

## **HART® 7.x Field Device Specification for Honeywell ST 700 Smart Pressure Transmitters**

**Document Number: 34-ST-00-120**

**Revision: 2.0**

**February 2013**

## **Copyrights, Notices and Trademarks**

---

**© Copyright 2013 by Honeywell, Inc.**

**February 2013, Revision 2.0**

While the information in this document is presented in good faith and believed to be accurate, Honeywell disclaims any implied warranties of merchantability and fitness for a particular purpose and makes no express warranties except as may be stated in the written agreement with and for its customers. In no event is Honeywell liable to anyone for any indirect, special, or consequential damages. The information and specifications in this document are subject to change without notice.

Honeywell, TDC 3000, SFC, SmartLine, PlantScape, Experion PKS, and TotalPlant are registered trademarks of Honeywell International Inc. Other brand or product names and service marks are the property of their respective owners.

**Honeywell Process Solutions  
1860 Rose Garden Lane**

**Phoenix, AZ 85027**

---

## Release Information

*HART® 7.x Field Device Specification*, Document # 34-ST-00-120, Rev. 1.0, January 2013

*HART® 7.x Field Device Specification*, Document # 34-ST-00-120, Rev. 2.0, February 2013

---

## References

The following list identifies publications that may contain information relevant to the information in this document.

*ST 700 Series HART/DE Option User Manual*, Document # 34-ST-25-47

*SmartLine Pressure Transmitter Quick Start Installation Guide*, Document # 34-ST-25-36

*ST 800 & ST 700 SmartLine Pressure Transmitter w/ HART Comms Safety Manual*, 34-ST-25-37

*ST 700 SmartLine Pressure Transmitter User Manual*, Document # 34-ST-25-44

*ST 700 SmartLine FF Transmitter with FOUNDATION Fieldbus Option Installation & Device Reference Guide*, Document # 34-ST-25-48

---

## Table of Contents

<b>Copyrights, Notices and Trademarks</b>	<b>ii</b>
<b>1 Introduction</b>	<b>1</b>
1.1 Scope .....	1
1.2 Purpose.....	1
1.3 Who should use this document? .....	1
1.4 Abbreviations and definitions .....	1
1.5 References.....	2
<b>2 Device Identification</b>	<b>2</b>
<b>3 Product Overview</b>	<b>3</b>
3.1 Transmitter .....	3
3.2 Communicator Purpose .....	5
<b>4 Product Interfaces</b>	<b>6</b>
4.1 Process Interface .....	6
4.1.1 Sensor Input Channel.....	6
4.1.2 Process Connections .....	6
4.2 Host Interface .....	7
4.3 Local Interfaces, Jumpers and Switches .....	9
4.3.1 Device Malfunction .....	10
4.4 Meter Display Options .....	11
<b>5 Dynamic Variables</b>	<b>12</b>
<b>6 Status Information</b>	<b>13</b>
6.1 Field Device Status .....	13
6.2 Extended Device Status .....	14
6.2.1 Command #48 – Additional Field Device Status .....	14
<b>7 Universal Commands</b>	<b>16</b>
<b>8 Common-Practice Commands</b>	<b>18</b>
8.1 Supported Common Practice Commands.....	18
8.2 Burst Mode .....	18
8.3 Catch Device Variable .....	18
<b>9 Device-Specific Commands</b>	<b>19</b>
9.1 Device Specific Commands .....	22
9.1.1 Command #130: Correct Input to URV.....	22
9.1.2 Command #131: Correct input at LRV .....	22
9.1.3 Command #133: Reset Corrects .....	23

---

9.1.4	Command #134: Read Transmitter Specifics .....	24
9.1.5	Command #138: Read Primary Variable Sensor Information.....	24
9.1.6	Command #139: Read Model Number – Key Number, Table I.....	25
9.1.7	Command #140: Read Model Number – Table II .....	25
9.1.8	Command #141: Read Model Number –Table III.....	26
9.1.9	Command #142: Read time in service, percent time in stress, service life remaining .	26
9.1.10	Command #144: Read last Time & Date for correct URV, correct LRV, zero trim....	26
9.1.11	Command #146: Write filter selection .....	27
9.1.12	Command #148: Read power fail counter and its timestamp .....	28
9.1.13	Command #149: Read ET and electronics temperature tracking values. ....	28
9.1.14	Command #150: Read ET lower tracking parameters.....	29
9.1.15	Command #151: Read differential PV UP tracking parameters.....	29
9.1.16	Command #152: Read MBT upper tracking parameters .....	30
9.1.17	Command #153: Read MBT lower tracking parameters .....	30
9.1.18	Command #154: Read SP and its tracking parameters.....	31
9.1.19	Command #155: Read current, minimum operating voltage and its timestamp.....	31
9.1.20	Command #156: Reset min terminal voltage and its time stamp .....	32
9.1.21	Command #157: Read M360 core temperature up tracking parameters .....	32
9.1.22	Command #158: Read M360 core temperature down tracking parameters .....	33
9.1.23	Command #159: Read AVDD max and time stamp .....	33
9.1.24	Command #160: Read AVDD min and time stamp .....	34
9.1.25	Command #161: Read sensor install date.....	34
9.1.26	Command #162: Read MB stress monitor and MB service life .....	35
9.1.27	Command #163: Write install date to sensor.....	35
9.1.28	Command #164: Read Model Number –Table IV .....	36
9.1.29	Command #165: Read Previous Time & Date for correct URV, correct LRV, zero trim	36
9.1.30	Command #166: Read current Time & Date for correct URV, correct LRV, zero trim	37
9.1.31	Command #167: Read current, last and previous reset correct Time & Date .....	37
9.1.32	Command #168: Read differential PV Down tracking parameters .....	38
9.1.33	Command #175: Read/Lock Write Protect Configuration .....	38
9.1.34	Command #176: Write/Change Write Protect Password .....	39

---

9.1.35 Command #177: Read Database ID .....	39
9.1.36 Command #178: Read Configuration history .....	40
9.1.37 Command #185: Read low flow cutoff mode.....	41
9.1.38 Command #186: Read sensor time in service.....	41
9.1.39 Command #187: Read HART-DE board firmware revision .....	42
9.1.40 Command #202: Write Display Screen configuration I .....	42
9.1.41 Command #203: Write Display View configuration II .....	44
9.1.42 Command #204: Write View configuration III .....	45
9.1.43 Command #205: Write Display View configuration IV.....	45
9.1.44 Command #206: Read Display View configuration I .....	46
9.1.45 Command #207: Read Display View configuration II .....	47
9.1.46 Command #208: Read Display View configuration III.....	48
9.1.47 Command #209: Read Display View configuration IV.....	48
9.1.48 Command #210: Write Display General configuration.....	49
9.1.49 Command #211: Read Display General configuration.....	50
9.1.50 Command #212: Read Display Firmware Version.....	51
9.1.51 Command #220: Read additional status .....	51
9.1.52 Command #221: Set Date/Time for calibration.....	52
9.1.53 Command #222: Read sensor firmware version number.....	52
9.1.54 Command #223: Read flow value for square-root functionality .....	53
9.1.55 Command #225: Low flow cutoff method selection .....	53
9.1.56 Command #226: Read user breakpoint in % flow for low flow cutoff .....	54
9.1.57 Command #227: Write user breakpoint in % flow for low flow cutoff .....	54
9.1.58 Command #228: Read maintenance flag.....	55
9.1.59 Command #229: Write maintenance flag .....	55
9.1.60 Command #230: Read tamper alarm settings.....	56
9.1.61 Command #231: Write Tamper alarm settings.....	56
9.1.62 Command #232: Reset executed attempts counter .....	57
9.1.63 Command #245: Read Output level Selection.....	57
9.1.64 Command #246: Write Output level Selection.....	58

---

<b>10</b>	<b>Tables</b>	<b>59</b>
10.1	Unit Codes .....	59
10.2	Unit Conversion .....	60
10.2.1	Pressure Units .....	60
10.2.2	Temperature Units .....	60
10.3	Command 220 details .....	61
<b>11</b>	<b>Performance</b>	<b>63</b>
11.1	Sampling Rates .....	63
11.2	Power-Up .....	63
11.3	Device Reset.....	63
11.4	Self Test .....	63
11.5	Command Response Times .....	64
11.6	Busy and Delayed-Response.....	64
11.7	Long Messages .....	64
11.8	Non-Volatile Memory .....	65
11.9	Modes.....	65
11.10	Write Protection .....	65
11.11	Damping.....	65
<b>Annex A.</b>	<b>Capability Checklist</b>	<b>66</b>
<b>Annex B.</b>	<b>Default Configuration</b>	<b>67</b>
<b>Annex C.</b>	<b>Revision History</b>	<b>72</b>

---

## List of Figures

Figure 1 Typical Communication Interface.....	4
Figure 2 Transmitter Operating Ranges.....	7
Figure 3 Transmitter 3-Screw Terminal Board and Grounding Screw .....	7
Figure 4 Three-Button Option .....	9
Figure 5 Locating the Failsafe Jumper .....	10

## List of Tables

Table 1 Abbreviations and Definitions .....	1
Table 2 Device Identification .....	2
Table 3 Process Connections .....	6
Table 4 Analog Output Values .....	8
Table 5 Available Display Characteristics .....	11
Table 6 List of Dynamic Variables .....	12
Table 7 Field Device Status .....	13
Table 8 Extended Device Status .....	14
Table 9 Additional Field Device Status .....	14
Table 10 Universal Commands .....	16
Table 11 Common Practice Commands.....	18
Table 12 Device Specific Commands.....	19
Table 13 Unit Codes supported .....	59
Table 14 Common Unit Conversions.....	60
Table 15 Temperature Units .....	60
Table 16 Command 220 details .....	62
Table 17 Sampling Rates .....	63
Table 18 Response Times .....	64
Table 19 Capability checklist .....	66
Table 20 Default Configuration .....	67



---

# 1 Introduction

## 1.1 Scope

The Honeywell Smart Pressure Transmitter, ST 700, 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

**Table 1 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

---

## 1.5 References

HART Field Communications Protocol Specification. HCF\_SPEC-12, Revision 7.4, dated 29 June 2012.

ST\_700\_HART\_DE\_34-ST-25-47\_13Dec12\_review: Document under review.

## 2 Device Identification

**Table 2 Device Identification**

<b>Manufacturer Name:</b>	Honeywell	<b>Model Name(s):</b>	ST700
<b>Manufacture ID Code:</b>	23 (17 Hex)	<b>Device Type Code:</b>	33 (21 Hex)
<b>HART Protocol Revision</b>	7.x	<b>Device Revision:</b>	1
<b>Number of Device Variables</b>	3		
<b>Physical Layers Supported</b>	FSK		
<b>Physical Device Category</b>	Transmitter, Non-DC-isolated Bus Device		

The Honeywell ST 700 is designed to meet hazardous area approvals.

Refer to the user manual on the available methods of protections for use in hazardous locations.

---

## 3 Product Overview

### 3.1 Transmitter

The ST 700 Pressure Transmitter comes in a variety of models for measurement applications involving one of these basic types of pressure:

- Differential Pressure
- Gauge Pressure
- Absolute Pressure

The transmitter measures the process pressure and transmits an output signal proportional to the measured variable over a 4 to 20 milliampere, two-wire loop. Its major components are electronics housing and a meter body as shown in Figure 1 for a typical differential pressure model transmitter.

The ST 700 can transmit its output in either an analog 4 to 20 milliampere format or a digital DE protocol 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 its meter body temperature as a secondary variable and the Static Pressure as a tertiary variable, which are both available as read-only parameters through the MC Toolkit when the transmitter is in its analog mode.

A configuration tool (Honeywell MCToolkit) is connected to the loop wiring of the ST 700 transmitter for direct communication with the transmitter. The handheld device communicates with the transmitter via the HART interface.

Note that multiple mounting configurations are possible and are fully described in the ST 700 Installation and User Manuals.

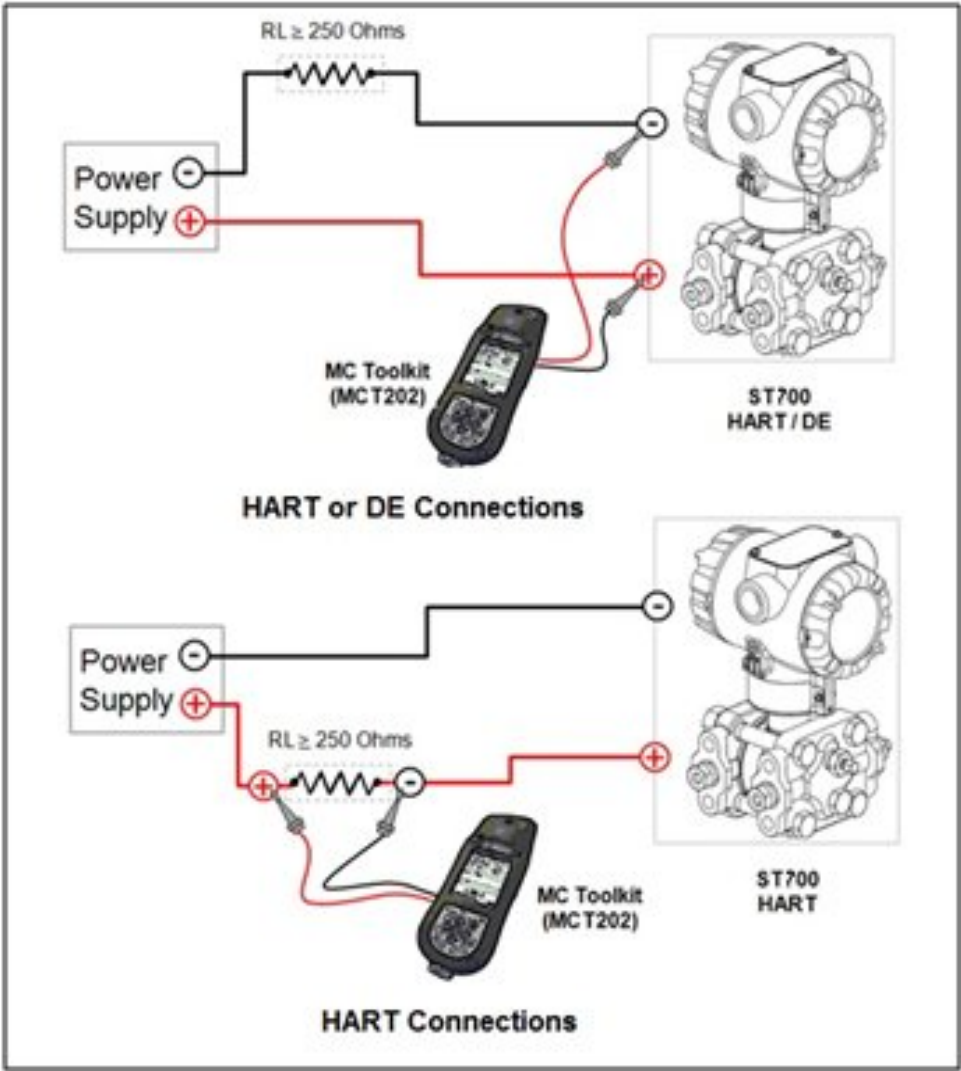


Figure 1 Typical Communication Interface

---

## 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 pressure 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

#### 4.1.1 Sensor Input Channel

The primary variable is the pressure measured by the pressure sensor. Pressure Sensors are housed in the meter body of the transmitter. The transmitter is piped to the process where the pressure is to be measured using a mechanical connection. Please refer to the User Manual for details on mounting and piping the transmitter to the process.

An additional internal sensor measures the meter body temperature that is provided to the user as the secondary variable and Static Pressure is available as the tertiary variable.

#### 4.1.2 Process Connections

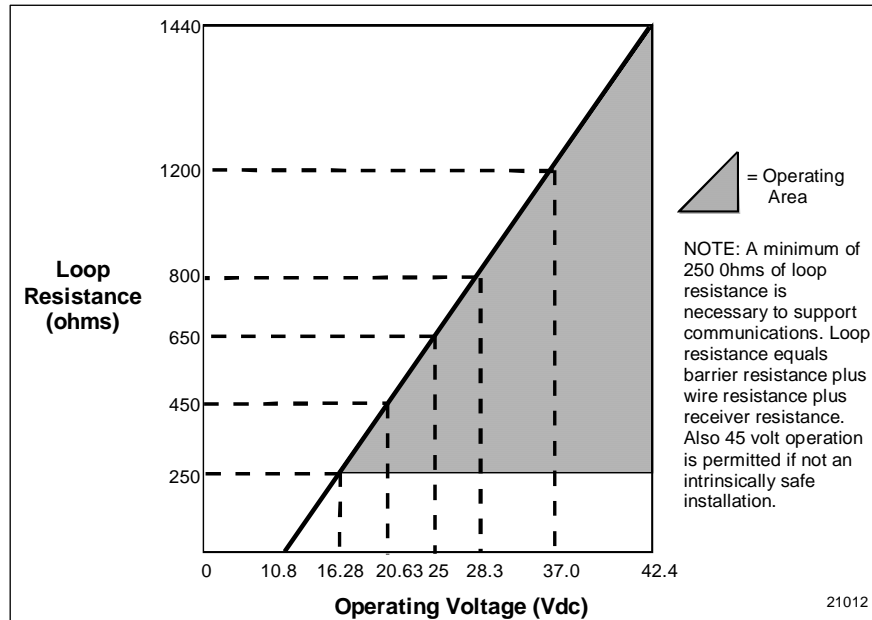
**Table 3 Process Connections**

Transmitter Type	Process Connection
Differential Pressure	<ul style="list-style-type: none"> <li>• Process heads with ¼ -inch NPT female connection.</li> <li>• Flange adapters and manifolds with 1/2-inch female connection are optional.</li> <li>• Models with pseudo flange on one side include 2- or 3-inch ANSI class 150 flange.</li> </ul>
Gauge Pressure	<ul style="list-style-type: none"> <li>• Process head with ½ -inch NPT female connection.</li> <li>• In-line ½ -inch NPT female connection (STG7xL).</li> <li>• In-line ½ inch NPT male</li> <li>• 9/16 AMINCO</li> <li>• DIN 19213</li> <li>• Process heads with ¼ -inch NPT female connection (STG7x4).</li> <li>• Flange adapters and manifolds with 1/2-inch female connections are optional (STG7x4).</li> <li>• 2-inch Sanitary Tri-Clamp (STG7xT)</li> <li>• Flush mount in 1-inch weld sleeve, with O-ring and locking bolt (STG7xP).</li> </ul>
Absolute Pressure	<ul style="list-style-type: none"> <li>• Process head with ½ -inch NPT female connection. (STA722, 740).</li> <li>• In-line ½ inch NPT Female</li> <li>• In-line ½ inch NPT male</li> <li>• 9/16 AMINCO</li> <li>• DIN 19213</li> </ul>
Flange Mounted Liquid Level	<ul style="list-style-type: none"> <li>• Small flange ½ -inch, 1-, 1 ½ - and 2-inch (STF7xT)</li> <li>• 2, 3- or 4-inch flange with flush or 2-, 4- or 6-inch extended diaphragm (See Table 14) on high pressure side.*</li> <li>• DN 50, 80, or 100 PN 40 flange with flush or 2, 4 or 6 inch extended diaphragm (See Table 14) on High Pressure Side*.</li> </ul>
Remote Diaphragm Seals	See Model Selection Guide for description of available Flanged, Threaded, Chemical Tee, Saddle, and Sanitary process connections.

\* Reference side has standard differential pressure process head.

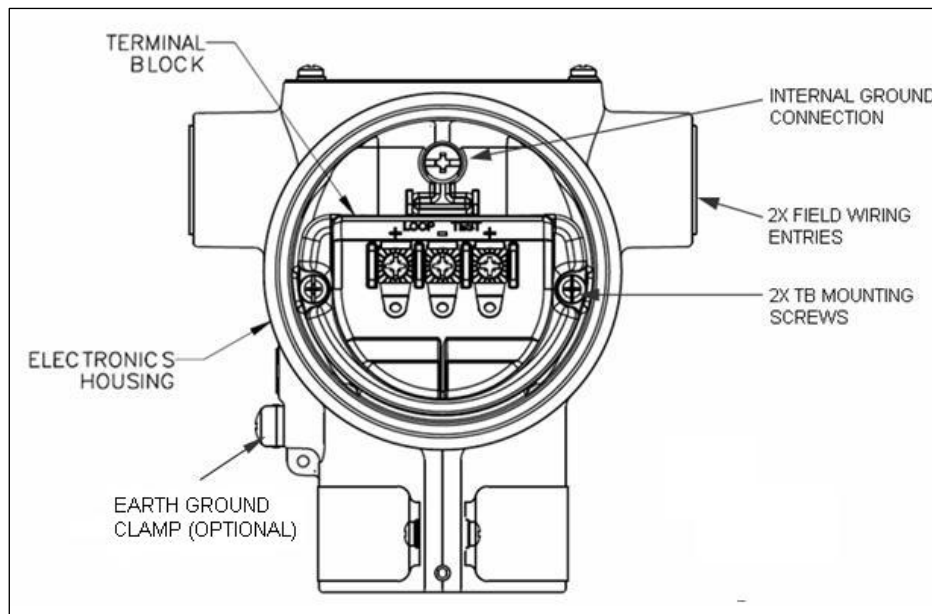
## 4.2 Host Interface

The transmitter is designed to operate in a two-wire power/current loop with loop resistance and power supply voltage within the operating range shown in figure 2.



**Figure 2 Transmitter Operating Ranges**

Loop wiring is connected to the transmitter by simply attaching the positive (+) and negative (-) loop wires to the positive (+) and negative (-) terminals on the Transmitter terminal block in the Electronics Housing shown earlier in figure..



**Figure 3 Transmitter 3-Screw Terminal Board and Grounding Screw**

As shown in figure 3, each Transmitter has an internal terminal to connect it to earth ground. Optionally, a ground terminal can be added to the outside of the Electronics Housing. While it is not necessary to ground the Transmitter for proper operation, doing so tends to minimize the possible effects of noise on the output signal and provides additional protection against lightning and static discharge. Optional lightning protection can be ordered for Transmitters that will be installed in areas highly susceptible to lightning strikes. When the optional lightning protection is installed in the Transmitter, the terminal block will be red.

**Table 4 Analog Output Values**

	Direction		Values (% of range)	Values (mA or V)
Linear over-range*	Classic	Down	-1.25 % $\pm$ 0.1 %	3.8 to 4.0 mA 0.95 to 1.0 V
		Up	105.0 % $\pm$ 0.1 %	20.0 to 20.8 mA 5.0 to 5.2 V
	NAMUR	Down	-1.25 % to $\pm$ 0.1 %	3.8 to 4.0 mA 0.95 to 1.0 V
		Up	103.125 % $\pm$ 0.1 %	20.0 to 20.5 mA 5.0 to 5.125 V
Device malfunction indication	Down: less than		- 1.25 %	3.58 mA
	Up: greater than		+ 105 %	21 mA
Maximum current				21.8 mA
Multi-Drop current draw				4.0 mA
Lift-off voltage **				10.8 V

\* Honeywell will offer the ST 700 HART transmitter with NAMUR compliant analog outputs, in addition to the "Classic" levels traditionally featured in the product.

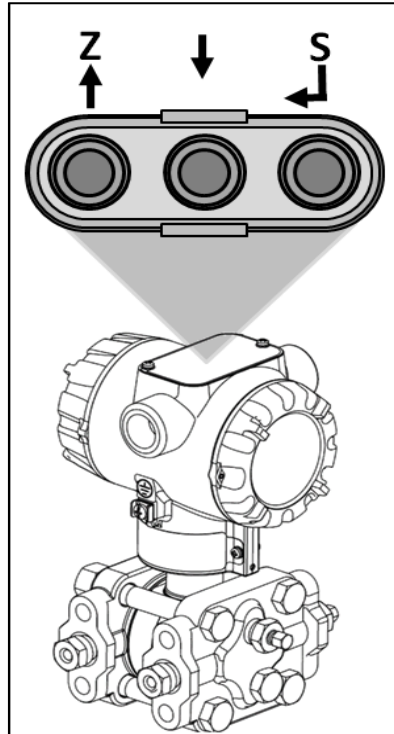
\*\* For the Lightning protection option, add 1 Volt (internal added 50 Ohm impedance).



---

### 4.3 Local Interfaces, Jumpers and Switches

The ST 700 three-button option provides a user interface and operation without the use of the MC Toolkit. Figure shows the location of the three-button option and the labels for each button.



**Figure 4 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↑)

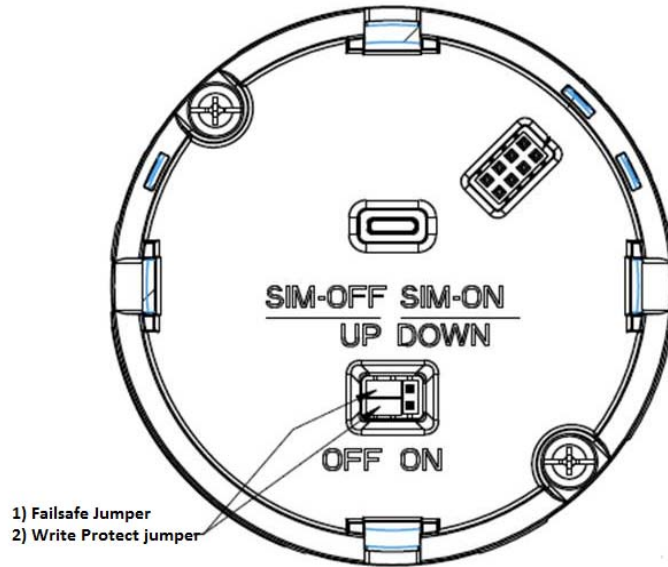
---

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 5 Locating the Failsafe Jumper**

### 4.3.1 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. ST 700 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 ST 700 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 a 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 ST 700 Pressure Transmitter offers two display options: Basic and Advanced; see Table 5.

**Table 5 Available Display Characteristics**

Basic Display	<ul style="list-style-type: none"><li>• Suitable for basic process needs</li><li>• 360o rotation in 90o Increments</li><li>• 2 lines, 16 characters</li><li>• Standard units-of-measurement: Pa, KPa, MPa, KGcm2, TORR, ATM, inH2O, mH2O, bar, mbar, inHg, FTH2O, mmH2O, MMHG, and PSI</li><li>• Diagnostic messaging</li><li>• Square root indication &amp; Out-of-range indication</li><li>• Supports optional 3-Button configuration</li></ul>
---------------	---

---

## 5 Dynamic Variables

Three Dynamic Variables are implemented.

**Table 6 List of Dynamic Variables**

<b>Process Variable</b>	<b>Meaning</b>	<b>Units</b>
<b>PV</b>	Pressure	InH2O, psi, Pa, inH2O @ 4degC, InHg, bar, kPa, mmH2O @ 4degC, ftH2O, mbar, torr, inH2O @ 60degF, mmH2O, g/Sqcm, atm, mmHg, Kg./Sqcm, Mpa
<b>SV</b>	Meter Body Temperature	Deg C, deg F, Rankine, Kelvin
<b>TV</b>	Static Pressure	Psi

The HART units' code for inH2O@60degF is 145 as well as 240.

---

## 6 Status Information

### 6.1 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 6.2.1.

**Table 7 Field Device Status**

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 6.2.1.
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 6.2.1).
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 <i>not</i> set bit 7 ("Field Device Malfunction").
1	Non-Primary Variable Out Of Limits	Set if the temperature calculated from the internal meter body temperature sensor is too high (greater than 125 deg C 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 6.2.1).
0	Primary Variable Out of Limits	Set if the pressure is greater than twice the Upper Range Limit (URL) of the device. When this status is asserted, the "More Status Available" flag is also set, and the specific failure is indicated as "Meter Body Overload" in the manufacturer specific status (see section 6.2.1).

## 6.2 Extended Device Status

The Extended Device Status byte has the following flags:

**Table 8 Extended Device Status**

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 6.2.1).
2-7	Undefined	

### 6.2.1 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 6.2. 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.

**Table 9 Additional Field Device Status**

Status Type	Bit	Command 48 Status
Critical status (Byte 1)	7	Unused
	6	Unused
	5	Sensor Comm Timeout
	4	Meter Body Critical Failure
	3	Electronic Module Diag Failure
	2	Config Data Corrupt
	1	Meter Body NVM Corrupt
	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	Sensor Over Temperature
	2	Meter Body Excess Correct
	1	Electronic Module Comm Failure
	0	Display Failure

---

Non critical status 2 (Byte 3)	7	Low Supply Voltage
	6	No DAC Calibration
	5	Tamper Alarm
	4	Meter Body Unreliable Comm
	3	Loop current noise
	2	AO Out of Range
	1	URV Set Error - Span Config Button
	0	LRV Set Error - Zero Config Button

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.

## 7 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:

**Table 10 Universal Commands**

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 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.



---

<b>Number</b>	<b>Name</b>	<b>Notes</b>
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.

---

## 8 Common-Practice Commands

### 8.1 Supported Common Practice Commands

The following common-practice commands are implemented:

**Table 11 Common Practice Commands**

Number	Name	Notes
33	Read Device Variables	Will return Device Variable 0 = PV (Pressure), Device Variable 1 = SV (Meter body Temperature) and Device Variable 2= TV (Static Pressure) when requested.
34	Write PV Damping Value	Accepts damping values between 0 and 32 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. Some ST 700 models support accurate operation in both the forward and reverse directions. Consult the Model Selection Guide for models that are compound characterized.
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
43	Set Primary Variable Zero	Sets present PV to zero
44	Write Primary Variable Units	Write PV units value
45	Trim Loop Current Zero	Trims loop current to 4mA
46	Trim Loop Current Gain	Trims loop current to 20mA
47	Write PV Transfer Function	Writes Transfer Function as Linear and Square root.
53	Write Device Variable Units	Writes Device Variable Units
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.

### 8.2 Burst Mode

This Field Device does not support Catch Device Variable.

### 8.3 Catch Device Variable

This Field Device does not support Catch Device Variable.

## 9 Device-Specific Commands

The following device-specific commands are implemented:

**Table 12 Device Specific Commands**

Number	Name	Notes
130	Write Upper Sensor Trim Point (Correct URV)	It trims the PV to URV.
131	Write Lower Sensor Trim Point (Correct LRV)	It trims the PV to LRV.
133	Reset Corrects	It resets all the user correct operations performed.
134	Read transmitter specifics	13 digit Meter-body bar code and display information
138	Read Primary Variable Sensor Information	Reads LRV and URV
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 and zero trim.	Reads Calibration records.
145	Read filter selection	Reads filter parameters.
146	Write filter selection	Write filter parameters.
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.
151	Read differential PV UP tracking parameters	Reads PV maximum tracking.
152	Read Meter Body Temperature upper tracking parameters	Reads Meter Body Temperature tracking (maximum)
153	Read Meter Body Temperature lower tracking parameters	Reads Meter Body Temperature tracking (minumum)
154	Read Static Pressure and its tracking parameters	Reads Static Pressure tracking
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 M360 core temperature up tracking parameters	Reads M360 temp up tracking.
158	Read M360 core temperature down tracking parameters	Reads M360 temp 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 sensor install date and time in service	Reads sensor installed date.
162	Read MB stress monitor and MB service life	Reads MB Stress and service life.
163	Write install date to sensor	Writes Sensor install date. 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, zero trim	Reads Calibration records.
166	Read current time and date for correct URV, correct LRV, zero trim	Reads Calibration records.
167	Read current, last and previous reset correct Time & Date	Reads Calibration records for Reset corrects.
168	Read differential PV Down tracking parameters	Reads PV down tracking.
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.
185	Read low flow cutoff mode	Reads Method selected for Low Flow cut-off.
186	Read sensor time in service	Reads Sensor time in Service.
187	Read f/w revision	It reads Communication board firmware rev. number.
202	Write Screen configuration I	Writes Screen Configuration I for display
203	Write Screen configuration II	Writes Screen Configuration II for display
204	Write Screen configuration III	Writes Screen Configuration III for display
205	Write Screen configuration IV	Writes Screen Configuration IV for display

206	Read Screen configuration I	Reads Screen Configuration I for display
207	Read Screen configuration II	Reads Screen Configuration II for display
208	Read Screen configuration III	Reads Screen Configuration III for display
209	Read Screen configuration IV	Reads Screen Configuration IV for display
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.
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
223	Read flow value	Read the % flow value.
225	Low flow cutoff method selection	Selects the method for Low flow cutoff.
226	Read user breakpoint	It reads the user break point for method 1 selected.
227	Write user breakpoint in % flow	It writes the user break point for method 1 selected.
228	Read the state of "Available for maintenance" flag	Reads the status of "Available for Maintenance" Flag
229	Enable "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.
245	Read Output level Selection	Reads whether device is in Classic mode or NAMUR?
246	Write Output level Selection	Write output mode as NAMUR or Classic.

---

## 9.1 Device Specific Commands

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

### 9.1.1 Command #130: Correct Input to URV

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

### 9.1.2 Command #131: Correct input at LRV

This command performs a calibration trim for the sensor. The calibration pressure applied to the transmitter is received with this command and the PV is calibrated to the applied URV 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
32	Error	Busy

## **9.1.3 Command #133: Reset Corrects**

This command removes the calibration and returns the performance to factory calibration. This function is useful as a diagnostic tool to get an indication of characterization performance, as well as 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
6	Error	Transmitter specific command error
7	Error	In Write Protect Mode
32	Error	Busy

### 9.1.4 Command #134: Read Transmitter Specifics

The command reads the 13 digit Meter-body bar code and display information.

#### ***Request Data Bytes***

Byte	Format	Description
None		

#### ***Response Data Bytes***

Byte	Format	Description
0	Enum	Device type
1-13	ASCII	Meter-body bar code
14	Enum	meter connected flag 00: Not Connected 01: Connected
15	Enum	meter type 01: Advanced display 02: Basic display

#### ***Command-Specific Response Codes***

Code	Class	Description
0	Success	No Command-Specific Errors

### 9.1.5 Command #138: Read Primary Variable Sensor Information

This command reads the PV related information for sensor.

#### ***Request Data Bytes***

Byte	Format	Description
None		

#### ***Response Data Bytes***

Byte	Format	Description
0	Enum	Sensor Limits/Min Span Units
1-4	IEEE Float	Upper Range Limit
5-9	IEEE Float	Lower Range Limit

#### ***Command-Specific Response Codes***

Code	Class	Description
0	Success	No Command-Specific Errors



---

### 9.1.6 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
7-27	Enum	Table 1 information

#### ***Command-Specific Response Codes***

Code	Class	Description
0	Success	No Command-Specific Errors

### 9.1.7 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

---

### 9.1.8 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

### 9.1.9 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

### 9.1.10 Command #144: Read last Time & Date for correct URV, correct LRV, zero trim

This command reads Last Time and Dates for correct URV, correct LRV and zero trim.

---

### ***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

## **9.1.11 Command #146: Write filter selection**

This command writes the filter selection.

### ***Request Data Bytes***

Byte	Format	Description
0	Enum	0x00 selects the optimal 50/60 Hz noise filter. 0x01 selects the fastest speed of response filter.

### ***Response Data Bytes***

Byte	Format	Description
0	Enum	0x00 selects the optimal 50/60 Hz noise filter. 0x01 selects the fastest speed of response filter.

### ***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
16	Error	Access Denied

---

### 9.1.12 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

### 9.1.13 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

---

### 9.1.14 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

### 9.1.15 Command #151: Read differential PV UP tracking parameters

This command reads differential PV UP tracking parameters.

#### ***Request Data Bytes***

Byte	Format	Description
None		

#### ***Response Data Bytes***

Byte	Format	Description
0-3	Float	PV max
4-7	Float	PV up accumulator
7-11	Float	PV up time stamp

#### ***Command-Specific Response Codes***

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

---

### 9.1.16 Command #152: Read MBT upper tracking parameters

This command reads MBT upper tracking parameters.

#### ***Request Data Bytes***

Byte	Format	Description
None		

#### ***Response Data Bytes***

Byte	Format	Description
0-3	Float	MBT max
4-7	Float	MBT max accumulator
8-11	Float	MBT max time stamp

#### ***Command-Specific Response Codes***

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

### 9.1.17 Command #153: Read MBT lower tracking parameters

This command reads MBT lower tracking parameters.

#### ***Request Data Bytes***

Byte	Format	Description
None		

#### ***Response Data Bytes***

Byte	Format	Description
0-3	Float	MBT min
4-7	Float	MBT min accumulator
8-11	Float	MBT min time stamp

#### ***Command-Specific Response Codes***

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

---

### 9.1.18 Command #154: Read SP and its tracking parameters

This command reads SP and its tracking parameters.

#### ***Request Data Bytes***

Byte	Format	Description
None		

#### ***Response Data Bytes***

Byte	Format	Description
0-3	Float	SP max
4-7	Float	SP max accumulator
8-11	Float	SP max time stamp

#### ***Command-Specific Response Codes***

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

### 9.1.19 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

---

### 9.1.20 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

### 9.1.21 Command #157: Read M360 core temperature up tracking parameters

This command reads the M360 (Sensor's Microprocessor) core temperature up tracking parameters.

#### ***Request Data Bytes***

Byte	Format	Description
None		

#### ***Response Data Bytes***

Byte	Format	Description
0-3	Float	M360 core temp max
4-7	Float	max accumulator
7-11	Float	max time stamp

#### ***Command-Specific Response Codes***

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



---

### 9.1.22 Command #158: Read M360 core temperature down tracking parameters

This command reads the M360 core temperature down tracking parameters.

#### ***Request Data Bytes***

Byte	Format	Description
None		

#### ***Response Data Bytes***

Byte	Format	Description
0-3	Float	M360 core temp min
4-7	Float	min accumulator
7-11	Float	min time stamp

#### ***Command-Specific Response Codes***

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

### 9.1.23 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	Float	max time stamp

#### ***Command-Specific Response Codes***

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

---

### 9.1.24 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

### 9.1.25 Command #161: Read sensor install date

This command reads the sensor install date.

#### ***Request Data Bytes***

Byte	Format	Description
None		

#### ***Response Data Bytes***

Byte	Format	Description
0-4	Enum	install date

#### ***Command-Specific Response Codes***

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

---

### 9.1.26 Command #162: Read MB stress monitor and MB service life

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

#### ***Request Data Bytes***

Byte	Format	Description
None		

#### ***Response Data Bytes***

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

#### ***Command-Specific Response Codes***

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

### 9.1.27 Command #163: Write install date to sensor

This command write install date to sensor.

#### ***Request Data Bytes***

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

#### ***Response Data Bytes***

Byte	Format	Description
0	Enum	Date
1	Enum	Month
2	Enum	Year
3-4	Enum	Minutes

#### ***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

Code	Class	Description
16	Error	Access Restricted
32	Error	Busy

### 9.1.28 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

### 9.1.29 Command #165: Read Previous Time & Date for correct URV, correct LRV, zero trim

This command reads Previous Time and Dates for correct URV, correct LRV and zero trim.

#### ***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

---

### 9.1.30 Command #166: Read current Time & Date for correct URV, correct LRV, zero trim

This command reads Current Time and Dates for correct URV, correct LRV and zero trim.

#### ***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

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

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

#### ***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

### 9.1.32 Command #168: Read differential PV Down tracking parameters

This command reads the differential PV Down tracking parameters.

#### ***Request Data Bytes***

Byte	Format	Description
None		

#### ***Response Data Bytes***

Byte	Format	Description
0-3	Float	DP min
4-7	Float	DP min accumulator
8-11	Float	DP min time stamp

#### ***Command-Specific Response Codes***

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

### 9.1.33 Command #175: Read/Lock Write Protect Configuration

This command Read/Lock Write Protect Configuration.

#### ***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

Code	Class	Description
16	Error	Access Denied
32	Error	Busy

### 9.1.34 Command #176: Write/Change Write Protect Password

This command Write/Change Write Protect Password.

#### ***Request Data Bytes***

Byte	Format	Description
0	Enum	Unlock(0x00) / Change(0x03)
1-4	ASCII	Password

#### ***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

### 9.1.35 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

## **9.1.36 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 fourth 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



---

### 9.1.37 Command #185: Read low flow cutoff mode

This command reads low flow cutoff mode

#### ***Request Data Bytes***

Byte	Format	Description
None		

#### ***Response Data Bytes***

Byte	Format	Description
0	Enum	0x00 – Method 1 0x01 – Method 2

#### ***Command-Specific Response Codes***

Code	Class	Description
0	Success	No Command-Specific Errors

### 9.1.38 Command #186: Read sensor time in service

This command reads the Sensor Time in Service.

#### ***Request Data Bytes***

Byte	Format	Description
None		

#### ***Response Data Bytes***

Byte	Format	Description
0-3	Float	Sensor Time in Service

#### ***Command-Specific Response Codes***

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

### 9.1.39 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	

#### ***Command-Specific Response Codes***

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

### 9.1.40 Command #202: Write Display Screen configuration I

This command Write Screen Configuration I.

#### ***Request Data Bytes***

Byte	Format	Description
0	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
1	Enum	Screen Format None- 00 PV - 01 PV & Bar Graph - 02 PV & Trend — 03
2	Enum	Identifies which of the process variables in the publish message is displayed in the view – parameter index
3-4	Enum	Unit Code (Refer Table 11.1)
5	Enum	Number of digits to display after the decimal point.

6	Enum	PV Processing. 0 – NONE 1 – CONVERT EU. 2 – LINEAR 3 – SQRT
7	Trend duration	Duration of a trend screen in hours. Valid range 1 – 24

### **Response Data Bytes**

Byte	Format	Description
0	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
1	Enum	Screen Format None- 00 PV - 01 PV & Bar Graph - 02 PV & Trend – 03
2	Enum	Identifies which of the process variables in the publish message is displayed in the view – parameter index
3-4	Enum	Unit Code (Refer Table 11.1)
5	Enum	Number of digits to display after the decimal point.
6	Enum	PV Processing. 0 – NONE 1 – CONVERT EU. 2 – LINEAR 3 – SQRT
7	Trend duration	Duration of a trend screen in hours. Valid range 1 – 24

### **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

Code	Class	Description
7	Error	Transmitter In Write Protect Mode
16	Error	Access Denied
32	Error	Busy

### 9.1.41 Command #203: Write Display View configuration II

This command Write Screen Configuration II.

#### ***Request Data Bytes***

Byte	Format	Description
0	Enum	View OID
1-4	Float	fCustomEuHi
5-8	Float	fCustomEuLo
10-13	Float	fLowLimit (Trend, Bar chart)
14-17	Float	fHighLimit (Trend, Bar chart)

#### ***Response Data Bytes***

Byte	Format	Description
0	Enum	View OID
1-4	Float	fCustomEuHi
5-8	Float	fCustomEuLo
10-13	Float	fLowLimit (Trend, Bar chart)
14-17	Float	fHighLimit (Trend, Bar chart)

#### ***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

---

### 9.1.42 Command #204: Write View configuration III

This command Write Screen Configuration III.

#### ***Request Data Bytes***

Byte	Format	Description
0	Enum	View OID
1-18	Float	CustomUnits

#### ***Response Data Bytes***

Byte	Format	Description
0	Enum	View OID
1-18	Enum	CustomUnits

#### ***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

### 9.1.43 Command #205: Write Display View configuration IV

This command Write Screen Configuration IV.

#### ***Request Data Bytes***

Byte	Format	Description
0	Enum	View OID
1-32	Enum	CustomTag

#### ***Response Data Bytes***

Byte	Format	Description
0	Enum	View OID
1-32	Enum	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

#### **9.1.44 Command #206: Read Display View configuration I**

This command reads view configuration I.

##### **Request Data Bytes**

Byte	Format	Description
0	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	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

1	Enum	Screen Format None- 00 PV - 01 PV & Bar Graph - 02 PV & Trend - 03
2	Enum	Identifies which of the process variables in the publish message is displayed in the view – parameter index
3-4	Enum	Unit Code (Refer Table 11.1)
5	Enum	Number of digits to display after the decimal point.
6	Enum	PV Processing. 0 – NONE 1 – CONVERT EU. 2 – LINEAR 3 – SQRT
7	Trend duration	Duration of a trend screen in hours. Valid range 1 – 24

### ***Command-Specific Response Codes***

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

## **9.1.45 Command #207: Read Display View configuration II**

This command reads the View configuration II

### ***Request Data Bytes***

Byte	Format	Description
0	Enum	Screen Number

### ***Response Data Bytes***

Byte	Format	Description
0	Enum	View OID
1-4	Float	fCustom Eu Hi
5-8	Float	fCustom Eu Low
10-13	Float	fLow Limit (Trend, Bar chart)
14-17	Float	fHigh Limit (Trend, Bar chart)

---

### ***Command-Specific Response Codes***

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

#### **9.1.46 Command #208: Read Display View configuration III**

This command reads the View configuration III

##### ***Request Data Bytes***

Byte	Format	Description
0	Enum	Screen number

##### ***Response Data Bytes***

Byte	Format	Description
0	Enum	View OID
1-18	Enum	Custom Units

##### ***Command-Specific Response Codes***

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

#### **9.1.47 Command #209: Read Display View configuration IV**

This command reads the View configuration IV.

##### ***Request Data Bytes***

Byte	Format	Description
0	Enum	Screen Number

##### ***Response Data Bytes***

Byte	Format	Description
0	Enum	View OID
1-32	Enum	Custom Tag

##### ***Command-Specific Response Codes***

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



### 9.1.48 Command #210: Write Display General configuration

This command Writes the General Display Configuration

#### ***Request Data Bytes***

Byte	Format	Description
0	Enum	Language: English—0 French—1 German—2 Spanish—3 Itaian—4 Russian—5 Chinese—6 Japanese—7
1	Enum	Rotation Time (3 to 30 Seconds.)
2-5	ASCII	Password
6	Enum	Display Contrast (0-9)

#### ***Response Data Bytes***

Byte	Format	Description
0	Enum	Language: English—0 French—1 German—2 Spanish—3 Itaian—4 Russian—5 Chinese—6 Japanese—7
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

Code	Class	Description
16	Error	Access Denied
32	Error	Busy

### 9.1.49 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
0	Enum	Language: English—0 French—1 German—2 Spanish—3 Italian—4 Russian—5 Chinese—6 Japanese—7
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

---

### 9.1.50 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

### 9.1.51 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

---

### 9.1.52 Command #221: Set Date/Time for calibration

This command 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

### 9.1.53 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

---

### 9.1.54 Command #223: Read flow value for square-root functionality

This command reads the 4 byte float value for the flow calculation when the device is configured for square root mode.

#### ***Request Data Bytes***

Byte	Format	Description
None		

#### ***Response Data Bytes***

Byte	Format	Description
0-3	Float	Flow value

#### ***Command-Specific Response Codes***

Code	Class	Description
0	Success	No Command-Specific Errors

### 9.1.55 Command #225: Low flow cutoff method selection

This command helps in selecting the method for Low Flow Cutoff.

#### ***Request Data Bytes***

Byte	Format	Description
0	Enum	0x00 - Method 1 0x01 - Method 2

#### ***Response Data Bytes***

Byte	Format	Description
0	Enum	0x00 - Method 1 0x01 - Method 2

#### ***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

---

### 9.1.56 Command #226: Read user breakpoint in % flow for low flow cutoff

This command reads the user breakpoint in % flow for low flow cut-off.

#### ***Request Data Bytes***

Byte	Format	Description
None		

#### ***Response Data Bytes***

Byte	Format	Description
0-3	Float	Flow value in %.

#### ***Command-Specific Response Codes***

Code	Class	Description
0	Success	No Command-Specific Errors

### 9.1.57 Command #227: Write user breakpoint in % flow for low flow cutoff

This command Writes user breakpoint in % flow for low flow cutoff.

#### ***Request Data Bytes***

Byte	Format	Description
0-3	Float	User configured breakpoint in % flow for low cut off feature

#### ***Response Data Bytes***

Byte	Format	Description
0-3	Float	User configured breakpoint in % flow for low cut off feature

#### ***Command-Specific Response Codes***

Code	Class	Description
0	Success	No Command-Specific Errors
3	Error	Passed parameter too large
4	Error	Passed parameter too small
5	Error	Too Few Data Bytes Received
7	Error	Transmitter In Write Protect Mode
32	Error	Busy

---

### 9.1.58 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

### 9.1.59 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

### 9.1.60 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

### 9.1.61 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



Code	Class	Description
5	Error	Too Few Data Bytes Received
7	Error	Transmitter In Write Protect Mode
16	Error	Access Denied
32	Error	Busy

### 9.1.62 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
32	Error	Busy

### 9.1.63 Command #245: Read Output level Selection

This command reads whether the output level is Classic or NAMUR..

#### ***Request Data Bytes***

Byte	Format	Description
None		

#### ***Response Data Bytes***

Byte	Format	Description
0	Enum	0x00: Classic mode 0x01: NAMUR mode

#### ***Command-Specific Response Codes***

Code	Class	Description
------	-------	-------------

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

### 9.1.64 Command #246: Write Output level Selection

This command writes output level selection as NAMUR or Classic mode.

#### ***Request Data Bytes***

Byte	Format	Description
0	Enum	0x00: Classic mode 0x01: NAMUR mode

#### ***Response Data Bytes***

Byte	Format	Description
0	Enum	0x00: Classic mode 0x01: NAMUR mode

#### ***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	Transmitter In Write Protect Mode
32	Error	Busy

---

## 10 Tables

### 10.1 Unit Codes

	Unit	HART Code
0	Custom	0
1	Inch of Water (68 Deg. F)	1
2	Inch of Mercury (0 Deg. C)	2
3	Feet of Water (68 Deg. F)	3
4	Millimeter of Water (68 Deg. F)	4
5	Millimeter of Mercury (0 Deg. C)	5
6	PSI	6
7	Bar	7
8	Millibar	8
9	gram-force/cm <sup>2</sup>	9
10	Kgf/cm <sup>2</sup>	10
11	Pascals	11
12	Kilopascal	12
13	Torr	13
14	Atmosphere	14
15	Mega-pascal	237
16	Inch of Water (39.2 Deg. F)	238
17	Millimeters of Water (4 Deg. C)	239
18	Inch of Water (60 Deg. F)	145
19	Degrees Celsius	32
20	Degrees Fahrenheit	33
21	Degrees Rankin	34
22	Kelvin	35
23	Gallons per Minute	16
24	Gallons per Hour	136
25	Liters per Minute	17
26	Liters per Hour	138
27	Percent	57

Table 13 Unit Codes supported

## 10.2 Unit Conversion

### 10.2.1 Pressure Units

Internally, the transmitter uses inches H<sub>2</sub>O at 39.2 degF (4 degC) for the pressure variable. Conversions to the other supported units are made using the following equations:

"To" unit	Formula
inH <sub>2</sub> O 68 degF	$P_{\text{inH}_2\text{O}68\text{F}} = 1.00177 * P_{\text{inH}_2\text{O}39\text{F}}$
inHg 0 degC	$P_{\text{inH}_2\text{O}0\text{C}} = 0.073555 * P_{\text{inH}_2\text{O}39\text{F}}$
ftH <sub>2</sub> O 68 degF	$P_{\text{ftH}_2\text{O}68\text{F}} = 0.083483 * P_{\text{inH}_2\text{O}39\text{F}}$
mmH <sub>2</sub> O 68 degF	$P_{\text{mmH}_2\text{O}68\text{F}} = 25.445313 * P_{\text{inH}_2\text{O}39\text{F}}$
mmHg 0 degC	$P_{\text{mmH}_2\text{O}0\text{C}} = 1.868286 * P_{\text{inH}_2\text{O}39\text{F}}$
Psi	$P_{\text{psi}} = 0.036126 * P_{\text{inH}_2\text{O}39\text{F}}$
Bars	$P_{\text{bar}} = 0.002491 * P_{\text{inH}_2\text{O}39\text{F}}$
Mbar	$P_{\text{mbar}} = 2.490845 * P_{\text{inH}_2\text{O}39\text{F}}$
g/cm <sup>2</sup>	$P_{\text{gcm}^2} = 2.539917 * P_{\text{inH}_2\text{O}39\text{F}}$
kg/cm <sup>2</sup>	$P_{\text{kgcm}^2} = 0.00254 * P_{\text{inH}_2\text{O}39\text{F}}$
Pascals	$P_{\text{P}} = 249.082031 * P_{\text{inH}_2\text{O}39\text{F}}$
kilopascals	$P_{\text{KP}} = 0.249081 * P_{\text{inH}_2\text{O}39\text{F}}$
Torr	$P_{\text{P}} = 1.868286 * P_{\text{inH}_2\text{O}39\text{F}}$
Atm	$P_{\text{atm}} = 0.002458 * P_{\text{inH}_2\text{O}39\text{F}}$
megapascals	$P_{\text{MP}} = 0.000249 * P_{\text{inH}_2\text{O}39\text{F}}$
inH <sub>2</sub> O 4 degC	$P_{\text{inH}_2\text{O}4\text{C}} = 1.0 * P_{\text{inH}_2\text{O}39\text{F}}$
mmH <sub>2</sub> O 4 degC	$P_{\text{mmH}_2\text{O}4\text{C}} = 25.399902 * P_{\text{inH}_2\text{O}39\text{F}}$
inH <sub>2</sub> O 60 degF	$P_{\text{inH}_2\text{O}60\text{F}} = 1.000976 * P_{\text{inH}_2\text{O}39\text{F}}$

**Table 14 Common Unit Conversions**

### 10.2.2 Temperature Units

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

"To" unit	Formula
Fahrenheit	$T_{\text{F}} = (T_{\text{C}} * 1.8) + 32$
Rankine	$T_{\text{K}} = T_{\text{C}} + 273.15$
Kelvin	$T_{\text{R}} = (T_{\text{C}} + 273.15) * 1.8$

**Table 15 Temperature Units**

### 10.3 Command 220 details

Type	Bit	Command 220 bit status
DAC Failure (HART/DE) (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/DE) (BYTE2)	7	Unused
	6	Unused
	5	Unused
	4	Unused
	3	Unused
	2	Program Flow Failure
	1	ROM Failure
	0	RAM Failure
Display (HART/DE) (BYTE3)	7	Unused
	6	Unused
	5	Unused
	4	Unused
	3	Unused
	2	Display Config Data Corrupt
	1	Display Comm Timeout
	0	Unused
DAC Info (HART/DE) (BYTE4)	7	Unused
	6	Unused
	5	Unused
	4	Unused
	3	Unused
	2	Unused
	1	Low Transmitter supply
	0	Control Word Write Fault

Sensor (BYTE5)	7	Program Flow Failure
	6	ROM Failure
	5	RAM Failure
	4	Suspect Input
	3	PV/SV/TV Bad
	2	Char Table CRC Fault
	1	Meter Body Failure
	0	Low sensor supply
Sensor (BYTE6)	7	Sensor RAM Database Fault
	6	PV Out of Range
	5	TV Bad
	4	SV Bad
	3	PV Bad
	2	Charact Calc Error
	1	Excess Span Correction
	0	Excess Zero 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 16 Command 220 details**

---

## 11 Performance

### 11.1 Sampling Rates

Typical sampling rates are shown in the following table.

Primary pressure sensor sample	50 per second
Internal (meter-body) sensor sample (MB Temp)	1.67 per second
PV digital value calculation	50 per second
SV digital value calculation	1.67 per sec
Analog output update	50 per second

**Table 17 Sampling Rates**

### 11.2 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 = 1-2 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.

### 11.3 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 11.2). 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.

### 11.4 Self Test

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

---

## 11.5 Command Response Times

Minimum	15.1778ms
Typical	67ms
Maximum	180.5778ms

**Table 18 Response Times**

## 11.6 Busy and Delayed-Response

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.

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.

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.

Delayed-response is not used.

## 11.7 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.



---

## 11.8 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.

## 11.9 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.

## 11.10 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.

## 11.11 Damping

The damping is available from 0 to 32 seconds in HART.

## Annex A. Capability Checklist

Manufacturer, model and revision	Honeywell Intl (23)., ST 700, rev.1
Device type	1 (Transmitter)
HART revision	7.x
Device Description available?	Yes
Number and type of sensors	3(three internal)
Number and type of actuators	0
Number and type of host side signals	1: 4 - 20mA analog
Number of Device Variables	3
Number of Dynamic Variables	3
Map able Dynamic Variables?	No
Number of common-practice commands	15
Number of device-specific commands	65
Bits of additional device status	24 (8 bytes are used)
Alternative operating modes?	No
Burst mode?	No
Capture Device Variables?	No
Write-protection?	Yes

**Table 19 Capability checklist**

---

## Annex B. Default Configuration

Parameter	Default value
Sensor Type	Differential Pressure
Lower Range Value	0
Upper Range Value	depends on the model (400 inH <sub>2</sub> O@4C for a 400" DP, for example)
PV Units	Inches of H <sub>2</sub> O @ 4 deg C
SV Units	Degrees Celsius
TV Units	PSI
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 20 Default Configuration**

---

## Annex C. Revision History

Document Revision	Date	Device Revision	DD Revision	Description
0.1	20 <sup>th</sup> December 12	1	1	Preliminary version - for HART 7.x device.
0.2	9 <sup>th</sup> January 13	1	1	Added reference document as ST 700 User Manual.

---

## Sales and Service

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

### ASIA PACIFIC

(TAC) [hfs-tac-support@honeywell.com](mailto:hfs-tac-support@honeywell.com)

Australia  
Honeywell Limited  
Phone: +(61) 7-3846 1255  
FAX: +(61) 7-3840 6481  
Toll Free 1300-36-39-36  
Toll Free Fax:  
1300-36-04-70

China – PRC - Shanghai  
Honeywell China Inc.  
Phone: (86-21) 5257-4568  
Fax: (86-21) 6237-2826

Singapore  
Honeywell Pte Ltd.  
Phone: +(65) 6580 3278  
Fax: +(65) 6445-3033

South Korea  
Honeywell Korea Co Ltd  
Phone: +(822) 799 6114  
Fax: +(822) 792 9015

### EMEA

Phone: + 80012026455 or +44  
(0)1202645583  
FAX: +44 (0) 1344 655554  
Email: (Sales) [sc-cp-apps-salespa62@honeywell.com](mailto:sc-cp-apps-salespa62@honeywell.com) or  
(TAC) [hfs-tac-support@honeywell.com](mailto:hfs-tac-support@honeywell.com)

### NORTH AMERICA

Honeywell Process Solutions,  
Phone: 1-800-423-9883  
Or 1-800-343-0228  
Email: (Sales) [ask-ssc@honeywell.com](mailto:ask-ssc@honeywell.com) or  
(TAC) [hfs-tac-support@honeywell.com](mailto:hfs-tac-support@honeywell.com)

### SOUTH AMERICA

Honeywell do Brazil & Cia  
Phone: +(55-11) 7266-1900  
FAX: +(55-11) 7266-1905  
Email: (Sales) [ask-ssc@honeywell.com](mailto:ask-ssc@honeywell.com) or (TAC)  
[hfs-tac-support@honeywell.com](mailto:hfs-tac-support@honeywell.com)

*Specifications are subject to change without notice.*

# Honeywell

Honeywell Process Solutions  
1860 West Rose Garden Lane  
Phoenix, Arizona 85027  
[www.honeywellprocess.com](http://www.honeywellprocess.com)

34-ST-00-120 Rev.2  
February 2013  
©2013 Honeywell International Inc.