = RTD Cu100, a=426
		12 = RTD Cu100, a=428
		if sensor2 type is OHMS then
		0 = OHM 500,
		1 = OHM 2K)

Response Data Bytes

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

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

10.63 Command #195: Read SV(CJ) tracking values

This command reads Secondary Variable 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(In minutes)
8-11	Float	Lowest SV recorded
12-15	Unsigned-32	Lowest SV Timestamp(In minutes)
16-19	Float	SV High alarm limit
20-23	Float	SV Low alarm limit
24-25	Unsigned-16	No of times SV recorded above High alarm limit
26-27	Unsigned-16	No of times SV recorded below low alarm limit

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

10.64 Command #198: Write high and low alarm limits for PV and SV

This command writes the high and low alarm limits for PV and SV. These values are used for tracking PV and SV values.

Request Data Bytes

Byte	Format	Description
0	Unsigned-8	0 = PV 1 = SV
1-4	Float	High alarm limit
5-8	Float	Low alarm limit

Response Data Bytes

Byte	Format	Description
0	Unsigned-8	0 = PV 1 = SV
1-4	Float	High alarm limit
5-8	Float	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 Received
7	Error	In-Write Protect Mode
16	Error	Access Restricted

10.65 Command #199: 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(In minutes)
8-11	Float	Lowest PV recorded
12-15	Unsigned-32	Lowest PV Timestamp(In minutes)
16-19	Float	PV High alarm limit
20-23	Float	PV 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

10.66 Command #200: Reset PV and SV tracking data

This command resets the tracking data. User has the option to select what tracking data to clear either for PV or SV.

Request Data Bytes

Byte	Format	Description
0	Unsigned – 8	0: PV 1: SV
1	Unsigned – 8	Monitoring parameter code 1: All 2: Highest value and time stamp 3: Lowest value and time stamp 4: High alarm limit and counter 5: Low alarm limit and counter

Response Data Bytes

Byte	Format	Description
0	Unsigned – 8	0: PV 1: SV
1	Unsigned – 8	Monitoring parameter code

Command-Specific Response Codes

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

10.67 Command #201: 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
7	Error	In-Write Protect Mode
16	Error	Access Restricted
32	Error	Busy

10.68 Command #202: Read current, minimum operating voltage and its timestamp

This command reads Loop Voltage Current value, Loop Voltage min value, Loop Voltage min time stamp,

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0-3	Float	VLOOP current value
4-7	Float	VLOOP min value
8-11	Unsigned -32	VLOOP min time stamp

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

10.69 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	Unsigned 32	DD 1 MM 1 YY 1 HR 1 MIN 1

Response Data Bytes

Byte	Format	Description
0-4	Unsigned 32	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

10.70 Command #222: Acknowledge latching

This command is used to acknowledge sensor errors.

Request Data Bytes

Byte	Format	Description

Response Data Bytes

Byte	Format	Description

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

10.71 Command #225: Write Display Configuration Parameters

This command writes the display configuration parameters like display publish, display units, display contrast and extended menu selection to support advance configuration through display.

Request Data Bytes

Byte	Format	Description
0	Enum	Display Publish 0x00 = Loop PV 0x01 = %output 0x02 = Loop Output 0x03 = CJ Temperature 0x04 = Sensor 1 0x05 = Sensor 2
1	Enum	Display Units 0x00 = degC 0x01 = degF 0x02 = degR 0x03 = Kelvin 0x04 = mV 0x05 = Ohm 0x06 = mA 0x07 = %
2	Enum	Display Contrast 0x01 = 1 0x02 = 2 0x03 = 3 0x04 = 4 0x05 = 5 0x06 = 6 0x07 = 7
3	Enum	Extended Menu Selection 0x00 = Disable 0x01 = Enable

Response Data Bytes

Byte	Format	Description
0	Enum	Display Publish 0x00 = Loop PV 0x01 = %output 0x02 = Loop Output 0x03 = CJ Temperature 0x04 = Sensor 1 0x05 = Sensor 2
1	Enum	Display Units 0x00 = degC 0x01 = degF 0x02 = degR 0x03 = Kelvin 0x04 = mV 0x05 = Ohm 0x06 = mA 0x07 = %
2	Enum	Display Contrast 0x01 = 1 0x02 = 2 0x03 = 3 0x04 = 4 0x05 = 5 0x06 = 6 0x07 = 7
3	Enum	Extended Menu Selection 0x00 = Disable 0x01 = Enable

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
32	Error	Busy
65	Error	Display Connection Issue

Command #226: Read Display Configuration parameters

This command reads display configuration parameters like display publish, display units, display contrast and extended menu selection

Request Data Bytes

Byte	Format	Description
None		

Response Data Bytes

Byte	Format	Description
0	Enum	Display Publish 0x00 = Loop PV 0x01 = %output 0x02 = Loop Output 0x03 = CJ Temperature 0x04 = Sensor 1 0x05 = Sensor 2
1	Enum	Display Units 0x00 = degC 0x01 = degF 0x02 = degR 0x03 = Kelvin 0x04 = mV 0x05 = Ohm 0x06 = mA 0x07 = %
2	Enum	Display Contrast 0x01 = 1 0x02 = 2 0x03 = 3 0x04 = 4 0x05 = 5 0x06 = 6 0x07 = 7
3	Enum	Extended Menu Selection 0x00 = Disable 0x01 = Enable

Command-Specific Response Codes

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

Code	Class	Description
16	Error	Access Restricted
65	Error	Display Connection Issue

10.72 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

Command #229: Read last Time & Date for correct URV, correct LRV and reset corrects for Sensor 1 / Sensor 2

This command reads Last Time and Dates for correct URV, correct LRV and reset corrects of sensor 1 / sensor 2

Request Data Bytes

Byte	Format	Description
0	Unsigned – 8	Request data from user 0: Sensor 1 1: Sensor 2

Response Data Bytes

Byte	Format	Description
0	Unsigned – 8	0: Sensor 1 1: Sensor 2
1	Unsigned 8	Last URV Correct Date
2	Unsigned 8	Last URV Correct Month
3	Unsigned 8	Last URV Correct Year
4	Unsigned 8	Last URV Correct Hours
5	Unsigned 8	Last URV Correct Minutes
6	Unsigned 8	Last LRV Correct Date
7	Unsigned 8	Last LRV Correct Month
8	Unsigned 8	Last LRV Correct Year
9	Unsigned 8	Last LRV Correct Hours
10	Unsigned 8	Last LRV Correct Minutes
11	Unsigned 8	Last Reset Correct Date
12	Unsigned 8	Last Reset Correct Month
13	Unsigned 8	Last Reset Correct Year
14	Unsigned 8	Last Reset Correct Hours
15	Unsigned 8	Last Reset Correct Minutes

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
6	Error	Transmitter specific command error
5	Error	Too few data bytes received
2	Error	Invalid Selection

Command #230: Read Previous Time & Date for correct URV, correct LRV and reset corrects for Sensor 1/ Sensor 2

This command reads Previous Time and Dates for correct URV, correct LRV and reset corrects of sensor 1/ sensor2.

Request Data Bytes

Byte	Format	Description
0	Unsigned – 8	Request data from user 0: Sensor 1 1: Sensor 2

Response Data Bytes

Byte	Format	Description
0	Unsigned – 8	0: Sensor 1 1: Sensor 2
1	Unsigned 8	Previous URV Correct Date
2	Unsigned 8	Previous URV Correct Month
3	Unsigned 8	Previous URV Correct Year
4	Unsigned 8	Previous URV Correct Hours
5	Unsigned 8	Previous URV Correct Minutes
6	Unsigned 8	Previous LRV Correct Date
7	Unsigned 8	Previous LRV Correct Month
8	Unsigned 8	Previous LRV Correct Year
9	Unsigned 8	Previous LRV Correct Hours
10	Unsigned 8	Previous LRV Correct Minutes
11	Unsigned 8	Previous Reset Correct Date
12	Unsigned 8	Previous Reset Correct Month
13	Unsigned 8	Previous Reset Correct Year
14	Unsigned 8	Previous Reset Correct Hours
15	Unsigned 8	Previous Reset Correct Minutes

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

Code	Class	Description
6	Error	Transmitter specific command error
5	Error	Too few data bytes received
2	Error	Invalid Selection

Command #231: Read Current Time & Date for correct URV, correct LRV for Sensor 1 sensor 2

This command reads Current Time and Dates for correct URV, correct LRV of sensor 1 and sensor 2

Request Data Bytes

Byte	Format	Description
0	Unsigned – 8	Request data from user 0: Sensor 1 1: Sensor 2

Response Data Bytes

Byte	Format	Description
0	Unsigned 8	0: Sensor 1 1: Sensor 2
1	Unsigned 8	Current URV Correct Date
2	Unsigned 8	Current URV Correct Month
3	Unsigned 8	Current URV Correct Year
4	Unsigned 8	Current URV Correct Hours
5	Unsigned 8	Current URV Correct Minutes
6	Unsigned 8	Current LRV Correct Date
7	Unsigned 8	Current LRV Correct Month

8	Unsigned 8	Current LRV Correct Year
9	Unsigned 8	Current LRV Correct Hours
10	Unsigned 8	Current LRV Correct Minutes
11	Unsigned 8	Current Reset Correct Date
12	Unsigned 8	Current Reset Correct Month
13	Unsigned 8	Current Reset Correct Year
14	Unsigned 8	Current Reset Correct Hours
15	Unsigned 8	Current Reset Correct Minutes

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
6	Error	Transmitter specific command error
5	Error	Too few data bytes received
2	Error	Invalid Selection

Command #232: Read Current, Last, Previous Time & Date for reset corrects for Sensor 1 / Sensor 2

This command reads Current Time and Dates for correct URV, correct LRV of sensor 1 / sensor 2

Request Data Bytes

Byte	Format	Description
0	Unsigned – 8	Request data from user 0: Sensor 1 1: Sensor 2

Response Data Bytes

Byte	Format	Description
0	Unsigned – 8	0: Sensor 1 1: Sensor 2
1	Unsigned 8	Current Reset Correct Date
2	Unsigned 8	Current Reset Correct Month
3	Unsigned 8	Current Reset Correct Year
4	Unsigned 8	Current Reset Correct Hours
5	Unsigned 8	Current Reset Correct Minutes
6	Unsigned 8	Last Reset Correct Date
7	Unsigned 8	Last Reset Correct Month
8	Unsigned 8	Last Reset Correct Year
9	Unsigned 8	Last Reset Correct Hours
10	Unsigned 8	Last Reset Correct Minutes
11	Unsigned 8	Previous Reset Correct Date
12	Unsigned 8	Previous Reset Correct Month
13	Unsigned 8	Previous Reset Correct Year
14	Unsigned 8	Previous Reset Correct Hours
15	Unsigned 8	Previous Reset Correct Minutes

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
6	Error	Transmitter specific command error
5	Error	Too few data bytes received
2	Error	Invalid Selection

Command #233: 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	Unsigned – 8	Request data from user 0:Index 0 1:Index 1 2:Index 2 3:Index 3
1-7	Enum	key number
8-27	Enum	Table 1 information

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

Command #234: 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	Unsigned – 8	Request data from user 0:Index 0 1:Index 1 2:Index 2 3:Index 3
1-20	Enum	Table II information

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors

Command #235: Read CVD1/CVD2 co-efficient Values:

This command Reads CVD1/CVD2 co-efficient values.

Request Data Bytes

Byte	Format	Description
0	Unsigned-8	0 = CVD1 1 = CVD2

Response Data Bytes

Byte	Format	Description

0	Unsigned-8	0 = CVD1 1 = CVD2
1-4	Float	CVD R0 value
5-8	Float	CVD α value
9-12	Float	CVD δ value
13-16	Float	CVD β value

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
5	Error	Too few data bytes received
2	Error	Invalid Selection

Command #236: Read CVD1/CVD2 Coefficient activation:

This command Reads CVD1/CVD2 Coefficient activation.

Request Data Bytes

Byte	Format	Description

0	Unsigned-8	0 = CVD1 1 = CVD2

Response Data Bytes

Byte	Format	Description
0	Unsigned-8	0 = CVD1 1 = CVD2
1	Unsigned-8	CVD Activation

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid selection
5	Error	Too few data bytes received

Command #237: Read error log part1/part2

This command reads the error log part 1-> 5 latest errors information and error log part 2-> 5 oldest error information.

Request Data Bytes

Byte	Format	Description
0	Unsigned-8	0x00 – Error Log Part1 0x01 –Error Log Part2

Response Data Bytes

Byte	Format	Description
0	Unsigned-8	0x00 – Error Log Part1
1	Enum	Error code0
2	Enum	Error code1
3	Enum	Error code2
4	Enum	Error code3
5	Enum	Error code4
6-9	Unsigned -32	Error 0 time stamp
10-13	Unsigned -32	Error 1 time stamp
14-17	Unsigned -32	Error 2 time stamp
18-21	Unsigned -32	Error 3 time stamp
22-25	Unsigned -32	Error 4 time stamp
26-29	Unsigned -32	Transmitter time in service

Byte	Format	Description
0	Unsigned-8	0x01 – Error Log Part2
1	Enum	Error code5
2	Enum	Error code6
3	Enum	Error code7
4	Enum	Error code8
5	Enum	Error code9
6-9	Unsigned -32	Error 5 time stamp
10-13	Unsigned -32	Error 6 time stamp
14-17	Unsigned -32	Error 7 time stamp
18-21	Unsigned -32	Error 8 time stamp
22-25	Unsigned -32	Error 9 time stamp

Error Log codes:

a) No error = 0
b) DAC failure = 1
c) Calibration corrupt = 2
d) Configuration corrupt = 3
e) SIL Diagnostic Failure = 4
f) Excess Delta Detected = 5
g) Watch dog reset = 7
h) Cold start = 8
i) Non-Critical failure = 9
j) Input 1 Open = 10
k) Input 2 open = 11

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
2	Error	Invalid selection
5	Error	Too few data bytes received

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

Table 11 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
Fahrenheit	$T_F = (T_C*1.8) + 32$
Rankine	$T_R = (T_C + 273.15)*1.8$
Kelvin	$T_K = T_C + 273.15$

Table 12 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	DAC Write Failure
	0	Unused
Communication (HART) (BYTE2)	7	Calibration Table Fault
	6	Char table Fault
	5	EEPROM Block Corrupt
	4	Stack Over Flow
	3	Flow Control Fault
	2	Flash/ROM Corrupt
	1	RAM Database Corrupt
	0	RAM Corrupt
(HART) (BYTE3)	7	Input 2 Short (RTD)
	6	Input 2 Open
	5	Input 1 Short (RTD)
	4	Input 1 Open
	3	Input 2 Under Range
	2	Input 2 Over Range
	1	Input 1 Under Range
	0	Input 1 Over Range
Other Info (HART) (BYTE4)	7	Unsed
	6	Input2UserCorrectActive
	5	Input1UserCorrectActive
	4	DAC Loop Voltage Failure
	3	MCU Supply Fault
	2	CTCJ Delta Warning
	1	ADC Reference Fault
	0	ADC Range Fault
Sensor (BYTE5)	7	Reserved
	6	Reserved
	5	Reserved
	4	Reserved
	3	Reserved
	2	User Correct Active
	1	Break Detect Status
	0	Latch Status

Database Integrity (BYTE6)		
	7	Advanced diagnostic database corrupt
	6	Sensor2 block database corrupt
	5	Sensor1 block database corrupt
	4	Sensor Common block database corrupt
	3	Config Change block database corrupt
	2	General block database corrupt
	1	Vital block database corrupt
	0	Common block database corrupt
Database Integrity (BYTE7)		
	7	Advanced diagnostic write fail
	6	Sensor2 block write fail
	5	Sensor1 block write fail
	4	Sensor Common block write fail
	3	Config Change block write fail
	2	General block write fail
	1	Vital block database write fail
	0	Common block write fail
Display Database Integrity (BYTE8)	7	Reserved
	6	Reserved
	5	Reserved
	4	Reserved
	3	Reserved
	2	Reserved
	1	Reserved
	0	Standard Display block database corrupt
Display Database Integrity (BYTE9)	7	Reserved
	6	Reserved
	5	Reserved
	4	Reserved
	3	Reserved
	2	Reserved
	1	Reserved
	0	Standard Display block write fail

Table 13 Command 220 details

11.4 Sensor Type Codes

0	MV22
1	MV125
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	Thermocouple Type L (GOST)
12	RTD Pt 100, ,a=385
13	RTD Pt 200, ,a=385
14	RTD Pt50, a=391
15	RTD Pt100, a=391
16	RTD Ni 120,
17	RTD Cu50, a=426
18	RTD Cu50, a=428
19	RTD Cu100, a=426
20	RTD Cu100, a=428
21	OHM 500
22	OHM 2K)

Table 14 Sensor type codes

12. Performance

12.1 Sampling Rates

Typical sampling rates are shown in the following table.

Primary Temperature sensor sample	6 per second(Dual Input) 3 Per Second (Single Input)
Internal sensor sample	50 per second
PV digital value calculation	3 per second
SV digital value calculation	3 per second
TV digital value calculation	3 per second
QV digital value calculation	3 per second
Analog output update	3 per second

Table 15 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 = 18 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 64773 for “Self-Test”.

12.5 Command Response Times

Minimum	18.236ms
Typical	64ms
Maximum	208.643ms

Table 16 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 software write protect (command 175 and 176) .When there is no write protect, all commands are available.

12.11 Damping

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

12.12 Damping for bump less transfer

The damping for bump less transfer is available from 0 to 99.9 seconds in HART.

Annex A. Capability Checklist

Manufacturer, model and revision	Honeywell Intl (2B)., STT700, rev.2
Device type	1 (Transmitter)
HART revision	7.x
Device Description available?	Yes
Number and type of sensors	2
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	82
Bits of additional device status	51 (9 bytes are used)
Alternative operating modes?	No
Burst mode?	No
Capture Device Variables?	No
Write-protection?	Yes

Table 17 Capability checklist

Annex B. Default Configuration

Parameter	Default value
Sensor type	MV
Loop control mode	Redundant
Lower Range Value	-20
Upper Range Value	120
Mid Range Value	70
PV Units	mV
SV Units	Degrees Celsius
TV Units	mV
QV Units	mV
Damping time constant	0.5 seconds
Damping for bump less transfer	0.5 seconds
Fault-indication	Up-scale
Write-protect	write disabled
Number of response preambles	7
Polling Address	0
Loop Current	Enable
Output mode	Analog

Table 18 Default Configuration

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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